ORIGINAL RESEARCH

Heterogeneity in Cardiovascular Disease Risk Factor Prevalence Among White, African American, African Immigrant, and Afro-Caribbean Adults: Insights From the 2010–2018 National Health Interview Survey

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BACKGROUND: In the United States, Black adults have higher rates of cardiovascular disease (CVD) risk factors than White adults. However, it is unclear how CVD risk factors compare between Black ethnic subgroups, including African Americans (AAs), African immigrants (AIs), and Afro-Caribbeans, and White people. Our objective was to examine trends in CVD risk factors among 3 Black ethnic subgroups and White adults between 2010 and 2018.

METHODS AND RESULTS: A comparative analysis of the National Health Interview Survey was conducted among 452,997 participants, examining sociodemographic characteristics and trends in 4 self-reported CVD risk factors (hypertension, diabetes, overweight/obesity, and smoking). Generalized linear models with Poisson distribution were used to obtain predictive probabilities of the CVD risk factors. The sample included 82,635 Black (89% AAs, 5% AIs, and 6% Afro-Caribbeans) and 370,362 White adults. AIs were the youngest, most educated, and least insured group. AIs had the lowest age- and sex-adjusted prevalence of all 4 CVD risk factors. AAs had the highest prevalence of hypertension (2018: 41.9%) compared with the other groups. Overweight/obesity and diabetes prevalence increased in AAs and White adults from 2010 to 2018 (P values for trend <0.001). Smoking prevalence was highest among AAs and White adults, but decreased significantly in these groups between 2010 and 2018 (P values for trend <0.001), as compared with AIs and Afro-Caribbeans.

CONCLUSIONS: We observed significant heterogeneity in CVD risk factors among 3 Black ethnic subgroups compared with White adults. There were disparities (among AAs) and advantages (among AIs and Afro-Caribbeans) in CVD risk factors, suggesting that race alone does not account for disparities in CVD risk factors.

Key Words: cardiovascular disease ■ ethnicity ■ risk factors

Cardiovascular disease (CVD) is the leading cause of death in the United States, contributing to 1 in 3 deaths.1 CVD disproportionately affects non-Hispanic Black adults, who have a higher CVD mortality rate (211.6 per 100,000) than all other racial and ethnic groups.1 Furthermore, Black adults have a higher prevalence of modifiable CVD risk factors, including hypertension, diabetes, and obesity.1

Although Black versus White disparities in CVD are well-established, most studies that have examined racial
CLINICAL PERSPECTIVE

What Is New?
- There was significant heterogeneity in cardiovascular risk factors among 3 Black ethnic subgroups (African Americans, Afro-Caribbeans, and African immigrants) compared with White adults.
- Black immigrants from Africa and the Caribbean differ from US-born Black adults (African Americans) in rates of hypertension, diabetes, smoking, and overweight/obesity.
- African immigrants had the lowest age- and sex-adjusted prevalence of all 4 cardiovascular disease risk factors and African Americans had the highest prevalence of hypertension compared with the other groups.

What Are the Clinical Implications?
- There were disparities (among African Americans) and advantages (among Afro-Caribbeans and African immigrants) in cardiovascular disease risk factors among the 3 Black ethnic subgroups, suggesting that race alone does not account for disparities in cardiovascular disease risk factors.
- Greater specificity is needed in examining racial and ethnic disparities to advance cardiovascular health equity in the United States.
- There is a need to disaggregate data for Black ethnic subgroups about cardiovascular disease risks, which should be addressed to ensure that healthcare delivery and public health strategies are properly tailored to these populations.

Nonstandard Abbreviations and Acronyms

AA African American
AC Afro-Caribbean
AI African immigrant
NCHS National Center for Health Statistics
NHIS National Health Interview Survey
PIR poverty-income ratio

METHODS

Study Design and Data Source
We performed a cross-sectional analysis of the 2010–2018 NHIS, a principal source of information on the health status of noninstitutionalized adults who are aged ≥18 years in the United States.9,10 The NHIS is one of the major data collection programs for the National Center for Health Statistics (NCHS) and the Centers for Disease Control and Prevention.11 Data from the NHIS is reported in aggregate, providing estimates of health indicators, healthcare utilization and access, and healthcare behaviors.11,12 Data used in this study were publicly available from the NCHS website13 and deidentified and therefore did not require ethical approval from an institutional review board.

Participants
We included adults aged ≥18 years who self-identified as: (1) White and born in the United States, and (2) Black and born in the United States, Caribbean Islands, or Africa. All individuals who responded in the affirmative to the question: “Were you born in the United States?” were considered US-born.15 Individuals who were born outside of the 50 United States were considered immigrants or foreign-born; these included people who had visas including alien and naturalized citizens, legal permanent residents, and students or guest workers, refugees, and undocumented immigrants. Specific information on participants’ country of origin is restricted information and was not obtained; however, information on participants’ region of origin was used in ascertaining region of birth. The NCHS categorizes foreign-born population increased from 81,600 in 1980 to 4.2 million in 2016, representing a 5-fold increase.4 Although AAs and foreign-born Black people share the same racial identity in the United States, foreign-born Black people have unique experiences and challenges because of their status as immigrants, which may influence their cardiovascular health.7 Greater specificity is needed in examining racial and ethnic disparities to advance cardiovascular health equity in the United States. For this study, the National Institute of Minority Health and Health Disparities Research Framework is used as a conceptual model to convey the relationships between race and ethnicity with other variables.8 Our focus was to examine potential influencing factors to health disparities based on sociocultural environment, behavioral, and healthcare systems rather than biological mechanisms for CVD risk. Thus, our aim was to examine disparities and trends in CVD risk factors among 3 Black ethnic subgroups (AAs, ACs, AIs) compared with White adults using the 2010–2018 National Health Interview Survey (NHIS).
respondents in the following mutually exclusive regions of birth: Mexico/Central America/Caribbean islands; South America; Europe; Russia (and former Soviet Union areas); Africa; the Middle East; the Indian sub-continent; Asia; and Southeast Asia. Among Black individuals, those who were born in the United States were considered AAs, those born in the African region were considered AIs, and those born in the Caribbean islands were considered ACs.

Outcomes
The outcomes of interest were the following 4 self-reported CVD risk factors: hypertension, diabetes, current smoking status, and overweight/obesity. Hypertension and diabetes were defined as a participant’s affirmative response to the question: “Have you ever been told by a doctor or healthcare professional that you had: ‘hypertension, also called high blood pressure?’ or ‘diabetes, or sugar diabetes?’” For people who reported a diagnosis of diabetes, the diagnosis was restricted to type II. For the outcome of overweight/obesity, we used participants’ self-reported height and weight, without shoes, to calculate their body mass index (BMI). The BMI categories for overweight and obesity were based on cutoffs designated by the National Institutes of Health. Based on these classifications, a BMI between 18.5 and 24.9 kg/m² is classified as normal weight, and a BMI of 25.0 to 29.9 kg/m² and >30.0 kg/m² is considered overweight and obese, respectively. The overweight and obese BMI categories were combined into one category, and BMI was analyzed as a dichotomous outcome (overweight/obese versus normal weight). For smoking, participants self-reported smoking tobacco. Participants who responded in the affirmative to the question: “Do you now smoke cigarettes every day, or some days…?” among those who answered that they had “ever smoked at least 100 cigarettes in [their] entire life” were classified as current smokers. Those who answered no to ever smoking at least 100 cigarettes in their lifetimes and who do not smoke cigarettes now were classified as never and former smokers.

Covariates
The covariates examined included age in years, sex (men/women), race, education, poverty-income ratio (PIR), marital status, and health insurance status. We examined these variables as dichotomous: marital status (currently married/not married), and insurance status (insured/not insured). We examined educational status in the following categories: high school or lower, some college, and bachelor’s degree or higher. We examined PIR as a proxy for income status. The PIR, the ratio of income to poverty, was obtained by dividing the midpoint of an individual’s family income by the poverty threshold for that respective year; this was calculated using NCHS categories as defined by the US Census Bureau. The PIR was categorized as follows: <1, 1 to 1.99, and ≥2. A PIR of <1 means that an individual is below the federal poverty level, an individual with a PIR between 1 and 1.99 is between 100% and 200% of the poverty level, and a PIR ≥2 means that an individual is ≥200% above the poverty level. Additionally, we examined length of stay (LOS) in the United States (<10 years versus ≥10 years) as a covariate for those who identified as foreign-born Black adults (AC and AI). Other covariates examined were cigarette smoking history, hypertension history, and diabetes history. Cigarette smoking was dichotomized into never/former smoker and current smoker. Hypertension history was defined as a self-reported history of hypertension documented by a doctor or other healthcare professional. Similarly, diabetes history was also defined as a self-reported history of diabetes documented by a doctor or other healthcare professional.

Statistical Analysis
We pooled 9 years of data (2010–2018) to improve the reliability of our estimates. Sampling weights were applied per NCHS guidelines to account for the complex sampling strategy. Descriptive statistics were used to examine differences in sociodemographic characteristics between participants who were White, AA, AC, and AI. We used generalized linear models with Poisson distribution to calculate the predictive probabilities of the CVD risk factors, adjusting for age and sex. Statistical significance was determined with a 2-sided α of <0.05. All analyses were performed using Stata SE 16.1 statistical software (StataCorp LLC).

RESULTS
Sociodemographic Characteristics
We included 452,997 participants, 370,362 (82%) of whom identified as White and 82,835 (18%) who identified as Black. Among those who identified as Black, the majority (89%) were AA, 6% were AC, and 5% were AI.

We observed differences in sociodemographic characteristics among all groups. Sociodemographic characteristics were stratified by race and Black ethnic groups. Descriptive statistics were performed to examine age, sex, health insurance status, PIR, education, and marital status among all groups. AIs were the youngest, with a mean age of 39.9 years (±0.3 years), and were the least likely to be insured (76.5%). The proportion of AIs with a college education was 38.0%, which is the highest observed, and over twice the proportion of college-educated AAs (18.5%), compared with 33.0% among White adults (Table 1). White individuals were more likely to live above the poverty level,
while AAs were more likely to live below the poverty level. Among all groups, AAs were also less likely to be married.

### Trends in CVD Risk Factors

There were differences among the 3 Black ethnic subgroups compared with White adults for the prevalence of all 4 CVD risk factors studied: high blood pressure, diabetes, overweight/obesity, and cigarette smoking (Table S1). AIs had the lowest age- and sex-adjusted prevalence of all 4 CVD risk factors.

#### Hypertension

From 2010 to 2018, the prevalence of hypertension was highest among AAs; however, the prevalence showed a slight decrease over the 9-year period. The \( P \) value for trend was only significant for White adults \((P<0.001)\) (Figure 1).

#### Diabetes

Diabetes prevalence was consistently highest among AAs at almost 15%, while AIs had the lowest diabetes prevalence at 7%. The trend for diabetes

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**Table 1. Sociodemographic Characteristics (N=452997)**

| Characteristics (% | Racial or ethnic groups | Total | White | AA | AI | AC | \( P \) value |
|--------------------|-------------------------|-------|-------|----|----|----|-------------|
| Weighted, n        | 452,997                 | 370,362| 73,450| 4071| 5114|    |             |
| Unweighted, n      | 176,319,217             | 148,109,649| 24,921,753| 1,488,965| 1,798,849|    |             |
| Age, mean (±SD)    | 48.1 (±0.1)             | 48.9 (±0.8) | 43.9 (±0.1) | 39.9 (±0.3) | 48.0 (±0.4) |    | P<0.001     |
| Sex                |                         |       |       |    |    |    |             |
| Men                | 48.0                    | 48.54 | 44.77 | 51.78 | 43.88 |    |             |
| Women              | 52.0                    | 51.46 | 55.23 | 48.22 | 56.12 |    |             |
| Marital status     |                         |       |       |    |    |    | P<0.001     |
| Married/cohabitating | 89.5               | 57.19 | 31.92 | 55.59 | 51.89 |    |             |
| Not married/ cohabitating | 10.6               | 42.81 | 68.08 | 44.41 | 48.11 |    |             |
| Education          |                         |       |       |    |    |    | P<0.001     |
| Less than a college degree | 69.1             | 67.02 | 81.49 | 61.99 | 75.72 |    |             |
| College degree or higher | 30.9            | 32.98 | 18.51 | 38.01 | 24.28 |    |             |
| Poverty-income ratio|                        |       |       |    |    |    | P<0.001     |
| Below FPL          | 10.7                    | 8.37  | 23.35 | 20.80 | 17.84 |    |             |
| Between 100% and 200% FPL | 16.5            | 15.09 | 24.12 | 23.23 | 22.80 |    |             |
| >200% Above FPL    | 72.8                    | 76.53 | 52.53 | 55.97 | 59.36 |    |             |
| Employment status  |                         |       |       |    |    |    | P<0.001     |
| Employed           | 66.6                    | 66.91 | 63.63 | 77.07 | 70.61 |    |             |
| Not employed       | 33.4                    | 33.09 | 36.37 | 22.93 | 29.39 |    |             |
| Health insurance   |                         |       |       |    |    |    | P<0.001     |
| No                 | 89.5                    | 9.34  | 16.50 | 23.47 | 17.97 |    |             |
| Yes                | 10.6                    | 90.66 | 83.50 | 76.53 | 82.03 |    |             |
| Have a usual place to go when sick | 60.6              | 60.42 | 60.69 | 70.91 | 65.69 |    | P<0.001     |
| Do not have a usual place | 39.4              | 39.58 | 39.31 | 29.09 | 34.31 |    |             |
| BMI                |                         |       |       |    |    |    | P<0.001     |
| Normal weight      | 33.2                    | 34.58 | 24.87 | 35.12 | 30.31 |    |             |
| Overweight         | 33.0                    | 33.19 | 30.77 | 39.37 | 39.77 |    |             |
| Obese              | 32.2                    | 30.49 | 43.04 | 24.04 | 29.28 |    |             |
| Underweight        | 1.7                     | 1.74  | 1.32  | 1.47  | 0.64  |    |             |

Results are weighted. AA indicates African American; AC, Afro-Caribbean; AI, African immigrant; BMI, body mass index; and FPL, federal poverty level.
prevalence among all groups remained largely un-
changed, but there was a nonsignificant increase
among White adults ($P=0.07$) over the 9-year period
(Figure 2).

**Overweight/Obesity**
Prevalence of overweight/obesity was highest
among AAs compared with the other ethnic groups,
with AIs having the lowest. In 2018, the prevalence was
76% in AAs but 60% in AIs (Figure 3). There was a
significant increase in overweight/obesity prevalence
among White adults during that time frame ($P$ values
for trend $<0.001$).

**Smoking**
With respect to smoking, there was a clear sepa-
ration of data. The lowest prevalence was observed
among foreign-born Black adults (AI and ACs) and the
highest was in AAs and White adults (Figure 4). In 2018,
smoking prevalence was 18% among AAs and 16%
among White adults. In contrast, the prevalence was
8.3% in ACs and 5% in AIs. However, there has been a
significant decline in smoking prevalence among AAs and White individuals over the 9-year period \( (P \text{ values for trend} < 0.001) \).

**LOS and CVD Risk Factors Among Foreign-Born Black Adults**

There was an association between longer LOS and the prevalence of CVD risk factors among foreign-born Black adults (AIs and ACs). There were significant differences in the prevalence of CVD risk factors for between LOS <10 years versus ≥10 years. For AIs, there was a significant increase in the prevalence of hypertension, diabetes, and overweight/obesity with increased LOS (Table 2). For ACs, significant increases were noted in prevalence of hypertension and diabetes among those who lived in the United States for ≥10 years. Although the prevalence of CVD risk factors is higher with increased LOS, AI and AC adults who had lived in the United States for ≥10 years had a lower prevalence of CVD risk factors than AAs.

![Figure 3. Trends in overweight/obesity prevalence from 2010 to 2018.](image)

![Figure 4. Trends in smoking prevalence from 2010 to 2018.](image)
DISCUSSION

In this study, we examined the trends in CVD risk factors among 3 Black ethnic groups compared with White adults. We found that disparities (among AAs) and advantages (among AIs and ACs) exist in CVD risk factors. AIs, who have the highest degree of African ancestry, had the lowest burden of CVD risk factors but they were less likely to have health insurance than White adults and the other Black ethnic groups. The trends in overweight/obesity and diabetes showed an increasing prevalence among both AAs and White adults. We also found that AAs and White adults were more likely to be smokers than AIs and ACs. However, the prevalence of smoking among AAs and White adults has significantly decreased over the past 9years. Our results suggest that although racial disparities in CVD risk factors exist, ethnic disparities among Black individuals need to be addressed to ensure that healthcare delivery and public health strategies are properly tailored to these populations.

Prior studies examining racial differences in cardiovascular health have largely compared Black versus White adults instead of comparing Black ethnic subgroups with White individuals.2,16–18 This analysis adds to the prior literature by comparing 3 Black ethnic subgroups with White adults in a large national data set. Only a few smaller studies19,20 have compared Black ethnic subgroups, largely AAs and AIs, and preliminarily found that AIs may have worse cardiometabolic health than AAs.2 However, in this analysis, we found that AAs were more likely to have a higher prevalence of CVD risk factors than AIs. This research supports a more detailed look at Black ethnic groups and the role of social and cultural factors when investigating racial disparities in CVD risk factors.2,18,21,22 These findings are similar to that of a recent analysis of NHIS, which observed significant heterogeneity in CVD risk factors among 3 Asian immigrant subgroups as well as varied prevalence of CVD risk factors compared with White people.23 Additionally, previous studies24,25 have shown that longer duration of stay in the United States among foreign-born Black people can increase risk for developing CVD.9

Strengths and Limitations

There are limitations that should be considered while interpreting the results of this study. First, we employed a cross-sectional design, which hampers our ability to make any causal inferences about the association between CVD risk factors and sociodemographic characteristics of the participants. Second, hypertension and diabetes diagnoses, height and weight, and cigarette smoking were self-reported. Thus, it is possible that the current study may underestimate the prevalence of hypertension and diabetes as a result of recall
bias. Although hyperlipidemia and physical inactivity are well-established CVD risk factors, these variables were not included in our final analyses because the estimates were imprecise for the foreign-born Black groups (AIs and ACs), with wide CIs. Furthermore, there is a chance of information bias related to height and weight (ie, BMI) and cigarette smoking. Third, because of the relatively smaller samples for ACs and AIs, the estimates are not as precise. We must also consider that those with poor access to health care, specifically the AIs and ACs, may be underdiagnosed with conditions such as hypertension and diabetes. Additionally, people who are born in the United States and identify as AA or Black are not a homogenous group. This population could also include those who identify as AC, Hispanic, Latino, or AI and admixed with other races or ethnicities. We were not able to make those distinctions in the current study. For the current investigation, we relied on the self-reported diagnosis of the 4 CVD risk factors and not clinical markers, which could have further contribute to recall bias, leading to underestimation of the prevalence of CVD risk factors among participants. There is no evidence that recall bias is more pronounced between the Black ethnic subgroups.

A strength of this study includes the use of a relatively large sample from a nationally represented dataset, contributing to the generalizability of results. The examination of ethnic diversity among Black individuals is understudied in the cardiovascular literature. To our knowledge, this is the first study of this type to compare trends of CVD risk factors among Black sub ethnic groups, compared with White adults.

CONCLUSIONS

There is significant heterogeneity in CVD risk factors among 3 Black ethnic subgroups compared with White individuals. Race alone does not account for health disparities in CVD risk factors. Cultural and genetic influences, along with social factors such as wealth and employment, marital status, how people are educated, and where they live and work, can affect risk and how it is managed, and ultimately health outcomes.

It is important for healthcare providers to consider that the Black population in the United States is diversified, especially in large metropolitan areas such as Washington, DC, Texas, and New York, among others. Differences in cultural practices and structural and social determinants of health influence the development and management of these risk factors and failing to recognize and incorporate them into clinical practice will lead to poor health outcomes and widening health inequities. Recognizing and addressing structural and social determinants of cardiovascular health must become a cornerstone of public health efforts and clinical care if we are to reverse these trends and achieve greater equity. Future research to explore the differential impact of structural and social determinants rather than attributing differences to “race” is needed.
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SUPPLEMENTAL MATERIAL
Table S1. Age- and Sex-Adjusted Prevalence of Trends in Cardiovascular Disease Risk Factors from 2010-2018 in the NHIS; N=452,997

| Risk Factor (%) | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | Odds ratio | p for trend |
|-----------------|------|------|------|------|------|------|------|------|------|------------|-------------|
| **Hypertension** |      |      |      |      |      |      |      |      |      |            |             |
| White           | 34.2 | 33.6 | 33.7 | 33.4 | 34.3 | 33.9 | 33.7 | 33.1 | 34.1 | 0.99       | <0.001      |
| African American| 43.5 | 42.6 | 41.7 | 41.1 | 42.4 | 43.6 | 41.9 | 41.0 | 41.9 | 0.99       | 0.48        |
| African Immigrant| 19.2 | 26.1 | 15.9 | 21.3 | 20.8 | 17.2 | 16.3 | 17.9 | 16.5 | 0.97       | 0.202       |
| Afro-Caribbean  | 38.8 | 31.7 | 38.6 | 31.9 | 33.2 | 37.9 | 35.1 | 34.5 | 31.9 | 0.98       | 0.332       |
| **Diabetes**    |      |      |      |      |      |      |      |      |      |            |             |
| White           | 9.5  | 9.2  | 9.5  | 9.6  | 9.4  | 9.7  | 9.8  | 9.6  | 10.0 | 1.01       | 0.07        |
| African American| 14.0 | 13.5 | 13.9 | 14.4 | 14.9 | 13.4 | 14.1 | 13.2 | 14.7 | 1          | 0.441       |
| African Immigrant| 8.7  | 6.0  | 3.7  | 6.5  | 6.4  | 7.9  | 4.2  | 3.2  | 7.1  | 0.96       | 0.293       |
| Afro-Caribbean  | 11.9 | 13.3 | 13.3 | 10.1 | 16.6 | 18.2 | 18.8 | 12.8 | 12.0 | 1.04       | 0.636       |
| **Overweight/Obesity** |      |      |      |      |      |      |      |      |      |            |             |
| White           | 63.3 | 63.2 | 64.6 | 63.8 | 64.9 | 65.2 | 66.0 | 65.9 | 66.2 | 1.02       | <0.001      |
| African American| 74.2 | 75.4 | 73.4 | 74.1 | 75.8 | 73.7 | 74.6 | 75.5 | 76.2 | 1.01       | 0.10        |
| African Immigrant| 66.9 | 64.5 | 60.2 | 66.9 | 64.2 | 65.6 | 60.6 | 71.1 | 60.0 | 1.00       | 0.86        |
| Afro-Caribbean  | 63.4 | 72.7 | 69.7 | 69.7 | 67.4 | 71.1 | 68.4 | 74.9 | 67.6 | 1.00       | 0.86        |
| **Smoking**     |      |      |      |      |      |      |      |      |      |            |             |
| White           | 21.2 | 20.6 | 20.2 | 19.5 | 18.2 | 17.2 | 17.2 | 16.1 | 16.0 | 0.96       | <0.001      |
| African American| 21.9 | 22.1 | 20.5 | 20.7 | 19.7 | 19.2 | 19.5 | 18.1 | 17.8 | 0.96       | <0.001      |
| African Immigrant| 6.5  | 5.1  | 7.5  | 7.0  | 4.3  | 6.8  | 4.5  | 4.0  | 5.1  | 0.97       | 0.52        |
| Afro-Caribbean  | 8.4  | 5.2  | 9.1  | 7.4  | 5.2  | 6.2  | 5.5  | 3.3  | 8.3  | 0.99       | 0.735       |

Results are weighted