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Length of Residence and Cardiovascular Health among Afro-Caribbean Immigrants in New York City

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Abstract

Cardiovascular disease (CVD) disproportionately affects non-Hispanic blacks (NHB) in the United States (U.S.). Afro-Caribbean (AC) immigrants comprise over 50% of the immigrant black population and are critical in understanding the health trajectories of blacks in the U.S. We assessed the relationship between length of residence (proxy measure for acculturation) and cardiovascular health (CVH) based on the American Heart Association's (AHA) seven ideal cardiovascular health components among AC immigrants in New York City (NYC). CVH scores were categorized into poor/intermediate CVH (0–3 components) or ideal CVH (4 components). Multivariable logistic regression was used to examine the association between length of residence in the U.S. and poor/intermediate CVH. In adjusted models, the odds of poor/intermediate CVH were significantly higher for Guyanese (OR = 3.51; 95% CI 1.03–11.95) and Haitian immigrants (OR = 8.02; 95% CI 1.88–34.12) residing in the U.S. for ≥ 10 years than for those living in the U.S. for < 10 years. Length of residence was not significantly associated with CVH among Jamaican immigrants. We found evidence of ethnic differences in the association between acculturation and CVH among AC immigrants in a major metropolitan city. Culturally tailored interventions are needed to improve the CVH of AC immigrants as they become integrated into the U.S., with special consideration of country of birth.

Keywords

Cardiovascular health; Afro-Caribbean; Immigrants; Acculturation

Introduction

Cardiovascular disease (CVD) remains the leading causes of death in the U.S. [1]. The American Heart Association (AHA) proposed the concept of “cardiovascular health” (CVH)

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to account for an individual's total CVD risk profile using seven health metrics [1] including fasting plasma glucose, total cholesterol, blood pressure, body mass index (BMI), physical activity, diet, and smoking status [1]. Further, the AHA placed special emphasis on the significance of addressing disparities among underserved minority groups to expand its preventative goals [1]. Blacks in the U.S. have a significantly higher prevalence of CVD and known risk factors than any other racial/ethnic minority group [2]. By 2035, it is projected that blacks will have the highest rates of CVD in relation to other races [3]. Additionally, poor CVH is more common in Blacks in the U.S. [4, 5].

Blacks in the U.S. are a heterogeneous group comprised of African Americans, African, and Afro-Caribbean (AC) immigrants [6]. AC immigrants are those who trace their ancestry to both Africa and the Caribbean (West Indies) but are not Hispanic [7]. There are approximately four million AC immigrants in the U.S. who make up more than half of the immigrant black population [8, 9]. Although AC immigrants share similarities such as historical legacies of slavery and European colonialism [7], they differ in language, immigrant selectivity, migration patterns, economic and sociocultural backgrounds which influence health outcomes [10–13].

Jamaica has the largest number of black immigrants in the U.S. from the English-speaking Caribbean [9]. Jamaican immigration to the U.S. significantly increased in the late twentieth century and primarily included individuals with family ties in the U.S. and those seeking work visas; however, the most recent waves of immigrants from Jamaica include those in skilled and professional classes [8, 14]. Similar to Jamaican immigrants, Guyanese immigrants have migrated to the U.S. to avoid economic hardship in their native country; and have typically been comprised of a mixture of skilled, professional class, and domestic workers [15]. However, while approximately 91% of Jamaica's population is of African ancestry [16], the Guyanese population mainly consists of individuals of East Indian (44%) or African (30%) descent [17]. In contrast to Jamaica and Guyana, Haitian immigration patterns to the U.S. have mainly been propelled by poverty, political instability, and violence in their home country [18]. While the earliest Haitian immigrants to the U.S. were middle-class professionals, after the passage of the 1965 Immigration Act, there was a marked increase in Haitian immigrants via sponsored visas, immigrants of low-socioeconomic status, refugees, and political asylees [18, 19]. Consequently, sociocultural differences such as their low human capital (educational attainment, financial resources) and linguistic barriers (French/Creole speaking) posed significant challenges towards social and economic mobility in the U.S. [20, 21].

Segmented assimilation theory describes the divergent pathways of immigrants and their children into mainstream U.S. society. The theory asserts that assimilation is largely dependent on immigrant socioeconomic characteristics and the social context of the host country [22]. Briefly, segmented assimilation theory proposes that immigrants may take three possible paths to assimilation. First, immigrants may assimilate into a middle class also known as *straight line assimilation*. This pathway assumes that immigrant groups that possess high levels of human capital are favorably incorporated into the host society and have upward socioeconomic mobility in the U.S. society [22]. The second pathway proposes an assimilation into an urban underclass or *downward assimilation* where immigrants

integrate into economically disadvantaged neighborhoods and have limited upward social mobility [22, 23]. The third variant to segmented assimilation theory is *selective assimilation* which may also propel immigrants into middle-class America rather than an “underclass” society. This middle-class status is attained through maintaining traditional cultural immigrant values, education, and strong sense of community that exist in ethnic communities [22]. Immigrants and their children are offered a social safety net that includes access to moral and material resources that safeguard against downward assimilation [22]. For AC immigrants, their different national/ethnic identities and human capital may account for different rates of acculturation in the U.S. society. Given the geographical, social economic and cultural diversity that exist between these countries, segmented assimilation theory may serve as a theoretical rationale for examining these groups separately.

A growing body of literature has focused on the health status of AC immigrants in the U.S. relative to U.S. born blacks and shown variations in physical and psychological health outcomes [24–38]. Most studies have revealed a health advantage for Afro-Caribbean blacks on various physical health indicators [24, 26, 31, 33] over U.S. born blacks. For example, Griffith and colleagues found that Caribbean born blacks had the best physical health outcomes, followed by African Americans and U.S. born Caribbean blacks [24]. Davis and Huffman observed that U.S. born blacks were more likely to have more CVD risk factors in comparison to AC immigrants [33]. Read and Emerson found Caribbean blacks reported the second-best overall health following African immigrants; U.S. born blacks reported the worst health [31]. Fang et al. also found that cardiovascular mortality rates were highest among southern and northeastern U.S. born blacks in comparison to AC immigrants [26].

Despite collectively displaying a health advantage on physical health outcomes, an aggregated analysis of AC immigrants may conceal important health differentials among this subgroup [11, 12, 31, 39, 40]. Consequently, among the few studies that examined health outcomes among Afro-Caribbean subgroups, Carlisle reported ethnic subgroup differences for chronic cardiovascular conditions among foreign born AC immigrants and U.S. born AC immigrants [40]. Foreign born AC immigrants in this study had a lower likelihood of reporting chronic cardiovascular conditions relative to their U.S. born counterparts [40]. Similarly, Carlisle also found ethnic subgroup differences in the prevalence of chronic cardiovascular conditions among three AC immigrant subgroups (Jamaicans, Trinidadians, and Haitian) [39]. Likewise, Hamilton and Hummer found variations in reported health across national origin among black immigrants from major sending countries to the U.S. [12].

Length of residence has consistently been used as a proxy for acculturation [41, 42]. Acculturation refers to psychological and cultural changes that occur as a result of persistent and first hand contact with two or more cultural groups [43, 44]. Longer stay in the U.S. may propel continuous contact with sociocultural and environmental factors that negatively affect immigrants’ health [45, 46]. The proxy measure assumes greater length of residence is associated with greater acculturation, thus adopting a more “western” (and potentially unhealthy) lifestyle and loss of health behaviors associated with immigrants’ home countries [47, 48]. Length of residence therefore, importantly denotes how social contexts and migration processes affect health.

Prior studies examining the impact of length of residence on CVH have found mixed results, though the majority of studies suggest a negative association of length of residence and CVH. For example, greater length of residence was associated with increased prevalence of diabetes, overweight/obesity, and diabetes mellitus among a diverse population of immigrants in the U.S. [41]. Similar studies that examined U.S. immigrants from different regional groups found that immigrants with 15 years of residence in the U.S. had increased odds of diabetes, [49] obesity, [50] and high cholesterol [50] prevalence compared to those with < 15 years duration in the U.S. Among a sample of Hispanics, higher prevalence rates of obesity were found more acculturated immigrants compared to less acculturated immigrants [47]. Among Asian immigrants, longer length of residence was associated with increased smoking rates [51, 52], better dietary practices, [53, 54] and increased physical activity [55]. Also, a cross-sectional sample of West African immigrants residing 10 years in the U.S. had higher odds of hypertension and obesity among males and females compared to recent immigrants (< 10 years) [56].

In contrast, other studies have yielded null associations between length of residence and CVH outcomes among immigrants in the U.S. For instance, among a sample of South Asian immigrants there was no association found between length of residence and diabetes, hypertension, high cholesterol, and smoking [53]. A study conducted among Chinese Americans in New York City found no association with BMI, fasting blood glucose, and serum cholesterol [57]. Nguyen and colleagues also found no support for an association between length of residence and obesity [58]. Few studies have shown beneficial effects of acculturation on CVH behaviors. For instance, among a sample of Latina women, low acculturated women were less likely to engage in leisure-time physical activity in comparison to more acculturated Latina women [59]. It was also found that older Hispanics residing in the U.S. for 20 years had greater levels of macronutrient intakes relative to their counterparts residing in the U.S. < 20 years.

There are significant gaps in knowledge on the association between acculturation and CVH among ACs in the U.S. Further, AHA metrics have not been broadly applied to the AC immigrant population. Building upon previous work [12, 39, 40] we sought to assess the relationship between length of residence in the U.S. and CVH for a population of AC immigrant subgroups. We hypothesize that ACs with greater length of residence (> 10 years) will have a higher prevalence of poor/intermediate CVH than those who have resided in the U.S. for a shorter duration (< 10 years).

Methods

This study used data from the New York City (NYC) Department of Health and Mental Hygiene Community Healthy Survey (CHS) 2010–2014. The CHS is a cross-sectional telephone survey of approximately 9000 randomly sampled NYC non-institutionalized residents 18 years. Data from the random sample are weighted to properly represent the NYC population [60]. The CHS utilized a computer-assisted telephone interviewing system (CATI), and interviews were conducted in English, Spanish, Russian, Mandarin, and Cantonese. The CHS captures neighborhood and citywide estimates of a variety of chronic diseases and behavioral risk factors of the NYC population. One adult is randomly selected

from the household to complete the survey then consent information is received [61]. The 2010–2014 combined years' analyses are weighted to the NYC adult residential population as per Census 2010 and the 2011–2013 American Community Survey. Institutional Review Board was not required for this study as the data were de-identified and provided under a data use agreement.

Sampling and Weighting Methodology

A stratified random sampling technique is employed to produce citywide and neighborhood estimates. The sampling frame was constructed from a list of telephone numbers provided by a commercial vendor. One adult is randomly selected from the household to complete the survey then consent to participate is received. The 2010–2014 combined years' analyses are weighted to the NYC adult residential population as per Census 2010 and the 2011–2013 American Community Survey. The CHS uses weights so that over-or under-represented groups in the survey sample better represent the actual proportions of the target population. The weightings also consider probability of participant selection and non-response bias. Weightings for the CHS are created using the “raking” or “iterative proportional fitting” so demographic characteristics such as age, sex, and race/ethnicity are accurately represented in the survey. During this process, as each demographic characteristic is included, the weights are fitted until population representativeness is achieved. Detailed information of the CHS methodology is published elsewhere [60].

Study Population and Sample

The study population consisted of AC immigrant respondents who reported their race as non-Hispanic Blacks (NHB) and place of birth as Guyana ($n = 369$), Haiti ($n = 291$), or Jamaica ($n = 1031$) in the CHS. These three subgroups provide the largest samples of AC immigrants and also reflect the demographic distribution of ACs living in New York City [62]. Respondents' place of birth was ascertained from the question “Where were you born? Please tell me the country” in the CHS.

Covariates for this study included participant age (18–44, 45–64, 65+ years), sex (male, female), education (high school graduate or less education, some college or higher), employment status (employed, not in the labor force/unemployed), health insurance (insured, uninsured), and healthcare access. Healthcare access was determined from the question “Was there a time in the past 12 months when you needed medical care but did not get it?” Responses were dichotomized into yes or no. Responses were reverse coded to satisfy having healthcare access or not.

Calculation of Cardiovascular Health

CVH was assessed from CHS self-report data using methodology adapted from previous studies [63, 64]. CVH incorporated seven metrics (fasting glucose, total cholesterol, blood pressure, body mass index (BMI), physical activity, diet and smoking status) as per AHA's definition, but adapted based on CHS items. Diabetes, high cholesterol, and high blood pressure were self-reported as “yes” or “no” on the CHS survey and were categorized as “not ideal” = 0 or “ideal” = 1, respectively. The survey responses from the CHS did not capture information on “intermediate” category for each health factor. Hence, each

behavioral factor and BMI were also categorized as “ideal” or “not ideal” as adapted from previous studies [63, 64]. BMI was categorized as not ideal (overweight/obese) and ideal (underweight/normal). For physical activity, “ideal” or “not ideal” was determined from a self-reported “yes” or “no” respectively on CHS survey question: “during the past 30 days, other than your regular job, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?” Regarding dietary health, respondents who reported having consumed ≥ 5 servings of fruit and/or vegetable yesterday were classified as “ideal”. Respondents who reported < 5 servings were classified as “not ideal”. For smoking status, respondents who reported never having smoked at least 100 cigarettes in their lifetime were considered “ideal” and those who reported to be current or former smokers were considered “not ideal”. The seven metrics were summed together and could range from 0 to 7.

For the purpose of this study the overall CVH score was further grouped into three categories: “ideal” where the overall CVH score was ≥ 4; “intermediate” where the overall CVH score ranged from 2 to 3; and “poor” where the overall CVH score ranged from 0 to 1. Overall CVH score cutoff points were consistent with previous studies [65]. After conducting cross tabulations of length of stay and CVH as three categories (ideal, intermediate, and poor), there was a paucity of individuals in the poor category. Therefore, intermediate and poor categories were combined into a single group for more stable estimates for each country of birth group. This CVH variable was analyzed as a dichotomous variable coded as 0 for “ideal” CVH and 1 for “poor/intermediate” CVH.

Independent Variables

Main Independent Variable: Length of Residence in the U.S.

Length of residence in the U.S. was determined from the question “how long have you lived in this country?” Responses were categorized as < 5 years, 5–9 years, and ≥ 10 years. This variable was dichotomized into < 10 years and ≥ 10 years based on prior literature among U.S. immigrants [56, 66].

Statistical Analysis

Analyses were conducted in SAS 5.1 [67] with p values of ≤ 0.05 considered significant for all analyses. To account for complex survey design, all analyses included weights, and weighted percentages are reported. We compared the crude prevalence of sample sociodemographic characteristics, CVH score metrics and CVH groups (ideal, intermediate/poor) by COB. Rao-Scott chi-square statistic was used to assess the relationship among sociodemographic characteristics and COB [68].

Multiple logistic regression analyses were used to determine the association between length of residence and CVH group (ideal vs poor/intermediate) for each COB. Based on methodology adapted from previous studies [12, 39, 40], we performed univariable logistic regression models for each independent variable and CVH group. Second, multivariable models were assessed which included all covariates (age, sex, education, employment, insurance, and healthcare access). These covariates were included in the model because of

their theoretical significance and use in prior immigrant studies [39–41, 50]. Odds ratios and 95% confidence intervals are reported.

Results

Sociodemographic Characteristics

Descriptive characteristics of the sample are described in Table 1 (weighted percentages reported). The majority (76.4%) of AC immigrants reported residing in the U.S. for 10 years. Almost half of the sample was younger than 45 years old. Most AC immigrants in the sample reported being a high school graduate or having less education (53.9%), employed (61.9%) and insured (76.6%). Among the subgroups, Haitian immigrants were more likely to have more than a high school degree (56.7%) in comparison to Guyanese (42.9) and Jamaican (44.0%) immigrants, $\chi^2(4, 1688) = 22.2, p = 0.02$.

CVH Score Metrics and CVH Groups

Table 1 also shows that among the AC immigrant subgroups, the greatest prevalence of achieving the “ideal” category of the behavioral risk factors was for smoking status (i.e., had not smoked at least 100 cigarettes in their lifetime; Guyana = 82.2%, Haiti = 87.1% and Jamaica = 86.9%). The prevalence of meeting “ideal” metabolic health factors was highest for diabetes (i.e., participant had never been told by a health professional they had diabetes) for all three subgroups (Guyana = 82.7%, Haiti = 91.3%, and Jamaica = 84.1%). For all seven health metrics, AC immigrants were least likely to achieve ideal dietary health (Guyana = 5.9%,¹ Haiti = 7.9%,¹ and Jamaica = 9.2%). The prevalence of overall CVH group (ideal vs poor/intermediate) for each AC subgroup is shown in Fig. 1.

Association Between Length of Residence and CVH Group by Country of Birth

Table 2 shows univariable and multivariable analyses for the association between length of residence and CVH group by COB. In univariable analysis, Guyanese immigrants residing in the U.S. 10 vs. < 10 years were more likely to have intermediate/poor CVH (OR = 4.88; 95% CI 1.69–14.11). In multivariable analysis, the association remained although reduced (OR = 3.51; 95% CI 1.03–11.95). Results were similar for Haitian immigrants in both models. Haitian immigrants residing in the U.S. for 10 years were more likely to have poor/intermediate CVH than Haitian immigrants residing in the U.S. < 10 years (OR = 10.17; 95% CI 3.06–33.80). This association remained significant, although attenuated in the multivariable model adjusting for all known covariates (OR = 8.02; 95% CI 1.88–34.12). In both adjusted and unadjusted analysis, the results for Jamaican immigrants showed that length of residence was not associated with CVH.

Discussion

Our analyses yield important insights regarding the association between CVH and length of residence in the U.S. among AC immigrants from Guyana, Jamaica, and Haiti in a major

¹Estimate should be interpreted with caution. Estimate's Relative Standard Error (a measure of estimate precision) is greater than 30%, or the 95% Confidence Interval half-width is greater than 10 or the sample size is too small, making the estimate potentially unreliable.

metropolitan city. Firstly, we observed that greater length of residence was associated with poor/intermediate CVH but only among Guyanese and Haitian immigrants. This result is consistent with prior studies among Ghanaian and Nigerian immigrants that found increased length of residence in the U.S. to be associated with higher odds of having elevated CVD risk [56]. Similar results were also found among ethnically diverse immigrants using data from the National Health Interview Survey (NHIS), greater length of residence in the U.S. was associated with higher prevalence of cardiovascular risk factors [41, 50]. Previous studies have examined the relationship between length of residence and individual cardiovascular risk factors among immigrant groups [41, 58, 69]. However, the use of a CVH score gives a more salient representation of overall health in comparison to individual components of the score [70].

In contrast, we did not find an association between length of residence and CVH among Jamaican immigrants. The observed differences in results may be potentially attributed to varying socioeconomic conditions existing in native countries. Jamaica's racial composition is predominantly black [16]. This could result in lower levels of internalized racism and discrimination experienced prior to migration compared to their Afro-Guyanese counterparts. Previous research has shown that the level of pre-migration exposure to racism and discrimination may negatively affect black immigrants' post-migration health [31]. Cumulative exposure to factors such as perceived discrimination may influence psychosocial stressors [71]. Psychosocial stressors have been shown to be associated with adverse CVH outcomes and health behaviors [72–76]. Relative to Guyana, Jamaica's close geographical proximity to the U.S. may provide opportunities for more frequent travel to their home country, greater support networks, and increased reinforcement of their ethnic identity.

Compared to Haiti, Jamaican immigrants may also depict glaring differences in health outcomes owing to their English proficiency. U.S. immigrants who speak English are less likely to have linguistic barriers related to health insurance access, receiving preventative services, and access to care than immigrants with limited English proficiency [77]. Their English proficiency coupled with their advanced educational attainment may grant them more opportunities for success in the U.S. labor force in comparison to their French speaking counterparts [21]. It is also argued that education from Anglo-phone Caribbean countries (Jamaica, Guyana, Trinidad) may be better valued by U.S. employers than that received in Haiti [20].

Additionally, Jamaican immigrants may also be positively selected on factors such as social and human capital in comparison to Haitians. Jamaicans also have a more stable economic, educational, and political system in their home country relative Haiti [19, 21, 78]. This has impacted the classes of recent immigrants from both destinations. For instance, most recent immigrants from Jamaica included a large number of skilled and professional classes while Haiti has demonstrated an increase in the lower socioeconomic class, political asylees and refugees [14, 15, 18]. It has been shown that conditions in native countries such as socioeconomic development may explain the degree of health selectivity among black immigrants in the U.S. [11].

In this sample of AC immigrants, there was an observed difference in educational status across subgroups. Guyanese immigrants in this sample had significantly lower percentage of individuals reporting to have more than high school education than other immigrant groups. Although Haitian immigrants had the highest percentage of technical school/college graduate, Haitian immigrants tend to experience the most negative stereotypes among these subgroups [21] which may be further compounded by their double minority status of being non-native English speakers and black [79]. Negative social experiences may lead to increased psychological stress [71]. Furthermore, a combination of stress and linguistic barriers may yield greater odds of adverse health outcomes in comparison to immigrants without a language barrier [80].

In our sample, length of residence was associated with poor/intermediate cardiovascular health among Guyanese and Haitian immigrants, but not among Jamaican immigrants. Similar null results have been found in studies examining single cardiovascular risk factors among Asian immigrants [53, 58]. This study develops on previous immigrant CVH studies by applying a comprehensive measure of CVH instead of individual risk factors. The results of the study also highlight the importance of subgroup investigation among regional groups that have very different social and cultural histories such as the Caribbean region.

This study is limited in a number of ways. The cross-sectional nature of the data does not allow causal inferences or to assess temporal changes in immigrants' health. The prevalence of cardiovascular risk factors was self-reported; recall bias, cultural barriers or underestimation especially among the undiagnosed may limit accuracy of reports. Length of residence although conventionally used as a proxy for acculturation may not capture all the multidimensional facets of acculturation. The study may be underpowered because of the subgroup analyses that were conducted for the different COB categories and prevalence estimates for CV risk factors were unreliable for some sub-groups. The study has noteworthy strengths despite these limitations. A key strength is the use of the CHS data, which allows for COB stratification and analysis among three major AC immigrant groups in NYC. To our knowledge, this is the first examination of CVH using AHA metrics in the AC immigrant population. The study also highlights the importance of examining COB differences in an immigrant population that is usually grouped together with other racial/ethnic or regional groups.

Guyanese and Haitian immigrants could benefit from culturally tailored strategies to address modifiable CVD risk factors. Longitudinal studies among Guyanese and Haitian subgroups are also needed to assess aspects of acculturation that may influence CVD risk such as changes in behavioral factors such as diet, physical activity, and use of preventative services. Studies should also assess other social factors such as post-migration stress that may give rise to an increased risk of CVD over time [81]. Additionally, emphasis should be placed on CVH disparities among understudied black immigrant populations that are often concealed under regional or racial groupings.

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Fig. 1.
Prevalence of ideal and intermediate/poor cardiovascular health score by country of birth of Afro-Caribbean adult immigrants in New York City Community Health Survey, 2010–2014

Descriptive characteristics by country of birth among Afro-Caribbean adult immigrants, New York City Community Health Survey, 2010–2014. Weighted % (95% CI)

Table 1

	Guyana (<i>n</i> = 369) Weighted % (95% CI)	Haiti (<i>n</i> = 291) Weighted % (95% CI)	Jamaica (<i>n</i> = 1031) Weighted % (95% CI)	Total (<i>n</i> = 1691) Weighted % (95% CI)
Age group				
18–44	44.9 (37.7, 52.2)	60.4 (52.7, 68.1)	47.4 (43.1, 51.6)	49.3 (46.0, 52.7)
45–64	39.3 (32.3, 46.3)	30.9 (23.7, 38.0)	38.2 (34.2, 42.1)	37.0 (33.9, 40.2)
65+	15.8 (10.7, 20.8)	8.7 ^a (4.8, 12.6)	14.4 (11.7, 17.2)	13.6 (11.5, 15.7)
<i>P</i> value				0.02
Sex				
Female	56.6 (49.4, 63.7)	55.6 (47.4, 63.8)	61.5 (57.4, 65.6)	59.2 (56.0, 62.5)
<i>P</i> value				0.30
Education				
High school	57.2 (50.1, 64.2)	43.3 (34.8, 51.7)	56.0 (51.8, 60.2)	53.9 (50.6, 57.3)
Tech school/college grad	42.9 (35.8, 49.9)	56.7 (48.3, 65.2)	44.0 (39.8, 48.2)	46.1 (42.7, 49.4)
<i>P</i> value				0.02
Employment				
Unemployed/not in labor force	38.2 (31.2, 45.2)	42.4 (34.0, 50.7)	36.6 (32.5, 40.7)	38.1 (34.8, 41.4)
<i>P</i> value				0.79
Insurance				
Uninsured	19.8 (14.1–25.6)	23.4 (15.7, 31.2)	24.7 (21.0, 28.4)	23.3 (20.4, 26.3)
<i>P</i> value				0.45
Healthcare Access				
No	8.1 ^a (4.1, 12.2)	16.7 ^a (10.3, 23.2)	10.0 (7.5, 12.5)	10.9 (8.7, 13.0)
<i>P</i> value				0.03
Length of residence				
< 10 years	20.5 (14.4, 26.7)	26.4 ^a (18.2, 34.1)	23.9 (20.1, 27.7)	23.6 (20.6, 26.7)
10 years	79.5 (73.3, 85.6)	73.6 (65.3, 81.8)	76.1 (72.3, 79.9)	76.4 (73.3, 79.4)
<i>P</i> value				0.50
Cardiovascular health score components Diabetes ^a				

	Guyana (<i>n</i> = 369) Weighted % (95% CI)	Haiti (<i>n</i> = 291) Weighted % (95% CI)	Jamaica (<i>n</i> = 1031) Weighted % (95% CI)	Total (<i>n</i> = 1691) Weighted % (95% CI)
0—not ideal	17.3 (11.6, 23.0)	8.7* (4.7, 12.7)	15.9 (12.8, 19.0)	14.9 (12.5, 17.2)
1—ideal	82.7(77.0, 88.4)	91.3 (87.3, 95.3)	84.1 (81.0, 87.2)	85.1 (82.8, 87.5)
Cholesterol ^b				
0—not ideal	28.3 (22.0, 34.7)	23.3 (16.4, 30.1)	28.6 (25.0, 32.2)	27.5 (24.7, 30.4)
1—Ideal	71.7 (65.3, 78.0)	76.7 (69.9, 83.6)	71.4 (67.8, 75.0)	72.5 (69.6, 75.3)
Blood pressure ^c				
0—not ideal	38.2 (31.3, 45.1)	27.3 (20.3, 34.4)	38.9 (34.9, 42.9)	36.5 (33.4, 39.7)
1—Ideal	61.8(54.9, 68.7)	72.7 (65.6, 79.7)	61.1 (57.1, 65.1)	63.5 (60.3, 66.6)
BMI ^d				
0—not ideal	62.2 (55.1, 69.3)	73.8 (66.6, 80.9)	63.7 (59.6, 67.9)	65.3 (62.1, 68.5)
1—Ideal	37.8 (30.7, 44.9)	26.2 (19.1, 33.4)	36.3 (32.1, 40.4)	34.7 (31.5, 37.9)
Physical activity ^e				
0—not ideal	27.7 (21.0, 34.4)	29.6 (22.1, 37.0)	21.7 (18.2, 25.3)	24.6 (21., 27.6)
1—Ideal	72.3 (65.6, 79.0)	70.4 (63.0, 77.9)	78.3 (74.7, 81.8)	75.4 (72.4, 78.3)
Diet ^f				
0—not ideal	94.1 (91.0, 97.2)	92.1 (86.8, 97.3)	90.8 (88.2, 93.4)	91.8 (88.2, 93.4)
1—Ideal	5.9* (2.8, 9.0)	7.9* (2.7, 13.2)	9.2 (6.6, 11.8)	8.2 (6.6, 11.8)
Smoking status ^g				
0—not ideal	17.8 (12.2, 23.4)	12.9* (7.5, 18.3)	13.1 (10.5, 15.8)	14.2 (11.9, 16.4)
1—Ideal	82.2 (76.6, 87.8)	87.1 (81.7, 92.5)	86.9 (84.2, 89.5)	85.8 (83.6, 88.1)

* Estimate should be interpreted with caution, Estimate's Relative Standard Error (a measure of estimate precision) is greater than 30%, or the 95% confidence interval half-width is greater than 10 or the sample size is too small, making the estimate potentially unreliable

^aDiabetes: *not ideal*, participant was told by a health professional they had diabetes; *ideal*, participant had never been told by a health professional they had diabetes

^bCholesterol: *not ideal*, participant was told by a health professional they had high cholesterol; *ideal*, participant had never been told by a health professional they had high cholesterol

^cBlood pressure: *not ideal*, participant was told by a health professional they had high blood pressure; *ideal*, participant had never been told by a health professional they had high blood pressure

^dBMI: *not ideal*, participant is overweight; *ideal*, participant is underweight/normal weight

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Physical activity: *not ideal*, participant did not participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise during the past 30 days, other than their regular job; *ideal*, participant did participate in physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise during the past 30 days, other than their regular job

Diet: *not ideal*, participant consumed < 5 servings of fruits and vegetables per day; *ideal*, participant consumed five servings of fruit and vegetables per day

Smoking status: *not ideal*, participant is a current/former smoker; *ideal*, participant has never smoked at least 100 cigarettes in their lifetime

Logistic regression analyses of the association between length of residence and poor/intermediate cardiovascular health, among Afro-Caribbean adult immigrants, New York City Community Health Survey, 2010–2014

Table 2

	Guyana		Haiti		Jamaica	
	Model 1 Unadjusted OR (95% CI)	Model 2 Adjusted OR (95% CI)	Model 1 Unadjusted OR (95% CI)	Model 2 Adjusted OR (95% CI)	Model 1 Unadjusted OR (95% CI)	Model 2 Adjusted OR (95% CI)
Length of residence ^a						
< 10 years	Ref	Ref	Ref	Ref	Ref	Ref
10 years	4.88 (1.69–14.11) *	3.51 (1.03–11.95) *	10.17 (3.06–33.80) *	8.02 (1.88–34.12) *	1.52 (0.93–2.49)	0.91 (0.49–1.69)

* Significant values

^a Length of residence (LOR): Model 1: unadjusted association between LOR and poor/intermediate cardiovascular health. Model 2: adjusted for age, sex, education, employment, insurance status, healthcare access