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Hypertension among U.S.-born and Foreign-born Non-Hispanic Blacks: NHANES 2003–2014 data

Alison G.M. BROWN^a, Robert F. HOUSER^a, Josiemer MATTEI^b, Dariush MOZAFFARIAN^a, Alice H. LICHTENSTEIN^a, and Sara C. FOLTA^a

^aTufts University Friedman School of Nutrition Science and Policy, Boston, MA, USA

^bHarvard T.H. Chan School of Public Health, Boston, MA, USA

Abstract

OBJECTIVES—Non-Hispanic Blacks in the U.S. have the highest reported prevalence of hypertension (44%) worldwide. However, this does not consider the heterogeneity of Blacks within the U.S., particularly comparing U.S.-born to long-standing or recent (foreign-born) immigrants. The objective of this study is to compare hypertension odds between U.S.-born and foreign-born Blacks in the U.S.

METHODS—We assessed the prevalence of hypertension among U.S.-born (n=4,511) versus foreign-born (n=522) non-Hispanic Black adults aged 22–79y, based on pooled nationally representative data (2003–2014); as well by length of U.S. residency among immigrants. Multivariable-adjusted logistic regression was used to investigate the association between nativity and hypertension odds.

RESULTS—Nearly half (42.8%) of U.S.-born Blacks but only 27.4% of foreign-born Blacks had hypertension. After adjusting for major covariates, foreign-born Blacks were 39.0% less likely (OR 0.61 95% CI 0.49, 0.77) to have hypertension than their U.S.-born counterparts. Among foreign-born Blacks, length of U.S. residency was not significantly associated with odds of hypertension.

CONCLUSIONS—Foreign-born versus U.S.-born non-Hispanic Blacks have substantially lower prevalence of hypertension. Considering nativity among U.S. Blacks in clinical research and public health efforts may improve accuracy of characterizing health disparities and facilitate development of targeted interventions to reduce hypertension in this diverse population. Word Count: 200

Keywords

hypertension; health disparities; immigrants; Blacks/African Americans; place of birth/nativity; length of residency; NHANES

Corresponding author: Alison G.M. Brown, MS, PhD, alison.brown@tufts.edu, Tufts University Friedman School of Nutrition Science and Policy, USA, 150 Harrison Ave, Boston, MA 02111.

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INTRODUCTION

Blacks in the United States (U.S.) experience among the highest reported rate of hypertension (44%) worldwide [1]. In comparison, Nigeria has an age-adjusted hypertension prevalence of 13.5%, and Jamaica of 28.6% [2]. Compared to their White counterparts, Blacks in the U.S. are 40% more likely to be diagnosed with hypertension and 30% more likely to die from heart disease [1]. A major limitation of this evidence is the lack of consideration of the heterogeneity within the U.S. Black population, for example based on immigration trends over the past 50 years. While some Blacks have been in the U.S. for many generations, others are long-standing or recent immigrants of African descent from places such as Africa and the Caribbean. Indeed, the population of immigrant groups has markedly increased since the passage of the Immigration and Nationality Act of 1965, which lifted the quotas based on country of origin and replaced them with an immigration system based on family re-unification and employment [3]. Combined, Caribbean-born and African-born self-identified Black immigrants make up an estimated 8.7% of the U.S. Black population and the Census Bureau projects that by 2060, 16.5% of U.S. Blacks will be foreign born [3, 4]. Moreover, immigration statistics suggest that the influx of Black immigrants represent a diverse array of countries of origin (i.e., Nigeria, Ethiopia, Ghana, Jamaica, Trinidad and Tobago), which would deepen the heterogeneity of cultures, social realities, and lifestyle patterns, particularly, food preferences and physical activity habits, which are important modifiable risk factors for hypertension and related disease outcomes [5].

The healthy immigrant hypothesis posits that immigrant groups have favorable health behaviors, risk factors, and family support that reduce risk for a variety of diseases and poor health outcomes [6, 7]. There is also evidence that recent immigrant groups are healthier than those residing in the U.S. for longer periods, possibly due to adopting unhealthy eating and lifestyle habits through the acculturation process [8–10]. Most of this research, however, has been conducted among Mexican Americans and Asian immigrants [11, 12], and few large studies have examined the association between nativity, length of residency, and hypertension among non-Hispanic Blacks. While some previous research suggests that foreign-born Blacks from Africa and the Caribbean have more favorable health outcomes (i.e., overall mortality, perinatal health, cancer obesity, cardiovascular disease, allostatic load) than their U.S.-born counterparts, these studies have been small and limited to specific sites, and recent national-level data remains understudied [13–16]. More research is consequently needed to elucidate how these dynamics influence differences identified among foreign-born versus U.S.-born Blacks. Understanding these potential influences is also timely and relevant given potential for changes in our immigration policies with changing political perspectives.

To address this important gap in knowledge, the present study aimed to assess the association between nativity and odds of hypertension among non-Hispanic Blacks in the U.S. Given potential changes in immigration policies in the U.S., the research is both timely and relevant. We hypothesized that foreign-born Blacks would be less likely to have hypertension than their U.S.-born counterparts; and that among foreign-born Blacks, longer lengths of residency in the U.S. would be associated with increased odds of hypertension.

METHODS

Sample Description

We used pooled data from the 2003–2014 National Health and Nutrition Examination Survey (NHANES), a nationally representative health and nutrition survey of the non-institutionalized U.S. population [17]. The survey includes demographic, socioeconomic, and health- and diet-related questions and is carried out through complex, stratified, multistage probability sampling. The NHANES protocol was approved by the National Center for Health Statistics Research Ethics Review Board and all participants provided informed consent. Additional details about NHANES are available elsewhere [17]. The primary analysis was restricted to those who self-identified as non-Hispanic Black, were between the ages of 22–79, were not pregnant at the time of the examination, and who had data necessary to determine hypertension status (N=5,033).

Measures

The main exposure of interest was place of birth or nativity, represented categorically as U.S.-born versus foreign-born based upon the participants' self-response to the survey question "In what country were you born?". Naturalized citizens, permanent residents, undocumented immigrants, international students, and guest workers were included in the foreign-born category, and anyone born in the 50 U.S. states and the District of Columbia were considered U.S.-born. Additional information on place of birth among immigrants was not evaluated in NHANES. We additionally examined the potential association of length of residency among foreign-born Blacks and hypertension. 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 [9, 10, 17–20].

Participants were asked questions regarding medical diagnoses and current medication use. For the blood pressure measurements, each participant rested quietly in a seated position for 5 minutes and once the participant's maximum inflation level was determined, the trained professional obtained three consecutive blood pressure readings using sphygmomanometry with an appropriately sized arm cuff [21]. If a blood pressure measurement was interrupted or incomplete, a fourth attempt was made [21]. All equipment was regularly subjected to quality control checks and a list of all validated and calibrated equipment used for the blood pressure readings can be found in the NHANES Blood Pressure Procedures Manual [21].

An average of all available readings of both the systolic and diastolic blood pressure measures was used to best determine usual resting blood pressure. For the main analysis, 3.5% (152 participants) had 1 reading, 4.2% (181 participants) had 2 readings, 92.3% (4,009 participants) had 3 readings, and no participants required a 4th reading. To test for robustness, we also ran the analysis excluding the first blood pressure reading, which did not change the results. The primary outcome was prevalence of hypertension, defined as a self-reported physician diagnosis of hypertension plus current treatment for hypertension with prescription medication; or having a directly measured mean systolic blood pressure ≥ 140 mmHg or mean diastolic blood pressure ≥ 90 mmHg [22].

To minimize confounding by other factors, covariates in the analysis included age (years, continuous), sex (male/female), educational attainment (<high school or general equivalency diploma, associate degree or some college, or college degree), family income:poverty ratio (IPR, 0–5, continuous), health insurance status (self-reported, yes/no), smoking status (never, former, current), physical activity (self-reported moderate or vigorous levels of recreational/leisure activity for at least 10 minutes continuously over the past 30 days, yes/no), and body mass index (BMI, kg/m², continuous).

Statistical Analysis

Statistical analysis was conducted using STATA IC Version 13.0, with use of sampling weights for the complex survey design so that the results were representative of the noninstitutionalized U.S. population [23]. Chi square analysis and t-tests were used to determine statistical significance of any differences in sociodemographic, lifestyle, and hypertension characteristics between U.S.-born and foreign-born Blacks. Multivariable-adjusted logistic regression was used to investigate the association between nativity and hypertension. To assess confounding, we evaluated several logistic regression models. Model 1 included age and sex; including, given the importance of age for risk of hypertension, multiple evaluations of additional transformations for age were considered, none of which fit the model as best as age (continuous in years). Model 2 further included socioeconomic risk factors such as education level, IPR, and health insurance status; and Model 3, the behavioral risk factors of smoking status and physical activity. The final model, Model 4, added BMI; and we confirmed in sensitivity analysis that results were not appreciably different adjusting for waist circumference instead (data not shown). We additionally evaluated marital status in a preliminary model, but omitted it for parsimony as it did not appreciably alter the findings. Secondary analysis included multivariable-adjusted regression modeling with mean systolic or diastolic blood pressure measurements as the outcome variable. Additional post hoc exploratory analysis were conducted to examine potential sex and age differences, in which separate models were performed for each sex and for participants <65 years and ≥65 years. We considered a two-tailed $p < 0.05$ for statistical significance in all analyses. The same multivariable models were used to examine the association between length of U.S. residency and odds of hypertension among foreign-born Blacks. P for trend across categories of residency was determined by setting the value for each length of category available in NHANES to its midpoint (for the highest open-ended category of “50 years or more”, we used 55 years) and evaluating this as a continuous variable in each regression model.

RESULTS

Population Characteristics

The study population included 5,033 non-Hispanic Blacks, including 4,511 U.S.-born and 522 foreign-born (Table 1). In general, about half were female (54.6%), reported low income IPR (49.2%), had obesity (47.7%; plus an additional 29.5% being overweight), and engaged in any moderate/vigorous physical activity over the past 30 days (48.2%). About 2 in 5 (41.8%) Black adults had hypertension; of these, the majority (86.5%) used medication. Compared to U.S. born Black, more foreign-born Blacks were male ($p=0.01$), had higher

levels of educational attainment ($p<0.001$), classified as normal and overweight ($p<0.001$), reported never being a smoker ($p<0.001$), and reported more engagement in physical activity ($p<0.001$). In crude (unadjusted) comparisons, hypertension was more prevalent among U.S.-born Blacks than foreign-born Blacks (43.5% vs. 27.8%). A large fraction of U.S.-born Blacks (41.6%) were diagnosed with the condition by a clinician compared to foreign-born Blacks (26.3%) and more U.S.-born presented with either elevated systolic blood (20.3% vs. 14.4%) or diastolic blood (9.1% vs. 5.6%) pressure readings. There was no significant difference in the prevalence of having health insurance between the groups (71.1% vs. 75.4%).

Table 2 shows age-adjusted sociodemographic and health characteristics of foreign-born Blacks by length of residency category. In comparison to those who were in the U.S. for <10 years, a greater percentage of foreign-born Blacks who were in the U.S. for ≥30 years were categorized as current smokers (14.0% vs. 6.1%, respectively) and had higher income (53.0% vs. 23.2%). Conversely, more participants residing in the U.S. for <10 years compared to those residing in the U.S. ≥30 years reported having health insurance (28.2% vs. 16.3%). Even after adjusting for age, hypertension was more prevalent among those living in the U.S. for ≥30 years (29.8%) than for recent immigrants <10 years (25.1%). These results, however, may still be confounded by age since hypertension is more likely to present with increasing age.

Nativity/Place of Birth and Hypertension

In all models, foreign-born Blacks had significantly lower odds of hypertension than their U.S.-born counterparts (Figure 1). After adjusting for age, sex, income, educational attainment, health insurance status, smoking status, physical activity, and BMI, the strength of the association was attenuated but remained significant, with foreign-born Blacks being 39.0% less likely to have hypertension than their U.S.-born counterparts (OR 0.61 95% CI 0.49, 0.77). Foreign-born, non-Hispanics Blacks on average had systolic blood pressure readings that were significantly lower than U.S.-born Blacks (β -2.3 mmHg, 95% CI -3.8, -0.9). Differences in diastolic blood pressure were not statistically significant (β -0.7, 95% CI -2.3, 0.7) (Table 3). For the post hoc analysis by sex, significant associations persisted in the model for females (OR 0.51 95% CI 0.37, 0.71) but not for males (OR 0.76 95% CI 0.53, 1.08), suggesting effect modification by sex. The post hoc analysis by age category (<65 years and ≥65 years) suggested differences by age in which foreign-born Blacks <65 years had lower odds for hypertension in comparison to their U.S.-born counterparts (OR 0.56 95% CI 0.43, 0.72) and there was no significant association between nativity and hypertension odds for those ≥65 years (OR 1.46 95% CI 0.78, 2.73) (Supplementary Table 1).

Length of U.S. Residency and Hypertension

Among foreign-born Blacks (N=510), the central risk estimates suggested potentially higher odds of hypertension with longer length of U.S. residency, but these differences were not significant (Table 4).

DISCUSSION

The primary results support our hypothesis suggesting that foreign-born, non-Hispanic Blacks have significantly lower odds for hypertension than their U.S.-born counterparts, even after adjusting for relevant cofounders such as demographic, socioeconomic, behavioral, and health risk variables. The difference was large: 43.5% of U.S.-born Blacks were hypertensive, compared to 27.8% of the foreign-born Blacks, with a multivariable-adjusted risk of 0.61 among foreign-born Blacks. The high prevalence of hypertension among U.S.-born Blacks persists despite similar rates of reported medical insurance coverage of U.S.-born (76.2%) compared to foreign-born Blacks (70.4%). Existing research in the southeast region of U.S. (where U.S.-born Blacks predominate) also demonstrates that Blacks are more likely to have uncontrolled hypertension despite having a high likelihood of hypertension diagnosis and are more likely to have it treated more intensively [24]. Overall, these results suggest that future research studies and public health programs should consider place of birth when evaluating the health of U.S. Blacks in order to better characterize their risk of hypertension.

Our study results are similar to those observed with some Hispanic groups, particularly older people of Mexican origin, in which foreign-born groups tend to present with better CVD-related health outcomes and lower rates of all-cause mortality [25]; outcomes that persist despite greater levels of poverty, lower educational attainment, and less likelihood of having health insurance [26–29]. However, unlike Hispanic immigrant groups, foreign-born Blacks tend to be of higher socioeconomic status and have higher educational attainment than their U.S.-born counterparts [30]. In our study, 16.5% of U.S.-born Blacks reported having a college degree or higher in comparison to 30.2% of foreign-born Blacks. Foreign-born Blacks also had lower percentages of smoking ($p<0.001$), were more likely to be physically active ($p<0.001$), and had lower BMIs ($p<0.001$), supporting the hypothesis that immigrants tend to follow healthy behaviors. However, while differences in odds of hypertension between foreign-born Blacks and U.S.-born Blacks were partly attenuated they remained after adjusting for these factors, suggesting additional underlying contributors. These potential mediators are not measured consistently or at all in NHANES, causing residual confounding.

One possible explanation for the observed differences between U.S.-born and foreign-born Blacks may be exposure and impact of chronic stress, racial discrimination, and mental health distress. Racism, in its multiple forms (personally-mediated, internalized, and institutionalized) [31], is often perceived among many Blacks and other racial minorities [32]. In an early review examining the psychosocial factors contributing to hypertension among Blacks, the authors discussed suppressed hostility and an active stress coping style (coined “John Henryism”[33]) in response to environmental stressors as associated factors in the development of high blood pressure [34]. Recent literature also suggests an association between perceived discrimination and hypertension and other markers of CVD risk [35–37]. Some evidence suggests that U.S.-born Blacks report greater perceived racism than their foreign-born counterparts [25, 26]. Foreign-born Blacks who migrated to the U.S. at an earlier age, however, had similar perceptions of racism [38, 39]. A growing body of research also supports the role of persistent chronic stress and the development of chronic diseases

such as cardiovascular disease, low birth weight, and other poor health outcomes among Blacks [29]. Results are inconsistent, however, warranting future studies exploring perception of racism and stress among the diverse Black population and health outcomes such as hypertension. Specifically, U.S. born Blacks with historical roots in the sociopolitical system of slavery and Jim Crow (laws enforcing racial segregation from 1865 to mid-1960's) in the U.S. may have different social experiences and perceptions of these experiences in comparison to foreign-born Black immigrant groups that contribute to the observed differences in this study.

Physiological and genetic differences are also potential contributors to these findings. While controversial, there have been several historically based hypothesis aiming to explain the genetic causes of the higher prevalence of hypertension among U.S. Blacks [40]. One predominant hypothesis is based on the effect of the transatlantic slave trade and slavery in the Americas from the 16th century to the 19th century. According to the hypothesis, the conditions of slaves during the middle passage and within the plantation systems created an environment for “natural selection,” in which those genetically pre-disposed to conserve and retain salt had a selective advantage for survival [41, 42]. Specifically, the major causes of death during this time were thought to be salt-depletive diseases such as dehydration, diarrhea, fevers, and vomiting. Applying Darwin's theory, the slaves who were genetically fit for survival were also likely to carry on their genotype to subsequent generations of Western Hemisphere Blacks. While controversial and speculative, this hypothesis may explain the higher incidence of hypertension and stroke today among Blacks in the U.S. compared to those from Africa, and to a lesser extent those from the Caribbean/Latin America. Particularly, Blacks have been shown to have twice the likelihood of stroke, and those diagnosed with hypertension are more likely to exhibit salt sensitivity compared to their hypertensive counterparts of other races/ethnicities [1, 43]. Other research points to endothelium dysfunction caused by lowered bioavailability of the potent vasodilator, nitric oxide, lower plasma renin activity and lower RAS activity overall, mutations in the epithelial sodium channel and thus reduced sodium excretion, and increased activity of the Na-Cl cotransporter responsible for water retention, [43–47].

While previous studies among other racial/ethnic groups suggest an increased risk in health outcomes with length of U.S. residency [9, 10, 48–50], this study and other research among Blacks do not provide evidence for this association. Similarly, a 2004 study utilizing National Health Interview Survey data did not find a significant association between years of residency and BMI for foreign-born Blacks, but did find an association for all other racial/ethnic groups [10]. On the other hand, the observed risk estimates in our investigation were suggestive of a potential increased likelihood with longer length of residency, that could not be confirmed perhaps due to lack of statistical power in this relatively small subgroup (N=510). These findings suggest a need for additional investigation of this important question including the potential role of the acculturation process, which may differ across ethnic immigrant groups.

This study offers an examination of the differences in hypertension among U.S.-born and foreign-born, non-Hispanic Blacks using a large U.S. national dataset at a time when the foreign-born Black population is increasing. However, there are some limitations. First, the

study is observational and cannot confirm cause and effect, yet our findings can be considered descriptive in clearly confirming a relevant association between place of birth and hypertension. Although we pooled multiple waves of NHANES datasets to obtain a higher sample of foreign-born Blacks, the sample size for foreign-born Blacks was small, particularly after stratifying by length of residency category, which may have masked the ability to confirm true associations. It is possible that participation in NHANES was differential by both nativity and risk of hypertension however, foreign-born, non-Hispanic Blacks represented 10.2% of the Black population in our study, a figure similar to the 8.7% estimate of the foreign-born Black population based on 2013 American Community Survey data [4]. Misclassification when categorizing covariates also cannot be ruled out; and better assessments of certain covariates (including education, income, and lifestyle) might have shown these to explain a greater proportion of the observed difference in odds of hypertension. NHANES does not make place of birth or ethnicity data among foreign-born Blacks publicly available, so we were unable to evaluate nativity by country of origin or region (i.e., Caribbean-born Blacks, African-born Blacks). Finally, length of residency was used as a proxy for acculturation due to limitations of the dataset. Similarly, we were unable to consider age of migration, which would impact the process of acculturation and health behaviors during formative years, nor reasons for migration or migration patterns that may include extended periods of stay in one's home country. Based on recent evidence there is perception that these factors may have implications for blood pressure and other health outcomes. For example, a recent study among African immigrants found younger age of migration and family reunification to be linked with decreased allostatic load [51].

Overall, this study validates the need for future studies to consider nativity and place of birth when evaluating the health of the U.S. Black population, as well as research to understand potential underlying mechanisms including genetic and biological factors, modifiable lifestyle factors and social conditions that may contribute to the differences in hypertension odds between U.S.-born Blacks and foreign-born Blacks. For example, future studies should compare diet quality and leisure-time and work-related physical activity between the two groups, as well as exposure to and perception of racism. Our post hoc analysis also encourages further study on the effect modification of both sex and age. Younger (<65 years) but not older (>65 years) U.S.-born Blacks had a higher likelihood for hypertension compared to foreign-born Blacks, suggesting that U.S.-born Blacks may be diagnosed at an earlier age than their foreign-born counterparts. Meanwhile, foreign-born, Black women also had lower odds for hypertension compared to their U.S.-born counterpart, but this association was not consistent for foreign-born, Black men. Discerning differences by age and sex among diverse Blacks communities could ultimately have an influence on public health messaging and interventions targeting these groups. Acquiring a better understanding of the reasons for differences in risk of hypertension among the ethnically diverse U.S. Black population, including the influence of age and sex, will help better characterize health disparities more accurately and develop more targeted interventions to effectively address them.

CONCLUSIONS

These study findings suggest that the health disparities in hypertension outcomes are greater for U.S.-born Blacks compared to foreign-born Blacks. Nativity and/or ethnicity among U.S. Blacks are not commonly considered in most research studies and clinical and public health interventions. Our study supports accounting for the diversity of nativity among U.S. Blacks to advance clinical services and public health science and knowledge about health disparities and develop targeted ways to address them.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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References

1. Go AS, Mozaffarian D, Roger VL, Benjamin EJ, Berry JD, Blaha MJ, et al. Heart disease and stroke statistics-2014 update. *Circulation*. 2014; 129(3)
2. Cooper RS, Wolf-Maier K, Luke A, Adeyemo A, Banegas JR, Forrester T, et al. An international comparative study of blood pressure in populations of European vs. African descent. *BMC medicine*. 2005; 3(1):1. [PubMed: 15627402]
3. Thomas, KJ. A demographic profile of Black Caribbean immigrants in the United States. Washington, DC: Migration Policy Institute; 2012.
4. Anderson, M. A Rising Share of the US Black Population Is Foreign Born. Pew Research Center; Apr, 2015 p. 9
5. McCabe, K. African immigrants in the United States. Washington, DC: Migration Policy Institute; 2011.
6. Abraido-Lanza AF, Dohrenwend BP, Ng-Mak DS, Turner JB. The Latino mortality paradox: a test of the "salmon bias" and healthy migrant hypotheses. *American journal of public health*. 1999; 89(10):1543–8. [PubMed: 10511837]
7. Rubalcava LN, Teruel GM, Thomas D, Goldman N. The healthy migrant effect: new findings from the Mexican Family Life Survey. *American Journal of Public Health*. 2008; 98(1):78–84. [PubMed: 18048791]
8. Stephen EH, Foote K, Hendershot GE, Schoenborn CA. Health of the foreign-born population: United States, 1989–90. *Advance data*. 1994; 241:1–12.
9. Kaplan MS, Hugué N, Newsom JT, McFarland BH. The association between length of residence and obesity among Hispanic immigrants. *American journal of preventive medicine*. 2004; 27(4): 323–6. [PubMed: 15488363]
10. Goel MS, McCarthy EP, Phillips RS, Wee CC. Obesity among US immigrant subgroups by duration of residence. *Jama*. 2004; 292(23):2860–7. [PubMed: 15598917]
11. Sundquist J, Winkleby MA. Cardiovascular risk factors in Mexican American adults: a transcultural analysis of NHANES III, 1988–1994. *American Journal of Public Health*. 1999; 89(5):723–30. [PubMed: 10224985]

12. Elder JP, Castro FG, de Moor C, Mayer J, Candelaria JI, Campbell N, et al. Differences in cancer-risk-related behaviors in Latino and Anglo adults. *Preventive medicine*. 1991; 20(6):751–63. [PubMed: 1766946]
13. Cabral H, Fried LE, Levenson S, Amaro H, Zuckerman B. Foreign-born and US-born black women: differences in health behaviors and birth outcomes. *American Journal of Public Health*. 1990; 80(1):70–2. [PubMed: 2293806]
14. David RJ, Collins JW Jr. Differing birth weight among infants of US-born blacks, African-born blacks, and US-born whites. *New England Journal of Medicine*. 1997; 337(17):1209–14. [PubMed: 9337381]
15. Williams DR, Haile R, Gonzalez HM, Neighbors H, Baser R, Jackson JS. The mental health of Black Caribbean immigrants: results from the National Survey of American Life. *American Journal of Public Health*. 2007; 97(1):52–9. [PubMed: 17138909]
16. Singh GK, Yu SM. Adverse pregnancy outcomes: differences between US-and foreign-born women in major US racial and ethnic groups. *American Journal of Public Health*. 1996; 86(6): 837–43. [PubMed: 8659659]
17. Control for Disease Control and Prevention. National Health and Nutrition Examination Survey. National health and nutrition examination survey: plan and operations, 1999–2010. 2013; 2013
18. Hyman D, Ogbonnaya K, Pavlik V, Poston W, Ho K. Lower hypertension prevalence in first-generation African immigrants compared to US-born African Americans. *Ethnicity & disease*. 1999; 10(3):343–9.
19. Borrell LN, Crawford ND, Barrington DS, Maglo KN. Black/white disparity in self-reported hypertension: the role of nativity status. *Journal of health care for the poor and underserved*. 2008; 19(4):1148–62. [PubMed: 19029742]
20. Doamekpor LA, Dinwiddie GY. Allostatic load in foreign-born and US-born blacks: evidence from the 2001–2010 National Health and Nutrition Examination Survey. *American journal of public health*. 2015; 105(3):591–7. [PubMed: 25602865]
21. Survey NHANES. NHANES Health Tech/Blood Pressure Procedures Manual. 2009. [cited 2017 March 1]. Available from: https://www.cdc.gov/nchs/data/nhanes/nhanes_09_10/BP.pdf
22. Pickering TG, Hall JE, Appel LJ, Falkner BE, Graves J, Hill MN, et al. Recommendations for blood pressure measurement in humans and experimental animals part 1: blood pressure measurement in humans: a statement for professionals from the Subcommittee of Professional and Public Education of the American Heart Association Council on High Blood Pressure Research. *Hypertension*. 2005; 45(1):142–61. [PubMed: 15611362]
23. StataCorp. Stata Statistical Software: Release 14. College Station TSL; 2015.
24. Howard G, Prineas R, Moy C, Cushman M, Kellum M, Temple E, et al. Racial and geographic differences in awareness, treatment, and control of hypertension. *Stroke*. 2006; 37(5):1171–8. [PubMed: 16556884]
25. Markides KS, Eschbach K. Aging, migration, and mortality: current status of research on the Hispanic paradox. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*. 2005; 60(Special Issue 2):S68–S75.
26. Falcon A, Aguirre-Molina M, Molina CW. Latino health policy: Beyond demographic determinism. *Health issues in the Latino community*. 2001:3–22.
27. Ribble F, M, Keddle M. Understanding the Hispanic paradox. *Ethnicity & disease*. 2001; 11:496–518. [PubMed: 11572416]
28. Singh GK, Siahpush M. Ethnic-immigrant differentials in health behaviors, morbidity, and cause-specific mortality in the United States: an analysis of two national data bases. *Human Biology*. 2002:83–109. [PubMed: 11931581]
29. Lin CC, Rogot E, Johnson NJ, Sorlie PD, Arias E. A further study of life expectancy by socioeconomic factors in the National Longitudinal Mortality Study. *Ethnicity & disease*. 2002; 13(2):240–7.
30. Butcher KF. Black immigrants in the United States: A comparison with native blacks and other immigrants. *Industrial & Labor Relations Review*. 1994; 47(2):265–84.
31. Jones CP. Levels of racism: a theoretic framework and a gardener's tale. *American journal of public health*. 2000; 90(8):1212. [PubMed: 10936998]

32. Carlson ED, Chamberlain RM. The black–white perception gap and health disparities research. *Public Health Nursing*. 2004; 21(4):372–9. [PubMed: 15260843]
33. James SA. John Henryism and the health of African-Americans. *Culture, medicine and psychiatry*. 1994; 18(2):163–82.
34. Anderson NB, Myers HF, Pickering T, Jackson JS. Hypertension in blacks: psychosocial and biological perspectives. *Journal of hypertension*. 1989; 7(3):161–72. [PubMed: 2651519]
35. Beatty Moody DL, Waldstein SR, Tobin JN, Cassells A, Schwartz JC, Brondolo E. Lifetime racial/ethnic discrimination and ambulatory blood pressure: The moderating effect of age. *Health Psychology*. 2016; 35(4):333. [PubMed: 27018724]
36. Goosby BJ, Malone S, Richardson EA, Cheadle JE, Williams DT. Perceived discrimination and markers of cardiovascular risk among low-income African American youth. *American Journal of Human Biology*. 2015; 27(4):546–52. [PubMed: 25753652]
37. Dolezsar, CM., McGrath, JJ., Herzig, AJ., Miller, SB. Perceived racial discrimination and hypertension: A comprehensive systematic review. *American Psychological Association*; 2014.
38. Dominguez TP, Strong EF, Krieger N, Gillman MW, Rich-Edwards JW. Differences in the self-reported racism experiences of US-born and foreign-born Black pregnant women. *Social Science & Medicine*. 2009; 69(2):258–65. [PubMed: 19386406]
39. Krieger N, Kosheleva A, Waterman PD, Chen JT, Koenen K. Racial discrimination, psychological distress, and self-rated health among US-born and foreign-born Black Americans. *American Journal of Public Health*. 2011; 101(9):1704–13. [PubMed: 21778504]
40. Kaufman JS, Hall SA. The slavery hypertension hypothesis: dissemination and appeal of a modern race theory. *Epidemiology*. 2003; 14(1):111–8. [PubMed: 12500059]
41. Grim, CE., Wilson, TW. Pathophysiology of hypertension in blacks. Springer; 1993. Salt, slavery, and survival: physiological principles underlying the evolutionary hypothesis of salt-sensitive hypertension in western hemisphere blacks; p. 25–49.
42. Wilson TW, Grim CE. Biohistory of slavery and blood pressure differences in blacks today. A hypothesis. *Hypertension*. 1991; 17(1 Suppl):I122. [PubMed: 1986989]
43. Richardson SI, Freedman BI, Ellison DH, Rodriguez CJ. Salt sensitivity: a review with a focus on non-Hispanic blacks and Hispanics. *Journal of the American Society of Hypertension*. 2013; 7(2):170–9. [PubMed: 23428408]
44. Saunders E. Hypertension in blacks. Primary care. 1991; 18(3):607–22. [PubMed: 1946790]
45. Pickering TG. Hypertension in blacks. Current opinion in nephrology and hypertension. 1994; 3(2):207–12. [PubMed: 7842271]
46. Savica V, Bellinghieri G, Kopple JD. The effect of nutrition on blood pressure. *Annual review of nutrition*. 2010; 30:365–401.
47. Jones ES, Owen E, Davidson J, Rayner B, Van Der Merwe L. The R563Q mutation of the epithelial sodium channel beta-subunit is associated with hypertension: cardiovascular topics. *Cardiovascular journal of Africa*. 2011; 22(5):241–4. [PubMed: 21107496]
48. Gordon-Larsen P, Harris KM, Ward DS, Popkin BM. Acculturation and overweight-related behaviors among Hispanic immigrants to the US: the National Longitudinal Study of Adolescent Health. *Social science & medicine*. 2003; 57(11):2023–34. [PubMed: 14512234]
49. Koya DL, Egede LE. Association between length of residence and cardiovascular disease risk factors among an ethnically diverse group of United States immigrants. *Journal of general internal medicine*. 2007; 22(6):841–6. [PubMed: 17503110]
50. Perez CE. Health status and health behaviour among immigrants [Canadian community health survey-2002 annual report]. *Health Reports*. 2002; 13:89.
51. Bingham BA, Duong MT, Ricks M, Mabundo LS, Baker RL Jr, Utumatwishima JN, et al. The Association between Stress Measured by Allostatic Load Score and Physiologic Dysregulation in African Immigrants: The Africans in America Study. *Frontiers in Public Health*. 2016; 4:265. [PubMed: 27933289]

Figure 1.

Risk of having hypertension for foreign-born, non-Hispanic Blacks compared to U.S.-born Blacks hypertension status, pooled NHANES 2003–2014

Model 1 adjusted for demographic factors of age and sex. Model 2 included the Model 1 variables as well as proxies for socio-economic status such as educational attainment, PIR, and health insurance status. Model 3 also included behavioral factors such as smoking status and physical activity. The final, full Model 4 also included the health risk variable, BMI. All models are significant at the $p < 0.001$ level.

Table 1

Demographic characteristics, health behaviors and outcomes by nativity among non-Hispanic Blacks, pooled NHANES 2003–2014

Non-Hispanic Blacks				
	All (n= 5,033)	U.S.-born (n= 4,511)	Foreign-born (n= 522)	p value
Female, %	54.9	55.6	49.1	0.01
Age, years, Mean (SE)	45.2 (0.3)	45.3 (0.3)	43.9 (0.8)	0.09
22–34, %	28.7	29.0	26.6	<0.001
35–49, %	33.1	32.0	42.5	--
50–64, %	26.7	27.1	23.0	--
65–79, %	11.5	11.9	7.9	--
Educational attainment, %				
< High School	22.8	23.1	20.5	<0.001
High School or equivalent	25.6	26.5	18.1	--
Some college	33.7	33.9	32.0	--
College degree	17.8	16.5	29.4	--
Poverty:Income Ratio, Mean (SE)	2.4 (0.05)	2.39 (0.05)	2.52 (0.10)	0.21
< 1.00, %	22.8	23.3	18.7	0.38
1–1.99, %	25.9	26.0	25.3	--
2–2.99, %	16.7	16.4	19.5	
3–3.99, %	13.0	12.9	14.1	
4.00–5.00, %	21.5	21.4	22.4	--
Body Mass Index, kg/m ² Mean (SE)	30.8 (0.1)	31.1 (0.2)	27.7 (0.2)	<0.001
Normal weight (18.5–24.9)	21.4	20.3	30.7	<0.001
Overweight (25–29.9)	29.5	28.4	38.7	--
Obesity (≥ 30)	47.6	49.8	29.0	--
Health insurance, %	75.6	76.2	70.4	0.054
Smoking status, %				
Never	58.3	55.7	81.3	<0.001
Former	15.8	16.4	10.7	--
Current	25.9	27.9	8.0	--
Moderate or vigorous physical activity [*] , %	48.0	47.5	52.8	0.01
Hypertensive ^{**} , %	41.8	43.5	27.8	<0.001
Hypertension diagnosis ^{***}	36.9	38.4	24.0	<0.001
SBP ≥ 140 mmHg	19.4	20.0	14.5	0.002
DBP ≥ 90 mmHg	8.6	8.8	5.7	0.03
Medication use if diagnosed (Yes) ^{****}	86.6	86.7	85.3	0.69

^{*} Based on self-report of engaging in moderate and/or vigorous leisure/recreational physical activity for at least 10 minutes over the past 30 days

^{**} Hypertension status is defined as mean systolic blood pressure (SBP) ≥ 140 mm Hg or mean diastolic blood pressure (DBP) ≥ 90 mm Hg (based on mean of all available readings) OR (current treatment for hypertension with prescription medication and was told by a doctor or health professional that he/she had hypertension)

Told by a doctor or health professional that he/she had hypertension

Participant currently taking prescribed medication if s/he was ever told by a doctor or health professional that he/she had hypertension

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Age-adjusted demographic characteristics, health behaviors, and outcomes among foreign-born, non-Hispanic Blacks by U.S. length of residency, pooled NHANES 2003–2014

Table 2

	<10 years (n= 128, 25.1%)	10–19 years (n= 134, 26.3%)	20–29 years (n= 118, 23.1%)	30 years (n= 130, 25.5%)
Female, %	42.3	50.9	57.2	50.3
Educational attainment, %				
< High School	31.2	22.5	15.3	14.6
High School or equivalent	22.2	19.9	15.3	16.3
Some college	25.6	29.8	41.4	33.2
College degree	23.3	28.6	29.7	38.7
Income: Poverty Ratio, Mean (SE)	2.12 (0.14)	2.33 (0.15)	2.64 (0.18)	3.11 (0.19)
< 1.00, %	26.4	19.3	12.9	15.3
1–1.99, %	26.8	24.7	17.7	15.8
2–2.99, %	24.7	19.3	19.4	13.8
3–3.99, %	12.8	19.8	17.5	9.2
4.00–5.00, %	10.6	17.0	33.2	46.9
Health insurance, %	41.5	28.6	28.4	17.2
Body Mass Index, kg/m ² Mean (SE)	26.1 (0.4)	27.8 (0.4)	28.4 (0.6)	28.8 (0.7)
Normal weight (18.5–24.9), %	38.0	26.2	29.7	28.0
Overweight (25–29.9), %	42.8	40.6	37.2	32.8
Obesity (≥ 30), %	17.0	32.2	32.4	36.6
Smoking status, %				
Never	87.2	87.0	77.6	71.6
Former	6.5	6.5	13.1	15.1
Current	5.8	6.5	9.7	13.6
Moderate or vigorous physical activity [*] , %	48.8	48.3	55.7	56.8
Hypertensive ^{**} , %	25.2	25.9	26.4	32.1
Hypertension diagnosis ^{***}	21.7	20.9	21.8	30.8
SBP ≥ 140 mmHg	16.7	14.8	15.6	11.1
DBP ≥ 90 mmHg	4.0	7.0	4.8	7.0

	<10 years (n= 128, 25.1%)	10–19 years (n= 134, 26.3%)	20–29 years (n= 118, 23.1%)	30 years (n= 130, 25.5%)
Medication use if diagnosed (Yes)	67.0	74.6	95.2	94.6

* Based self-report of engaging in moderate and/or vigorous leisure/recreational physical activity for at least 10 minutes over the past 30 days				
** Hypertension status is defined as mean systolic blood pressure (SBP) 140 mm Hg or mean diastolic blood pressure (DBP) 90 mm Hg (based on mean of all available readings) OR (current treatment for hypertension with prescription medication and was told by a doctor or health professional that he/she had hypertension)				
*** Told by a doctor or health professional that he/she had hypertension				
**** Participant currently taking prescribed medication if s/he was ever told by a doctor or health professional that he/she had hypertension				
* p<0.05				
** p<0.001				

Predictions for systolic and diastolic blood pressure for U.S.-born compared to foreign-born, non-Hispanic Blacks, pooled NHANES 2003–2014

Table 3

	Model 1 Age + Sex		Model 2 + Education + Income:Poverty + Health Insurance		Model 3 + Smoking Status + Physical Activity		Model 4 + BMI	
	β	95% CI	β	95% CI	β	95% CI	β	95% CI
SBP (n=5,304)								
US-born	--	--	--	--	--	--	--	--
Foreign-born	-3.2	-4.8, -1.6	-2.9	-4.5, -1.37	-3.2	-4.8, -1.7	-2.3	-3.8, -0.9
DBP (n=5,288)								
US-born	--	--	--	--	--	--	--	--
Foreign-born	-1.3	-2.8, 0.2	-1.4	-2.9, 0.2	-1.5	-3.1, 0.06	-0.7	-2.3, 0.7

Table 4

Risk of hypertension among 510 foreign-born, non-Hispanic Blacks by length of residency in the U.S., pooled NHANES 2003–2014

Variables	Model 1 Age + Sex			Model 2 + Education			Model 3 + Income + Poverty + Health Insurance			Model 4 + Physical Activity + BMI		
	OR	95% CI	p value	OR	95% CI	p value	OR	95% CI	p value	OR	95% CI	p value
Years in U.S.												
<10 (n= 128)	--	--	--	--	--	--	--	--	--	--	--	--
10–19 (n= 134)	1.06	0.60, 1.87	0.84	1.06	0.61, 1.85	0.84	1.07	0.61, 1.88	0.82	0.95	0.53, 1.72	0.88
20–29 (n= 118)	1.10	0.55, 2.18	0.78	1.14	0.58, 2.28	0.70	1.12	0.57, 2.19	0.74	0.96	0.52, 1.79	0.91
30 (n= 130)	1.62	0.77, 3.41	0.20	1.69	0.80, 3.58	0.16	1.65	0.79, 3.43	0.18	1.38	0.68, 2.79	0.36
P for trend*	--	--	0.26	--	--	0.19	--	--	0.23	--	--	0.39

Model 1 adjusted for demographic factors of age and sex. Model 2 included the Model 1 variables as well as proxies for socio-economic status such as educational attainment, PIR, and health insurance status. Model 3 added behavioral factors such as smoking status and physical activity. The final, full Model 4 added the health risk variable, BMI.

* evaluated by setting the value for each length of residency category available in NHANES to its midpoint (for the highest open-ended category of “50 years or more”, we used 55 years) and evaluating this as a continuous variable in each regression model.