Assessing the Association of Nativity and Acculturation to Fast Food Restaurant Use and Its Relationship to Metabolic Risk Factors among US Blacks with Afro-Caribbean Ethnicity

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Objectives: This investigation among Afro-Caribbean adults in the United States Virgin Islands (USVI) examined whether acculturation and preference for dining out accounted for variation by nativity in the frequency of fast food restaurant use, and assessed the relationship of fast food restaurant use to body weight and insulin resistance.

Methods: A randomly selected sample of 679 Afro-Caribbean adults (aged ≥20 years), including 436 who were foreign-born and 243 who were native-born, were recruited on the island of St. Croix, USVI. Information on demographic characteristics, level of acculturation and dietary practices were obtained from participants by questionnaire. Fasting blood samples, which were measured for glucose and insulin, and anthropometric measurements were also collected from participants. Insulin resistance was estimated by the homeostasis model assessment (HOMA). Relationships between variables were assessed with analysis of variance and logistic regression analyses.

Results: In bivariate analyses, birth in the USVI, younger age, being single, greater preference for dining out and higher levels of education and acculturation were significantly ($P<.05$) associated with fast food restaurant use. In multivariate logistic regression analyses, birth in the USVI, younger age and preference for dining out were independently associated with frequent (≥ 2 days/week) fast food restaurant use. The mean level of HOMA insulin resistance among participants increased significantly with more frequent use of fast food restaurants.

Conclusions: Among Afro-Caribbean adults in the USVI, fast food restaurant use is positively associated with insulin resistance and varies by nativity, but acculturation does not account for this variation. (*Ethn Dis*. 2014;24[4]:438–443)

Key Words: Afro-Caribbean, Acculturation, Insulin Resistance, Fast Food Restaurant Use

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Introduction

It has been reported that compared to non-Hispanic Whites, the relative risk for developing and dying from a number of chronic diseases varies by nativity among Black Americans,[1] with foreign-born Blacks having a more favorable risk profile than those born in the United States.[2] This variability in disease risk by nativity has intriguing potential as a focus of research to identify factors responsible for the persistence of health disparities among Black Americans, but has been underutilized for that purpose.[3] For instance, among persons of Mexican origin in the United States, research that examined the association of acculturation (cumulative exposure to host country environment and culture) to disease outcomes has been extensively used to identify the reasons why, compared to non-Hispanic Whites, nativity influences the risk of developing some chronic diseases in this ethnic group.[4–7] In contrast, there are few data available in the scientific literature exploring the association of acculturation to chronic disease risk or outcomes among Black immigrants and their subsequent generations in the United States.

Impetus for assessing ethnic and nativity differences in disease frequency in the US Black population has recently come from the National Survey of American Life (NSAL) which compares health-related data from cohorts of English-speaking Blacks of Caribbean origin (Afro-Caribbean) and African Americans (descendants of US slaves).[8] One NSAL report suggests that the frequency of chronic illnesses among second generation Afro-Caribbean persons converges to the higher rate seen among African Americans.[9] The reasons for the generational increase in the frequency of chronic disease outcomes among Afro-Caribbean persons living in the United States are not clear. As with Mexican-Americans,[4–7] acculturation-related research could be used to address these gaps in knowledge and might help unmask the promoter and protective factors that contribute to making chronic disease related outcomes among US-born, and foreign-born Afro-Caribbean persons, more and less like that of African Americans, respectively.

The adoption of dietary behaviors similar to that of African Americans, as a result of acculturation, may be that one factor which contributes to the higher prevalence of chronic illnesses among US-born compared to foreign-born Afro-Caribbean persons. For instance, there is evidence that acculturation is positively correlated with the frequency of fast food restaurant use among some ethnic immigrant groups in the United States,[10] and the frequency of fast food restaurant use among African Americans is associated with chronic disease risk factors such as excess weight gain[11] and insulin resistance.[12] Thus, one might hypothesize that second generation Afro-Caribbean persons are likely to be more acculturated, use fast food restaurants more frequently and experience greater impact from the related chronic disease risk factors than foreign-born Afro-Caribbean persons. However, we are not aware of a prior study among Afro-Caribbean persons residing in US jurisdictions that assessed either the association of acculturation to fast food restaurant use and possible antecedents, such as preference for dining out, or examined the relationship of fast food restaurant use to metabolic risk factors. Therefore, to add to the limited litera-

ture in this area, we undertook the current investigation among Afro-Caribbean adults in the United States Virgin Islands (USVI) to assess: 1) whether the frequency of fast food restaurant use among Afro-Caribbean persons born in a US jurisdiction is more similar to that of African Americans than foreign-born Afro-Caribbean persons; 2) if acculturation and the preference for dining out are related, and if either can account for variation by nativity in the frequency of fast food restaurant use; and 3) if similar to African Americans, fast food restaurant use is associated with body weight and insulin resistance among Afro-Caribbean persons.

METHODS

Participants

We examined data for Afro-Caribbean persons aged ≥20 years without a history of diabetes who participated between 1995 and 2000 in a population-based cross-sectional study to identify cultural and lifestyle variables associated with type 2 diabetes and cardiovascular disease risk factors in the USVI.[13] Participants in our study were randomly selected and recruited on the island of St. Croix, USVI from households that were randomly chosen from the list of homes (98% of all homes) served by the Virgin Islands Water and Power Authority. In total, there were 781 Afro-Caribbean participants who completed the data collection process at the close of the study on December 31, 2000. These individuals represent 77% of the 1011 Afro-Caribbean persons who had been recruited for participation in the study. Of the 781 Afro-Caribbean participants, a total of ninety-seven had been diagnosed with diabetes mellitus. These diabetic individuals were excluded from our study because the level of fasting insulin, a key study variable, can be influenced by the treatment for diabetes mellitus. With the exclusion of the diabetic participants, and an additional 5 participants for whom information on the frequency of fast food restaurant use was missing, a final sample of 679 Afro Caribbean participants, including 466 women and 213 men, were available for our assessment.

Our study sample of 679 Afro-Caribbean participants included 436 immigrants and 243 USVI-born persons. The higher proportion of immigrants in the sample was due to a wave of migration of Afro-Caribbean peoples to the USVI, which began in 1960, and resulted in a 200% increase in the population of the territory by 1990.[14] Lifestyle patterns in the USVI at the time of data collection were similar to the US mainland, and use of fast food restaurants as venues to purchase away from home meals was a regular aspect of everyday life in the territory.

Data Collection

Prior to all data collection, participants signed consent forms that were approved by the Biomedical Institutional Review Board of the University of Pittsburgh, where the study coordinating center was located. Demographic data were collected from study participants by an in-home interview and additional interviews were conducted at the study clinic. At the study clinic, fast food restaurant use was assessed by a single question that asked about the number of days each week the participant ate at a fast food restaurants (like McDonalds, Burger King, Wendy's, etc.). The categories of responses for this question were <1, 1, 2, and ≥3. Each participant's preference for dining outside the home was assessed by responses to the statement, "I prefer to eat out (dining out at restaurants, etc.) to cooking at home." Responses to this item were scored on a 5-point Likert scale.

Acculturation was determined using a measure of the extent to which Afro-Caribbean persons living in the USVI had adopted values and practices more characteristic of the US mainland.[15] This acculturation measure has been shown to have good content and construct validity and a test-retest reliability coefficient of .80.[15] In our sample, the acculturation measure had a Cronbach's alpha of .70.

Each participant was measured for weight and height, and a venous blood specimen was drawn into a 10 mL blood collection tube without anticoagulant after an overnight fast of 10 to 12 hours. Height and weight were measured using standardized techniques.[16] Weight was measured using a balance-beam scale with participants standing without shoes in the middle of the platform with head erect and eyes looking straight ahead. Height was measured with a 200 cm aluminum ruler fastened vertically against the wall. With the participant standing without shoes on a level floor, feet together and his/her back against the vertical ruler on a level floor , a carpenters square was brought down snugly, but not tightly, on the top of the participant's head and the height was recorded to the nearest centimeter. The body mass index (BMI), an estimate of overall body size, was calculated for each participant as weight in kilograms (kg) divided by height in meters squared (m^2).[17] Serum samples from the clotted blood specimens were used to determine the participant's fasting levels of serum glucose and insulin. The fasting serum samples were analyzed for glucose at the Juan F. Louis Hospital Clinical Laboratory on St. Croix, Virgin Islands with a Kodak Ektachem 700 Analyzer (Eastman Kodak Company, Rochester, NY) using a glucose oxidase colorimetric method. Insulin was measured at the Heinz Nutrition Laboratory at the University of Pittsburgh (USA), using a radioimmune assay procedure (Kit Model #HI14K, Linco Research Inc., St. Charles, Missouri, USA,). Cross-

reactivity with proinsulin was under .02%. Insulin resistance was estimated by the Homeostasis Model Assessment (HOMA-IR), according to the following formula: (fasting glucose (mmol/L) × fasting insulin (μU/mL))/22.5.[18]

Statistical Analyses

Statistical analyses were performed using Statistical Analysis System (SAS) software.[19] Differences between two frequencies were assessed with the Chi-Square (X^2) or Fisher's Exact Test and the difference between two means was evaluated with the *t*-test. Spearman correlation analyses were used to examine the interrelationships of acculturation, the preference for dining out, demographic factors (age and sex) and socioeconomic factors (income and education) within the two nativity groups (USVI-born and foreign-born) of participants. Test for trends in frequencies of dichotomous study variables (eg, sex and nativity) and variable means (eg, age, weight, BMI, HOMA-IR) across categories of fast food restaurant use were performed with maximum likelihood analysis of variance statistics in the CATMOD procedure and with least means squares analysis of variance in the SAS GLM procedure, respectively. The means for body weight, BMI and HOMA-IR were adjusted for age and sex when compared across categories of fast food restaurant use. The logarithm of the HOMA-IR score was used in analyses because of the skewed distribution of insulin values.

Odds ratios with 95% confidence intervals from multivariate logistic regression analyses were used to determine if study variables found to be significantly related to fast food restaurant use in bivariate analyses were independently associated with frequent use of fast food restaurants. For these analyses, the dependent variable, frequent fast food restaurant use, was defined as use of fast food restaurants ≥two times per week. This definition was selected based on the finding, from a study of a representative sample of Black and White adults in the United States, that participants used fast food restaurants an average of two days per week.[12] In the logistic models, frequent fast food restaurant use was coded as a dummy variable where persons who used fast food restaurants ≥2 days/week were coded as 1 vs those who didn't who were coded as 0. Two logistic models were examined to assess the extent to which preference for dining out accounted for the relationship of acculturation to frequent fast food restaurant use. The first logistic model (Model 1) included the acculturation variable along with other study variables but excluded the preference for dining out variable. The second model (Model 2) included both the acculturation and preference for dining out variables together with other variables.

RESULTS

Compared to the foreign-born (FB) participants, the USVI-born participants had a higher mean acculturation score (USVI, 11.12 ± 2.39 vs FB, 10.69 ± 2.29; $P=.025$) and a higher preference for dining out score (USVI, 2.14 ± .78 vs FB, 1.98 ± .69; $P=.005$). USVI-born participants were also slightly younger (USVI mean age = 41.7 ± 17.0 years. vs FB mean age = 48.6 ± 13.5; $P<.001$), and more likely to report being single never married (USVI, 47.3% vs FB, 19.7%; $P<.001$), female (USVI, 73.7% vs FB, 65.8%; $P=.035$) and to have graduated from high school (USVI, 77.4% vs FB, 55.3%; $P<.001$) (data not shown).

Results of Spearman correlation analyses showed that the preference for dining out variable was significantly and positively correlated with acculturation among USVI-born ($R= .16$; $P=.0135$) and FB ($R=.27$; $P<.0001$) participants. In both groups, there were no significant correlations of age, sex, single status, education and household income with either the acculturation score or the preference for dining out score.

Table 1 shows the trends in demographic variables, socioeconomic factors, acculturation and preference for dining out across categories of increasing number of days per week when participants used a fast food restaurant. More frequent use of fast food restaurants was significantly associated with younger age, higher educational attainment, being single, birth in the USVI, higher acculturation score and greater preference for dining out.

The proportion of participants that used fast food restaurants frequently (≥ 2 days/week) was significantly ($P<.05$) higher for USVI-born than foreign born participants (USVI-born = 44.0% vs. foreign-born = 19.3%). Table 2 shows the results from multivariate logistic regression analyses that were used to determine which of the significant factors from Table 1 was independently associated with the frequent use of fast food restaurants. In Model 1 (Table 2), which did not include the preference for dining out variable, younger age, birth in the USVI, and acculturation score were significantly associated with eating at a fast food restaurant ≥two days per week. In Model 2, the preference for dining out variable was added to the model and it too was independently associated with eating at a restaurant ≥two days per week. However, the addition of the preference for dining out variable to the model attenuated the significance of the association of acculturation to fast food restaurant use.

Table 3 shows the age- and- sex-adjusted mean values for body weight, BMI and HOMA insulin resistance by frequency of fast food restaurant use. These data indicate that there was a significant positive trend in mean insulin resistance score with increasing use of fast food restaurants. However, neither body weight nor BMI showed a significant pattern of increase or decrease in relation to fast food restaurant use.

Table 1. Means (SE) and frequency (%) for demographic variables, socioeconomic factors, acculturation and preference for eating out by level of fast food restaurant use among Afro-Caribbean adults living in the United States Virgin Islands, 1995–2000

	Days per Week Eating at A Fast Food Restaurant				
	<1 Day	1 Day	2 Days	≥3 Days	P[a]
n	488	124	39	28	----
Age, years	48.7 (.66)	41.0 (1.32)	35.7 (2.35)	39.5 (2.77)	<.001
Sex - male, %	30.9	31.4	33.3	35.7	.579
Marital status – single, %	23.9	40.3	51.3	50.0	<.001
Place of birth – USVI, %	27.8	50.0	64.1	71.4	<.001
Education <HS, %	39.3	32.2	28.2	21.4	.013
Household income ≥$25,000, %	29.1	24.1	28.2	32.1	.816
Acculturation	10.7 (.10)	10.9 (.20)	11.6 (.37)	11.5 (.43)	.012
PDO score	1.97 (.03)	2.14 (.06)	2.44 (.12)	2.15 (.14)	<.001

USVI, US Virgin Islands; HS, high school; PDO, preference for dining out.
[a] *P* for significance of the test for a trend in the change of the variable mean or percentage across increasing category of days per week eating at a fast food restaurant.

DISCUSSION

A significant positive association of US acculturation with the frequency of fast food restaurant use was found among both USVI-born and foreign-born Afro-Caribbean adults in our study. This finding is consistent with results from prior studies that have examined the relationship of acculturation to dietary behaviors in other ethnic groups that migrate to the United States.[10,20,21] An additional insight provided by our study is that, independent of nativity and socioeconomic status, a positive relationship exists between the level of US acculturation and the preference for dining out among Afro-Caribbean adults. Further, the study results also suggest that the relationship of acculturation to fast food restaurant use in this ethnic group may be mediated by the preference for dining out. These observations are consistent with the hypothesis that, as Afro-Caribbean persons experience greater exposure to US culture and environment, their preference for dining out increases and this in turn contributes to more frequent use of fast food restaurants.

Irrespective of place of birth, younger age was a determinant of more frequent fast food restaurant use among participants in our study. The inverse association of age with fast food restaurant use has also been reported for African Americans.[22,23] This finding indicates that population level efforts that seek to moderate the frequency of fast food restaurant use in the USVI should place special emphasis on youth and young adults.

The proportion of USVI-born Afro-Caribbean participants in our study who used fast food restaurants frequently (>2 days/week) was similar to published findings for African Americans[22] but lower than the corresponding proportion among foreign-born study participants. Given their higher level of

Table 2. Odds ratios[a] with 95% confidence intervals from multivariate logistic regression analyses relating study variables to the likelihood of using a fast food restaurant ≥2 times per week while excluding Model 1 and including Model 2 the preference for dining out score, among Afro-Caribbean adults living in the United States Virgin Islands, 1995–2000

	Model 1			Model 2		
Variables	OR	95% CI	*P*	OR	95% CI	*P*
Age, years[b]	.97	.95–.98	<.001	.97	.95–.98	<.001
Marital status-single[c]	1.14	.72–1.77	.572	1.15	.73–1.83	.542
Education <high school[d]	1.06	.71–1.59	.757	1.08	.71–1.63	.713
Nativity-USVI-born[e]	2.61	1.78–3.81	<.001	2.57	1.74–3.80	<.001
Acculturation[f]	1.08	1.00–1.17	.043	1.05	.97–1.14	.215
Preference for dining out[g]	-----	-----	-----	1.32	1.03–1.69	.024

[a] Odds ratios represent the odds that a given level of each variable is associated with eating at fast food restaurants ≥2 days per week compared to eating at fast food restaurants <2 days per week.
[b] Odds ratio associated with each additional year of age.
[c] Odds ratio for single status (*n*=201) compared to the referent group marital status other (*n*=478).
[d] Odds ratio for educational level <high school (*n*=249) compared to the referent group ≥high school (*n*=430).
[e] Odds ratio for birth in the USVI (*n*=243) compared to the referent group birth elsewhere in the Caribbean (*n*=436).
[f] Odds ratio associated with each incremental increase in acculturation score.
[g] Odds ratio associated with each incremental increase in preference for dining out score.

Table 3. Age- and sex-adjusted means (SE) for metabolic variables by level of fast food restaurant use among Afro-Caribbean adults living in the US Virgin Islands, 1995–2000

	Days per Week Eating at A Fast Food Restaurant				
	<1 Day	1 Day	2 Days	≥3 Days	P[a]
n	488	124	39	28	----
Weight[b]	79.26 (.78)	81.18 (1.56)	80.57 (2.82)	85.22 (3.27)	.658
BMI[c]	28.64 (.28)	29.47 (.55)	29.09 (1.00)	29.64 (1.62)	.669
HOMA Score[d]	1.29 (.02)	1.37 (.05)	1.56 (.92)	1.50 (.12)	.005

[a] *P* for significance of the test for a trend in the change of the variable mean across increasing category of days per week eating at a fast food restaurant.
[b] Weight is measured in kilograms.
[c] BMI, body mass index measured as kg/m2.
[d] HOMA, Homeostasis Model Assessment insulin resistance (logarithm of HOMA score shown).

acculturation compared to foreign-born Afro-Caribbean participants, it is not surprising that the frequency of fast food restaurant use among USVI-born Afro-Caribbean participants would be more similar to that of African Americans. However, it is noteworthy that the significant association of place of birth with the frequency of fast food restaurant use in our study was independent of acculturation, socioeconomic status and other psychosocial factors. This suggests that other factors associated with place of birth, which either promote fast food restaurant use among USVI-born persons or, conversely, protect against fast food restaurant use among foreign-born Afro-Caribbean persons, remain to be elucidated.

Both the neighborhood density of fast food restaurants and the frequency of use of these establishments are positively associated with bodyweight and BMI among African Americans.[23–25] In contrast, our study of Afro-Caribbean adults did not find a significant relationship of fast food restaurant use to either body weight or BMI. One possible reason for the lack of an association between these variables is that the frequency of fast food restaurant use is too imprecise a measure to detect dietary-related effects on body weight in the study population. For instance, a study of Afro-Caribbean youth on the island of Jamaica, found a significant association of overweight with the weekly consumption of sugar sweetened beverages but not with the more general assessment of number of times per week eating fast food.[26] It is also possible that fast food restaurant use might not make an independent contribution to weight gain in every population. Among the Afro-Caribbean adults in our study, mean BMI at the lowest frequency of fast food restaurant use was already at a level that would be characterized as overweight. Therefore, factors other than fast food restaurant use appear to be the important contributors to weight gain among Afro-Caribbean adults in the USVI.

Similar to findings for African Americans and other ethnic groups,[12,27,28] more frequent use of fast food restaurants was associated with higher age- and- sex-adjusted levels of HOMA insulin resistance among Afro-Caribbean adults in our study. Several studies have shown that the frequent use of fast food restaurants is associated with increased intake of total dietary fat, saturated fat and poly unsaturated fat.[21,29,30] In both animal and observational human studies diets high in fat are implicated in the development of hyperinsulinemia and insulin resistance.[31] Thus, it is generally believed that the high fat content of many fast foods is a key reason for the association of fast food restaurant use with insulin resistance.[32] These findings, coupled with the association of fast food restaurant use with other chronic disease risk factors including low HDL cholesterol and elevated triglycerides[27] highlight the importance of targeting fast food restaurant use in intervention efforts to improve health outcomes among Black Americans.

Our study has notable strengths and limitations. A strength is the data were collected from a population-based random sample with a robust participation rate, which allows for generalization of the study results to the wider population of Afro-Caribbean adults living in the USVI. The cross-sectional design of the study is a limitation as it precludes inferences about causality based on variable associations. Another limitation is that the study used a single measure of the frequency of fast food restaurant use which may be too imprecise to detect associations with the body weight variables used in the study.

In summary, with respect to the frequency of fast food restaurant use, Afro-Caribbean persons born in the USVI are more similar to African Americans than foreign-born Afro-Caribbean persons. As with African Americans, frequent fast food restaurant use among Afro-Caribbean adults in the USVI is associated with insulin resistance, a metabolic risk factor for chronic diseases like diabetes and cardiovascular disease.[33] Therefore, it may be worthwhile to include efforts to reduce the frequency of fast food restaurant use in interventions that seek to improve the overall health among Blacks born in the USVI or US mainland. Such preventive efforts would benefit from additional research among foreign-born Afro-Caribbean persons to elucidate normative

and attitudinal factors that contribute to their relatively lower level of fast food restaurant use.

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Manuscript draft: Tull, Taylor
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