ABSTRACT

Title of Dissertation: ASSESSING CHANGES IN ACCESS TO HEALTH CARE AND UTILIZATION OF PREVENTIVE SERVICES AMONG IMMIGRANTS OF AFRICAN DESCENT BEFORE AND AFTER IMPLEMENTATION OF THE AFFORDABE CARE ACT

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In the U.S., African Americans experience a disproportionate burden of health disparities. The African American population includes 4.3 million people who are foreign-born. Yet, a paucity of empirical data exists on the health of immigrants of African descent. The lack of data disaggregation by subpopulations of African Americans, disregards the unique characterization of the African American diaspora and the influence of different cultural, linguistic, political, social, economic, environmental, and historical experience on the overall health of the population.

Access to health care including lack of health insurance coverage has been a longstanding contributor to poor health outcomes among African Americans. The passage of the Affordable Care Act aimed to improve access to care including health insurance coverage and utilization of preventive services with no cost-sharing. Studies have shown significant reductions in the

uninsured rate among African Americans and uptake in some preventive services, but the impact of the ACA on immigrants of African descent is not well understood.

This dissertation research examined changes in access to health care, and utilization of preventive screenings for cancer, high blood pressure, diabetes, and high cholesterol among immigrants of African descent and U.S.-born African Americans before and after implementation of the ACA. This research integrated three studies to understand changes in access and utilization of health care using t-test for descriptive analyses and multivariable logistic regressions to assess any differences post-ACA.

Results showed lower odds of being uninsured (OR=0.52, p=0.000), delaying care (OR=0.72, p=0.000), and forgoing care (OR=0.71, p=0.000) post-ACA, for all groups. There were higher odds of having cholesterol (OR=1.33, p=0.000) and hypertension screenings (OR=1.32, p=0.000) after the ACA. Cancer screening results found slightly higher odds of obtaining a mammogram (OR=1.07, p=0.069) after the ACA, but lower odds of having a pap smear (OR=0.89, p=0.002) or colorectal cancer (OR=0.91, p=0.021) screening. Citizenship was a significant factor that influenced screening rates with non-citizen immigrants having the lowest screenings for all groups.

ASSESSING CHANGES IN ACCESS TO HEALTH CARE AND UTILIZATION OF PREVENTIVE SERVICES AMONG IMMIGRANTS OF AFRICAN DESCENT BEFORE AND AFTER IMPLEMENTATION OF THE AFFORDABLE CARE ACT

by

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Dedication

I dedicate this dissertation to my family and immigrants of African descent in the United States

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List of Abbreviations

ACA	Affordable Care Act
ACS	American Cancer Society
CI	Confidence Interval
FPL	Federal Poverty Level
NHIS	National Health Interview Survey
OR	Odds Ratio
USPSTF	United States Preventive Services Taskforce

Chapter 1: INTRODUCTION

Health disparities is a complex public health issue that is a result of multiple interacting factors ranging from biological, social, environmental, economic, and system level influences. In the U.S., differences in health disproportionately affect racial and ethnic minorities. African Americans in particular, have an undue burden of morbidity and mortality from preventable diseases compared to other racial and ethnic populations, which in part may be linked to structural racism based on historical and institutional racial discrimination[1,2].

Approximately, 13.2 percent of the U.S. population are African Americans. There are 4.3 million immigrants of African descent in the U.S. who make up approximately 10% of the African American population. In this study, African Americans refer to individuals of African descent who were born in the United States (U.S.-born African Americans), and foreign-born individuals (immigrants of African descent) from the Caribbean and Africa, who self-identify their race as Black or African American. While there have been several research efforts, policies, community programs, and interventions to address the disturbing health disparities in the African American population, little is known about the health of immigrants of African descent.

Health disparities emerge at the individual, interpersonal, community or societal level, and are often influenced by biological, social, environmental, behavioral, or health care system determinants[3]. Access to health care whether due to a lack of health insurance coverage, cost, lack of a primary care physician or regular doctor visits, has been a principal contributor to health disparities for African Americans[4–8]. Lower educational attainment, and low-socio economic status have also influenced access to care. Issues of lack of reliable transportation, long work hours, difficulty obtaining a medical appointment, and having lower paying jobs without health benefits or paid sick leave have affected both U.S.-born African Americans and

immigrants of African descent ability to receive timely medical care[9–13]. Limited or no access to care contributes to lower screening rates for preventive services, delaying or forgoing care, late stage diagnosis for cancers and other preventable diseases, and overall poor health outcomes. Disparities in access to health care exist within the African American community with immigrants of African descent being less likely to have health insurance than U.S.-born African Americans and lower access to care[4,14–16].

A Look at Health Disparities

The prevalence of chronic diseases such as heart disease, stroke, diabetes, cancer, and associated risk factors such as obesity, high cholesterol, and hypertension in African Americans, signal the magnitude of health disparities in this population. Heart disease is the leading cause of death in African Americans, who are also more likely to die from the disease than Whites[17,18]. According to the Centers for Disease Control and Prevention, 16.4% of African Americans have diabetes, the highest rate of all racial and ethnic groups[19]. African Americans have the highest mortality rate for many cancers and are less likely to survive beyond five years after cancer diagnosis[20]. Breast cancer is the second leading cause of cancer deaths in African American women, who also have the highest mortality rate from the disease[20].

Hypertension and high cholesterol are risk factors for many chronic diseases such as diabetes, heart disease and stroke. African Americans are 50 percent more likely to have hypertension than Whites, and more likely to have uncontrolled hypertension[21]. Approximately 24.1 percent of African Americans have high cholesterol. African Americans are less likely to receive preventive services such as screenings for breast, cervical, or colorectal cancer[22–25]. High blood pressure and high cholesterol generally have no identifiable symptoms, and therefore

necessitate regular screening to ensure normal levels. Preventive screening is effective in detecting, diagnosing, and treating diseases like cancer, diabetes, and hypertension in the early stages and can help to prevent disease progression, improve survival and lower the disease burden.

Improving Health care Access

The Affordable Care Act was a landmark legislation enacted in 2010 to improve access to healthcare services for millions of uninsured Americans. Before the ACA, 50 million Americans including 21 percent of African Americans were uninsured. African Americans and Hispanics were the most likely to be uninsured. Although statistical data on the uninsured rate of immigrants of African descent was not available, approximately 34.5 percent of immigrants were uninsured including 46 percent who were non-citizens and 19 percent who were naturalized citizens. Individuals with lower income levels were more likely to be uninsured compared to those with higher incomes.

The ACA authorized the expansion of Medicaid through the states, 37 of which agreed to expand Medicaid to provide more affordable and cost-effective health insurance coverage. In addition, the ACA provided increased access to preventive services such as breast, cervical and colorectal cancer screening, high blood pressure, blood glucose, and high cholesterol checks with no cost-sharing.

Eligibility for health insurance coverage through the ACA requires U.S. citizenship or legal permanent residence of at least five years in the U.S. for immigrants. This suggested that not everyone in the U.S. who was considered African American would be eligible for ACA benefits. An unintentional consequence of the ACA was the establishment of a disparity between U.S.-born African Americans and some immigrants of African descent, particularly those who

were undocumented or did not have lawful immigration status in the U.S. and unable to obtain health insurance coverage.

There is a growing body of evidence that shows the effectiveness of the ACA in reducing the uninsured rate among African Americans, and in improving access to care including receipt of various preventive services. Studies have also shown that African Americans living in Medicaid expansion states were more likely to experience these improvements in access to care and increases in health insurance coverage. However, there is a dearth of research evidence that examines the impact of the ACA on subpopulations of the African American population.

Research suggests there are differences in health between immigrants of African descent and U.S.-born African Americans. Immigrants of African descent generally have lower prevalence of diseases like hypertension and cancer, lower rates of screening for preventive services, more likely to be uninsured and lack a usual source of care, more educated, and more likely to have higher income than U.S.-born African Americans. Studies also have shown that the healthy immigrant effect exist among immigrants of African descent when they initially arrive in the U.S. in that they are usually healthier than U.S.-born African Americans. Overtime, the health of immigrants of African descent converges with that of U.S.-born African Americans due to acculturation and adaptation of American lifestyle, culture, and diet.

The health practices, behavior, and the issues of access and utilization of health services among African Americans cannot be fully understood without disaggregating the data on immigrants of African descent. By 2065, immigrants of African descent will constitute 13% of the African American population. This rapid shift in the demographics of the U.S. immigrant population underscores the urgency of increasing research to understand the health of immigrants

of African descent to more strategically and aggressively address health disparities among African Americans.

Dissertation Research

This dissertation examined changes in access to health care and utilization of preventive services among immigrants of African descent and U.S.-born African Americans, to garner greater insights into the impact of the ACA on African Americans and more specifically, immigrants of African descent. U.S.-born African Americans is used as the reference group for this research because the African American population is a heterogeneous group comprised of individuals who self-identify as Black or African American who were born in the United States, or outside the U.S. mainly in Africa or the Caribbean.

African Americans in the U.S. have a high prevalence of morbidity and mortality for many diseases and health conditions. Immigrants of African descent arriving to the U.S. are generally healthier than U.S.-born African Americans and have lower access to health care and lower rates of screening for preventive services despite having higher levels of education. Differences in culture, social, economic, political, and environmental exposure and experiences influence health behaviors, health practices, perceptions towards health and overall health outcomes across the African American diaspora. However, these differences are often ignored in research studies that amalgamate the data on U.S.-born African Americans and immigrants of African descent, making it difficult to extricate the underlying factors contributing to poor health outcomes among foreign born individuals, independent of native-born subpopulations within the African American population.

The influence of the immigration experience on the health of immigrants of African descent is also important to recognize which can vary for different groups of immigrants. Several factors impact the immigration experience that can also determine health outcomes for immigrants such as age on arrival, length of U.S. residence, U.S. immigration climate and policies, the state of the U.S. economy at time of arrival, employment status, immigration status such as documented or undocumented upon arrival, and ability to access health care, coupled with cultural influences based on country of origin. Untangling the pathway of health disparities for subpopulations of African Americans, is fundamental in identifying and developing mechanisms, interventions, programs, and policies to address health disparities in the African American community.

This research is based on public-use data from the 2011-2017 National Health Interview Survey (NHIS). Health care access was measured by health insurance coverage, delaying care, forgoing care, and having a usual source of care. Utilization of preventive services had dual categorization by cancer screening (breast, cervical, and colorectal cancer), and preventive services screening for (hypertension, high cholesterol, and diabetes) (Figure 2).

Figure 2: Outcome Variables and Measures by Study

Study 1: Access to Health Care	Study 2: Cancer Screening	Study 3: Preventive Services Screening
• **Health insurance**: Has no health insurance • **Delay care**: Medical care delayed due to cost past 12 months • **Forgo care**: Needed but couldn't afford medical care past 12 months • **Usual source of care:** Has usual place for medical care	• **Mammogram:** Had mammogram past 12 months • **Pap smear:** Had pap smear in past 12 months • **Colorectal cancer screening:** Had any test for colon cancer past 12 months	• **Diabetes screening:** Had fasting blood glucose test past 12 months • **Cholesterol screening:** Had cholesterol checked by health professional past 12 months • **Hypertension screening:** Had blood pressure checked by health professional past 12 months

Chapter 2 describes the literature review that was conducted and helped to shape the research questions and strategy for this dissertation. Chapter 3 of this dissertation presents the conceptual framework that guided this research based on a combination of Thomas and Penchansky's Five Dimensions of Access and the Andersen Model of Behavioral Health Services.

This dissertation consists of three individual research projects. Chapter 4 presents the first study: *Differences in Access to Care among Immigrants of African Descent and U.S.-born African Americans Before and After Implementation of the ACA.* The study investigated health care access for immigrants of African descent compared to U.S.-born African Americans. The aim was to determine the extent to which the ACA made a difference in increasing health insurance coverage, decreasing delay medical care due to cost, reducing individuals forgoing medical care due to cost, or increasing the number of individuals with a usual source of care.

Chapter 5 describes and presents the results of the second study on *Cancer Screening Rates among Immigrants of African Descent and U.S.-born African Americans: Does the Affordable Care Act Matter.* This research assessed mammogram screening for breast cancer; pap smears to screen for cervical cancer; and any screening test such as colonoscopy for colorectal cancer in immigrants of African descent and U.S.-born African Americans before and after implementation of the ACA. U.S.-born African Americans and immigrants of African descent typically have lower rates of cancer screening, sometimes attributed to factors related to health care access such as lack of health insurance, lack of a primary care physician or regular place to receive medical care. While studies on the ACA have consistently demonstrated a reduction in the uninsured rate among African Americans, findings on the impact of the ACA on

cancer screening among African Americans have been mixed, and there is a dearth of data as it relates to the ACA and cancer screening in immigrants of African descent.

Chapter 6 discusses the third study on *Assessing Changes in Diabetes, Hypertension, and Cholesterol Screening among Immigrants of African Descent and U.S.-born African Americans Before and After Implementation of the Affordable Care Act.* Worldwide, individuals of African descent have high rates of diabetes, hypertension, and high cholesterol which are major risk factors for chronic diseases such as heart disease and stroke. In the U.S., heart disease is the leading cause of mortality for African Americans. Oftentimes, African Americans have uncontrolled risk factors such as diabetes, hypertension, and high cholesterol because there are no symptoms for hypertension, or high cholesterol, and consequently they are unaware of the health condition. Health insurance coverage as been associated with improved access to care including regular doctor visits and regular preventive services that can detect diabetes, hypertension, and high cholesterol at an early stage and result in early intervention to prevent, slow the progress, or effectively treat the disease or health condition.

Chapter 2: LITERATURE REVIEW

Introduction

Health disparities among African Americans are multi-dimensional. Although health disparities may be a shared experience among members of the African American population, each subgroup is uniquely characterized by language, culture, political, social, environmental, and/or historical experience, elements that may also impact their health status, and approach to health, and thus become important areas for mitigation. Social, economic, and environmental influences such as

lower educational level and poverty; environmental factors spurred by the design of the built environment or exposure to hazardous social and physical environments versus health promoting environments; access to clean and safe housing; and political forces are underlying influences of poor health outcomes [26,27].

Immigration has been a dominant topic in current U.S. discourse mainly within the context of national and population safety and socioeconomics, and seldom in terms of public health. Reducing and eliminating health disparities is a major priority for the public health community, yet immigrant health is not a prominent area of research emphasis in the health disparities field despite the changing demographics of the U.S. which is ascribed to the increasing immigrant population of racial and ethnic minorities.

Immigrant populations are generally studied as a homogeneous group amalgamated with the native-born population with which they most closely identify based on race or ethnicity. By combining immigrants with native born African Americans, researchers disregard the heterogeneity of African Americans and the influence of multiple interacting factors that shape the worldview and experiences of each group that also may contribute to the health status and health outcomes of this population. Factors including employment status, occupation, housing, income, immigration status, education, and residential patterns, are some of the issues that may affect each group in different ways, including their behavior and perspective on health and health care.

Research evidence has demonstrated positive impact of the ACA in improving access to care and utilization of health services for Americans including African Americans, but whether the ACA has had similar improvements for immigrants of African descent is not clear. The enactment of the Affordable Care Act (ACA) aligned immigrants who are naturalized citizens

with their U.S. counterparts in terms of eligibility for health insurance coverage and preventive services benefits, while separating immigrants into eligible and ineligible groups according to immigration status as citizens or non-citizens.

To understand factors contributing to health disparities, research must explore the interrelated cultural, social, environmental, and health system elements that are at the root of health disparities among African Americans. Thomas and colleagues highlight the need for more actionable research on health disparities that moves beyond describing, documenting and identifying health disparities, to fourth generation research. Immigrant health has not received that same level of focus in health disparities research, suggesting the scales are unbalanced among segments of the population, in our progress to address health disparities [2]

This review examined social, environmental, and policy factors that influence health care access and utilization among immigrants of African descent. A secondary focus was to understand the extent to which current literature addresses the impact of the Affordable Care Act on health care access and utilization among immigrants of African descent. The review offers insights into the knowledge that has been generated, and the gaps that remain to be filled in improving the health of immigrants of African descent.

Methods

A search of PubMed and Google Scholar was conducted to identify studies. A combination of search terms was necessary to obtain relevant studies given the dearth of data available on the health of immigrants of African descent. The search produced a limited mix of empirical studies, and systematic and narrative reviews.

Search terms for this review included: “immigrants health,” “Black immigrants health,” “Caribbean immigrants health,” “African immigrants health,” “diabetes and Black immigrants,”

"diabetes and African Americans," "hypertension and Black immigrants," "hypertension and African Americans," "cancer and Black immigrants," "cancer and African immigrants," "high cholesterol and Black immigrants," "high cholesterol and African Americans," "cardiovascular risk factors and Black immigrants," "cardiovascular risk factors and African Americans," "cancer screening and African Americans," "cancer screening and Black immigrants," "breast cancer and immigrants," "breast cancer and Afro-Caribbean immigrants," "breast cancer and African immigrants," "immigrants and health insurance," "Affordable Care Act and Black immigrants," "Affordable Care Act and Caribbean immigrants," "cervical cancer and immigrants," "cervical cancer and Afro-Caribbean immigrants," "cervical cancer and African immigrants," "colorectal cancer and immigrants," "colorectal cancer and Afro-Caribbean immigrants," "colorectal cancer and African immigrants," "immigrants and health insurance," "immigrants and health insurance," "Affordable Care Act and African immigrants," "Affordable Care Act preventive services and African Americans" "Affordable Care act preventive services and immigrants" "Affordable Care Act and immigrants," "health care and Black immigrants," health care and immigrants of African descent."

Two seminal publications on immigrants from Africa and the Caribbean in the U.S. were also used as references during this review, *The Other African Americans: Contemporary African and Caribbean Immigrants in the United States* by Yoku Shaw-Taylor and Steven A. Tuch; and *Black Identities: West Indian Immigrant Dreams and American Realities* by Mary C. Waters.

Articles selected for this review covered health, health care access, the Affordable Care Act, cancer, cancer screening, breast cancer screening, colorectal cancer screening, colorectal cancer, diabetes, cardiovascular disease in African Americans, or hypertension with the study population focused on immigrants of African descent in the U.S., immigrants of African descent

in Africa or the Caribbean, or immigrants in general inclusive of immigrants of African descent. The search did not reveal any articles exclusively focused on the Affordable Care Act and immigrants of African descent.

Results

Health Disparities among African Americans in the U.S.

Health disparities emerge due to a complex interplay of interacting factors that are grounded in social, behavioral, biological, community dynamics, and institutional or system level policies that govern the environment within which people function. Braveman and colleagues define health disparities as systematic and avoidable health differences that adversely affect socially disadvantaged individuals, who are labeled disadvantaged due to their race, ethnicity, skin color, religion, nationality, socio-economic status or resources, geography, age, gender, and other characteristics of discrimination or marginalization [26].

In the U.S., African Americans experience stark disparities in health compared to the general White population, and often compared to other racial and ethnic minorities such as Hispanics, American Indians and Alaska Natives, and Native Hawaiians or Other Pacific Islanders [17–21,28,29].

Chronic Diseases

Chronic diseases are a global health challenge [30]. Although generally preventable, chronic diseases such as cancer, diabetes, stroke, and heart disease disproportionately affect people of African descent populations globally. Risk factors for chronic diseases such as uncontrolled high blood pressure, high cholesterol, obesity which develops in part due to

unhealthy diet and inadequate physical activity, tobacco use, excessive alcohol consumption, and elevated blood glucose, are more pronounced among African Americans [18,20,29,31–35].

African Americans have the poorest health status and health outcomes for many diseases, disorders, and conditions among all racial and ethnic minority populations in the U.S. African Americans are more likely to die at an early age from all causes of death compared to Whites, and generally have higher mortality rates for diseases such as heart disease, stroke, cancer, and diabetes [18,36–39].

The overall rate of mortality among African Americans has decreased in recent years, but African Americans still are diagnosed at an earlier age than Whites, and are more likely to die from diseases and conditions such as diabetes, hypertension, and stroke[17–19,40–42]. African Americans also have a disproportionate burden of cancers such as breast, cervical, prostate, colorectal, and lung[20].

Heart disease is the leading cause of death in the United States, with African Americans having a high rate of morbidity and mortality [17]. Risk factors for chronic diseases like heart disease and diabetes are more pronounced among African Americans. Uncontrolled high blood pressure, obesity which develops in part due to unhealthy diet and inadequate physical activity, smoking, excessive alcohol consumption, high cholesterol, and elevated blood glucose are some of the risk factors for heart disease and diabetes [17,21].

Worldwide, there are approximately 463 million people living with diabetes, and this trend is expected to escalate with an estimated 578 million cases by 2030 [43]. Diabetes is more prevalent in low and middle-income countries compared to higher income countries, while the U.S. has the third highest rate of diabetes globally[43]. Low-income countries have a high rate of undiagnosed diabetes due to various factors such as limited health care access, lack of

knowledge about diabetes, and undertraining of health care professionals [43]. In the U.S., approximately 13 percent of African Americans are diagnosed with diabetes with about three percent having undiagnosed diabetes, compared to 8.2% of Americans who have diabetes [19].

Overview of the Affordable Care Act

Access to health care is a major health disparities issue particularly for racial and ethnic minority, immigrant, and low-income populations who are more likely to be uninsured. Studies have shown that having health insurance improves access and utilization of health services including preventative services and screening rates. However, immigrants are less likely to have regular doctor visits, a usual source of care, or access to preventive services such as primary care [44]. While there is no current comprehensive immigration policy in the U.S., the landmark Affordable Care Act may be considered the proxy immigration policy that addresses the health of some immigrant populations based on its citizenship or legal status eligibility requirement for health insurance coverage.

The ACA was legislated to reduce the number of uninsured individuals in the U.S. and make health care more affordable and accessible, while providing no cost sharing for preventive health services such as cancer screenings. The law also created the opportunity for some immigrants to have greater access to health care. Immigrants who are naturalized citizens or legal permanent residents with at least five years of residence in the U.S. are eligible for health insurance coverage under the ACA.

Prior to the enactment of the Affordable Care Act (ACA), 50 million Americans and 21 percent of African Americans were uninsured. People with lower incomes had a higher rate of being uninsured compared to those with higher incomes. Approximately 34.5 percent of immigrants were uninsured including 46 percent who were non-citizens and 19 percent who

were naturalized citizens. The geographic distribution of uninsured was 12.4 percent in the Northeast, 13.3 percent in the Midwest, 18.3 percent in the West and 19.7 percent in the South [45]. Data on the number of uninsured immigrants of African descent was limited. Batalova and Terrazas reported that prior to the ACA, 51 percent of Caribbean immigrants had private insurance and 21percent had public health insurance coverage (Batalova, J., & Terrazas, A. 2010). By 2014 with the implementation of the ACA, 21 percent were uninsured compared to 27 percent of the overall immigrant population. [46].

The ACA has significantly reduced the health insurance coverage gap for African Americans, and for immigrants in general, but its impact on health care access for immigrants of African descent has not been studied. With the ACA, some immigrants may fare better than other immigrants, documented or undocumented, in terms of health and health care [7,15,16,47–49]. The lack of health care access that many immigrants continue to experience is associated with a myriad of factors such as immigrant status, lack of knowledge about the ACA, income, employment status, fear of deportation, and lack of transportation [4,50–55].

Geographic residential locale is a significant determinant of health that is underscored by the ACA's provision that promotes state Medicaid expansion. In non-Medicaid expansion states such as Florida, and Georgia that have large populations of immigrants of African descent, immigrants may have less access to care compared to immigrants in Medicaid expansion states like New York, or Massachusetts and California that also have state-specific programs or policies in place to provide access to medical care for documented and undocumented immigrants [56–61]

Characterization of Immigrants of African Descent

Immigrant populations make up approximately 13.5 percent of the U.S. population (Pew Research Center) with immigrants of African descent comprising about nine percent of the overall immigrant pool. Immigrants of African descent refer to individuals of African or Black heritage who were born outside of the United States and its territories and currently reside in the U.S. Immigrants are also referred to as "foreign-born" (U.S. Census Bureau).

Immigrants of African descent in this paper consist primarily of individuals from the regions of the Caribbean and Africa. While 50 percent of immigrants of African descent in the U.S. are Caribbean immigrants, the fastest growing group of immigrants of African descent in recent years have come from Africa (39 percent) mainly from sub-Saharan Africa primarily Nigeria and Ethiopia [11,13,46,62].

The data on immigrants of African descent may be underreported since information is usually captured on immigrants from the larger islands of the Caribbean such as Jamaica, Haiti, Trinidad and Tobago, and the Dominican Republic, while disregarding the cumulative impact of immigrants from smaller islands of the Caribbean especially in terms of having adequate sample size (Shaw-Taylor & Tuch, 2007).

Migration to the U.S. for most immigrants of African descent is often voluntary in a quest for opportunities for success and advancement that are generally not available or limited in their country of birth. Some immigrants of African descent from Haiti, Cuba, and some African countries migrate to the U.S. as refugees, although they make up a small percentage of the African descent immigrant cohort. Many immigrants come with the goal of pursuing higher education, some come in hopes of retooling and gaining new skills, while others often commit to

finding, settling for, and maintaining steady although in some cases, precarious and low-skilled employment to take care of their families in the U.S. and abroad [9–13].

Immigrants of African descent are generally more educated than native-born African Americans having at least a college education (26 percent immigrants of African descent compared to 19 percent African Americans), less likely to live in poverty (20 percent compared to 28 percent), more likely to have a higher income, and more likely to be married. In comparison to the overall U.S. immigrant pool, these results were reversed, with 26 percent of immigrants of African descent having a college degree compared to 30 percent of all immigrants, and only 40 percent being homeowners compared to 51 percent for all immigrants [11,63–65].

Classification of Immigrants

The classification of immigrants is generally based on place of birth, race, and immigration status, which may be defined by citizenship. Immigrants of African descent are more likely to be U.S. citizens (58 percent) compared to all other immigrants (49 percent), with approximately 15 percent who are undocumented [11,63]. Immigration status is a principal determinant of health for immigrants in terms of the level of health care services and economic opportunities they can access, contingent upon their immigration status as naturalized citizens or legal permanent residents.

The differentiation between documented and undocumented immigrants is rarely distinguishable in research studies. Documented immigrants refer to individuals born outside the U.S. who have legal rights through permanent residency, naturalized citizenship, or other legal status such as refugees or asylees (Migration Policy Institute). Undocumented immigrants are those individuals who either entered the U.S. illegally, or others who entered legally but stayed beyond the length of stay granted by immigration officials upon entering the U.S.

There is within group variance for how immigrants of African descent are classified in the literature, including how Caribbean immigrants of African descent are stratified [10]. Earlier studies and analyses generally only included immigrants from the English-speaking Caribbean which is the main source of immigrants of African descent. Immigrants from non-English speaking countries like Haiti where creole is spoken, or Cuba and the Dominican Republic where Spanish is the primary language, have sometimes been excluded based on language. Recent mass migration of Haitians to the U.S. due to political instability, poverty, or natural disasters, have spurred increased research focus on the health of Haitian immigrants as a subgroup of immigrants of African descent.

A Glimpse into the Health of Immigrants of African Descent

Immigrants of African descent in the U.S. constitute 10 percent of the African American population. While this group of immigrants is steadily increasing in numbers, the data on immigrant health is sparse with only a few large national health-related data sources that collect information on immigrants. In many instances, studies focus on multiple years of data to obtain adequate sample sizes. The National Health Interview Survey (NHIS) is a cross-sectional health-related dataset with immigrant information on citizenship and place of birth. Other data sources with related immigrant or place of birth data include the American Community Survey, the March Current Population Survey, the National Health and Nutrition Examination Survey (NHANES), and the National Survey of American Life. These are the primary datasets along with the NHIS, used in studies identified for this review on immigrants of African descent. Much of the data available on immigrants of African descent, have characterized this population according to social and economic status, and are mainly literature reviews, with a paucity of rigorous research on the health of this population.

Griffith et al., looked at ethnic differences in health among the American Black population classified as U.S. born African Americans, U.S. born Caribbean Blacks, and Caribbean born immigrants. All groups reported differences in self-reported ratings of health and being diagnosed with chronic physical health conditions. Caribbean-born immigrants showed the best health outcomes while U.S. born Caribbean Blacks had the worst. Data was based on the National Survey of American Life[66].

Differences in health exist within African descent populations even from the same regions. Pinheiro et al., examined cancer incidence, survival, and mortality among U.S. born African Americans and immigrants of African descent from Haiti and Jamaica, and found U.S. born African Americans had higher cancer mortality rates than Haitians and Jamaicans which may be partially attributed to the healthy immigrant effect [67]. Consedine reported no differences in breast cancer screening among U.S.-born African American, Caribbean, and African women, but among Caribbean women, Haitians had the lowest screening rates. Caribbean immigrants showed lower rates of screening for breast cancer and less frequency compared to U.S. born African Americans, and screenings were inconsistent with recommended guidelines [68].

Studies to understand the landscape of the health of immigrants of African descent in the U.S. have predominantly examined immigrant health in terms of prevalence and incidence or qualitative examination of perceptions and attitudes towards health with few interventions or empirical studies focused on health care access. In one study, Adekeye and colleagues examining barriers to healthcare access among African immigrants, found that 45 percent of the participants were uninsured, and approximately the same percentage of participants identified cost as a major

barrier to health care access. In addition, the wait time for medical appointment and care was an inhibitor [14].

Wafula and Snipes conducted a review on access to health care and the influential factors that affect barriers to health care access among immigrants of African descent. Limited knowledge in navigating the U.S. healthcare system, low health literacy, lack of health insurance, language barriers, lack of transportation, lack of cultural consideration in delivering health information, and stigma related to certain diseases/conditions were driving factors identified [4]. In addition, cultural nuances and religious beliefs also led to delay in seeking medical care which often result in late stage diagnosis for diseases like cancer [4].

Healthcare Access

Health insurance coverage is a critical dimension in facilitating healthcare access and reduction in health disparities. A lack of health insurance is a key dynamic in an individual's decision to seek or delay care, as is socio-economic status for immigrants who delay seeking cancer screening. [69]. Many studies examining health insurance focus on the non-elderly population in part due to the age 65 eligibility for Medicare. Among immigrants, this eligibility requirement may be difficult for elderly immigrants to attain based on the citizenship or permanent residency requirement of five years if the elderly migrate at 65 years or older compared to those who migrated at an earlier age [55].

Stewart and colleagues explored the lack of health insurance among elderly U.S. born African Americans and immigrants of African descent in the U.S. using the 2008 American Community Survey. Immigrants were more likely to be uninsured. Multivariate logistic regression analyses found that 1.7 percent of U.S. born African Americans, 8.4 percent Latin American/Caribbean immigrants, 23.2 percent of African, and 9.3 percent of other immigrants

were uninsured. Acculturation and migration timing contributed to the African born immigrants 3.8 times higher odds of not having insurance, compared to Latin American/Caribbean immigrants, after controlling for socioeconomics and demographics [70].

Research has consistently shown that immigrants including those of African descent, are more likely to be uninsured, delay or forego medical care, lack a usual source of care, have unmet health needs and lack timely preventive screenings such as cancer screenings [71–75]. Many immigrants obtain medical care at community-based or hospital-based clinics often due to socio-economic status and affordability of medical care at these facilities [69].

Choi examined the prevalence of delay in seeking medical care among immigrants due to cost, based on region of birth. The study found that 15.5 percent of immigrants from Mexico/Central America/Caribbean delayed care when adjusted for age and were among the populations that were more likely to delay care. After controlling for geography and individual-level variables such as health insurance, the delay in care among Caribbean groups attenuated. This finding suggests access to health insurance among immigrants can potentially improve health. The study utilized the 2007-2011 American Community Survey data linked with county and state-level data according to population density and availability of health care services or facilities. Three groups of models were developed for the analysis by region of birth, individual-level variables, and county-state-level covariates [73].

Another important dimension of health care access is having a usual source of care. Hammond and colleagues looked at usual source of care based on immigration status (defined by nativity and acculturation), socioeconomics, health care access, health status, and health insurance among African American and Caribbean men. Being insured was associated with higher odds of usual source of care for African American men and lower odds for Caribbean

men. African American men with more health conditions were more likely to have a usual source of care than Caribbean men. Caribbean men are more likely to be uninsured and less likely to visit a doctor compared to African American men. Having a usual source of care was generally associated with being older, married, unemployed, having some college education, and higher income. There was no statistically significant association between having a usual source of care with length of time in the U.S. and nativity status. Although no association was observed between usual source of care and education, income, geography, or physical health status, unemployment was associated with having a usual source of care [76].

A study on breast cancer adherence among immigrant women found that the odds of immigrant women having a usual source of care receiving timely mammograms was more than twice as high as immigrant women who did not have a usual source of care (Yao & Hillmeier).

A Chance to Improve Health care Access for Immigrants

Empirical evidence shows that the Affordable Care Act has contributed to significant reductions in the uninsured rate for African Americans, Hispanics, and immigrants overall. Studies on the impact of the ACA on health care access have examined it within the context of racial and ethnic disparities among U.S. populations, or among immigrants in general. Few studies have disaggregated the immigrant data by race and ethnicity, and no studies were found specifically on the impact of the ACA on immigrants of African descent.

Eligibility for health insurance coverage including Medicaid through the ACA, is contingent upon legal immigration status and length of U.S. residence of at least five years for immigrants. Access to health insurance coverage is also determined by an immigrant's state of residence based on the state's Medicaid expansion or non-expansion status[48,56,60,61,77].

Stimpson and Wilson studied the impact of Medicaid expansion on insurance coverage among U.S. born citizens, naturalized citizens, and non-citizen immigrants, using American Community Survey data for 2010-2015 with adults 19-64. Findings showed a decline in the uninsured rate among all groups after the ACA. Medicaid expansion explained the decrease in being uninsured, except among naturalized citizens. Although the number of uninsured diminished after the ACA, disparities in coverage persisted among non-citizen immigrants and U.S. born citizens. Prior to the ACA, non-citizens were almost twice as likely as U.S. born citizens to be uninsured, but after the ACA they were three times more likely than U.S. born to be uninsured, a result of their ineligibility for health insurance under the ACA [60].

Two studies by Buchmueller et al., and Chen and colleagues, investigated racial and ethnic disparities in health insurance coverage after ACA implementation. Buchmueller et al., looked at the extent to which disparities in coverage after the ACA were associated with income and Medicaid. Results indicated that the health insurance coverage disparity between Whites and African Americans diminished by two percent, and by 4.3 percent between Whites and Hispanics. Prior to the ACA, Hispanics had the largest proportion of uninsured with 40.5 percent. Among African Americans, 25.8 percent, and 14.8 percent of Whites were uninsured. Overall, Buchmueller et al., reported an increase in health insurance coverage, and a reduction in the coverage gap by race and ethnicity with a 7.1 percent decrease in the uninsured rate among Hispanics, 5.1 percent among African Americans and 3 percent for Whites [78]. Disparities remained even with a reduction in the health insurance coverage gap, while differences in income explained some differences observed in the coverage gap between Whites and African Americans.

Chen et al., examined racial and ethnic disparities in health care access and utilization after the ACA with National Health Interview Survey data for 2011-2014. The ACA attributed to significant reductions in being uninsured, delaying care or foregoing care. In addition, there was a significant increase in physician visits. African Americans had a significant decrease in uninsured rates compared to Whites but were more likely to delay or forego care following the ACA implementation. Multi-variate probability models were completed after initial trend analyses, and Anderson Behavioral Model was applied in selecting independent variables [72]

Using data from the 2011-2016 National Health Interview Survey, Bustamante and colleagues also found a reduction in individuals delaying and foregoing care, with a study population of immigrants and U.S.-born citizens. The study examined changes in health insurance coverage, access and utilization of health care before and after the Affordable Care Act. The findings showed a decrease in the percentage of individuals delaying care, with U.S. born citizens and non-citizens who have more than 5 years residency showing a three percent reduction, a four percent decline among naturalized citizens, and recent non-citizens had the highest decrease at five percent. Compared to U.S. born citizens, all immigrants had higher odds of being uninsured. After controlling for covariates, lower odds of being uninsured, foregoing care or delaying care were found. The ACA was effective in closing the health insurance coverage gap between U.S. citizens and immigrants [47].

Cancer Screening among Immigrants

Cancer is a leading cause of mortality among individuals of African descent globally, although incidence rates vary by country and cancer type. In the U.S., there has been a reduction

in cancer death rates due to several factors including advances in science and medicine, early detection, and a decline in smoking (ACS).

Disparities in breast cancer mortality among African Americans persist despite the history of wide-ranging approaches to promote breast cancer awareness and screening through health education and health promotion campaigns; brochures; mass media; physician reminders; community and faith-based organizations [79,80]. African American women have the highest breast cancer mortality rate compared to women of all other racial and ethnic minority populations, and a 42 percent higher death rate than Whites (DeSantis et al., 2015). African American women younger than age 45 are more likely to have a breast cancer diagnosis than White women of the same age [81,82]. On average, African American women are diagnosed at a younger age (age 57) than White women (age 62), and experience a lower rate of survival after diagnosis [81].

Early detection through mammography, colonoscopy, or pap smear is a powerful mechanism to detect breast, cervical, or colorectal cancer before it metastasizes and with timely and effective treatment, women can potentially experience longer survival [20,81,83–85]. Race, ethnicity, and socio-economic status are major determinants of cancer screening disparities [22,23,86,87], and a longstanding concern in the medical community has been the low-screening rate for breast, cervical, and colorectal cancer among African American.

Studies have identified a wide range of social and structural factors attributed to the low rates of screening or delay in seeking mammogram among African Americans, such as cost, fear, lack of access to screening facilities due distance or inconvenient hours, poverty, lack of health insurance, lack of knowledge about the importance of regular mammograms, pain of the procedure, lack of a regular physician or physician referral [68,88–90].

Predictors of cancer screening among immigrants include having a usual source of care, socio-economic status, health insurance, and income [91]. Immigrants of African descent screen at a lower rate for breast cancer compared to U.S. born African Americans. Factors such as lack of a primary care doctor, and immigration status also play a role in African descent immigrant women's screening behaviors and practice [68,89,92,93]. Hurtado-de-Mendoza et al., found that African immigrants had lower rates of cancer screening, and inadequate knowledge about breast cancer screening practices, although higher socio-economic status was positively associated with higher rates of screening. Transportation, lack of health insurance or access, and fear or shame of screening and socio-demographic factors also inhibited African immigrants from seeking breast cancer screening [89].

Yao and Hillemeier examined disparities in mammogram among immigrant and U.S.-born women and found that while the rate of mammogram increased among immigrants, they still screened at a lower rate than U.S. born populations. Predictors of mammogram were age, usual source of care, lower education and length of U.S. residence. Yao and Hillemeier's work used National Health Interview Survey data for 2000 and 2008 with women age 40 and older; but did not stratify women by region of birth. Recent immigrants had a significantly lower rate of screening than immigrants who had been in the U.S. more than 10 years. Immigrant women with either private or public health insurance were significantly more likely to receive a mammogram compared to uninsured women [94].

The low rate of breast cancer screening among immigrants sometimes is attributed to a lack of health insurance coverage and access to medical care. Miranda and colleagues combined Medical Expenditure Panel and National Health Interview Survey data for 2000-2010, to determine the impact of citizenship and length of residence in the U.S. on breast cancer

screening. The sample was organized by U.S. born citizens, immigrant citizens, and immigrant non-citizens. Compared to U.S. born citizens, recent immigrants (less than 5 years residence) were less likely to receive screening consistent with screening guidelines for breast, cervical, and colorectal cancer. Both groups of immigrants living in the U.S. for more than 5 years, had higher odds of screening for breast and cervical cancer compared to U.S. born citizens. Findings suggest that while the ACA may improve the uptake in mammogram for immigrant women, this only applies to immigrants who are eligible for health insurance coverage under the ACA [49].

Cervical cancer screening or the pap test can help to prevent cervical cancer if screenings are obtained on a regular basis and cervical cancer is detected at an early stage. In general, women with lower education and no health insurance, and recent immigrants, are less likely to obtain cervical cancer screening [20].

Current cervical cancer screening guidelines from the U.S. Preventive Taskforce Services, recommends women between the ages of 21-65 screen for cervical cancer every three years. Screening is not recommended in women older than 65 unless they are at high-risk for cervical cancer or have not had regular screenings [95].

One study reported an incidence rate of cervical cancer among African American women as 10.3 per 100,000, compared to 7.2 among White women. African American women are also more likely to be diagnosed with late stage cervical cancer and less likely to receive treatment after diagnosis due to advanced cancer at diagnosis, patient refusal, or comorbidity [96]. Endeshaw and colleagues investigated screening for cervical cancer by birthplace and percentage of a person's lifetime living in the U.S. Compared to U.S.-born women, immigrant women were at least two times less likely to have received a pap test. Women from Africa were the second most likely group of immigrants to be unscreened compared to U.S.-born women. Immigrant women

living in the U.S. for less than 25 percent of their life had a lower rate of screening compared to immigrants living in the U.S. for more than 25 percent of their life [97].

African Americans in the U.S. have a disproportionate burden of colorectal cancer with diagnosis at a younger age, and the highest incidence and death rates compared to other racial and ethnic groups [20,98]. African Americans also have a lower rate of survival from colorectal cancer compared to Whites [20]. As with other cancers, the disparities in colorectal cancer outcomes have been associated with limited access to health care, late stage diagnosis and lower screening rates [99,100]. Recent screening guidelines from the American Cancer Society, have caught up with earlier recommendations from the American College of Gastroenterology for African American adults to begin receiving regular screenings for colorectal cancer at age 45 through stool-based testing or visual examination such as a colonoscopy or flexible sigmoidoscopy [101,102].

The ACA authorizes free preventive screening for breast, cervical, and colorectal cancer for eligible women, naturalized citizens, and permanent residents with a minimum of five years of U.S. residence. Coverage under Medicaid varies by states since Medicaid is a state-administered program. In some states that administer the National Breast and Cervical Cancer Early Detection program through primary care clinics, documented and undocumented immigrants who are not eligible for mammograms under the ACA, may be eligible for free breast cancer screening.

Evidence demonstrates an increase in the uptake of certain preventive services associated with implementation of the Affordable Care Act. Although fewer studies have examined the impact of the ACA on cancer screening, the results have been inconsistent for different cancers. Silva et al., found that African American and Hispanic/Latina women showed a slightly larger

shift to early stage breast cancer diagnosis after implementation of the ACA preventive services provision, compared to White women, but there was no major reduction in the breast cancer disparity [103]. The modest shift towards early detection suggests there is potential for the ACA to improve early diagnosis for breast cancer among African Americans.

Han et al., found few changes in cancer screening including mammogram after the ACA (Han et al., 2015).

A study of mammography and colonoscopy uptake during the ACA among Medicare beneficiaries by Cooper et al., found an increase in mammograms but no significant changes in colonoscopy uptake (Cooper et al., 2016). Limitations of this study included a predominantly White study population 70 years and older which was not the targeted population for the ACA but underscores the dearth of data available on the impact of the ACA on African Americans and particularly immigrants of African descent. In another study, Nelson and colleagues also had a majority White study population with only two percent African Americans based on data from a community health system, to assess the rate change in mammograms after ACA implementation. Investigators observed an increase in the rate of breast cancer screenings among women ages 50-74, but not among women younger than 40 or 75 years and older (Nelson et al., 2015). These studies suggest there is a need for research on the impact of the ACA on racial and ethnic disparities in breast cancer screening.

Prevalence of Hypertension

Hypertension, also referred to as high blood pressure, is a major risk factor for various diseases and health conditions including cardiovascular disease, stroke, and chronic kidney disease. It is often denoted as a silent killer because it generally has no distinguishable symptoms. Individuals of African descent residing in the Caribbean and Africa have high rates of

hypertension even before they migrate to the U.S. Inadequate healthcare infrastructure, lack of screening guidelines, lack of medication adherence, limited availability of medication, and medication costs may account for the high rate of uncontrolled hypertension in Africa and the Caribbean [104,105].

According to the World Health Organization, 46 percent of the world's high blood pressure cases are in Africa, which has the highest rate of high blood pressure worldwide [106]. One review study reported higher prevalence of high blood pressure among Caribbean residents of African ancestry compared to West Africans [107]. In the Caribbean, studies have found a 26 percent prevalence of hypertension among individuals 25 years or older, while the prevalence rate among those more than 40 years old was as high as 55 percent [108].

In the U.S., individuals of African descent have higher prevalence of hypertension compared to Whites [109], with more than a 41 percent rate of high blood pressure, compared to approximately 27 percent among Whites [29,110,111]. People across the African diaspora are diagnosed with hypertension at an earlier age compared to other populations [42], and in general are often not aware that they have high blood pressure [112]. Studies have also shown within group differences in hypertension with a higher hypertension prevalence among U.S.-born African Americans compared to immigrants of African descent [41,42,113,114].

In a study to examine awareness of hypertension among African American men living in the U.S., Cole et al., looked at the influence of nativity, and found that immigrant men were significantly less likely to be aware they had hypertension than U.S. born African Americans. The longer that immigrant men lived in the U.S., the more likely they were to be aware of having high blood pressure even after controlling for covariates. The study showed that 45.1 percent of immigrants of African descent did not have a regular doctor and 42.5 percent lacked health

insurance compared to 38.8 percent of U.S.-born African Americans without a doctor and 15 percent without health insurance. The study used 2010-2014 secondary data from the Men's Health Initiative aimed at addressing health disparities in older African American men (U.S. born or immigrant). The data was collected in the five boroughs of New York City through community-based organization partnerships and health fairs. Hierarchical multiple logistic regression analysis was conducted [112].

A lack of awareness of high blood pressure could also signal undiagnosed or uncontrolled hypertension [105,110], which are found in higher rates among individuals of African heritage regardless of region of birth or residence. Zallman and colleagues investigated the odds of immigrants having undiagnosed and uncontrolled hypertension and hyperlipidemia. The impact of socioeconomics such as health insurance based on place of birth, were also explored in relation to undiagnosed and uncontrolled hypertension. The study showed that uninsured immigrants with hypertension were twice as likely as insured immigrants to have undiagnosed hypertension. Access to health insurance coverage reduced the disparities in undiagnosed and uncontrolled hypertension among immigrants after controlling for socio-demographics. National Health and Nutrition Health Survey data for 1999-2008 were used for this study which employed multivariable logistic regression analyses [115].

Social, behavioral, and environmental factors have been linked to hypertension. Commodore-Mensah et al., examined the social determinants of cardiovascular disease risk factors in African descent populations, comparing African-born, Caribbean-born and U.S. born African Americans. Data from the NHIS for 2010-2014 was used for this study. Differences in hypertension prevalence were observed by ethnicity. Higher income was associated with lower odds of hypertension in African Americans and Caribbean immigrants. Hypertension prevalence

among African Americans was 37 percent, and 22, and 21 percent respectively among Caribbean, and African immigrants after adjusting for age and sex. Higher odds of hypertension were associated with being insured among African immigrants, while African American and Caribbean groups reported lower odds of hypertension with higher income [116].

The influence of acculturation or length of residence on hypertension prevalence among immigrants of African descent has been mixed. Another study by Commodore-Mensah and colleagues to assess the association between cardiometabolic risk and length of residence in the U.S. among immigrants, found that the prevalence of hypertension was associated with longer length of residence in the U.S. particularly among those who have lived in the U.S. for 10 or more years. Multivariable logistic regression analyses were conducted using 2010-2014 NHIS data [117].

In examining the association between nativity and the probability of having hypertension among immigrants of African descent living in the U.S., Brown and colleagues found a higher prevalence of hypertension among U.S.-born African Americans compared to immigrants of African descent. However, unlike Commodore-Mensah, Brown et al., showed no significant association in the odds of hypertension based on length of residence among immigrants. Health insurance coverage was higher among U.S.-born African Americans (76.2%) compared to immigrants (70%), but the high rate of hypertension prevalence persisted among U.S.-born African Americans. The researchers conclude that chronic stress, racial discrimination, and mental health distress may be the underlying explanations for the higher rate of hypertension among U.S.-born African Americans [113].

Individuals who are overweight, smoke, have diabetes, physically inactive, or have a family history of hypertension, are at increased risk for high blood pressure. Salt-sensitivity has been attributed to the prevalence of hypertension among individuals of African descent, who use or consume sodium in large amounts during food preparation, or frequent consumption of processed food or food prepared in restaurants and fast-food facilities [105]. Research also suggests some genetic association between salt retention among individuals of African heritage due to a defect in renal sodium handling that promotes salt retention through single gene mutations [105]. In recent years, the World Health Organization in collaboration with regional organizations such as the Pan American Health Organization and the Caribbean Public Health Association (CARPHA) issued guidelines or boost efforts to enhance training of health care professionals on how to evaluate and screen patients for hypertension, as well as how to treat and manage the condition [110].

Research on hypertension among African Americans is well-documented, but the prevalence of hypertension or access to care for immigrants of African descent with hypertension residing in the U.S. has been scarcely explored. Data on the ACA's impact on access to care for hypertension patients, or adherence to high blood pressure medication, is limited. Han et al., (2015), studied changes in the utilization of preventive services such as blood pressure and cholesterol checks, and cancer screenings, following implementation of the ACA. The study showed that blood pressure checks had the highest rates of increase in use. Among non-elderly adults, 80 percent of individuals with private health insurance received blood pressure checks, and more than 90 percent of those with Medicare, compared to 50 percent of uninsured young adults [118].

Hypertension is a risk factor for diabetes. Complications due to diabetes can lead to kidney disease, vision loss, lower limb amputations, and cardiovascular diseases. The literature on diabetes prevalence among immigrants of African descent in the U.S. is limited and mixed. Studies have found that Caribbean residents have higher prevalence of diabetes than Africans [31,119]. In one study, Caribbean immigrants had similar diabetes prevalence as African immigrants, and lower rates than U.S.-born African Americans [120]. Another study found that Caribbean and sub-Saharan Africa immigrants had higher rates of diabetes than residents living in Ontario Canada. Immigrant women from the Caribbean also had higher risk of diabetes than men [121].

Health disparities among immigrants is multifactorial. Factors include lack of access to medical care, immigration status, lack of health insurance, lack of a regular physician or healthcare facility for medical care, and limited English proficiency for some groups of immigrants. Some of the barriers that impact immigrants' access to medical care include cost, distance to medical care, lack of reliable transportation or long work hours that make it difficult to get to medical appointments. Many immigrants lack paid sick leave based on the nature of their jobs which may include working shift hours during the night and weekends, exacerbating their ability to access healthcare on a regular basis [10].

The Healthy Immigrant Effect

Research has shown that recent immigrants including immigrants of African descent, arrive in the U.S. in a healthier state of health compared to U.S. born citizens or immigrants of the same racial and ethnic background who have been residing in the U.S. for more than a decade. Paradoxically, research also points to a decline in immigrant health status with increasing assimilation or acculturation, which may be attributed to adapting the cultural

influences of the U.S. such as unhealthy nutrition and eating behavior, language/accent, dress, attitudes, and lifestyle [76,117]. Research by Commodore-Mensah and colleagues examining the association between length of U.S. residence and cardiometabolic risk factors among immigrants of African descent, found that those living in the U.S. for more than 10 years had higher rates of obesity, hypertension, and diabetes than those living in the U.S. for less than 10 years [117].

The health advantage of immigrants is partially explained by the cultural grounding of many immigrants who immigrate from regions where their consumption of alcohol, smoking, or use of illegal drugs occur on a smaller scale than in American society. Some immigrants adapt these behaviors to assimilate into their new society. Unhealthy assimilation has been a major determinant of the convergence of immigrant health with that of U.S. born citizens and emerges over time while the initial health advantage diminishes. Stress associated with migration and acclimatization to the social and economic fabric, and culture of the U.S., are factors that influence the health of immigrants but is inadequately studied.

Immigration status, and acculturation defined by years in the U.S., has significant implications for health care access and utilization for immigrants. Acculturation of immigrants transcends multiple dimensions such as language, education, work, residential settlement, politics, and racial and ethnic identification [16]. Studies have consistently found an association between acculturation and health status and receipt of health services [1,36,89,122]. Brown and colleagues found a higher rate of mammogram and clinical breast exams associated with time spent in the U.S., among immigrant women in New York City [36].

Studies have historically found that the immigrant health advantage disappears with increased years of acculturation. Lu and colleagues' longitudinal study to examine the self-rated health of U.S. born residents and immigrants did not support this long-held research evidence of

many cross-sectional studies. The immigrant health advantage remained constant during the study irrespective of their length of residence, while the health of U.S. born counterparts declined. Recent immigrants, those who arrived after 2000, had better self-reported health than all other immigrant groups who arrived earlier. No decline in health was observed among immigrants in this study using data from the Survey of Income and Program Participation [123].

The immigrant health advantage is observed among immigrants of African descent although the results have been inconsistent in terms of the duration of the healthy effect. A study by Hamilton and Hummer found a persistence of the healthy immigrant effect among African immigrants who were residing in the U.S. for more than 20 years, compared to U.S. born African Americans [124]. Analysis by subgroups of immigrants however, showed negative health effects among Caribbean immigrants who were residing in the U.S. for more than 20 years. In a separate study, Hamilton examined differences in self-rated health outcomes across generations and regions of birth among immigrants of African descent who identified as West Indian, Haitian, Latin American, or African. Generational differences were observed, with first generation African descent immigrants exhibiting a lower probability of reporting poor or fair health than third generation immigrants. Health advantage was more prominent among first generation compared to third generation immigrants who were 13 years or older when they migrated.

In another study, Hamilton examined the health advantage of immigrants to assess whether the persistence of that advantage was due to characteristics of the country of birth or selective migration. Recent immigrants showed a 6.1 percent lower probability of self-reporting their health as poor or fair, compared to U.S. born adults. This health advantage decreased in changing the reference group to U.S. born movers, or people migrating or moving for employment purposes or some other motivation. The 1999-2013 waves of the March Current

Population Survey were used for this study [9]. The findings dispute longstanding findings about the underlying factors that contribute to the elimination of the immigrant health effect.

The Effect of Racial and Linguistic Discrimination

Racism is a strong predictor of health disparities for African Americans, but for immigrants of African descent depending on the racial composition of their country of origin, this factor may have less of an effect until they arrive in the U.S. and confront racial, immigration, and linguistic discrimination. The interacting factors of racism and immigrant status may also be associated with immigrant health and access to care, although this area of research has not been fully explored in U.S. studies on immigrants' health. One study found that immigrants may underutilize or delay health care services due to perceived discrimination, immigration status, race, accent and socio-economic status [4].

The African descent immigrant diaspora, although predominantly from Africa and the Caribbean, represents multiple languages and different accents particularly among those from English-speaking countries. The diversity in language among immigrants of African descent, presents challenges for them in communicating effectively with health care providers. The frustration of not understanding the health care provider or not being understood by the health care provider may contribute to avoidance of the healthcare system [4].

Hamilton and Hummer examined the influence of racial composition of immigrants of African descent country of origin, to determine whether exposure to discrimination prior to migration explains variation in health. The study used data from the 1996-2010 March Current Population Survey and revealed that immigrants of African descent had lower odds of poor health compared to African Americans. After controlling for socio-demographics, the differences observed between both populations were modest. Although the healthy immigrant effect

persisted, in general, pre-exposure to discrimination did not explain the variation in health among immigrants of African descent [124].

Prus et al., investigated race and immigrant disparities in relation to health and health care access among middle to older age immigrants in the U.S. and Canada. Significant negative health status and access to care were observed for non-White U.S. born and immigrant populations even after controlling for health insurance coverage, socioeconomics, lifestyle factors and demographics. The study used data from the Joint Canada/U.S. Survey of Health for 2002-2003 to examine the dual effects of race and nativity. Compared to the U.S., no significant health differences were observed for the Canadian cohort [75].

Residential Patterns of Immigrants of African Descent

Poor health status among African Americans is associated with racial residential segregation, an institutionalized system of separation that defines the community and neighborhood, and the socioeconomic opportunities, services, and resources available in African American versus White communities [125]. Geography is a key factor that impacts health as it relates to the availability of quality health services, access to physicians and health care facilities, and the availability of salutogenic neighborhoods [126] that foster healthy lifestyles and diets such as supermarkets with fresh fruits and vegetables, walkable communities and access to exercise facilities.

Residential patterns of immigrants of African descent are not well-documented. There is growing interest in understanding place within the context of health to address health disparities, but there are persistent gaps in research studies that examine residential segregation and health care services. Many of the studies examine racial residential segregation and the disadvantages that African Americans in particular, experience. Gaskin and colleagues examined residential

segregation within the context of race and ethnicity based on zip codes. The study found that healthcare utilization was influenced by the individual's race and ethnicity, as well as the racial and ethnic makeup of the community, emphasizing the importance of studying residential segregation in healthcare from a community level. [127]. Few health services research studies have investigated racial residential segregation related to immigrants of African descent.

Immigrants migrating to the U.S., reside in large numbers in select geographic regions of the country, and generally in less-desirable living and working conditions and situations than they are used to in their country of birth, which eventually impact their health in part due to stress and the nature of the physical environment. Racial and ethnic minorities in the U.S. including immigrants, are more likely to reside in environmentally hazardous neighborhoods with Superfund sites, hazardous waste generators, powerplants, factories, and toxic release facilities that expose them to toxic chemicals that can be detrimental to their health and increase their risk for many diseases like cancer and lead to poor health outcomes [128–130].

Many immigrants settle in communities with limited access to physicians or in physician shortage areas [71]. Immigrants of African descent often migrate to large metropolitan areas such as New York-Newark-Jersey City (28 percent), Miami-Fort Lauderdale-West Palm Beach in Florida (34 percent), and Washington D.C.-Arlington-Alexandria in Virginia (15 percent). Approximately 95 percent of Caribbean immigrants reside in the Northeast and South, compared to African immigrants who are more dispersed in the Northeast (25 percent), South (40 percent), Midwest (19 percent), and West (16 percent) [11,13,46,63].

The effect of residential segregation on health is not only tied to race; but may also be influenced by state of residence. Implementation and success of the ACA varies across states based on their decision to expand or reject expansion of Medicaid, and the extent of the health

insurance coverage offered. The ACA included provisions for states to expand Medicaid and receive matching funds. At the beginning of 2019, 14 states still had not adopted the Medicaid expansion provision. Even with Medicaid expansion in some states, many individuals remain in the coverage gap because they fall outside the eligibility threshold for Medicaid or subsidies to purchase insurance on the Marketplace. As a result, access to affordable healthcare is limited for these individuals. Buchmueller et al., found that Medicaid expansion states showed a higher rate of reduction among uninsured compared to non-expansion states [78]. A study by Bustamante and colleagues showed that immigrants in Southern states had higher odds of being uninsured and foregoing care after the ACA, many being non-Medicaid expansion states [47].

Geographic disparities in hypertension prevalence exist in the U.S., although the reasons are not well understood. Kershaw and colleagues investigated the association between place of birth and place of residence with the prevalence of hypertension. African Americans in southern states were more likely to have hypertension than those in non-southern states [41]. The study showed higher prevalence of hypertension among African Americans compared to Whites irrespective of place of birth or residence, and among African Americans born in southern versus non-southern states. African Americans residing in Baltimore, New York City, and Forsyth had much higher rates of hypertension prevalence compared to their counterparts in Chicago. Foreign-born African Americans showed a lower rate of hypertension prevalence compared to African Americans born in southern states. The study used 2000 and 2002 cross-sectional data from the Multi-Ethnic Atherosclerosis Study (MESA) [41].

White and colleagues, using 2002 and 2005 data from the New York City Community Health Survey, studied the association between hypertension and racial residential segregation among U.S-born African Americans and immigrants of African descent. The data was linked to

2000 U.S. Census data and Infoshare Online database to calculate segregation and neighborhood poverty level data, respectively. Prevalence ratio was determined using generalized estimating equations to fit log binomial marginal models. U.S.-born African Americans had a 35.5 percent prevalence of hypertension compared to a 29.3 percent rate of prevalence among immigrants of African descent. Older immigrants of African descent living in highly segregated neighborhoods had a 46 percent lower probability of having hypertension, compared to older immigrants living in less segregated neighborhoods. Overall, the findings suggest there is no association between segregation and hypertension in U.S.-born African Americans or younger foreign-born individuals of African descent, which is contrary to previous studies. Researchers note that any modest association between segregation and hypertension may be dominated by individual-level risk factors, social support or protective factors from discrimination [131].

The Impact of Ethnic Enclaves

Residing in an immigrant enclave with high proportions of immigrants of the same ethnic group may be an indication of the degree of acculturation for some immigrants. It can also be a protective factor or a deterrent to their health. Research using data from the Multi-Ethnic Atherosclerosis study investigated the association between living in an immigrant enclave and health behavior. Osypuk and colleagues concluded that living in an immigrant enclave may provide varying health benefits. Immigrant neighborhoods had better availability of healthy foods, worse walkability and safety, and fewer exercise facilities [53]. Some immigrants live in immigrant enclaves because of their immigrant status or socio-economic status [132].

Immigrants of African descent are more likely to live in low-income neighborhoods [91]. In some instances, irrespective of socio-economic status, some immigrants choose to remain in immigrant enclaves due to the need to remain in proximity to their culture and maintain their

cultural identity [10]. A part of the acculturation phase for some immigrants entails spatial assimilation, whereby immigrants gain improvements in socioeconomic or immigration status and consequently move into more affluent, predominantly White neighborhoods. [132]. Few studies have looked at neighborhood residential segregation and how it affects the health of immigrant populations in general, and specifically immigrants of African descent such as risk for certain diseases and conditions or access to health services.

Racial residential segregation is predominantly studied by comparing African American and White populations in the U.S., with less emphasis on immigrant subgroups (Acevedo-Garcia), particularly immigrants of African descent. Iceland and Scopilliti found that among all immigrants, immigrants of African descent had the highest levels of segregation with lower levels of segregation associated higher income. Recent immigrants were also more likely to be segregated than other groups of immigrants or U.S. born African Americans. Length of stay in the U.S. is associated with lower levels of segregation and more integration of immigrants, the longer the years of U.S. residence [132].

Discussion

The goal of this review was to understand the landscape of the literature on social, environmental, and policy factors, specifically the Affordable Care Act's influence on health care access and utilization among immigrants of African descent. To better understand health care access, utilization, and health status among immigrants of African descent, breast cancer screening and hypertension prevalence among immigrants of African descent were also reviewed. Overall, there was a dearth of data on the health of immigrants of African descent. As a result, it was necessary in some instances to consider the health of this population within the

broader context of immigrant health where the group was aggregated with overall immigrant populations. Few studies explicitly examined health care access among immigrants except within the context of the Affordable Care Act, and there were no studies that investigated the impact of the ACA on the health of immigrants of African descent.

The Affordable Care Act has reduced the rate of uninsured among African Americans and immigrants in general [47,72,78]. The increase in health insurance coverage among immigrants was observed among naturalized citizens and legal non-citizens with at least five years of residence in the U.S. since undocumented immigrants are not eligible for coverage under the ACA. Most of the studies used data from national health surveys, which rarely disaggregated immigrant data beyond citizenship to identify non-citizen legal residents. Some studies use non-citizenship status and/or number of years of residence in the U.S. as a proxy for undocumented immigrants or to define legal immigration status, particularly if the years of residence is less than five years. This classification is misleading because a legal permanent resident could be incorrectly classified as undocumented because they either choose not to obtain citizenship or may not have attained the required years of residency to be eligible for citizenship. It is important that this distinction is made in studies on immigrants, and that data is collected in a manner that allows for differentiation of immigrants by immigration status beyond restriction to citizen or non-citizen classification, to explicitly include legal permanent residents.

The factors that influence the health of immigrant populations of African descent are complex. While immigrants generally have higher levels of education and income than U.S.-born African Americans they share some of the same underlying factors that influence their health. Health insurance coverage, having a usual source of care, delaying or foregoing care were strong predictors of health care access among immigrants of African descent and for breast cancer

screening among immigrant women. Policies, resources, infrastructure, and practices in the home country of immigrants may influence their health behavior, attitudes, and outcomes in the U.S. Few studies explored the effect of factors in country of origin on immigrants' health. Environmental influences such as the use of pesticides which disrupt estrogen have been traditionally used extensively in many Caribbean islands and may also be correlated with breast cancer risk [133,134].

An important contributor to immigrant of health is geographical residential location which is a combination of residential racial segregation tied to neighborhood zip code and socio-economic status, but it is also defined according to state Medicaid expansion status. Immigrants residing in non-expansion states tend to have less access to health care services compared to immigrants in expansion states. A major gap in the literature is a lack of studies that examine the impact of the ACA on the health of immigrants of African descent. It is assumed that immigrants of African descent will have increased access to health services and improved health status with the implementation of the ACA, since African Americans have seen a decrease in the rate of uninsured individuals with the implementation of the ACA, and greater access to health care for those individuals in Medicaid expansion states.

In examining hypertension and diabetes prevalence, a paucity of U.S. studies on hypertension and diabetes among immigrants of African descent were identified [31,107]. Undiagnosed and uncontrolled hypertension were associated with lack of health insurance, while there were mixed results on the effect of length of U.S. residence on hypertension awareness [109,114,135]. However, acculturation was a key predictor of health status for immigrants of African descent the longer they resided in the U.S. Additional research to understand the effect of health

insurance coverage on diagnosed and controlled hypertension of immigrants of African descent is needed.

Many immigrants may arrive in the U.S. without knowledge of having high blood pressure because they did not receive regular doctor visits in their country of origin, health care professionals were not appropriately checking and diagnosing high blood pressure, or they were aware of having high blood pressure but could not afford the medications, or they may have acquired high blood pressure since arriving in the U.S. which may be linked to the stress of adapting to a new environment and culture, or with surviving in a new country. Immigrants of African descent living in the U.S. may be aware of a hypertension diagnosis, but either due to cultural beliefs or practices such as preference for traditional medicine, or socio-economic status, may not be able to afford the medications required to properly control the condition.

Variation in cancer screening guidelines such as mammography may contribute to a woman's decision about obtaining regular mammograms (Harvey, Vegesna, Mass, Clarke, & Skoufalos, 2014; Passmore, Williams-Parry). Women migrating to the U.S. from some developing countries, may lack knowledge about the importance of breast cancer screening [89] if they migrate from a country that lacks adequate healthcare infrastructure, or follows the WHO breast cancer screening guidelines.

The World Health Organization's guidelines are recommended according to country's economic level defined as low-resourced or well-resourced, the health system's capacity; the availability of research evidence on benefits and harm of mammography; and women's age (WHO Mammography Screening, 2014). These guidelines are likely to place many women of African descent at risk for low screening depending on their age and their country of origin. Research on screening guidelines and the influence on breast cancer screening practices and

attitudes are needed to determine whether it partially explains the low breast cancer screening rate among immigrants of African descent in the U.S., who may have had no knowledge or never been referred for breast cancer screening in their country of birth.

The effect of the ACA on the health of immigrants of African descent has not been exclusively studied. Studies have assessed the ACA's impact on preventive services including mammogram, cervical and cancer screening, cholesterol, blood glucose and high blood pressure checks. Some studies looked at immigrants overall, a few studies focused on race and ethnicity, but the African American population was not disaggregated, leaving a research gap. The African American population continues to have a disproportionate burden of morbidity and mortality from diseases and conditions such as cancer, heart disease, stroke and diabetes, and associated risk factors such as obesity, hypertension, high cholesterol and physical inactivity. Further research on the impact of the Affordable Care Act requires data disaggregation by racial and ethnic, socio-economic, and geographical groups to understand the extent to which the ACA has been effective in improving access to health care for the targeted populations.

Conclusion

Understanding the factors that influence the health of immigrants of African descent is integral in developing policies, programs, and interventions to address health disparities among African Americans. Implementation of the ACA has contributed in closing the disparities in health insurance coverage between Whites and African Americans, with African Americans experiencing a significant increase in health insurance coverage. Studying the health of immigrants of African descent, will foster data disaggregation which is critical in tackling the wide range of factors that influence the health of African Americans in general. Data aggregation

of the African American population neglects the unique differences in demographics of this group in terms of education, income, and socio-economic status, and especially the effect of the immigration experience and cultural factors.

Chapter 3: CONCEPTUAL FRAMEWORK

The health of immigrants is complex and associated with multiple social determinants such as employment, housing, education, and health care system factors. While health care access is only one facet of the factors that affect the health of immigrants of African descent, it is a major determinant of health outcomes for this population. Access alone will not fully address the disparities in health experienced by immigrants of African descent who may have access to care but still do not utilize it due to other factors such as lack of knowledge about the importance of preventive services or a health condition such as hypertension that requires treatment to control it.

The emphasis of this research is on health care access and utilization and will use the Penchansky and Thomas concept of health care access [137] guided by the Anderson Health Behavioral Model to select independent variables. The Anderson Health Behavioral Model and the Penchansky and Thomas model have been used to study the ACA (King, Chen, Dagher, Holt, & Thomas, 2015). In a study on the dimensions of medical care for cancer survivors, King et al., used the Anderson Behavioral Health Model guided by the Penchansky and Thomas model.

The Penchansky and Thomas model identifies five dimensions of health care access - availability, affordability, accessibility, accommodation, and acceptability.

- *Availability* is the volume and type of existing services and resources in relation to the clients' level and type of needs. This refers to the adequacy of health care providers and facilities including specialized and emergency care.
- *Accessibility* refers to the relationship between the location of health care services and providers and where clients live as it relates to transportation resources and travel time, distance and cost.
- *Accommodation* refers to the organization of health care resources (facilities and providers) and the ease of obtaining care such as hours of operation, appointment systems, walk-in facilities, telephone services.
- *Affordability* is the relationship between cost and willingness to pay for health care services, and patients perceived value of the services provided.
- *Acceptability* focuses on patient and provider attitudes towards each other, and patient perception of the practice.

In this research, the dimensions of affordability, accommodation, and accessibility will be used for access to health care. Access to health care for immigrants of African descent is significantly determined based on having health insurance, a usual place to obtain health services, making regular doctor visits, and the ability to obtain medical care when needed without having to delay or forgo care due to cost.

Within the context of the ACA, accessibility may be measured according to state expansion status of Medicaid as studies have shown that people living in Medicaid expansion states are more likely to have access to care such as health insurance coverage compared to

people in non-expansion states. This study uses public data which does not provide state-level data. Instead, this study will use regions as a proxy.

The Penchansky and Thomas dimensions of access for this study and the corresponding variables were (Figure 1):

Affordability

- *Health insurance coverage* is a major determinant of access to care for immigrants of African descent who are more likely to seek preventive services or regular physician visits with health insurance. Immigration status and specifically citizenship, is a key factor in the eligibility requirement for health insurance coverage.
- *Delay care* -research has demonstrated that immigrants of African descent delay care due to cost.
- *Forgo care* -a lack of health insurance coverage, low income, low-paying jobs and overall cost, are all factors that influence immigrants of African descent to forego medical care.

Accommodation

- *Usual source of care* -several factors including the ability of the health care provider or facility to have convenient hours, a short wait time for appointments, and accommodating customer service, contribute to an individual's decision and ability to have a regular doctor or a specific facility to receive medical care.

Accessibility

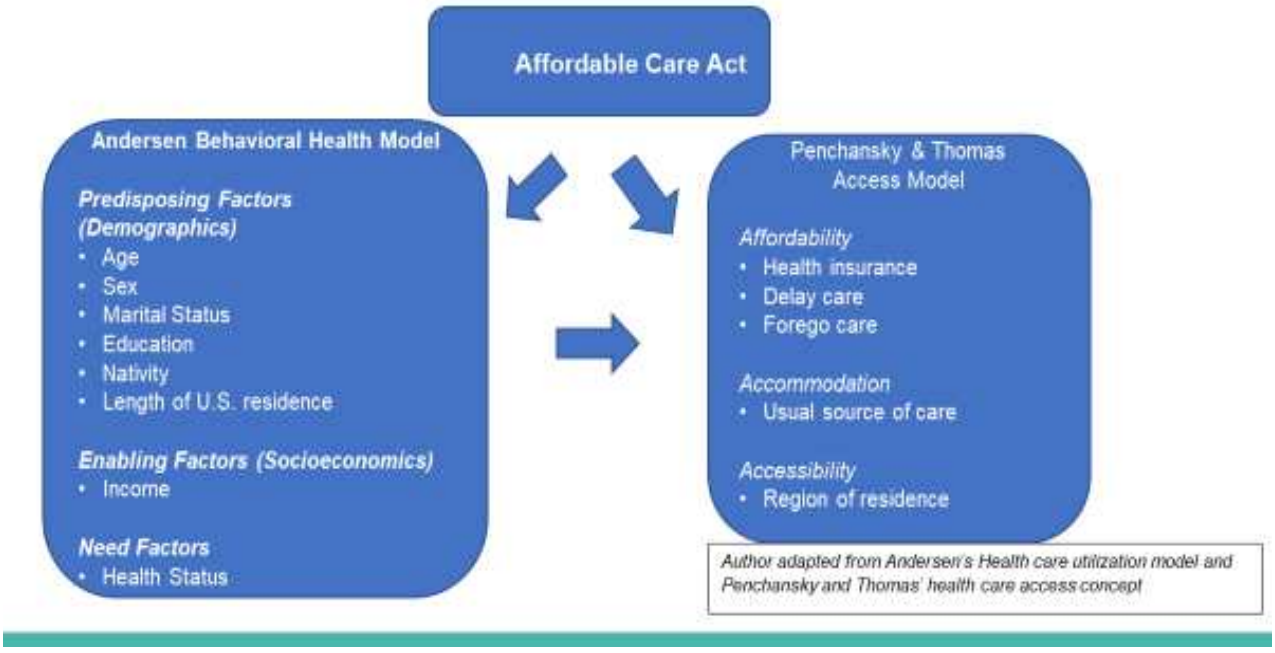
- *Region of residence* -In this study, regions of residence will be used as a proxy for states based on the U.S. Census Bureau's division of states by regions. Immigrants of African descent are more likely to live in the Northeast [New York (24%), Massachusetts (5%)

New Jersey (6%), and South [Maryland (5%), Florida (17%), Georgia (4%)] than the Midwest [Minnesota (2%)] and West [California (5%)]. States in the Northeast are more likely to be Medicaid expansion states.

The Anderson Health care Utilization model is organized by predisposing, enabling, and need factors. Predisposing factors capture demographics, social characteristics or personal beliefs about health services. Enabling factors incorporates access to necessary resources and the availability of health services locally. Need factors focus on perceived severity of illness and necessity for health services.

In this study the *predisposing factors* were marital status, gender, age, education, nativity (citizen/non-citizen) and length of U.S. residence. *Enabling factor* was income, while *need factor* was health status (Figure 1).

Figure 1: Conceptual Framework of Health care Access and Utilization for Immigrants of African descent



Chapter 4: DIFFERENCES IN ACCESS TO CARE AMONG IMMIGRANTS OF AFRICAN DESCENT AND U.S.-BORN AFRICAN AMERICANS BEFORE AND AFTER IMPLEMENTATION OF THE ACA

Introduction

Health care access and utilization are major determinants of health disparities for racial and ethnic minority, immigrant, and low-income populations who are more likely to be uninsured. Studies have shown that having health insurance coverage improves access and utilization of health services including preventative services and screening rates. Research has consistently demonstrated that immigrants including those of African descent, are more likely to be uninsured, delay or forego medical care, lack a usual source of care, have unmet health needs, are less likely to have regular physician visits, and lack timely preventive screenings such as cancer screenings [71–75].

The Affordable Care Act was enacted with a primary goal of improving access to care for the uninsured by making health insurance more affordable through Medicaid expansion and providing subsidies to assist with purchasing coverage and protections for pre-existing conditions. Prior to the enactment of the Affordable Care Act (ACA), 50 million Americans including 21 percent of African Americans were uninsured. People with lower incomes had a higher rate of being uninsured compared to those with higher incomes. Approximately 34.5 percent of immigrants were uninsured including 46 percent who were non-citizens and 19 percent who were naturalized citizens. The geographic distribution of uninsured was 12.4 percent in the Northeast, 13.3 percent in the Midwest, 18.3 percent in the West and 19.7 percent in the South [45]. Implementation of certain ACA provisions began late in 2010, although full ACA

implementation of Medicaid expansion was legislatively mandated to occur by 2014. Thirty-seven states in the U.S. have expanded Medicaid, but all states did not expand Medicaid at the same time.

The uninsured rate for African Americans, Hispanics, and immigrants overall, have significantly decreased since the passage of the Affordable Care Act [60,72,78,139,140]. The ACA has led to increased access to preventive screenings for racial and ethnic minorities including African Americans, significant reductions in being uninsured, emergency room visits, delaying care or forgoing care; increased physician visits and having a usual place of care [56,60,78,141–144]. In one study, African Americans had a significant decrease in uninsured rates compared to Whites but were more likely to delay or forgo care following the ACA. [72].

The ACA has contributed to reduction in the health disparities coverage gap, and while differences in income explain some differences observed in the coverage gap between Whites and African Americans, disparities in health persist. Studies on the impact of the ACA on health care access have examined it within the context of racial and ethnic disparities among U.S. populations, immigrants in general, or among Hispanics or Asians [52,56,60,72,139,145,146]. Even among the few studies that have studied immigrants [54,56,141,143,145,147–150], no studies specifically examine the impact of the ACA on immigrants of African descent.

The African American diaspora is a heterogeneous group of individuals with a heritage that is historically linked to Africa and a people who share a common race. Individuals of African background living in the U.S., irrespective of place of birth, have distinct characteristics due to the unique cultural, political, economic, geographical, environmental and social milieu that undergird their history and upbringing. Disentangling and understanding the differences and

commonality of the groups that comprise the African descent population, are fundamental in advancing efforts to address health disparities among African Americans in the United States.

In the U.S., there are approximately 4.2 million immigrants of African descent who comprise 10 percent of the African American population [11,62]. The undocumented immigrants of African descent population in the U.S. is approximately 575,000 [151]. The factors that influence the health of immigrants of African descent are complex. The intersection of race and ethnicity, and immigration status presents a double jeopardy for immigrants including people of African descent.

Immigration status has significant implications for health care access and utilization for immigrants. Eligibility for health insurance coverage including Medicaid through the ACA, is contingent upon legal immigration status and length of U.S. residence. Individuals born in the U.S. are eligible by virtue of their place of birth. Immigrants who are naturalized citizens, and legal permanent residents with at least five years of U.S. residency are also eligible, whereas undocumented immigrants are ineligible. Medicaid implementation is state-based, and some states such as New York and California have state-specific free or cost-effective health insurance programs through Medicaid and community health centers for example, that provide health care access to documented and undocumented non-citizen immigrants [54,152,153].

Individuals who are ineligible for public health insurance coverage or lack employer sponsored health insurance, have the option of purchasing health insurance on the Health Insurance Exchange (HIE) or Marketplace. This group includes non-citizen legal permanent residents, and other eligible individuals with incomes between 100% and 400% of the federal poverty level (FPL) [154].

Immigrants of African descent migrating to the U.S. mainly from Africa and the Caribbean, reside in large numbers in select geographic regions. The largest percentage of immigrants of African descent live in the Northeast and the South (41% each), and nine percent in the Midwest and West [151]. Immigrants of African descent generally live in less-desirable living and working conditions and situations than they are used to in their country of birth [10,12,155]. Such living conditions eventually impact their health in part due to stress and the nature of the physical environment [10,12]. Many immigrants settle in communities with limited access to physicians or in physician shortage areas [7,10,132,155].

Health care access is in part determined by having health insurance coverage which is also influenced by geographic location. In one study, Choi and colleagues found that after adjusting for age, 15.5 percent of immigrants from Mexico/Central America/Caribbean delayed care and were among the study populations that were more likely to delay care. After controlling for geography and individual-level variables such as health insurance, the delay in care among Caribbean groups attenuated [73]. A study by Stimpson and Wilson showed a decline in the uninsured rate among U.S. born citizens, naturalized citizens, and non-citizen immigrants after the ACA, although disparities in coverage persisted among non-citizen immigrants and U.S. born citizens. Medicaid expansion explained the decrease in being uninsured, except among naturalized citizens [60].

Immigrants of African descent often migrate to large metropolitan areas such as New York-Newark-Jersey City (28 percent), Miami-Fort Lauderdale-West Palm Beach in Florida (34 percent), and Washington D.C.-Arlington-Alexandria in Virginia (15 percent). Approximately 95 percent of Caribbean immigrants reside in the Northeast and South, compared to African

immigrants who are more dispersed in the Northeast (25 percent), South (40 percent), Midwest (19 percent), and West (16 percent) [11,13,46,63].

Another important dimension of health care access is having a usual source of care. Hammond and colleagues looked at usual source of care among African American and Caribbean men. Having a usual source of care was generally associated with being older, married, unemployed, having some college education, and higher income. African American men were more likely than Caribbean men to have a usual source of care especially if they had multiple health conditions. Caribbean men are more likely to be uninsured and less likely to visit a doctor compared to African American men [76].

The Healthy Immigrant Effect

Research has shown that recent immigrants including immigrants of African descent, arrive in the U.S. in a healthier state of health than to U.S.-born citizens or immigrants of the same racial and ethnic background who have been residing in the U.S. for more than a decade. Paradoxically, research also points to a decline in immigrant health status with increasing assimilation or acculturation, which may be attributed to adapting the cultural influences of the U.S. such as unhealthy nutrition and eating behavior, language/accent, dress, attitudes, and lifestyle [76,117].

Unhealthy assimilation has been a major determinant of the convergence of immigrant health with that of U.S. born citizens and emerges overtime while the initial health advantage diminishes. Stress associated with migration and acclimatization to U.S. culture, social and economic fabric, are factors that influence the health of immigrants but are inadequately studied. Research by Commodore-Mensah and colleagues examining the association between length of U.S. residence and cardiometabolic risk factors among immigrants of African descent, found that

those living in the U.S. for more than 10 years had higher rates of obesity, hypertension, and diabetes than those living in the U.S. for less than 10 years [117].

Immigration status and acculturation defined by years in the U.S., has significant implications for health care access and utilization for immigrants [36,49,53,55,156]. Brown and colleagues found a higher rate of mammograms and clinical breast exams associated with time spent in the U.S., among immigrant women in New York City [36]. A study by Hamilton and Hummer found a persistence of the healthy immigrant effect among African immigrants who were residing in the U.S. for more than 20 years, compared to U.S. born African Americans [124].

Acculturation of immigrants transcends multiple dimensions such as language, education, work, residential settlement, politics, and racial and ethnic identification [16]. Stewart and colleagues found that acculturation and migration timing contributed to 3.8 times higher odds of not having insurance for African born immigrants, compared to Caribbean immigrants, after controlling for socioeconomics and demographics [70]. The health advantage of immigrants is partially explained by the cultural grounding of many immigrants who immigrate from regions where they consume alcohol, smoke, or use illegal drugs on a smaller scale, and are less likely to be obese or overweight compared to their U.S. counterparts.

The Effect of Racial and Linguistic Discrimination

Racism is a strong predictor of health disparities among African Americans [1,2,127,129,130,157–159], but for immigrants of African descent depending on the racial composition of their country of origin, this factor may have less of an effect until they arrive in the U.S. and confront racial and linguistic discrimination [1,124,158].

The interacting factors of racism and immigrant status may also be associated with immigrant health and access to care, although this area of research has not been fully explored in

U.S. studies on immigrants' health. One study found that immigrants may underutilize or delay health care services due to perceived discrimination, immigration status, race, accent and socio-economic status [4]. The African descent immigrant diaspora, although predominantly from Africa and the Caribbean, represents multiple languages and different accents particularly among those from English-speaking countries. The diversity in language among immigrants of African descent, presents challenges for them in communicating effectively with health care providers. The frustration of not understanding the health care provider or not being understood by the health care provider may contribute to avoidance of the healthcare system [4].

This research is the first to examine differences in access to health care in terms of delaying or forgoing care, having health insurance coverage or a usual source of care before and after the Affordable Care Act for subpopulations of African Americans residing in the United States. The populations studied were U.S.-born African Americans, and immigrants of African descent who are naturalized U.S. citizens and non-citizens, from the Caribbean or Africa who self-identify their race as Black or African American.

Methods

Data

This research study used 2011-2017 National Health Interview Survey (NHIS) public use data. NHIS is a cross-sectional nationally representative annual household survey of the civilian, non-institutionalized population of adults living in the United States. The NHIS data monitors the health of the U.S. population based on various demographic and socio-economic characteristics. The dataset includes data on health care access, utilization, preventive services, health status, and region of birth. Variables for this research were selected from the Integrated

Public Use Microdata Series (IPUMS) NHIS database which was initially developed to harmonize U.S. census microdata over time [160,161]. This study was not based on human subjects, and instead used secondary de-identified data which did not require Institutional Review Board approval. Additional information on sample selection, survey weighting, and data imputation methods are available publicly [162].

The sample size for this study was 24,415 African Americans living in the U.S. between the ages of 18-64 who had complete data for all variables used to measure access to care. Individuals with missing data for selected variables were excluded. There were 21,569 U.S.-born African Americans, 1,624 immigrants of African descent who were naturalized citizens, and 1,222 immigrants of African descent who were non-citizens. The non-elderly adult population was selected for this study consistent with the overall goals of the ACA and because at age 65 citizens and legal permanent residents become eligible for Medicare.

Studies have shown a significant increase in health insurance coverage among African Americans and immigrants with the ACA. The hypothesis for this study is that immigrants of African descent and U.S.-born African Americans will have increased health care access, specifically improvements in health insurance coverage and usual source of care and decrease in delaying and forgoing care after implementation of the ACA. The study uses a timeframe consistent with the literature. The pre-ACA period included the years 2011, 2012, 2013, and the post-ACA years are 2014, 2015, 2016, 2017. Full implementation of the ACA began in 2014.

Outcome Variables

The outcome variables for this study used to measure access to care were health insurance coverage, delayed care, forgo care, and usual source of care. The study used a "yes/no" binary variable for each measure of access.

The insured were coded as "yes" for those who had insurance coverage in response to the question on "Health insurance coverage status," and the "uninsured" as "no" for those who had "no insurance coverage." Delayed care is classified as "yes" for individuals who responded yes to the question "Medical care delayed due to cost in the past 12 months." Forgo care due to cost was selected for individuals who responded "yes" to "Needed but couldn't afford medical care in the past 12 months." "Usual source of care" was determined for participants who selected either: "Has usual place for medical care" or "There is more than one place."

Independent Variables

Consistent with previous studies, several independent variables were selected. Nativity/Immigration Status was determined first by race, for those who self-identified as "Black/African American." In response to the question on "Global region of birth," those who selected "U.S." were considered U.S.-born African Americans. Immigrants of African descent was a combination of immigrants from the Caribbean and Africa, those who selected the regions of Mexico/Central America/Caribbean or Africa. Three mutually exclusive groups were established for nativity based on the eligibility requirements of the ACA -U.S.-born African Americans who were considered citizens; immigrants of African descent who identified as "naturalized" citizens, and non-citizen immigrants of African descent who did not identify as "naturalized" citizens.

Age included adults 18-64 years old consistent with the non-elderly population that is targeted by the ACA, categorized as 18-29, 30-39, 40-49, 50-59, 60-64. Sex/Gender was identified as male or female. Marital status was categorized as married and not married. Income had three main categories for individuals with income <100% of the federal poverty level (FPL); individuals with income 100-200% (FPL); and individuals with income >=200% of the federal poverty level. The NHIS variable for income selected for this study used a categorical variable and the income categories were constructed due to sample size and consistent with previous studies examining the effects of the ACA on healthcare access [47,147]. Education was categorized as less than high school, high school, some college, college, and advanced degree. Self-Reported Health Status was categorized as excellent, very good, good, and fair/poor.

Region of residence used the four U.S. Census regions which are categorized by states as follows: Northeast (Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, and Pennsylvania); North Central/Mid-West (Michigan, Ohio, Indiana, Illinois, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Kansas, and Nebraska); South (Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Mississippi, and Alabama, Texas, Arkansas, Oklahoma, and Louisiana); West (Washington, Alaska, Oregon, California, Hawaii, Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, and Nevada). Years in U.S. was determined for immigrants only and categorized as 0-4 years; 5-9 years; 10-14 years; and 15+ years.

Statistical Analyses

The study conducted descriptive statistics using t-tests to determine the statistical significance of comparing the outcome variables for access (Table 1) and sociodemographic variables (Table 2) pre- and post-ACA by each nativity group. This study examined socio-demographic variables to characterize the sample and to determine whether other factors besides health insurance coverage may contribute to changes in access before and after the ACA.

Multivariable logistic regressions were performed to compare changes in access based on each of the outcome measures: uninsured, delayed care, forgo care, and usual place of care, before and after implementation of the ACA. The pre-ACA variable was used as the reference group (Table 3 and Table 4). Interaction terms for the ACA were used to assess whether having health insurance coverage made a difference in access for U.S.-born African Americans, immigrant citizens, or non-citizen immigrants. Pre-ACA (years 2011-2013) is the reference group (Table 4).

Stata 14 was used for the statistical analyses.

Results

Table 1 Results

Table 1 illustrates t-test descriptive statistics for health care access by metrics of access. The rate of uninsured individuals decreased for all nativity groups post-ACA. The most significant reduction of 16.3% post-ACA, was observed among the non-citizen immigrant group, followed by a 9.4% reduction among U.S.-born African Americans, and a 6.7% reduction among immigrant citizens. U.S.-born African Americans had a 13% rate of delaying care post-ACA,

were just as likely as non-citizen immigrants to forgo care (11.6% and 11.9% respectively), and the most likely to have a usual place of care although non-citizen immigrants had the greatest increase in having a usual place of care post-ACA (10.1%).

Overall, immigrants were more likely to report their health as excellent or good before and after implementation of the ACA. Among non-citizen immigrants, 40% reported their health as excellent and 29.1% reported their health as good, while for citizen immigrants, 35.5% reported their health as excellent and 29% reported their health as good, with 23% of U.S.-born African Americans reporting their health as excellent and 26.8% reporting their health as good prior to the ACA. U.S.-born African Americans were at least two times (20.5%) more likely to report their health as fair or poor compared to citizen immigrants (10.3%), and non-citizen immigrants (7.4%) before the ACA. No changes in health status were observed among U.S.-born African Americans post-ACA.

Table 2 Results

Table 2 shows t-test results by socio-demographics pre- and post-ACA. Immigrants were more likely to be married, and more highly educated than U.S.-born African Americans. U.S.-born African Americans had a 13.3% rate of college educated individuals post-ACA, and 21.9% among immigrant citizens. The percentage of individuals with an advanced degree post-ACA for immigrant citizens was 11.2%, for non-citizen immigrants 9.7%, and for U.S.-born African Americans 6.9%. Except for immigrant citizens, all other groups had more than a 50 percent rate of respondents who had an income level less than 100% the federal poverty level pre-and post-ACA. Non-citizen immigrants had the highest rate of poverty at sixty-two percent. The South was the most likely region of residence for all groups especially for U.S.-born African Americans (64.2%), with the Northeast being the second most likely region for all immigrants.

Almost 75 percent of immigrant citizens have been living in the U.S. for more than 15 years post-ACA, compared to 38% of non-citizen immigrants, which also had 26.6% of respondents who had not been in the U.S. for more than four years.

Tables 3 & 4 Results

Table 3 presents the results of the multivariable logistic regressions that control for socio-demographics after ACA implementation. Overall, there were lower odds of being uninsured (OR=0.52, p=0.000), delaying care (OR=0.72, p=0.000), and forgoing care (OR=0.71, p=0.000) post-ACA. Immigrant citizens (OR=1.22, p=0.006), non-citizen immigrants (OR=2.96, p=0.000) and unmarried individuals (OR=1.38, p=0.000), had higher odds of being uninsured post-ACA. Lower odds of being uninsured were observed among women (OR=0.57, p=0.000), those with higher levels of education, and older adults. These groups also had higher odds of having a usual place of care. Non-citizen immigrants had the highest odds of delaying care (OR=1.46, p=0.000) which was statistically significant, while all other educational categories showed lower odds of delaying care than individuals with an advanced degree. The rates were statistically significant for high school (OR=0.56, p=0.000) and less than high school categories (OR=0.53, p=0.000).

Immigrants had higher odds of forgoing care than U.S.-born African Americans, with non-citizen immigrants having a statistically significant difference (OR=1.61, p=0.000). Individuals with a college degree or some college education were just as likely as those with an advanced degree to forgo care, while high school (OR=0.75, p=0.010) and less than high school educated individuals (OR=0.76, p=0.018) had lower odds of forgoing care. Individuals age 40-49 had the highest statistically significant odds of forgoing care (OR=1.45, p=0.000), as were those with income below 100% FPL. Self-reports of health other than excellent, had statistically

significant higher odds of forgoing care, very good (OR=1.54, p=0.000), good (OR=2.21, p=0.000), fair or poor (OR=3.49, p=0.000).

After implementation of the ACA, there was a higher likelihood overall, of having a usual place of care. Statistically significant higher odds of having a usual place were found among most groups for example, women (OR=2.56, p=0.000), individuals age 50-59 (OR=2.37, p=0.000) and age 60-64 (OR=3.33, p=0.000), and those who self-reported their health as fair or poor (OR=1.82, p=0.000). U.S.-born African Americans were more likely than all immigrants to have a usual place of care.

Table 4 shows the results of the interaction terms for post-ACA with each study group by nativity. The reference group was U.S.-born African Americans. The findings show statistically significant changes in access after the ACA for non-citizen immigrants who had lower odds of delaying care (OR=0.67, p=0.02) and forgoing care (OR=0.71, p=0.05), and higher odds of having a usual source of care (OR=1.28, p=0.058). These results significantly attenuated after adding the ACA interaction. Although immigrants of African descent citizens showed slightly higher increases in access post-ACA compared to pre-ACA, the results were not statistically significant.

Discussion

This study is the first to examine the impact of the Affordable Care Act on sub-populations of African Americans living in the United States. Studies have consistently found an increase in health insurance coverage among African Americans and among immigrants after ACA implementation [47,72,148]. However, there is a paucity of data on the health of immigrants of African descent and few studies aimed at understanding the effect of the ACA on African Americans, have disaggregated the data by subpopulations. It is important to understand the

ACA's impact based on heterogeneity to effectively address health disparities in African Americans. The specific focus of this study on immigrants of African descent adds to the paucity of literature on the health of immigrants of African descent, and to the literature on the role of the ACA in improving healthcare access specifically for African Americans.

The findings of this study show that there are differences in access to care, the sociodemographic, and health profile of immigrants of African descent in comparison to U.S.-born African Americans. Healthcare access improved for all groups in this study -U.S.-born African Americans, naturalized immigrant citizens, and non-citizen immigrants following implementation of the ACA, consistent with the hypothesis for this study and the findings of previous studies on the ACA's impact on health care access [47,56,60,72,139,140]. However, the largest proportional difference among the three groups were observed between U.S.-born African Americans and non-citizen immigrants, suggesting there are immigration policy implications given that non-citizen immigrants are not eligible for ACA health insurance coverage unless they are legal permanent residents for at least five years.

After implementation of the ACA, immigrants of African descent, both citizens and non-citizens had higher rates of uninsured compared to U.S.-born African Americans. Although non-citizen immigrants were not eligible for health insurance coverage under the ACA, certain states like New York with 24% of immigrants of African descent, Massachusetts and California with 5% each, had state-specific programs that made health insurance coverage affordable and accessible for non-citizen immigrants. The individual mandate to purchase health insurance coverage and the associated penalties during the early years of the ACA, may have also spurred eligible study participants to obtain coverage. It is also possible that the non-citizen immigrant group included legal permanent residents who have lived in the U.S. at least five years and

would have been eligible to purchase health insurance on the Health Insurance Exchange or obtain other employer-sponsored coverage. This group was not distinguishable in the National Health Interview Survey data. Having the ability to identify legal permanent residents in the NHIS data, may have revealed a larger rate of uninsured among non-citizens and a smaller rate among eligible immigrants (citizens and legal permanent residents).

Although this study did not assess the type of usual place of care, non-citizen immigrants may have benefitted in terms of accessing health care and increasing health insurance coverage through the safety net although they were not eligible for coverage under the ACA. Many immigrants obtain medical care at community-based or hospital-based clinics often due to socio-economic status and affordability of medical care at these facilities [69]. Community health centers provide immigrants with medical care irrespective of immigration status or ability to pay [6], and this may be one factor that influenced the increased rate of health insurance among non-citizen-immigrants post-ACA.

Individuals living in the South were the most likely to be uninsured, which may be attributed to the lack of Medicaid expansion in most Southern states such as Florida, and Georgia. The classification of Medicaid expansion states like Maryland and the District of Columbia as Southern states may have masked the rate of insured U.S.-born African Americans and immigrants of African descent.

After implementation of the ACA, the percentage of non-citizen immigrants reporting their health as excellent decreased, while there was an increase in immigrant citizens and non-citizens reporting their health as fair or poor. An explanation for these post-ACA changes may be the stress associated with ambiguous immigration policies, and increased authority and demand for Immigration and Customs Enforcement Officers to raid homes and workplaces of immigrants

[163]. The fear among naturalized citizens, permanent residents, and undocumented immigrants that they or their family members risk detention and deportation may have further exacerbated the worsening self-perception of health.

This study found that U.S.-born African Americans were the most likely to report having a usual place of care and at the same time self-report their health status as fair or poor. Studies have shown that African Americans have a disproportionate burden of chronic diseases, co-morbidities and associated risk factors [21,37,38] which generally require regular physician visits and monitoring and may explain the higher likelihood of having a usual place of care and having worse self-perceptions of health status.

Findings also showed that immigrants were more educated than U.S.-born African Americans, consistent with previous studies [11,63,65], but had lower access to health care. Migration to the U.S. for immigrants of African descent, is often a quest for opportunities for success and advancement that are generally not available or limited in their country of birth.

Immigrants had a higher level of perception regarding their health status but fared worse on all levels of access. They were more likely to be uninsured, delay and forgo care and less likely to have a usual place of care. While citizenship explains the lack of access to care to some extent particularly for non-citizen immigrants, the healthy immigrant effect may also explain the simultaneous interplay of self-perception of having excellent health and lower access. Immigrants cultural beliefs and behavior may be an influencing factor as many may choose to use traditional or alternative medicine approaches instead of the standard health care system. Furthermore, their residential neighborhood may be another factor as immigrants of African descent are more likely to live in low-income neighborhoods [91] which often means limited availability of physicians and health care facilities.

An unexpected finding was that higher educated individuals were more likely to have access to care specifically health insurance coverage and a usual source of care, yet more likely than lower educated individuals to delay and forgo care. This may be attributed to time constraints due to highly demanding jobs or discrimination related to scheduling of physician appointments that are often not immediate [164] or distrust of health care providers [165]. Wiseniewski and Walker found that African Americans and Hispanics had a longer wait time to receive a physician appointment compared to Whites and were more likely to be asked about health insurance coverage [164].

Limitations

There were several limitations of the study to take into consideration. The study used a repeated cross-sectional design which did not allow for longitudinal observation of differences. The small sample size for the immigrant population limited the depth of further analyses the study could perform.

Number of years of residence in the U.S. is a key factor in eligibility for the ACA for immigrants who are not naturalized citizens but require at least five years of U.S. residence to be eligible for Medicaid or health insurance through the Marketplace. NHIS does not collect data on immigration status based on permanent residency, thus it is likely that the non-citizen immigrant cohort may include legal permanent residents with at least five years of U.S. residence.

Use of the NHIS public data limited the level of analyses that could be performed. For example, the data provided information on regions and not state-specific or census-tract data. The lack of more granular geographic data restricted the ability to assess the impact of Medicaid expansion

in states and areas such as New York, New Jersey, Maryland, and the District of Columbia and non-expansion states like Florida and Georgia, all home to large numbers of immigrants of African descent.

Conclusion

This study demonstrated that the Affordable Care Act improved access to care for immigrants of African descent. It also showed that there are differences in access to health care among subpopulations of African Americans in the U.S. particularly according to citizenship, education and income. It points to the value and need to disaggregate data on African Americans in the U.S. in research studies and interventions. The study also highlights the implications of immigration status and healthcare policies that should both be considered in research and policies to address the health of immigrants and African Americans.

Future research is needed to delve deeper into understanding the health of immigrants of African descent, the factors associated with insured higher educated African Americans and immigrants who delay and forgo care, and the factors associated with access to health care for immigrants of African descent irrespective of citizenship status. The impact of Medicaid expansion by state would be important to better understand the landscape of ACA impact on the health of immigrants of African descent.

Chapter 5: CANCER SCREENING RATES AMONG IMMIGRANTS OF AFRICAN DESCENT AND U.S.-BORN AFRICAN AMERICANS: DOES THE AFFORDABLE CARE ACT MATTER?

Introduction

In the U.S., African Americans have the highest mortality rate for several cancers and the shortest survival compared to other racial and ethnic populations. African American women have the highest death rate for breast cancer, while colorectal cancer is the third leading cause of cancer deaths among African American men and women. Cancer screening is effective in preventing cervical and colorectal cancer through early detection by identifying and removing precancerous cells, and in reducing breast cancer mortality with early diagnosis, but African Americans continue to screen at low rates for these cancers.

Multiple factors have been associated with low rates of cancer screening in African American communities with similar patient and system-level barriers identified for mammograms, pap smears, and colorectal cancer screening. Some of the factors that influence cancer screening uptake include financial barriers, lack of health insurance [166], citizenship [50], fear [167], pain, cancer fatalism [168], lack of physician referral [166,169,170], lack of knowledge about the specific cancer [5], provider lack of knowledge of cancer screening guidelines [90,102,171], lack of a usual source of care or regular doctor, or lack of cancer risk [89,91,172,173].

The African American population in the U.S. is a heterogeneous group which consist of individuals who self-identify as Black or of African heritage, who were born in the United States of America also known as U.S.-born African Americans, and individuals born primarily in the

Caribbean and Africa, also referred to as immigrants of African descent. While 50 percent of immigrants of African descent in the U.S. are Caribbean immigrants, the fastest growing group of immigrants of African descent in recent years have come from Africa (39 percent) [11,13,46,62].

Breast Cancer

The overall rate of breast cancer has been declining in recent decades due to improvements in treatment, but disparities remain based on race, ethnicity, socioeconomic status, and geography (Freedman, Kouri, West, & Keating, 2015; Goel et al., 2003; Hunt, Whitman, & Hurlbert, 2014). African American women have the highest breast cancer mortality rate compared to women of all other racial and ethnic minority populations, and a 42 percent higher death rate than Whites (DeSantis et al., 2015). Although White women have a higher incidence rate for breast cancer, African American women are often diagnosed at a later stage. On average, African American women are diagnosed at a younger age (age 57) than White women (age 62), and experience a lower rate of survival after diagnosis [81].

African American women younger than age 45 are more likely to have a breast cancer diagnosis than White women of the same age [81,82]. Mammogram screening guidelines from the American Cancer Society (ACS) for 2016, recommends women may begin obtaining annual mammograms between age 40 to 44 [20], and at age 55 and older women should begin having mammograms every two years. In 2015, 69% of African American women age 40 and older, had a mammogram within the past two years. Yao and Hillemeier examined disparities in mammograms among immigrant and U.S.-born women and found that while the rate of mammograms increased among immigrants, they still screened at a lower rate than U.S. born populations [94]. Hurtado-de-Mendoza et al., found that African immigrants had lower rates of cancer screening, and inadequate knowledge about breast cancer screening practices, although

higher socio-economic status was positively associated with higher rates of screening. Transportation, lack of health insurance or access, and fear or shame of screening and socio-demographic factors also inhibited African immigrants from seeking breast cancer screening [89].

Cervical Cancer

Cervical cancer screening or the pap test can help to prevent cervical cancer if screenings are obtained on a regular basis and cervical cancer is detected at an early stage. In general, women with lower education and no health insurance, and recent immigrants, are less likely to obtain cervical cancer screening [20]. Current cervical cancer screening guidelines from the U.S. Preventive Taskforce Services and the ACS, recommend women between the ages of 21-65 screen for cervical cancer every three years. Screening is not recommended in women older than 65 unless they are at high-risk for cervical cancer or have not had regular screenings [95].

One study reported an incidence rate of cervical cancer among African American women as 10.3 per 100,000, compared to 7.2 among White women. African American women are also more likely to be diagnosed with late stage cervical cancer and less likely to receive treatment after diagnosis due to advanced cancer at diagnosis, patient refusal, or comorbidity [96]. Endeshaw and colleagues investigated screening for cervical cancer by birthplace and percentage of a person's lifetime living in the U.S. Compared to U.S.-born women, immigrant women were at least two times less likely to have received a pap test. Women from Africa were the second most likely group of immigrants to be unscreened compared to U.S.-born women. Immigrant women living in the U.S. for less than 25 percent of their life had a lower rate of screening compared to immigrants living in the U.S. for more than 25 percent of their life [97].

Colorectal Cancer

African Americans in the U.S. have a disproportionate burden of colorectal cancer with diagnosis at a younger age, and the highest incidence and death rates compared to other racial and ethnic groups [20,98]. African Americans also have a lower rate of survival from colorectal cancer compared to Whites [20]. As with other cancers, the disparities in colorectal cancer outcomes have been associated with limited access to health care, late stage diagnosis and lower screening rates [99,100].

Recent screening guidelines from the American Cancer Society, have caught up with earlier recommendations from the American College of Gastroenterology for African American adults to begin receiving regular screenings for colorectal cancer at age 45 through stool-based testing or visual examination such as a colonoscopy or flexible sigmoidoscopy [101,102]. Frequency of screening for colorectal cancer can range from one to 10 years depending on the type of screening. A flexible sigmoidoscopy is done every five years, compared to a colonoscopy which happens every 10 years.

Aggregation of the African American population in research studies neglects the unique differences in demographics of this group in terms of education, income, and socio-economic status. Understanding the disparities in cancer outcomes among African Americans, requires enhanced insights into cancer prevention in the African American diaspora including cancer screening behaviors, practices, and impediments.

Legislation to Improve Cancer Screening

Access to care has been a longstanding factor that influences poor health outcomes in African Americans. The enactment of the Affordable Care Act has led to a decline in the rate of

uninsured African Americans and improved access to health care. In addition to increasing health insurance coverage through Medicaid expansion, the Affordable Care Act included a provision to eliminate cost-sharing for preventive health services including mammograms, pap smears, and colorectal cancer screening for eligible individuals based on citizenship or at least five years of U.S. residency for legal permanent residents.

Preventive services cost-sharing such as co-pays for Medicare recipients was also eliminated through the ACA. Some groups of immigrants particularly undocumented immigrants with no lawful immigration residency status, are not eligible for ACA preventive services benefits. Several studies have examined the impact of the Affordable Care Act on access to health care, health insurance coverage, and preventive services such as cancer screenings, but no studies have examined changes in cancer screenings among subpopulations of the African American population in the U.S. before and after implementation of the ACA.

This study examined preventive cancer screening rates -mammograms, pap smears, and colorectal cancer screening, for immigrants of African descent and U.S.-born African Americans before and after implementation of the Affordable Care Act to determine whether the ACA had any effect on cancer screening.

Methods

Data

The 2011-2017 National Health Interview Survey (NHIS) was used for this research study. NHIS is a cross-sectional nationally representative annual household survey of the civilian, non-institutionalized population of adults living in the United States. The NHIS is used to monitor the health of the U.S. population based on various demographic and socio-economic

characteristics. The dataset includes data on health care access, utilization, preventive services, health status, and region of birth. NHIS data was obtained from the Integrated Public Use Microdata Series (IPUMS) [161]. This study was not based on human subjects, and instead used secondary de-identified data which did not require Institutional Review Board approval. Additional information on NHIS is available on-line [162].

Respondents for this study were African Americans living in the U.S., categorized as U.S.-born African Americans and immigrants of African descent who had complete data for the selected variables. Individuals with missing data were excluded. The sample size for this study was categorized according to the three cancer screening variables for mammogram: 10,095 women, 9,086 of which were U.S.-born African Americans and 1,009 were immigrants of African descent. The pap smears analysis had a sample size of 14,508 women, with 12,978 U.S.-born African Americans and 1,530 immigrants of African descent.

The colorectal cancer screening sample consisted of 15,093 adults of which there were 13,576 U.S.-born African Americans and 1,517 immigrants of African descent. Immigrants of African descent included naturalized citizens and non-citizens due to sample size.

The hypothesis for this study is that immigrants of African descent and U.S.-born African Americans with health insurance coverage will have increased rates of screening for mammograms, pap smears, and colorectal cancer after implementation of the ACA.

A dummy variable was created for the pre-ACA years of 2011, 2012, 2013, and the post-ACA years of 2014, 2015, 2016, and 2017. Full implementation of the ACA began in 2014.

Outcome Variables

The outcome variables for this study were mammogram for age-eligible women who had a breast cancer screening or mammogram within the past 12 months, pap smear for age-eligible

women who screened for cervical cancer within the past 12 months, and colorectal cancer screening for age-eligible adults who had any test for colon cancer in the past 12 months.

Independent Variables

Two mutually exclusive groups were established for nativity based on self-identification of race as Black/African American and region of birth. U.S.-born African Americans are individuals who self-reported their place of birth as the United States, and immigrants of African descent are individuals who reported their place of birth as the Caribbean or Africa.

Age for mammograms was women 40-74 years old consistent with the American Cancer Society (ACS) screening guidelines; for pap smears age was women 21-65 years old in accordance with ACS and U.S. Preventive Services Task Force (USPSTF) guidelines, and colorectal cancer screening was adults age 45-75 consistent with American College of Gastroenterology and ACS guidelines. Sex was identified as male or female for colorectal cancer screening.

The study controlled for other socio-demographic variables that could have influenced screening rates beyond having health insurance. Marital status was categorized as married and not married. Income had three main categories for individuals with a family income of <100% of the federal poverty level (FPL); individuals with a family income of 100-200% (FPL); and individuals with a family income of>=200% of the federal poverty level. The income categories were constructed into these three groups consistent with the literature, and due to sample size for immigrants of African descent in order to preserve statistical power. Education was categorized as less than high school, high school, some college, college, and advanced degree. Self-reported

health status was categorized as excellent, very good, good, and fair/poor. Region of residence used the four U.S. Census regions: Northeast, North Central/Mid-West, South, and West.

Statistical Analysis

Descriptive statistics were conducted using t-tests to determine statistical significance to characterize the sample by cancer screening (Table 1) and by socio-demographics (Table 2). Multivariable logistic regressions were performed to compare changes in mammograms, pap smears, and colorectal cancer screening among U.S.-born African Americans and immigrants of African descent, before and after implementation of the ACA. The study also controlled for citizenship using exclusive categories for U.S.-born African Americans (reference group), immigrant citizens, and non-citizen immigrants. The interaction term of the ACA and nativity were used to assess the effect of exposures to ACA for U.S.-born African Americans, immigrant citizens, and non-citizen immigrants (Table 4).

Stata 14 was used for the statistical analyses.

Results

Table 1 summarizes cancer screening rates for the sample of U.S.-born African Americans and immigrants of African descent. Overall, the rate of mammograms increased by 2.6% post-ACA (60.2%), while pap smears (61.3%) and colorectal cancer screenings (25.7%) decreased. U.S.-born African Americans were more likely to receive mammogram, pap smear, and colorectal cancer screenings than immigrants of African descent. The rate of colorectal cancer screening was low for both immigrants of African descent and U.S.-born African Americans pre-and post-ACA.

Descriptive Results

Table 2 provides demographic characteristics of the sample population for mammograms, pap smears and colorectal cancer screening.

Mammogram

On average, women who had a mammogram were in their mid-fifties (between age 54 and 57). Married women generally had higher rates of mammogram screening than unmarried women before and after implementation of the ACA. Mammogram rates increased with higher levels of education before and after implementation of the ACA for U.S.-born African Americans. Fifty percent of immigrants of African descent women with an advanced degree had a mammogram post-ACA, a 16.6% reduction. College-educated immigrants of African descent had a 70.2% mammogram screening rate post-ACA, the same as U.S.-born African Americans (70.0%) with an advanced degree.

U.S.-born African Americans with income level <100% FPL, had a 4.5% statistically significant increase in mammograms. The rate of mammograms decreased for immigrants of African descent at all income levels. U.S.-born African Americans living in the South had a 4.3% statistically significant increase in mammograms post-ACA (61.6%) and those in the Northeast had an 8.2% rate of increase (65.2%). Immigrants of African descent in the Northeast had a 15.1 percent statistically significant decrease in mammograms post-ACA (55.9%), while those in the South had a 9.6 percent increase (58.3%) in mammograms that was not statistically significant.

Statistically significant increases in mammograms were only observed for U.S.-born African Americans who reported their health status as very good (64.1%), and those reporting their health as good (62.9%). Immigrants of African descent reporting their health as very good (56.8%) or good (58.3%) had post-ACA increases. Prior to the ACA, insured immigrants of African descent screened at a higher rate (65.8%) than U.S.-born African Americans (62.2%) but had a 7% decrease after the ACA implementation.

Pap Smear

On average, women who had a pap smear were often in their early forties. The rate of pap smears among married U.S.-born African American women fell by 1.9% to 66.9% post-ACA, and by 5.7% to 61.4% for immigrants of African descent post-ACA. People with lower levels of education and lower income had lower rates of screening than those with higher education or higher income. Immigrants of African descent with an income level of <100% FPL had an 8.6% statistically significant decrease in pap smears post-ACA (49.8%). Immigrants of African descent living in the Northeast had a statistically significant reduction of 8% in pap smears, almost twice the percentage of reduction among U.S.-born African Americans (4.4%). In the West, U.S.-born African Americans had a statistically significant 5.8% of reduction in pap smears.

Pap smear screening rates increased with higher levels of self-reported health status before and after the ACA for U.S.-born African Americans. Those with excellent health had a screening rate of 71.6% and 54.0% for those with fair/poor health. Among immigrants of African descent, those reporting their health as excellent (57.2%) had a 5% reduction in pap smears, and those reporting their health as good (57.0%) had a 4.9% reduction post-ACA. Pap smear

screening rates decreased by 4.2% for U.S.-born African Americans with health insurance. Immigrants of African descent had statistically significant reductions in pap smear post-ACA for the insured (7.8%) and uninsured (4.1%).

Colorectal Cancer Screening

Twenty-eight percent of immigrants of African descent with health insurance had colorectal cancer screening pre-ACA with a 4% decrease post-ACA, compared to 29.9% of U.S.-born African Americans pre-ACA with a 2.4% reduction.

Colorectal cancer screening rates for married (28.6%) U.S.-born African Americans decreased by 1.3% post-ACA, and by 1.4% for immigrants of African descent (21.9%). Immigrants of African descent had lower rates of colorectal cancer screening compared to U.S.-born African Americans, except for the college-educated, where 30.2% of immigrants received screening, and 26.3% of U.S.-born African Americans. Immigrants with an income level of 100-200% FPL had the lowest colorectal cancer screening rate of 19.7%, a reduction of 3.9%. U.S.-born African Americans with an income level of more than 200% FPL, had a statistically significant reduction of 3.6% for colorectal cancer screening post-ACA.

After ACA implementation, only U.S.-born African Americans living in the West had an increase in colorectal cancer screening of 30.5%. Immigrants of African descent in the Northeast had the highest rate of screening of 25% prior to the ACA, but had a 2.5% reduction post-ACA, while immigrants in the Midwest had the highest rate of screening post-ACA (23.9%) with no change from the pre-ACA screening rate.

Individuals who reported their health as excellent had the lowest rate of screening for colorectal cancer for both U.S.-born African Americans and immigrants of African descent. Although U.S.-born African Americans with excellent health had no changes in colorectal cancer

screening post-ACA, immigrants of African descent had a 6.5% decrease in screening with only 13.5% of individuals screened.

Logistic Regression Results

Table 3 presents the multivariable logistic regression results after controlling for socio-demographics. There were slightly higher odds of obtaining a mammogram (OR=1.07, p=0.069, 95% CI=0.99-1.17) after the ACA, but lower odds of having a pap smear (OR=0.89, p=0.002, 95% CI=0.83-0.95) or colorectal cancer (OR=0.91, p=0.021, 95% CI=0.85-0.98) screening.

Overall, immigrants of African descent were less likely to obtain cancer screenings than U.S.-born African Americans. Immigrant citizens had lower odds of getting a mammogram (OR=0.97, p=0.737, 95% CI=0.82-1.14), while non-citizen immigrants also had lower odds, the results were statistically (OR=0.77, p=0.03, 95% CI=0.60-0.98). Immigrant citizens (OR=0.80, p=0.003, 95% CI=0.69-0.92) and non-citizens had lower odds of obtaining a pap smear (OR=0.51, p=0.000, 95% CI=0.43-0.60) than U.S.-born African Americans, and these results were statistically significant. Immigrant citizens (OR=0.98, p=0.863, 95% CI=0.84-1.14) had slightly lower odds of getting a colorectal cancer screening compared to U.S.-born African Americans, and immigrant non-citizens had the lowest odds of obtaining a colorectal cancer screening (OR=0.65, p=0.002, 95% CI=0.50-0.85), the results were statistically significant.

Married women were more likely to have a mammogram (OR=1.21, p=0.000, 95% CI=1.09-1.34) and a pap smear (OR=1.08, p=0.076, 95% CI=0.99-1.18) than unmarried women. Married individuals were slightly more likely than unmarried individuals to receive a colorectal cancer screening (OR=1.04, p=0.270, 95% CI=0.96-1.14). Men had higher odds of having a colorectal cancer screening than women.

The likelihood of having a mammogram or a pap smear increased with education level, except for the college educated individuals (OR=1.04, p=0.657, 0.86-1.26) who were slightly more likely than those with an advance degree to obtain a mammogram. Individuals with a high school (OR=0.81, p=0.030, 0.68-0.98) or less than high school (OR=0.77, p=0.011) degree had lower odds of obtaining a mammogram, which were statistically significant. High school (OR=0.66, p=0.000, 0.56-0.78) and less than high school (OR=0.61, p=0.000, 0.51-0.73) educated individuals also had lower odds of receiving a pap smear, which were statistically significant. Individuals with an advanced degree were the most likely to obtain a colorectal cancer screening, while individuals those with a high school (OR=0.82, p=0.022, 0.70-0.97) degree had lower odds of getting a colorectal cancer screening, which was statistically significant.

The rate of mammograms and colorectal cancer screening increased with age, with statistical significance. Younger women were more likely to have a pap smear than older women. Among the non-elderly population of women 21-64 years old, women age 40-49 [reference group] were the least likely to obtain a mammogram, while those age 21-29 [reference group] were the most likely to obtain a pap smear. Older individuals were more than two times likely to have a colorectal cancer screening than those who were younger.

People with higher income levels were more likely to have a mammogram, a pap smear, and colorectal cancer screening than those with lower incomes. Those with an income level of 100-<200% FPL had higher odds of mammogram (OR=1.39, p=0.000, 95% CI=1.26-1.54), pap smears (OR=1.17, p=0.000, 1.07-1.28), and colorectal cancer screening (OR=1.18, p=0.001, 1.07-1.29) than those with <100% FPL, while those with >200% FPL were the most likely to screen for breast, cervical, and colorectal cancer.

Individuals living in the Northeast were the most likely to obtain mammograms, pap smears, and colorectal cancer screening. Those living in the South (OR=0.89, p=0.067, 95% CI=0.78-1.00), Midwest (OR=0.83, p=0.017, 95% CI=0.71-0.96), and West (OR=0.73, p=0.001, 95% CI=0.61-0.88) had lower odds of having a mammogram. Those living in the Midwest (OR=0.74, p=0.000, 95% CI=0.65-0.84), the South (OR=0.79, p=0.000, 95% CI=0.71-0.88), and the West (OR=0.0.59, p=0.000, 95% CI=0.51-0.69) had statistically significant lower odds of having a pap smear. Among those who screened for colorectal cancer, those living in the Midwest (OR=0.91, p=0.217, 95% CI=0.79-1.05) and South (OR=0.98, p=0.857, 95% CI=0.88-1.10) had lower odds, and those living in the West (1.03, p=0.662, 95% CI=0.88-1.21) were slightly more likely to obtain colorectal cancer screening.

Study participants reporting their health as very good (OR=1.02, p=0.741, 95% CI=0.89-1.17) or good (OR=1.09, p=0.198, 95% CI=0.83-1.01) had higher odds of receiving a mammogram than those reporting their health as excellent, with those reporting their health as fair/poor having lower odds of breast cancer screening (OR=0.98, p=0.861, 95% CI=0.85-1.13).

The rate of pap smears decreased with lower perceived health status. Individuals reporting their health as very good (OR=0.93, p=0.200, 95% CI=0.84-1.03), good (OR=0.92, p=0.113, 95% CI=0.83-1.01) or fair/poor (OR=0.82, p=0.000, 95% CI=0.73-0.92) had lower odds of receiving a pap smear. Individuals were more likely to have a colorectal cancer screening the lower their self-perceived health status. Individuals reporting their health as very good (OR=1.07, p=0.310, 95% CI=), good (OR=1.12, p=0.67, 95% CI=), or fair/poor (OR=1.43, p=0.000, 95% CI=1.25-1.64) were more likely to have a colorectal cancer screening than those with a self-report of excellent health.

The interaction of the ACA and nativity is presented in Table 4, with U.S.-born African Americans as the reference group. Results of the post-ACA interaction term with immigrant citizens showed that immigrant citizen women would have lower odds of mammogram (OR=0.61, p=0.003, 95% CI=0.44-0.84) with statistical significance post-ACA, compared to U.S.-born African Americans than they did before the ACA. The results suggest health insurance coverage makes a difference in receipt of mammograms for immigrant citizens. Changes in pap smears and colorectal cancer screening with the post-ACA interaction term were not statistically significant. The post-ACA interaction term with non-citizen immigrants did not show any statistically significant changes for mammograms, pap smears, or colorectal cancer screening.

Discussion

This study examined changes in cancer screening among immigrants of African descent and U.S.-born African Americans before and after implementation of the ACA. Overall, screening rates for mammogram increased post-ACA, while there was a decrease in pap smears and colorectal cancer screening. The decrease in pap smears and colorectal cancer screening may be due in part to the screening frequency of three, five, and 10 years for these screenings which could not be sufficiently assessed to determine the full impact of the ACA with the post-ACA period only covering four years.

Cancer screening rates increased for some groups within both samples. U.S.-born African Americans who were unmarried, had some college education, had income level of <100% FPL, lived in the South, and self-reported their health as very good or good, all had statistically significant increases in mammograms post-ACA. Immigrants of African descent who had a college degree or self-reported their health as very good and good, also had increased rates of mammograms. College-educated immigrants of African descent, individuals living in the South,

and those with an income level >200% FPL had increased rates of pap smears post-ACA, while those who reported their health as fair/poor had increases in colorectal cancer screening.

In general, U.S.-born African Americans were more likely to receive cancer screenings than immigrants of African descent. While U.S.-born African Americans had increased rates of screening for mammograms overall, screening rates for all cancers decreased among immigrants of African descent post-ACA. Similar differences in mammogram, pap smear, and colorectal cancer screening have been found by other studies, although not within the context of the impact of the ACA on African Americans [56,174,175]. Some studies focused on the potential impact of the ACA in improving preventive services using pre-ACA data. Many of the studies that have examined the ACA's impact on preventive services utilization looked at the early years of the ACA and within the context of the elimination of cost-sharing[24,118,142,176].

The volatility of U.S. immigration policy following implementation of the ACA, increased immigration enforcement and deportation, negative immigration narrative, immigration raids[163,177,178], difficultly obtaining appointment or physician referral with increased patient volume[164], and job demands including lack of sick leave or inconvenient shift hours are factors that may have contributed to the decrease in mammogram, pap smear and colorectal cancer screening rates among immigrants of African descent after the ACA. A lack of accurate information in immigrant communities about the benefits of the ACA and access to care at community health centers irrespective of immigration status and programs like the National Breast and Cervical Cancer Screening program, may have also influenced the low rates of cancer screening.

Overall, screening rates for mammograms increased by 2.6% post-ACA, while screening rates decreased for pap smears and colorectal cancer. Other studies have shown similar results with some improvements in mammograms, and little or no changes in pap smears or colorectal cancer screening after ACA implementation[5,97,118,142,175]. Agirdas and Holding examined the effect of the ACA on mammogram, colonoscopy, pap smear, and cholesterol screening among Hispanics/Latinos, African Americans, Asians and Whites. The probability of insured African Americans receiving a mammogram or colonoscopy increased post-ACA, with no ACA effect for pap smears[179]. Abdus and colleagues used pre-ACA Medical Expenditure Panel Survey data to assess insurance coverage, access to care and preventive services utilization by race and ethnicity among adults targeted by the ACA. The study found significant decrease in colorectal cancer screening and higher rates of screening for mammograms and pap smear. The results point to the potential of the ACA to improve cancer screening rates for African Americans[56].

The Affordable Care Act explained some of the difference in breast cancer screening rates based on the multivariable logistic regression results. Breast cancer screening in African American women has been a focus of many interventions, public health programs and health education campaigns for several decades, and it is possible that women have become more aware and knowledgeable about mammograms and breast cancer[79,80,90,180], compared to cervical cancer[181] and colorectal cancer screening[167,182].

Women who were the most likely to screen for breast cancer lived in the Northeast, a possible indication that Medicaid expansion in states like New York and New Jersey may have contributed to the uptake of mammograms. Women residing in the South were the second most likely group to obtain a mammogram, and many of the non-expansion Medicaid states like Florida are in the South. These findings suggest exposure to different policies such as Medicaid

expansion versus non-Medicaid expansion may have some influence on screening adherence as other studies have shown[60,148,183]. Further research may be needed to enhance understanding of the impact of Medicaid expansion.

Immigrants of African descent had lower rates of screening for breast, cervical, and colorectal cancer than U.S.-born African Americans, and had lower screening rates for all cancers after the ACA. Findings of this study also imply there may be other factors that influence mammogram screening among the overall study population beyond having health insurance coverage and access to care. Barriers to screening among African Americans including immigrants of African descent, have included fear, pain, lack of physician referral, lack of health insurance coverage, transportation, fatalism, and risk perception[86,90,184].

This study confirmed that citizenship is an important factor in cancer screening for immigrants. Non-citizen immigrants are not eligible for health insurance coverage or free preventive services under the ACA, and they were consistently the least likely to have a mammogram, pap smear, or colorectal cancer screening. The differences in screening rates between non-citizen immigrants and immigrant citizens or U.S.-born African Americans were substantial. These findings align with previous studies that have found that non-citizens are less likely to have access to care, health insurance coverage, or preventive screenings compared to citizens[50,52,60]. In this study, there was a 23 percent difference between non-citizen immigrants and U.S.-born African Americans who had a mammogram post-ACA, and a 20 percent difference compared to immigrant of African descent citizens. Echeverria and Carrasquillo examined the role of citizenship, acculturation, and health insurance in breast and cervical cancer screening among Latina immigrant women. After controlling for age, education, income, and

marital status, there was a 14 percent difference between non-citizen immigrant Latinas and U.S.-born Latinas[50].

The findings suggest there is a need for increased programs, strategies, research and policies to improve cancer screening among U.S.-born African Americans and immigrants of African descent, since neither group met the Healthy People 2020 targets for breast, cervical, or colorectal cancer screening even with increased health insurance coverage. The mammogram target screening rate according to Healthy People 2020 was 81%, the cervical cancer screening target was 93%, and for colorectal cancer screening, 70.5%. These findings point to the need for enhanced education, outreach, and research efforts to understand and directly address the unique barriers to cancer screening adherence among immigrants of African descent and U.S.-born African Americans.

This research underscores that there are differences in cancer screening among immigrants of African descent and U.S.-born African Americans. It is critical to disaggregate the data on immigrants of African descent in future research to understand and address underlying factors that lead to persistent low cancer screening rates among African Americans in general. Insights into the factors that deter and motivate immigrants of African descent to obtain mammograms, pap smears, and colorectal cancer screening are needed to inform program, policy, and research intervention development to address cancer screening disparities among immigrants of African descent. Research that examines the impact of Medicaid expansion on cancer screening among immigrants of African descent can enhance understanding of the ACA's effect on immigrants and African Americans' health, exposure to different state-specific health policies, and geographic disparities in health among immigrants. Interventions, public health education programs, and campaigns are needed that incorporate cultural approaches to raise

awareness and education about breast, cervical, and colorectal cancer including prevention, screening, early detection and treatment. Effective use of embassies, immigrant associations and social organizations, barbershops, beauty salons, faith-based organizations, and other outreach efforts that integrate and involve the community are crucial in addressing immigrant community health.

Limitations

There are several limitations of the study that should be considered. The small sample size primarily for immigrants of African descent restricted the depth of the analysis the study was able to conduct. The grouping of citizen and non-citizen immigrants of African descent may have also masked some of the differences in screening rates for this population.

The Affordable Care Act's elimination of cost-sharing was aimed at preventive services such as mammography, pap smears, and colonoscopy. However, women with a breast cancer diagnosis were not excluded from the mammogram sample due to sample size particularly for immigrants of African descent. Similarly, women who had a hysterectomy were not excluded from the pap smear sample because of sample size and because the type of hysterectomy could not be determined from the data. A supracervical or partial hysterectomy does not remove the cervix and those women would still be eligible for pap smears, whereas a full hysterectomy removes the uterus, cervix, and fallopian tubes those women would not necessitate a pap smear.

The frequency of screening for pap smears and colorectal cancer screening beyond annual checks, vary from three to 10 years and the data may not have been adequate to capture screening frequency to assess the full effect of the ACA.

The low screening rate for colorectal cancer may be due to the sample size and the measure of colorectal cancer screening which asked: "Did you have any test for colon cancer in the past 12 months?" Analysis was conducted on those who responded "yes," although a response of "no" does not necessarily mean that someone is none adherent to colon cancer testing within the past 10 years. The NHIS only collected data on "ever had a colonoscopy" for three of the seven years used for this study, whereas each of the seven years had data for the selected variable on "had a test for colon cancer in the past 12 months."

Conclusion

This study contributes to the paucity of data on the health of immigrants of African descent in the U.S., and to the literature on the impact of the Affordable Care Act. It also underscores the value of disaggregating the data on African Americans and the need for enhanced efforts to increase the participation of immigrants of African descent in research to effectively address health disparities in the African American community. The low rates of cancer screening among African Americans living in the U.S., remains a major concern. The issue is multi-dimensional, complex, and extends beyond access. Policy and research efforts are necessary to address patient, provider, and system-level influences that have not been adequately explored such as fear, pain, lack of knowledge, lack of physician referral, or lack of access to screening facilities due to distance or inconvenient hours.

Chapter 6: ASSESSING CHANGES IN PREVENTIVE SERVICES SCREENING AMONG IMMIGRANTS OF AFRICAN DESCENT AND U.S.-BORN AFRICAN AMERICANS BEFORE AND AFTER IMPLEMENTATION OF THE ACA

Introduction

In the U.S., African Americans experience stark disparities in health compared to the general White population, and often compared to other racial and ethnic minorities. Health disparities among African Americans are multi-dimensional. Although health disparities may be a shared experience among members of the African American population, each subgroup is uniquely characterized by language, culture, political, social, environmental, and/or historical experience which may impact their approach and perspective on health differently.

Chronic diseases are a global health challenge, and although generally preventable, they disproportionately affect people of African descent populations especially in the U.S. African Americans have the poorest health status and health outcomes for many diseases, disorders, and conditions among all racial and ethnic minority populations. African Americans are disproportionately affected by diabetes, heart disease, stroke, and hypertension [18,41,185]. African Americans are more likely to die at an early age, and diagnosed at an earlier age with diseases and conditions such as diabetes, hypertension, and stroke [17,19,42]. Mortality rates for diseases such as heart disease, stroke, and diabetes are higher among African Americans (Brown et al., 2017; Mehta, Elo, Ford, & Siegel, 2015; Siegel, Miller, & Jemal, 2016).

Heart disease is the leading cause of death in the United States, with African Americans having a high rate of morbidity and mortality [17]. Risk factors for chronic diseases like heart disease and diabetes are more pronounced among African Americans. Uncontrolled high blood pressure, obesity which develops in part due to unhealthy diet and inadequate physical activity, smoking, excessive alcohol consumption, high cholesterol, and elevated blood glucose are some of the risk factors for heart disease and diabetes [17,21].

Approximately 13 percent of African Americans are diagnosed with diabetes with about three percent having undiagnosed diabetes, compared to 8.2% of Americans who have diabetes [19]. The literature on diabetes prevalence among immigrants of African descent in the U.S. is limited and mixed. Studies have found that Caribbean residents have higher prevalence of diabetes than Africans [31,119]. In one study, Caribbean immigrants had similar diabetes prevalence as African immigrants, and lower rates than U.S.-born African Americans [120]. Another study found that Caribbean and sub-Saharan Africa immigrants had higher rates of diabetes than residents living in Ontario Canada. Immigrant women from the Caribbean also had higher risk of diabetes than men [121].

Hypertension and hyperlipidemia or high blood cholesterol also are major risk factors for various diseases and health conditions including heart disease, diabetes, stroke, and chronic kidney disease. African Americans have higher prevalence of hypertension compared to Whites [109], with more than a 41 percent rate of high blood pressure, compared to approximately 27 percent among Whites [29,110,111].

Studies have also shown within group differences in hypertension with a higher hypertension prevalence among U.S.-born African Americans compared to immigrants of African descent (Brown et al., 2017). Another review study reported higher prevalence of high

blood pressure among Caribbean residents of African ancestry compared to West Africans [107]. People across the African diaspora are diagnosed with hypertension at an earlier age compared to other populations, and in general are often not aware that they have high blood pressure [112].

It is also well documented that social, economic, environmental, and political factors such as racial discrimination, lower educational level, and lower income levels influence the health of African Americans [1,125,157,186]. Commodore-Mensah et al., examined the social determinants of cardiovascular disease risk factors in African descent populations. Higher income was associated with lower odds of hypertension in African Americans and Caribbean immigrants. African Americans had higher prevalence of hypertension than Caribbean and African immigrants after adjusting for age and sex. Higher odds of hypertension were associated with being insured among African immigrants, while African American and Caribbean groups reported lower odds of hypertension with higher income [116].

Immigrants are often less likely to have access to care and to seek preventive services despite having a greater burden of chronic diseases and related risk factors [56,115]. The Affordable Care Act included a provision to provide free preventive health services including blood glucose checks for diabetes, high blood pressure checks for hypertension, and blood cholesterol screening high cholesterol [154]. Individuals eligible for no cost-sharing for these preventive services or health insurance coverage are citizens and based on citizenship and legal permanent residents with at least five years of U.S. residency. Some groups of immigrants particularly undocumented immigrants with no lawful immigration residency status, are not eligible for preventive services based on the Affordable Care Act requirements.

Under the Affordable Care Act, African Americans had increases in health insurance coverage, and improvements in accessing health care and preventive services such as blood pressure checks, cholesterol checks, flu vaccination and cancer screenings [54,60,72,118,140,187]. These studies have investigated the effect of the ACA inclusive of all racial and ethnic groups or various immigrant populations, but there are no studies on utilization of preventive services among immigrants of African descent and U.S.-born African Americans before and after implementation of the ACA.

Prevention and control of chronic diseases like diabetes and risk factors like hypertension and high cholesterol, begin with diagnosis and awareness about these diseases and health conditions through screening and early detection. There is growing data on the prevalence of diabetes and hypertension in African Americans. However, there is limited data about screening rates for diabetes, high cholesterol, and hypertension in immigrants of African descent compared to U.S.-born African Americans, and whether the Affordable Care Act had any effect in increasing screening rates in these populations.

This study aims to add to the literature on the Affordable Care Act and the dearth of data on the health of immigrants of African descent in the U.S. The purpose of this study is to assess changes in diabetes, high cholesterol, and hypertension screening rates before and after the ACA implementation among U.S.-born African Americans and citizen and non-citizen immigrants of African descent.

Method

Data

This study used 2011-2017 National Health Interview Survey (NHIS) data. The NHIS is a cross-sectional nationally representative annual household survey of the civilian, non-

institutionalized population of adults living in the United States. The NHIS monitors the health of the U.S. population based on various demographic and socio-economic characteristics. The dataset includes data on health care access, utilization, preventive services, health status, and region of birth. NHIS data was obtained from the Integrated Public Use Microdata Series (IPUMS) [161]. This study used public-use secondary de-identified data that did not include human subjects research data and therefore did not require Institutional Review Board approval. Additional information on NHIS is available on-line [162].

Study participants were African Americans living in the U.S., categorized as U.S.-born African Americans for individuals who were born in the 50 states or the District of Columbia, and immigrants of African descent who are defined as individuals who were born in Africa or the Caribbean who self-identified their race as Black. Individuals with missing data for the selected variables were excluded.

The sample size for this study was categorized according to the three preventive screening variables: diabetes screening (15,960) of which 14,185 were U.S.-born African Americans and 1,195 were immigrants of African descent citizens, and 580 immigrants of African descent non-citizens. The cholesterol screening analysis had a sample size of 29,816 women, with 26,534 U.S.-born African Americans 1,991 were immigrants of African descent citizens, and 1,291 immigrants of African descent non-citizens. The hypertension screening sample consisted of 30,631 adults of which there were 27,235 U.S.-born African Americans and 2,015 immigrants of African descent citizens and 1,321 immigrants of African descent non-citizens.

This study tests the hypothesis that U.S.-born African Americans and immigrants of African descent with health insurance coverage will have increased rates of diabetes, cholesterol and hypertension screening after implementation of the ACA.

A dummy variable was created for the pre-ACA years of 2011, 2012, 2013, and the post-ACA years of 2014, 2015, 2016, and 2017. Full implementation of the ACA began in 2014. The IPUMS National Health Interview Survey public use dataset does not have data on diabetes, cholesterol, and hypertension screening prior to 2011, as a result the early years of the ACA (2011, 2012, and 2013) are used as a proxy for before the ACA.

Outcome Variables

The primary outcomes for this study were diabetes screening based on self-reported fasting blood glucose check in the past 12 months, cholesterol screening for individuals who self-reported they had a cholesterol check by a health professional in the past 12 months, and hypertension screening for individuals who reported they had their blood pressure checked by a health professional in the past 12 months.

The United States Preventive Services Task Force (USPSTF) guidelines were used for the selected preventive services in this study. The USTPF 2015 guidelines recommend screening for diabetes in adults 40 to 70 years old who are overweight or obese, and screening individuals 18 years and older for hypertension. Cholesterol screening recommendations from the USPSTF in 2008, suggest screening high-risked men age 20 to 35, and women age 45 and older for lipid disorders.

Covariates

This study had three mutually exclusive groups of individuals who self-identified their race as African American or Black, -U.S.-born African Americans, immigrants of African descent citizens, and immigrants of African descent non-citizens. Covariates for this study were age, sex, marital status, income, education, region of residence, and health status. There was a difference in age for each screening category: diabetes screening was for adults age 40-70 years old, cholesterol screening was adults age 20-85, and hypertension screening was for adults age 18-85 years. The age categories were selected based on USPSTF guidelines and the disproportionate prevalence of chronic diseases among African Americans.

Marital status was categorized as married and not married. Income had three main categories for individuals with a family income of <100% of the federal poverty level (FPL); individuals with a family income of 100-200% (FPL); and individuals with a family income of>=200% of the federal poverty level. The categorization of the income groups is consistent with literature on the ACA and is also based on the small sample size for immigrants of African descent in order to preserve statistical power. The education categories were less than high school, high school, some college, college, and advanced degree. Self-reported health status was categorized as excellent, very good, good, and fair/poor. Region of residence used the four U.S. Census regions: Northeast, North Central/Mid-West, South, and West.

Statistical Analysis

This study used t-tests to determine statistical significance for descriptive statistics presented in Table 1 and Table 2 to characterize the sample. Multivariable logistic regressions were performed to compare the odds of changes in diabetes, cholesterol, and hypertension screening among U.S.-born African Americans, immigrants of African descent citizens and immigrants of African descent non-citizens, before and after implementation of the ACA. The

study also controlled for citizenship. The interaction of the ACA and the likelihood of screening by nativity was assessed for U.S.-born African Americans, immigrant citizens, and non-citizen immigrants. The study applied survey commands to logistic regressions to account for sample weighting and the complex survey design to ensure correct variance estimation.
Stata 14 was used for the statistical analyses.

Results

Screening Rates

Table 1 presents the screening rates for diabetes, cholesterol, and hypertension. The overall rate of screening for diabetes before implementation of the ACA was 55.3% with a two percent reduction post-ACA. U.S.-born African Americans (55.7%) and immigrants of African descent citizens (55.5%), had the same rate of diabetes screening pre-ACA, with only U.S.-born African Americans having a post-ACA change of 2.3% decrease in diabetes screening.

The overall rate of cholesterol screening increased by 6.3 percent post-ACA (74.9%). Immigrants of African descent citizens had the highest rate of cholesterol screening (75.0% and 76.5%). U.S.-born African Americans (84.6% and 88.7%) and immigrants of African descent citizens (85.1% and 88.0%) had similar rates of hypertension screening pre- and post-ACA. Non-citizen immigrants of African descent had the lowest rate of diabetes screening (43.5% and 46.3%), cholesterol screening (49.7% and 58.9%) and hypertension screening (69.0% and 74.8%) pre- and post-ACA.

Demographic Characteristics

The demographic characteristics of the sample is presented in Table 2. Immigrants of African descent non-citizens screened at a younger age pre-and post-ACA than U.S.-born

African Americans and immigrants of African descent citizens for diabetes (51 and 52 years), cholesterol (44 years), and hypertension (41-42 years old). U.S.-born African Americans and immigrants of African descent citizens were generally about the same age. Females had higher rates of screening than males for diabetes, cholesterol, and hypertension across all groups. Married individuals generally had higher rates of screening than those who were not married, except among non-citizen immigrants of African descent where unmarried individuals had slightly higher rates of diabetes screening post-ACA than married individuals.

Immigrants of African descent citizens with a college degree had a 15.1 percent statistically significant increase in diabetes screening post-ACA. U.S.-born African Americans had a decrease in diabetes screening post-ACA for all educational levels, except for those with a high school degree who had the lowest rate of screening with no change post-ACA. Cholesterol screening rates increased for U.S.-born African Americans and non-citizen immigrants of African descent at all levels of education post-ACA. Those with less than a high school degree (70.9% and 75.7%) had a statistically significant higher rate of cholesterol screening than those with a high school (64.7% and 72.8%) or some college education (68.1% and 74.7%). Immigrants of African descent citizens with less than a high school education had a 6.3% post-ACA increase for cholesterol screening.

The rates of hypertension screening increased for all groups, except for college educated immigrants of African descent citizens who had no change in screening rates post-ACA. Immigrants of African descent citizens with some college education (5.3%) and advanced degree (4.2%) had significant increases in hypertension screening post-ACA. U.S.-born-African Americans at all income levels had lower rates of screening for diabetes post-ACA, with a 4.2% statistically significant decrease among those with income more than 200% FPL. U.S.-born

African Americans had statistically significant increases in cholesterol screening post-ACA across all income levels with those having an income level less than 100% FPL showing a 7% increase post-ACA. Non-citizen immigrants of African descent also had statistically significant increases for cholesterol screening for those with income levels <100% FPL (46.6% and 54.0%) and 100%-<200% FPL (50.0% and 63.0%).

Non-citizen immigrants had statistically significant increases in cholesterol screening of 21.7% in the West, and 10.2% in the South, while U.S.-born African Americans had increases in all regions post-ACA. Hypertension rates for U.S.-born African Americans were statistically significant for those living in the Northeast (85.4% and 90.0%), the South (84.2% and 89.2%), and the West (83.7% and 86.8%). A 10% statistically significant rate increase in hypertension screening was observed among immigrants of African descent citizens in the West. Among U.S.-born African American residents in the South who screened for diabetes, there was a statistically significant decrease of 3.3 percent post-ACA. Increases in diabetes screening post-ACA were observed among immigrants of African descent citizens residing in the Midwest (15.1%) and West (1.2%), U.S.-born African Americans living in the Northeast (3.6%) and the West (1.6%), non-citizen immigrants of African descent living in the Northeast (4.5 percent) and those living in the South (11.8 percent), although the results did not reach statistical significance.

Prior to the ACA implementation, diabetes, cholesterol, and hypertension screening rates among U.S.-born African Americans increased with poorer self-perceived health status, while diabetes screening rates decreased post-ACA. Immigrants of African descent citizens had higher rates of diabetes and cholesterol screening post-ACA, than U.S.-born African Americans irrespective of self-perceived health status. Immigrants of African descent citizens with very good self-perceived health had the lowest rate of cholesterol screening pre-ACA (42.5%) and

had a statistically significant post-ACA increase of 19.4 percent. Immigrants of African descent citizens reporting fair/poor health status had the highest post-ACA (96.9%) statistically significant rate of hypertension screening, an increase of 8.2%. Among non-citizen immigrants of African descent, those reporting their health as very good had a 13.4% increase in hypertension screening post-ACA.

Individuals with health insurance coverage across all groups had higher rates of screening for all preventive services than those without health insurance.

Diabetes screening rates decreased for insured and uninsured groups post-ACA. Cholesterol screening rates increased post-ACA for U.S.-born African Americans (3.3%) and non-citizen immigrants of African descent (3.7%) with health insurance coverage. The insured across all groups had high rates of screening for hypertension with U.S.-born African Americans and immigrants of African descent citizens having rates of approximately 91% post-ACA.

Odds of Receiving Preventive Screening

Table 3 presents multivariable logistic regression results on the odds of receiving diabetes, hypertension, and cholesterol screening before and after implementation of the ACA. People were more likely to have cholesterol (OR=1.33, p=0.000, 95% CI=1.22-1.45) and hypertension screenings (OR=1.32, p=0.000, 95% CI=1.19-1.48) after the ACA, than diabetes screenings (OR=0.95, p=0.403, 95% CI=0.87-1.05). Statistically significant results showed that non-citizen immigrants of African descent had lower odds of cholesterol (OR=0.66, p=0.000, 95% CI=0.56-0.79) and hypertension screening, than U.S.-born African Americans. Married individuals had higher odds of screening for diabetes ((OR=1.33, p=0.000, 95% CI=1.20-1.46) cholesterol (OR=1.25, p=0.000, 95% CI=1.15-1.36) and hypertension (OR=1.30, p=0.000, 95% CI=1.16-1.45). Females were more likely than males to be screened for diabetes (OR=1.24, p=0.000, 95% CI=1.14-1.36), cholesterol (OR=1.69, p=0.000, 1.56-1.82) and hypertension (OR=2.35, p=0.000, 2.12-2.60).

Lower levels of education were significantly associated with lower rates of screening for diabetes, cholesterol, and hypertension. Individuals with less than a high school education had the lowest odds of screening for hypertension (OR=0.45, p=0.000, 95% CI=0.34-0.59) and cholesterol (OR=0.54, p=0.000, 95% CI=0.44-0.65), while individuals with a high school degree had the lowest odds of screening for diabetes (OR=0.67, p=0.000, 0.54-0.82).

Older age was associated with higher odds of screening for diabetes, cholesterol, and hypertension. Among those who screened for cholesterol the odds of screening were significantly higher for those 60 years and older than younger individuals: age 60-64 (OR=6.19, p=0.000, 95% CI=5.5-7.45), age 65-70 (OR=8.77, p=0.000, 95% CI=7.27-10.58) and age 71-85 (OR=11.17, p=0.000, 95% CI=9.24-13.49). Individuals with incomes less than 100 percent of the federal poverty level were the least likely to receive any screenings, while those with income levels 200% or more FPL were the most likely to be screened for diabetes (OR=1.30, p=0.000, 95% CI=1.16-1.45), cholesterol (OR=1.82, p=0.000, 95% CI=1.61-2.04), and hypertension (OR=1.75, p=0.000, 95% CI=1.49-2.04).

People living in the Northeast were the least likely to screen for diabetes, while those living in the West were the most likely (OR=1.28, p=0.011, 95% CI=0.98-1.28). Residents of the Northeast were the most likely to screen for cholesterol and hypertension. Those living in the South had lower odds of cholesterol (OR=0.76, p=0.022, 95% CI=0.65-0.89) and hypertension screening (OR=0.70, p=0.001, 95% CI=0.57-0.86).

Poorer self-reported health status was significantly associated with higher rates of screening for diabetes, cholesterol, and hypertension. Individuals reporting their health status as fair/poor had more than two times the screening rate for diabetes (OR=2.25, p=0.000, 95% CI=1.94-2.63), cholesterol (OR=2.24, p=0.000, 95% CI=1.98—2.52), and hypertension (OR=2.49, p=0.000, 95% CI=2.10-2.95) as those who reported their health as excellent.

Immigrants of African descent citizens had higher odds of receiving diabetes (OR=1.09, p=0.342, 95% CI=0.90-1.32) and cholesterol screenings (OR=1.07, p=0.359, 95% CI=0.91-1.26), and lower odds of hypertension screenings compared to U.S.-born African Americans. The results were not statistically significant.

In table 4, the results of screening based on the interaction of the Affordable Care Act and nativity are presented. Higher rates of cholesterol (OR=1.37, p=0.000, 95% CI=1.24-1.50) and hypertension (OR=1.37, p=0.000, 95% CI=1.21-1.54) screenings overall were associated

with the ACA. Lower rates of cholesterol screening among immigrants of African descent citizens were associated with the ACA (OR=0.75, p=0.043, 95% CI= (0.56-0.99). No statistically significant changes were observed for diabetes or hypertension screenings, nor were any differences observed for non-citizen immigrants.

Discussion

This study examined changes in preventive services screening for diabetes, high cholesterol, and hypertension before and after implementation of the Affordable Care Act for U.S.-born African Americans, immigrants of African descent citizens and non-citizen immigrants of African descent. The findings showed that overall, study participants were more likely to screen for cholesterol and hypertension after implementation of the ACA.

These findings are consistent with previous studies [118,187]. Holden and colleagues reported higher odds of hypertension screening among African Americans post-ACA [187]. Han and colleagues used Medical Expenditure Panel Survey data and also found post-ACA improvements in cholesterol and hypertension screening, although the results were not stratified by race/ethnicity or immigrant status [118]. The study showed that blood pressure checks had the highest rates of increase in use. Among non-elderly adults, 80 percent of individuals with private health insurance received blood pressure checks, and more than 90 percent of those with Medicare, (Han et al., 2015). This study showed that hypertension screening rates significantly increased with age for the non-elderly (18-64) and at an even higher rate for the elderly population (65+). Individuals age 65 and older had more than four times the hypertension screening rates of young adults age 18-26.

Factors that contributed to overall diabetes, cholesterol, and hypertension screening included being married, female, older age, higher income, and lower health status. Individuals who self-reported their health as fair/poor were the most likely to screen for diabetes, cholesterol, and hypertension, as were individuals who were 60 and older. One explanation may be that older individuals for example, may have chronic diseases and co-morbidities which develop more often with older age. People with chronic diseases may report feeling sick more often and may require frequent doctor visits for effective chronic disease management.

Across all screenings, women had higher rates of screening than men, which may be a result of men being less likely than women to have a regular physician or to attend physician visits. The study also achieved statistical significance in identifying education, income, health status, and region of residence as strong predictors of hypertension screening among U.S.-born African Americans. Immigrants of African descent were more likely to receive diabetes and cholesterol screening, and less likely to receive hypertension screening than U.S.-born African Americans.

In this study, there were high rates of screening for hypertension across all groups and post-ACA screening increases at almost every socio-demographic level. Hypertension screening rates increased slightly for insured U.S.-born African Americans (1.8%) but showed no changes for either immigrant group after the ACA. The findings suggest the high rate of hypertension screening may be due in part to other factors besides the ACA, such as enhanced awareness about hypertension throughout the African American diaspora [112].

In the U.S., historical racial discrimination, stress, environmental hazards, and residential segregation have long been associated with hypertension among African Americans [1,125,157,188,189]. In one study, Brown and colleagues found that although U.S.-born African

Americans (76.2%) had higher rates of insurance than immigrants (70%), the higher prevalence of hypertension persisted. They attributed the hypertension prevalence to chronic stress, racial discrimination, and mental health distress (Brown et al., 2017). Recognizing these factors as daily challenges and the high rates of hypertension in the African American community including family history, U.S.-born African Americans may be more willing to screen for hypertension.

Individuals of African descent residing in the Caribbean and Africa have high rates of hypertension even before they migrate to the U.S. According to the World Health Organization, 46 percent of the world's high blood pressure cases are in Africa, the region with the highest rate of high blood pressure worldwide ("A Global Brief on Hypertension," WHO 2013). In the Caribbean, studies have found a 26 percent prevalence of hypertension among individuals 25 years or older, while the prevalence rate among those more than 40 years old was as high as 55 percent ("Managing Hypertension in Primary Care in the Caribbean," CARPHA, 2007).

Inadequate healthcare infrastructure, lack of screening guidelines, lack of medication adherence, limited availability of medication, and medication costs may account for the high rate of uncontrolled hypertension in Africa and the Caribbean [104,105]. In the U.S., availability, accessibility, and affordability of those barriers in the developing world are more within reach in the U.S. even for non-citizen immigrants.

This study revealed that non-citizen immigrants of African descent were the least likely to screen for diabetes, high cholesterol, and hypertension, and had significantly lower rates of screening for high cholesterol and hypertension than U.S-born African Americans and immigrants of African descent citizens. The results suggest that citizenship may be an important factor in preventive screening adherence. This finding aligns with other studies that examined

different preventive services utilization primarily cancer screenings among Hispanic and Asian immigrants [48,50,70,190].

A principal eligibility requirement of the Affordable Care Act to obtain health insurance coverage and consequently access to care, was citizenship or at least five years of U.S. residence for individuals with lawful permanent residence. Non-citizen immigrants of African descent without legal permanent residency did not meet this eligibility criteria for any ACA benefits. At the same time, non-citizen immigrants had significant increases in cholesterol screening rates for those with incomes below 200% federal poverty level, those with self-reported health status as very good, and those living in the South and West. Although screening rates increased overall for non-citizen immigrants for all three screenings, the increases were generally not significant. Increased rates of screening among non-citizen immigrants may have been driven in part by the availability of free screenings especially hypertension screenings through community programs such as barbershops, grocery stores, health fairs, faith-based organizations.

The ACA also included provisions to increase funding for federally qualified health centers (FQHCs) where 11.3% of the patient population were African American and 17.2% were uninsured [6,54,191]. Non-citizen immigrants who lack health insurance coverage may also seek medical care at FQHCs and other safety net health care facilities that offer low-cost preventive services [152]. Additional funding allowed FQHCs to expand their health services and open opportunities for non-citizen immigrants to obtain screenings.

The highest rates of screening post-ACA for diabetes, cholesterol, and hypertension among non-citizen immigrants of African descent were in the Northeast. This is not surprising given that most states in the Northeast such as New York, Connecticut, and Massachusetts expanded Medicaid and states like New York have state-specific programs such as emergency

Medicaid that provide access to care for non-citizens. Although increases in cholesterol and hypertension screening in the South were statistically significant, Given the high prevalence of hypertension, stroke, and diabetes in the South, the expectation was that there would be higher rates of screenings than the Northeast in light of the number of African Americans living in the South. The post-ACA screening rates in the South likely would have increased if more Southern states had expanded Medicaid under the ACA.

Limitations

This study had several limitations. Use of the National Health Interview Survey (NHIS) public data and the small sample size for the immigrant population limited the depth of analyses the study could perform. The NHIS does not collect data on immigration status beyond citizenship. The inability to distinguish legal permanent residents from the data suggest the non-citizen immigrants of African descent cohort may have included legal permanent residents. Those with at least five years of U.S. residency would have been eligible for health insurance on the Marketplace and thus the effect of the ACA may have produced stronger results. The study used a repeated cross-sectional design which did not allow for longitudinal observation of differences.

The public use data provided broad geographical data by region which did not allow for more granular analysis of screenings at the state, census tract or county-level. State-specific data for example would have provided the ability to assess the impact of Medicaid expansion in states and areas such as New York, New Jersey, Maryland, and the District of Columbia and non-expansion states like Florida and Georgia, all home to large numbers of immigrants of African descent. For racial and ethnic minorities and individuals living in poverty, environmental factors are often directly and indirectly associated with poorer health outcomes. Historical trends reveal

that African Americans have occupied geographical spaces that are typically urban or rural, and commonly highly segregated due to poor socio-economic conditions and circumstances stemming from a legacy of discriminatory practices, including restrictive zoning laws (Massey 2001; Taylor 2014). A more in-depth focus on states, counties or neighborhoods based on census tracts, can help to offer insights into how settlement patterns and areas like immigrant enclaves may influence health outcomes.

Conclusion

This study was the first to examine changes in diabetes, cholesterol, and hypertension screening among immigrants of African descent and U.S.-born African Americans before and after the Affordable Care Act, using pooled nationally representative data from the National Health Interview Survey. Increasing the rate of preventive screenings such as blood pressure, cholesterol, and blood glucose checks, can be fundamental in the early detection and prevention of diabetes, hypertension, and high cholesterol in the broader African American community.

The findings of the study underscore the intersection and implications of immigration and healthcare policies for immigrants, and the overall reduction in health disparities among African Americans in the U.S. Future research is needed to further explore the underlying factors associated with the decrease in diabetes screening, and the uptake of cholesterol and hypertension screening among U.S.-born African Americans and immigrants of African descent.

Chapter 7: CONCLUSION

Immigrants of African descent are an important segment of the African American and the overall U.S. population, and their health cannot be ignored. Immigrants of African descent make up 27.5% of the U.S. healthcare sector. In 2018, immigrants of African descent earned $133 billion, had a spending power of $96 billion and paid almost $36 billion in taxes. In this country, 2.3 million immigrants of African descent are eligible to vote.

The purpose of this research was to enhance understanding of the health of immigrants of African descent in relation to U.S.-born African Americans, and to contribute to the limited data on health disparities among immigrants of African descent. This research examined the influence of the Affordable Care Act (ACA) in improving access to care for immigrants of African descent and U.S.-born African Americans, and on differences in preventive services screening. The results of this research provide important insights into the landscape of health care access and utilization for immigrants of African descent and adds to the data on health disparities among African Americans. This research can inform future efforts in the research, health and immigration policy, health care system, and community and public health sphere to address health disparities in the African American community.

The findings of this research showed an overall increase in access to care and utilization for U.S.-born African Americans, immigrants of African descent citizens, and non-citizen immigrants of African descent. The results also confirmed that differences in access to health care and utilization of mammograms, pap smears, colorectal cancer screening, blood glucose checks for diabetes, blood pressure checks for hypertension, and cholesterol checks for high cholesterol, exist between subpopulations of the African American population in the U.S.

Health insurance coverage is an important factor in facilitating access to care for U.S.-born African Americans and immigrants of African descent, but the findings of this study underscore the complexity of health disparities for the overall African American population and the fact that health insurance alone is not sufficient. The increase in mammogram, cholesterol, and hypertension screening after the ACA implementation demonstrated that the ACA made a difference in some preventive services. The decrease in pap smears, colorectal cancer screening, and screening for diabetes post-ACA, also suggest there are other factors besides health insurance coverage that impact access to health care for both U.S.-born African Americans and immigrants of African descent citizens and non-citizens that require further research.

Policy Implications

Not surprisingly, citizenship was a significant predictor of access to care and receipt of cancer screening and other preventive services. Immigrants of African descent who are not naturalized citizens or legal permanent residents with at least five years living in the U.S. were not eligible for ACA benefits. Non-citizen immigrants were the least likely to have any preventive screenings for breast, cervical or colorectal cancer, or for diabetes, high cholesterol, and hypertension. Immigrants of African descent were less likely to have mammograms, pap smears, and any screening for colorectal cancer compared to U.S.-born African Americans.

U.S. immigration policies and narrative have implications for the overall health of immigrants including mental health and overall health outcomes. The absence of a solid immigration policy and promotion of anti-immigration rhetoric, perpetuate health disparities in this country when immigrants of racial and ethnic minority backgrounds in particular, lack access to health care or are fearful of seeking medical care due to concerns about potential personal or family member deportation or jeopardizing their future legal immigration status.

Immigration and health care policies in the U.S. are intricately linked, and this country needs a comprehensive national immigration policy that provides a path to citizenship and access to health care for immigrants to help address health disparities in racial and ethnic minority communities including the African American community. Policy efforts must be further explored at the state and local level even in the absence of federal immigration policy to provide health care access options and opportunities for legal and unlawful immigrants to obtain health insurance coverage and needed medical care. Enhanced focus on integrating immigration and health care policies are needed that do not leave anyone behind regardless of immigration status. Non-citizen immigrants have a vital role in the American community and in fact contribute to the strength of the U.S.

Future Research

Health disparities research on African Americans must be approached through the frame of heterogeneity recognizing that health behavior practices, access to health care, utilization, and health outcomes vary across subpopulations. There is a need for more research to understand the underlying factors that prevent U.S.-born African Americans and immigrant populations from utilizing preventive services such as blood glucose screening for diabetes, cervical, and colorectal cancer screening. The decrease in diabetes screening after ACA implementation was a surprising finding given the prevalence of diabetes in Africa, the Caribbean, and the United States, which would suggest there is general knowledge about the disease, its risk factors, and complications. A priority for community health and public health practitioners is to increase awareness about the importance of preventive screenings and early detection, while using culturally appropriate measures to enhance educational outreach to these populations on diseases like diabetes, cervical cancer and colorectal cancer.

This research provides data on the landscape of preventive services screening among immigrants of African descent. Future research can build on this foundation to explore diagnosis and prevalence of breast cancer, colorectal cancer, cervical cancer, hypertension, diabetes, and high cholesterol among immigrants of African descent following implementation of the ACA.

Increased focus on social, economic, environmental and system-level influences are needed. Health services is not merely about the role of the health care provider and the health care system in providing access to care, services, and quality of care. It is also an issue of the external factors in the social and physical environment and how they interact with system level factors to impact people's health outcomes. The association between racial residential segregation, immigrant enclaves, and health outcomes among immigrants of African descent have hardly been explored, and this is an area that can help to inform settlement patterns and health care services in communities for immigrants of African descent. Place matters not only as it relates to environmental hazards and neighborhood socio-economics; but also in terms of access to health care, the availability of health care providers and health care facilities depending on residence in a Medicaid or non-Medicaid expansion state; and the implications of immigration enforcement policies and immigration narrative in relation to residing in a sanctuary versus non-sanctuary city or state.

Contextualizing the immigrant lived experience through research approaches, is fundamental in understanding the health status, health behaviors, practices and utilization of health care services of immigrants of African descent to address health disparities in the African American community. There are many stories about the immigration and acclimatization experience from immigrants of African descent that have not been captured and generally are not considered in developing research interventions, strategies, or policies.

Cultural differences within the African American diaspora also play a role in people's perspective and approach to health and consequently utilization of preventive services. Medical mistrust of medical professionals, the health care system, and the scientific community linked to a historical legacy of racial discrimination and unethical research practices involving African Americans, such as the Tuskegee Syphillis study, continue to influence the general African American community in health care seeking, utilization and medical decision-making. Immigrants of African descent often come from countries with an inadequate health care infrastructure where access to doctors or affordable medications may be limited, or guidelines for preventive screenings such as cancer screenings may be irregular or none existent and therefore they are not familiar with the need for certain preventive services.

In some African American and immigrant of African descent communities, visiting the doctor is unthinkable for some and others prefer the use of traditional or herbal medicines to treat their sickness or disease. The influence of religion, fear, and privacy especially in terms of receiving a pap smear, mammogram, or colonoscopy that results in a cancer diagnosis also immobilize immigrants of African descent and U.S.-born African Americans from seeking medical care. The engagement of influential allies within the African American community is vital to health promotion, education and outreach through faith-based organizations, barbershops, beauty salons, and other community groups. Collaboration with untapped avenues such as embassies and immigrant civic and professional associations or social organizations are pivotal in reaching immigrants of African descent with educational materials, accurate and objective information, and available resources of relevance. These groups are key in fostering relationships and bridging any gaps between original home and host countries.

Disease transcend borders as we are vividly learning with the coronavirus disease 2019 (COVID-19) pandemic. Understanding social, environmental, cultural, health care system and political influences in the country of origin for immigrants of African descent, may offer insights into health behaviors and practices when they migrate to the U.S. A major focus in some Caribbean countries for example, is on universal health coverage. Research to examine the health of immigrants of African descent within the context of the health care system, such as universal health coverage in their country of origin can be an important area of research opportunity to understand health behavior, practices, and health outcomes when they arrive in the U.S.

In the U.S., COVID-19 is disproportionately affecting African American communities with early data showing three times the rate of COVID-19 infection in predominantly African American counties, and six times the rate of death from the disease compared to majority White counties. The underlying cause of the disparities in COVID-19 morbidity and mortality are not yet clear, although some initial assumptions suggest it may be due to prevalence of chronic diseases and other health conditions among African Americans. Research is needed to understand how much of the COVID-19 disparities are due to lack of access to care including lack of health insurance coverage, not having a usual source of care or a primary care physician, and the potential impact that reopening of the ACA national Health Insurance Marketplaces could have in providing access to health insurance coverage. Social factors such as exposure due to the types of jobs people are employed in and their inability to work from home or have paid sick leave should also be explored. In addition, research from a health care system level is key in terms of disparities in testing availability and access, and ventilator use. It is also important to understand the COVID-19 morbidity and mortality disparities as it relates to immigrants of

African descent including how much of this is linked to fear of seeking care because of immigration status.

Data Collection

Finally, improvements in data collection on immigrants are warranted, and can begin with national datasets like the National Health Interview Survey which currently does not collect data on legal permanent residents. These are individuals who have lawful authorization to live in the United States, and with at least five years of residence they are eligible for certain benefits under the ACA and Medicare. However, they are not distinguishable in the NHIS public use data. Some researchers have used years of U.S. residence of five years or more and health insurance coverage as a proxy. Such a proxy would still miss some legal permanent residents for example those who are either unemployed or by the nature of their job may not have health insurance coverage but have lived in the U.S. for more than five years. Data disaggregation of the African American population is critical in health disparities research. Immigration status has health policy implications, and accurate classification of immigrant populations is essential in program, policy, and intervention development to ensure the needs of immigrants are appropriately addressed and can advance the elimination of health disparities.

Table 1. Access to Care among Immigrants of African Descent and U.S.-Born African Americans Before and After Implementation of the Affordable Care Act (ACA), National Health Interview Survey data (2011-2017)

	All Participants n=24,415				U.S.-Born African Americans n=21,569				Immigrants of African Descent (Naturalized Citizens) n=1,624				Immigrants of African Descent (Non-Citizens) n=1,222			
	Pre ACA		Post-ACA		Pre ACA		Post-ACA		Pre ACA		Post-ACA		Pre ACA		Post-ACA	
	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n
Health Insurance Coverage																
Insured	75.7%	9,326	85.2%*	10,306	76.7%	8,417	86.1%*	9,117	80.0%	599	86.7%**	759	52.2%	310	68.5%*	430
Uninsured	24.3%	2,998	14.8%*	1,785	23.3%	2,564	13.9%*	1,471	20.0%	150	13.3%**	116	47.8%	284	31.5%*	198
Delay of Care																
Yes	16.6%	2,048	12.7%*	1,539	16.6%	1,828	13.0%*	1,372	13.5%	101	10.5%****	92	20.0%	119	11.9%*	75
No	83.4%	10,276	87.3%*	10,552	83.4%	9,153	87.0%*	9,216	86.5%	648	89.5%****	783	80.0%	475	88.1%*	553
Forgo Care																
Yes	15.3%	1,880	11.4%*	1,379	15.3%	1,682	11.6%*	1,224	10.9%	82	9.1%	80	19.5%	116	11.9%*	75
No	84.7%	10,444	88.6%*	10,712	84.7%	9,299	88.4%*	9,364	89.1%	667	90.9%	795	80.5%	478	88.1%*	553
Usual Place of Care																
Yes	83.1%	10,241	86.5%*	10,462	84.3%	9,253	87.3%*	9,243	81.8%	613	86.7%**	759	63.1%	375	73.2%*	460
No	16.9%	2,083	13.5%*	1,629	15.7%	1,728	12.7%*	1,345	18.2%	136	13.3%**	116	36.9%	219	26.8%*	168

*t-tests were conducted to measure significance. * p <0.001 **p <0.01 ***p <0.05 ****p <0.10*

Table 1-A Sociodemographic Characteristics of Immigrants of African Descent and U.S.-Born African Americans Before and After the Implementation of the ACA, National Health Interview Survey data (2011-2017)

	All Participants n=24,415				U.S.-Born African Americans n=21,569				Immigrants of African Descent (Naturalized Citizens) n=1,624				Immigrants of African Descent (Non-Citizens) n=1,222			
	Pre ACA		Post-ACA		Pre ACA		Post-ACA		Pre ACA		Post-ACA		Pre ACA		Post-ACA	
	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n
Sex																
Female	59.7%	7,356	60.2%	7,277	60.4%	6,638	61.2%	6,477	55.3%	718	55.7%	800	51.2%	304	49.8%	313
Male	40.3%	4,968	39.8%	4,814	39.6%	4,343	38.8%	4,111	44.7%	625	44.3%	703	48.8%	290	50.2%	315
Marital Status																
Married	24.7%	3,045	25.7%****	3,102	22.8%	2,502	23.0%	2,437	42.2%	316	45.0%	394	38.2%	227	56.8%****	271
Not Married	75.3%	9,279	74.3%****	8,989	77.2%	8,479	77.0%	8,151	57.8%	433	55%	481	61.8%	367	43.2%****	357
Age																
18-29	23.9%	2,957	22.8%	2,759	24.4%	2,677	23.7%	2,511	16.0%	120	11.5%	101	26.9%	160	23.4%	147
30-39	22.2%	2,737	21.8%	2,632	21.8%	2,383	20.9%	2,216	23.2%	174	24.5%	214	30.3%	180	32.1%	202
40-49	20.5%	2,550	20.4%	2,471	20.0%	2,197	19.7%	2,088	28.0%	210	28.3%	248	24.1%	143	21.5%	135
50-59	23.5%	2,902	24.0%	2,899	23.9%	2,634	24.1%	2,557	24.4%	183	26.4%	231	14.3%	85	17.7%	111
60-64	10.0%	1,178	11.0%*	1,330	10.0%	1,090	11.5%*	1,216	8.3%	62	9.3%	81	4.4%	26	5.3%	33
Education																
Less than High School	16.2%	1,994	14.4%*	1,745	15.8%	1,739	13.9%*	1,482	14.0%	105	11.4%	100	25.3%	150	25.9%	163
High School	29.3%	3,613	28.7%	3,469	30.1%	3,292	29.4%	3,117	19.8%	148	21.0%	184	29.1%	173	26.8%	168
Some College	35.6%	4,375	35.7%	4,317	36.0%	3,958	36.4%	3,858	35.5%	266	34.5%	302	25.4%	151	25%	157
College	13.0%	1,605	13.8%****	1,674	12.5%	1,377	13.3%	1,403	19.2%	144	21.9%	192	14.1%	84	12.6%	79
Adv degree	5.9%	737	7.3%*	886	5.6%	615	6.9%	728	11.5%*	86	11.2%	97	6.0%	36	9.7%**	61
Income^																
<100% FPL	53.9%	6,649	52.2%**	6,312	54.3%	5,960	52.6%	5,567	42.2%	316	40.1%	351	62.8%	373	62.7%	394
<200% FPL	26.9%	3,316	26.6%	3,216	26.6%	2,925	26.3%	2,786	30.9%	232	30.9%	270	26.8%	159	25.5%	160
>200% FPL	19.1%	2,359	21.2%*	2,563	19.8%	2,096	21.1%	2,235	26.8%	201	29.0%	254	10.4%	62	11.8%	74
Region of residence																
Northeast	14.9%	1,836	13.5%**	1,638	12.5%	1,358	11.1%**	1,179	39.1%	293	34.6%	303	31.1%	185	24.8%***	156
Midwest	16.5%	2,030	15.9%	1,918	16.9%	1,866	16.1%****	1,705	11.6%	87	11.8%	103	12.9%	77	17.5%***	110
South	57.8%	7,125	61.5%*	7,430	60.1%	6,607	64.2%*	6,793	36.4%	273	43.7%**	382	41.2%	245	40.6%	255
West	10.8%	1,333	9.1%*	1,105	10.5%	1,150	8.6%*	911	12.8%	96	9.9%****	87	14.6%	87	17.0%	107
Health Status																
Excellent	24.6%	3,032	25.3%	3,057	23.0%	2,528	23.6%	2,499	35.5%	266	36.7%	321	40.0%	238	37.7%	237
Very Good	27.0%	3,332	27.3%	3,304	26.8%	2,942	26.9%	2,858	29.0%	217	29.6%	259	29.1%	173	29.7%	187
Good	29.2%	3,593	28.8%	3,487	29.7%	3,265	29.9%	3,152	25.2%	189	22.1%	193	23.4%	139	22.6%	142
Fair/Poor	19.2%	2,367	18.6%	2,243	20.5%	2,246	19.6%	2,079	10.3%	77	11.6%	102	7.4%	44	10.0%	62
Years in the U.S.																
0-4	11.9%	160	12.9%	195	-	-	-	-	1.6%	12	3.2%***	28	24.9%	148	26.6%	167
5-9	15.5%	208	13.6%	204	-	-	-	-	9.8%	74	8.9%	78	22.6%	134	20.1%	126
10-14	20.4%	274	14.2%*	213	-	-	-	-	18.4%	138	13.4%**	117	22.9%	136	15.3%*	96
15 or more	52.2%	701	59.3%*	891	-	-	-	-	70.1%	525	74.5%***	652	29.6%	176	38.0%**	239

*t-tests were conducted to measure significance. * p <0.001 **p <0.01 ***p <0.05 ****p <0.10*

^Federal Poverty Level (FPL); Pre-ACA=2011-2013, Post-ACA=2014-2017

~ Years-in-the U.S. applicable only to immigrants. Overall sample: n=2,846; immigrant citizens: n=1,624; non-citizen immigrants: n=1,222

Table 1.-B Access to Care Multivariable Logistic Regression Analyses of Immigrants of African Descent and U.S.-Born African Americans Before and After Implementation of the ACA, National Health Interview Survey data, 2011-2017 (n=24,415)

	Uninsured			Delayed Care			Forgo Care			Usual Place of Care		
	OR	**p**	**95% CI**	**OR**	**p**	**95% CI**	**OR**	**p**	**95% CI**	**OR**	**p**	**95% CI**
ACA												
Pre-ACA	REF	REF	REF	REF	REF	REF	REF	REF	REF	REF	REF	REF
Post-ACA	0.52	0.000	(0.48-0.55)	0.72	0.000	(0.67-0.78)	0.71	0.000	(0.65-0.76)	1.29	0.000	(1.20-1.39)
Nativity/Immigration Status												
U.S.-born African American	REF	REF	REF	REF	REF	REF	REF	REF	REF	REF		REF
Immigrants (citizen)	1.22	0.007	(1.05-1.41)	1.07	0.388	(0.91-1.26)	1.08	0.363	(0.90-1.29)	0.69	0.000	(0.59-0.80)
Immigrants (non-citizen)	2.95	0.000	(2.58-3.36)	1.46	0.000	(1.23-1.73)	1.61	0.000	(1.36-1.91)	0.38	0.000	(0.33-0.44)
Marital Status												
Married	REF	REF	REF	REF	REF	REF	REF	REF	REF	REF	REF	REF
Not Married	1.38	0.000	(1.26-1.51)	1.66	0.000	(1.51-1.84)	1.56	0.000	(1.40-1.73)	0.71	0.000	(0.64-0.78)
Sex												
Male	REF	REF	REF	REF	REF	REF	REF	REF	REF	REF	REF	REF
Female	0.57	0.000	(0.53-0.61)	1.02	0.479	(0.95-1.11)	0.97	0.579	(0.90-1.05)	2.56	0.000	(2.36-2.75)
Education												
Advanced Degree	REF	REF	REF	REF	REF	REF	REF	REF	REF	REF	REF	REF
College	1.32	0.006	(1.08-1.62)	0.88	0.159	(0.73-1.05)	1.00	0.959	(0.81-1.24)	0.86	0.143	(0.70-1.05)
Some College	1.43	0.000	(1.17-1.76)	0.83	0.055	(0.69-1.00)	1.03	0.775	(0.83-1.27)	0.77	0.013	(0.63-0.94)
High School	1.86	0.000	(1.52-2.28)	0.56	0.000	(0.47-0.68)	0.75	0.010	(0.61-0.93)	0.70	0.001	(0.58-0.86)
Less than High School	1.81	0.000	(1.47-2.24)	0.53	0.000	(0.44-0.65)	0.76	0.018	(0.61-0.95)	0.74	0.007	(0.60-0.92)
Age												
18-29	REF	REF	REF	REF		REF	REF	REF	REF	REF	REF	REF
30-39	1.03	0.469	(0.94-1.13)	1.07	0.207	(0.95-1.20)	1.17	0.009	(1.03-1.32)	1.26	0.000	(1.14-1.39)
40-49	0.98	0.766	(0.88-1.08)	1.42	0.000	(1.26-1.59)	1.45	0.000	(1.28-1.64)	1.63	0.000	(1.45-1.81)
50-59	0.77	0.000	(0.70-0.86)	1.31	0.000	(1.17-1.47)	1.27	0.000	(1.12-1.43)	2.37	0.000	(2.10-2.66)
60-64	0.57	0.000	(0.49-0.65)	1.07	0.348	(0.92-1.23)	1.05	0.459	(0.90-1.23)	3.33	0.000	(2.79-3.96)
Income												
<100% FPL^	REF	REF	REF	REF		REF	REF	REF	REF	REF	REF	REF
<200% FPL	0.53	0.000	(0.49-0.57)	0.72	0.000	(0.66-0.79)	0.59	0.000	(0.53-0.65)	1.40	0.000	(1.28-1.54)
>200% FPL	0.20	0.000	(0.17-0.22)	0.32	0.000	(0.28-0.37)	0.20	0.000	(0.17-0.24)	2.43	0.000	(2.14-2.76)
Region of Residence												
Northeast	REF	REF	REF	REF		REF	REF		REF	REF	REF	REF
Midwest	1.40	0.000	(1.22-1.60)	1.43	0.000	(1.24-1.64)	1.62	0.000	(1.39-1.89)	0.57	0.000	(0.49-0.66)
South	1.98	0.000	(1.77-2.21)	1.34	0.000	(1.19-1.51)	1.66	0.000	(1.45-1.89)	0.53	0.000	(0.47-0.60)
West	1.43	0.000	(1.23-1.66)	1.53	0.000	(1.30-1.78)	1.67	0.000	(1.41-1.99)	0.45	0.000	(0.38-0.52)
Health Status												
Excellent	REF	REF	REF	REF	REF	REF	REF	REF	REF	REF	REF	REF
Very Good	0.99	0.907	(0.90-1.09)	1.68	0.000	(1.48-1.89)	1.54	0.000	(1.35-1.75)	1.06	0.209	(0.96-1.17)
Good	1.05	0.238	(0.96-1.16)	2.19	0.000	(1.95-2.47)	2.22	0.000	(1.96-2.51)	1.11	0.032	(1.00-1.23)
Fair/Poor	0.68	0.000	(0.61-0.76)	3.40	0.000	(2.99-3.86)	3.49	0.000	(3.06-3.99)	1.82	0.000	(1.60-2.07)

Pre-ACA covers years 2011-2013. Post-ACA is for years 2014-2017 following implementation of the Affordable Care Act. ^Federal Poverty Level (FPL)

Table 1-C Odds of Access to Care for Immigrants of African Descent and U.S.-Born African Americans by Function of Interaction between Nativity and Affordable Care Act (ACA), Before and After ACA Implementation, National Health Interview Survey data, 2011-2017 (n=24,415)

	Uninsured			Delayed Care			Forgo Care			Usual Place of Care		
	OR	**p**	**95% CI**	**OR**	**p**	**95% CI**	**OR**	**p**	**95% CI**	**OR**	**p**	**95% CI**
ACA												
Pre-ACA	REF			REF			REF			REF		
Post-ACA	0.52	0.000	0.48-0.56	0.74	0.000	0.68-0.80	0.72	0.000	0.66-0.78	1.25	0.000	1.16-1.36
Nativity/Immigration Status												
U.S.-born African American	REF			REF			REF			REF		
Immigrants (citizen)	1.15	0.159	0.94-1.40	1.06	0.568	0.85-1.33	1.01	0.928	0.79-1.29	0.64	0.000	0.52-0.79
Immigrants (non-citizen)	3.40	0.000	2.53-3.64	1.73	0.000	1.39-2.15	1.86	0.000	1.49-2.32	0.34	0.000	0.28-0.41
Immigrants (citizen) x post-aca	1.14	0.357	0.85-1.52	1.01	0.940	0.75-1.39	1.15	0.423	0.81-1.62	1.14	0.376	0.85-1.52
Immigrants (non-citizen) post-aca	0.93	0.635	0.72-1.21	0.67	0.022	0.48-0.94	0.71	0.053	0.51-1.00	1.29	0.058	0.99-1.69

Pre-ACA= 2011-2013; Post-ACA=2014-2017 following implementation of the Affordable Care Act (ACA).
**Model also controlled for marital status, age, sex, income, education, U.S. region of residence and self-reported health status. Results available upon request.*
OR -odds ratio, CI -confidence interval

Table 2. Cancer Screening Utilization among Immigrants of African Descent and U.S.-Born African Americans Before and After Implementation of the Affordable Care Act (ACA), National Health Interview Survey data (2011-2017)

	All Participants				U.S.-Born African Americans				Immigrants of African Descent			
	Pre ACA		Post-ACA		Pre ACA		Post-ACA		Pre ACA		Post-ACA	
	%	n		% n	%	n		% n	%	n		% n
Mammogram			**n=10,095**				**n=9,086**				**n=1,009**	
Yes	57.6	2,791		60.2** 3,166	57.5	2,515		60.8* 1,847	58.3	197		55.4 239
No	42.4	2,052		39.8 2,086	42.5	1,855		39.2 2,869	41.7	276		44.6 297
Pap Smear			**n=14,508**				**n=12,978**				**n=1,530**	
Yes	63.8	4,600		61.3* 4,475	64.2	4,171		62.1** 4,032	59.5	429		54.7 443
No	36.2	2,608		38.7 2,825	35.8	2,316		37.9 2,459	40.5	292		45.3 366
Colorectal Screening			**n=15,093**				**n=13,576**				**n=1,517**	
Yes	26.8	1,931		25.7 2,031	27.0	1,766		26.2 1,850	24.0	165		21.7 181
No	73.2	5,271		74.3 5,860	73.0	4,751		73.8 5,209	76.0	520		78.3 651

*t-tests were conducted to measure significance. * p <=0.001 **p <=0.01*

Table 2-A. Demographic Characteristics of Cancer Screening Sample of Immigrants of African Descent and U.S.-Born African Americans Before and After Implementation of the ACA, National Health Interview Survey data (2011-2017)

	Mammogram (women age 40-74)				Pap Smear (women age 21-65)				Colorectal Screening (adults age 45-75)			
	U.S.-Born African Americans (n=9,086)		Immigrants of African Descent (n=1,009)		U.S.-Born African Americans		Immigrants of African Descent		U.S.-Born African Americans		Immigrants of African Descent	
	Pre-ACA	Post-ACA	Pre-ACA	Post-ACA	Pre-ACA	Post-ACA	Pre-ACA	Post-ACA	Pre-ACA	Post-ACA	Pre-ACA	Post-ACA
	% n	% n	% n	% n	% n	% n	% n	% n	% n	% n	% n	% n
Age (years)	56	57	54	55	40	41	41	42	59	61	58	60
Marital Status												
Married	66.5 687	65.5 711	63.0 106	60.6 120	66.9 873	65.0 859	61.4 174	55.7 180	29.9 574	28.6 578	23.3 67	21.9 85
Not Married	54.7 1,828	59.4* 2,158	55.7 170	52.3 177	63.6 3,298	61.3** 3,173	58.2 255	54.1 263	25.8 1,192	25.2 1,272	24.6 98	21.5 96
Education												
Less than High School	51.4 420	53.0 431	54.2 58	54.1 72	55.7 550	52.1 474	51.7 76	45.8 78	27.2 379	26.4 354	20.8 34	19.3 37
High School	54.1 666	56.3 707	57.1 76	52.6 60	60.1 1,065	57.7 958	56.1 101	45.7*** 80	25.6 512	24.5 522	20.6 38	21.5 41
Some College	58.9 893	63.3* 1,037	58.7 77	50.0 71	65.8 1,621	63.8 1,580	64.5 149	59.0 147	27.3 563	27.2 618	24.7 42	23.3 51
College	65.5 323	67.5 404	62.5 45	70.2 71	73.1 603	69.1 637	62.3 73	66.9 93	26.8 183	26.3 214	30.2 33	22.7 35
Advanced Degree	67.6 213	70.0 290	66.6 20	50.0 23	74.6 332	72.5 383	65.2 30	59.2 45	32.9 129	27.3 142	30.5 18	21.5 17
Income												
<100% FPL^	49.6 1,127	54.1*** 1,315	54.0 134	50.0 127	60.8 2,290	58.7 2,168	58.4 232	49.8** 214	24.4 798	24.9 877	21.5 71	20.6 74
100% - <200% FPL	61.4 735	64.0 809	61.4 86	56.9 86	65.9 1,074	64.1 1,031	60.5 126	55.6 119	28.2 509	26.9 506	23.6 40	19.7 50
>200% FPL	72.3 653	72.8 745	65.8 56	64.1 84	73.8 807	69.5 833	61.2 71	66.2 110	31.5 459	27.9*** 467	29.5 49	25.9 57
Region of Residence												
Northeast	57.0 334	65.2 321	71.0 130	55.9*** 117	69.7 596	65.3 460	69.5 199	61.5*** 173	27.6 217	25.4 187	25.0 67	22.5 69
Midwest	59.0 442	56.4 412	48.8 22	43.1 19	64.5 707	58.9 569	55.4 46	43.7 49	25.1 273	24.9 281	23.3 14	23.9 17
South	57.3 1,525	61.6* 1,938	48.7 97	58.3 129	63.4 2,493	63.0 2,703	52.1 147	55.2 175	27.4 1,101	26.0 1,205	23.9 67	20.9 76
West	56.9 214	56.2 198	58.6 27	51.6 32	61.6 375	55.8*** 300	52.8 37	46.4 46	27.2 175	30.5 177	21.7 17	20.4 19
Health Status												
Excellent	58.6 332	60.7 358	63.2 74	54.1 72	71.6 948	68.8 937	62.2 147	57.2 158	24.1 185	24.0 209	20.0 34	13.5 27
Very Good	59.0 605	64.1** 737	55.4 71	56.8 83	68.4 1,201	64.6**1,111	59.0 124	57.0 137	26.6 380	24.1 394	25.2 48	20.6 48
Good	59.5 879	62.9*** 1,035	55.4 81	58.3 87	63.0 1,261	60.8 1,243	61.9 117	53.4 102	25.9 584	25.3 618	26.1 56	26.1 62
Fair/Poor	53.6 699	55.3 739	60.9 50	50.9 55	54.0 761	54.0 741	47.6 41	45.0 46	29.7 617	29.6 629	23.8 27	26.9 44
Health Insurance												
Yes	62.2 2,309	63.3 2,737	65.8 245	58.8 279	68.6 3,545	64.4 3,681	66.9 354	59.1*** 392	29.9 1,658	27.5 1,789	28.0 151	24.0 173
No	31.2 206	33.1 132	30.6 31	29.0 18	47.3 626	45.1 351	39.0 75	34.9*** 51	11.0 108	10.5 61	9.5 14	7.0 8

*t-tests were conducted to measure significance. * p <=0.001 **p <=0.01 ***p <=0.05*
Pre-ACA years=2011-2013. Post-ACA years=2014-2017 following implementation of the Affordable Care Act. ^Federal Poverty Level (FPL)

Table 2-B. Utilization of Cancer Screening by U.S.-Born African Americans and Immigrants of African Descent Before and After Implementation of the ACA, National Health Interview Survey data, 2011-2017

	Mammogram (women age 40-74)			Pap Smear (women age 21-65)			Colorectal Cancer Screening (adults age 45-75)		
	OR	**p**	**95% CI**	**OR**	**p**	**95% CI**	**OR**	**p**	**95% CI**
ACA									
Pre-ACA	REF	REF	REF	REF	REF	REF	REF	REF	REF
Post-ACA	1.07	0.069	0.99-1.17	0.89	0.002	0.83-0.95	0.91	0.021	0.85-0.98
Nativity/Immigration Status									
U.S.-born African American	REF	REF	REF	REF	REF	REF	REF	REF	REF
Immigrants (citizen)	0.97	0.737	0.82-1.14	0.80	0.003	0.69-0.92	0.98	0.863	0.84-1.14
Immigrants (non-citizen)	0.77	0.039	0.60-0.98	0.51	0.000	0.43-0.60	0.65	0.002	0.50-0.85
Marital Status									
Not Married	REF	REF	REF	REF	REF	REF	REF	REF	REF
Married	1.21	0.000	1.09-1.34	1.08	0.076	0.99-1.18	1.04	0.270	0.96-1.14
Sex									
Male	-----	----	-----	----	----	-----	REF	REF	REF
Female	-----	----	-----	----	----	-----	0.68	0.000	0.63-0.73
Education									
Advanced Degree	REF	REF	REF	REF	REF	REF	REF	REF	REF
College	1.04	0.657	0.86-1.26	0.92	0.340	0.77-1.09	0.92	0.366	0.77-1.09
Some College	0.97	0.785	0.82-1.16	0.79	0.004	0.68-0.92	0.96	0.657	0.82-1.12
High School	0.81	0.030	0.68-0.98	0.66	0.000	0.56-0.78	0.82	0.022	0.70-0.97
Less than High School	0.77	0.011	0.64-0.94	0.61	0.000	0.51-0.73	0.84	0.55	0.70-1.00
Age									
21-29	------	-----	------	REF	REF	REF	-----	-----	-----
30-39	------	-----	------	0.90	0.079	0.81-1.01	-----	-----	-----
40-49	REF	REF	REF	0.68	0.000	0.60-0.76	REF	REF	REF
50-59	1.54	0.000	1.39-1.71	0.46	0.000	0.41-0.51	2.69	0.000	2.35-3.08
60-64	1.78	0.000	1.56-2.03	0.35	0.000	0.30-0.40	3.36	0.000	2.90-3.90
65-75	1.98	0.000	1.76-2.23	0.32	0.000	0.25-0.41	3.77	0.000	3.28-4.33
Income									
<100% FPL^	REF	REF	REF	REF	REF	REF	REF	REF	REF
<200% FPL	1.39	0.000	1.26-1.54	1.17	0.000	1.07-1.28	1.18	0.001	1.07-1.29
>200% FPL	2.01	0.000	1.76-2.30	1.50	0.000	1.34-1.69	1.34	0.000	1.20-1.50
Region of Residence									
Northeast	REF	REF	REF	REF	REF	REF	REF	REF	REF
Midwest	0.83	0.017	0.71-0.96	0.74	0.000	0.65-0.84	0.91	0.217	0.79-1.05
South	0.89	0.067	0.78-1.00	0.79	0.000	0.71-0.88	0.98	0.857	0.88-1.10
West	0.73	0.001	0.61-0.88	0.59	0.000	0.51-0.69	1.03	0.662	0.88-1.21
Health Status									
Excellent	REF	REF	REF	REF	REF	REF	REF	REF	REF
Very Good	1.02	0.741	0.89-1.17	0.93	0.200	0.84-1.03	1.07	0.310	0.93-1.22
Good	1.09	0.198	0.95-1.24	0.92	0.113	0.83-1.01	1.12	0.67	0.99-1.27
Fair/Poor	0.98	0.861	0.85-1.13	0.82	0.001	0.73-0.92	1.43	0.000	1.25-1.64

Pre-ACA years=2011-2013. Post-ACA years=2014-2017 following implementation of the Affordable Care Act. ^Federal Poverty Level (FPL)

Table 2-C. Interaction of Nativity and Affordable Care Act on Cancer Screening among Immigrants of African Descent and U.S.-Born African Americans Before and After Implementation of the ACA, National Health Interview Survey data, 2011-2017

	Mammogram (women age 40-74)			Pap Smear (women age 21-65)			Colorectal Cancer Screening (adults age 45-75)		
	OR	**p**	**95% CI**	**OR**	**p**	**95% CI**	**OR**	**p**	**95% CI**
ACA									
Pre-ACA	REF	REF	REF	REF	REF		REF	REF	REF
Post-ACA	1.11	0.012	(1.02-1.21)	0.90	0.009	(0.84-0.97)	0.92	0.068	(0.86-1.00)
Nativity/Immigration Status									
U.S.-born African American	REF	REF	REF	REF	REF	REF	REF	REF	REF
Immigrants (citizen)	1.27	0.051	(0.99-1.63)	0.87	0.221	(0.70-1.08)	1.11	0.340	(0.89-1.38)
Immigrants (non-citizen)	0.77	0.132	(0.55-1.07)	0.53	0.000	(0.41-0.68)	0.65	0.028	(0.44-0.99)
Immigrants (citizen) x post-ACA	0.61	0.003	(0.44-0.84)	0.85	0.284	(0.64-1.13)	0.80	0.142	(0.59-1.07)
Immigrants (non-citizens) x post-ACA	0.99	0.996	(0.61-1.60)	0.91	0.614	(0.65-1.28)	1.00	0.972	(0.60-1.69)

Pre-ACA years= 2011-2013. Post-ACA years= 2014-2017 following implementation of the Affordable Care Act. ^Federal Poverty Level (FPL). OR -odds ratio. CI-confidence interval
**Model also controlled for marital status, age, sex, income, education, U.S. region of residence and self-reported health status. Results available upon request.*

Table 3. Diabetes, Hypertension and Cholesterol Screening Rates for Immigrants of African Descent and U.S.-Born African Americans Before and After Implementation of the Affordable Care Act (ACA), National Health Interview Survey data (2011-2017)

	All Participants				U.S.-Born African Americans				Immigrants of African Descent (Citizens)				Immigrants of African Descent (Non-Citizens)			
SCREENING	**Pre ACA**		**Post-ACA**		**Pre ACA**		**Post-ACA**		**Pre ACA**		**Post-ACA**		**Pre ACA**		**Post-ACA**	
	%	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**
Diabetes	**(n=15,960)**				**(n=14,185)**				**(n=1,195)**				**(n=580)**			
Yes	55.3	4,303	53.3**	4,366	55.7	3,890	53.4*	3,852	55.5	292	55.9	374	43.5	121	46.3	140
No	44.7	3,475	46.7	3,816	44.3	3,084	46.6	3,359	44.5	234	44.1	295	56.5	157	53.7	162
Cholesterol	**(n=29,816)**				**(n=26,534)**				**(n=1,991)**				**(n=1,291)**			
Yes	68.6	10,099	74.9	11,318	69.1	9,119	75.5	10,083	75.0	670	76.5	841	49.7	310	58.9	394
No	31.4	4,613	25.1	3,786	30.9	4,077	24.5	3,255	25.0	223	23.5	257	50.3	313	41.1	274
Hypertension	**(n=30,631)**				**(n=27,295)**				**(n=2,015)**				**(n=1,321)**			
Yes	84.0	12,711	88.0	13,654	84.6	11,497	88.7	12,168	85.1	774	88.0	974	69.0	440	74.8	512
No	16.0	2,413	12.0	1,853	15.4	2,081	11.3	1,549	14.9	134	12.0	132	31.0	197	25.2	172

*t-tests were conducted to measure significance. * p <=0.001 **p <=0.01*

Table 3-A. Demographic Characteristics of Diabetes, Cholesterol and Hypertension Screening Sample of Immigrants of African Descent and U.S.-Born African Americans Before and After Implementation of the ACA, National Health Interview Survey data (2011-2017)

	Diabetes Screening (adults age 40-70)								Cholesterol Screening (adults age 20-85)							
	U.S.-Born African Americans (n=)				Immigrants of African Descent (Citizens) (n=)				Immigrants of African Descent (Non-citizens)				U.S.-Born African Americans				Immigrants of African Descent (Citizens)				Immigrants of African Descent (Non-Citizens)			
	Pre-ACA		Post-ACA		Pre-ACA		Post-ACA		Pre-ACA		Post-ACA		Pre-ACA		Post-ACA		Pre-ACA		Post-ACA		Pre-ACA		Post-ACA	
	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n
Age (years)	55		56		54		54		51		52		52		52		51		52		44		44	
Sex																								
Male	53.4 ***	2,908	50.5	2,906	54.5	231	49.3	300	33.0	127	42.1	166	64.4	5,142	71.4	5,127	71.2	390	71.3	474	35.4	299	54.0	335
Female	57.4***	4,066	55.3	4,305	56.2	295	61.2	369	52.3	151	51.4	136	72.0	8,054	78.1	8,211	77.9	503	80.6	624	62.9	324	63.9	333
Marital Status																								
Married	60.2	2,020	58.9	2,113	55.9	236	55.7	319	46.8	111	47.8	142	76.1 *	3,219	81.2	3,236	75.5	372	77.1	486	54.6	236	61.9	289
Not Married	53.9	4,954	51.1	5,099	55.1	290	56.0	350	41.3	167	45.0	160	66.8	9,977	73.7	10,102	74.6	521	76.1	612	46.7	387	56.7	379
Education																								
< High School	54.9	1,283	48.4	1,205	65.5	90	63.3	101	47.1	87	45.4	99	70.9 *	2,539	75.7	2,301	75.6	160	81.9	172	48.7	166	57.1	189
High School	48.8	2,157	49.2	2,138	50.0	114	46.0	141	43.0	93	37.3	75	64.7*	3,893	72.8	3,870	72.9	192	72.2	249	53.3	180	54.2	175
Some College	58.6	2,291	56.4	2,409	57.7	154	49.2	201	42.8	56	50.7	65	68.1*	4,418	74.7	4,531	71.2	278	73.0	334	47.4	154	60.7	158
College	63.3	793	56.9	904	50.4	107	65.5**	148	39.2	28	56.0	41	73.0 *	1,548	79.6	1,674	80.0	165	79.7	227	46.5	86	64.6	82
Advanced Degree	63.3	450	61.2	555	54.0	61	62.8	78	35.7	14	50.0	22	82.0	798	83.2	962	80.6	98	81.8	116	54.0	37	65.6	64
Income																								
<100% FPL^	51.6	3,405	49.5	3,483	58.6	208	55.7	251	39.7	176	45.0	180	64.7*	7,138	71.7	6,965	70.3	401	74.6	461	46.6***	390	54.0	418
100% - <200% FPL	56.5	1,953	54.7	1,944	47.1	157	49.2	201	48.7	78	47.6	86	71.6*	3,590	77.4	3,593	74.9	267	74.4	337	50.0**	170	63.0	173
>200% FPL	63.6 **	1,616	59.4	1,784	59.6	161	62.2	217	54.1	24	50.0	36	77.9*	2,468	82.8	2,780	83.5	225	82.0	300	68.2	63	76.6	77
Region of Residence																								
Northeast	51.9	829	55.5	751	53.7	212	51.0	249	46.5	88	51.0	94	70.2*	1,628	79.6	1,462	81.4	367	81.9	410	60.8	194	63.6	176
Midwest	55.8	1,190	50.9	1,140	50.9	55	66.0	50	48.1	27	27.5	40	69.2*	2,264	73.4	2,119	61.1	90	72.8	107	37.8	74	50.4	109
South	56.4**	4,255	53.1	4,735	57.3	197	57.0	296	39.0	123	50.8	120	69.5*	7,961	75.9	8,617	74.4	336	74.6	474	49.8**	265	60.0	273
West	56.0	700	57.6	585	59.6	62	60.8	74	47.5	40	41.6	48	64.7*	1,343	71.3	1,140	66.0	100	68.2	107	35.5**	90	57.2	110
Health Status																								
Excellent	45.1***	952	44.8	1,000	44.8	145	51.8	187	43.1	88	36.0	75	56.7*	2,566	65.2	2,575	65.8	272	72.2	350	46.4	239	54.8	239
Very Good	52.4 ***	1,639	48.9	1,790	54.9	151	50.2	195	40.0	85	50.6	79	65.8*	3,348	72.9	3,417	75.3	256	69.7	311	42.5*	174	61.9	192
Good	56.2	2,333	55.0	2,404	60.6	155	58.6	174	44.3	79	42.0	88	70.3*	4,113	77.6	4,260	80.4	241	82.0	273	58.9	151	59.3	155
Fair/Poor	62.8***	2,049	59.7	2,017	66.6	75	68.1	113	58.3	36	58.0	50	80.8*	3,169	84.3	3,086	83.8	124	89.6	164	61.0	59	63.4	82
Health Insurance																								
Yes	60.5	5,761	56.1	6,499	59.5	450	58.6	605	55.6	160	52.8	227	76.0	10,693	79.3	11,888	80.9	744	80.1	983	65.3	341	69.0	459
No	33.3	1,213	28.2	712	31.5	76	26.6	64	27.1	118	26.6	75	39.3	2,503	45.1	1,450	45.6	149	46.0	115	30.8	282	36.8	209

*t-tests were conducted to measure significance. * p <=0.001 **p <=0.01 ***p <=0.05*
Pre-ACA covers years 2011-2013. Post-ACA is for years 2014-2017 following implementation of the Affordable Care Act. ^Federal Poverty Level (FPL)

Table 3-A. Demographic Characteristics of Diabetes, Cholesterol and Hypertension Screening Sample of Immigrants of African Descent and U.S.-Born African Americans Before and After Implementation of the ACA, National Health Interview Survey data (2011-2017)

	Hypertension (adults age 18-85)							
	U.S.-Born African Americans (n=)				Immigrants of African Descent (Citizens) (n=)				Immigrants of African Descent (Non-Citizens) (n=			
	Pre-ACA		Post-ACA		Pre-ACA		Post-ACA		Pre-ACA		Post-ACA	
	%	n	%	n	%	n	%	n	%	n	%	n
Age (years)	48		50		49		50		41		42	
Sex												
Male	78.7	5,311	83.5	5,290	81.5	396	83.0	477	57.0	303	70.0	340
Female	88.4	8,267	91.9	8,427	87.9	513	91.8	629	79.9	334	79.6	344
Marital Status												
Married	88.7	3,226	91.5*	3,238	87.3	372	86.2	486	71.4	238	75.8	290
Not Married	83.3	10,352	87.8	10,479	83.6	537	89.5***	620	67.6	399	74.1	394
Education												
Less than High School	84.8	2,649	88.1*	2,395	87.0	162	88.4	173	65.6	172	70.7	195
High School	80.7	4,033	85.7*	4,012	80.0	195	82.8	251	69.8	186	72.0	179
Some College	85.4	4,549	89.3*	4,671	83.7***	289	89.0	339	70.5	156	73.7	164
College	88.3	1,549	92.0*	1,677	89.0	165	88.9	227	67.4	86	81.7	82
Advanced Degree	92.6	798	93.3	962	89.7***	98	93.9	116	78.3	37	89.0	64
Income												
<100% FPL^	82.3*	7,418	87.1	7,236	82.5	413	86.2	466	66.4	402	72.9	433
100% - <200% FPL	85.5*	3,659	89.0	3,666	84.8	270	87.3	339	70.3	172	74.1	174
>200% FPL	90.1**	2,501	92.3	2,815	90.2	226	91.6	301	82.5	63	87.0	77
Region of Residence												
Northeast	85.4*	1,685	90.0	1,515	89.2	371	90.8	414	76.5	200	81.2	181
Midwest	86.2	2,346	86.5	2,202	78.7	94	87.1	109	68.8	77	71.4	112
South	84.2*	8,172	89.2	8,823	85.0	340	86.1	476	65.2	268	73.0	278
West	83.7***	1,375	86.8	1,177	76.9	104	86.9***	107	64.1	92	72.5	113
Health Status												
Excellent	76.5*	2,740	82.7	2,760	79.3	281	84.9	353	66.2	243	71.0	245
Very Good	83.0*	3,454	87.3	3,514	86.9	260	84.6	312	65.7***	181	79.1	197
Good	85.6*	4,193	89.7	4,334	88.1	244	90.5	275	74.6	154	71.6	159
Fair/Poor	92.0**	3,191	94.0	3,109	88.7***	124	96.9	166	76.2	59	81.9	83
Health Insurance												
Yes	89.5	10,999	91.3	12,230	90.0	756	90.7	990	83.7	345	83.5	473
No	63.9	2,579	67.0	1,487	60.7	153	65.5	116	51.7	292	55.4	211

*t-tests were conducted to measure significance. * p <=0.001 **p <=0.01 ***p <=0.05*

Pre-ACA covers years 2011-2013. Post-ACA is for years 2014-2017 following implementation of the Affordable Care Act. ^Federal Poverty Level (FPL)

Table 3-B. Odds of Utilizing Diabetes, Hypertension, and Cholesterol Screening by Immigrants of African Descent and U.S.-Born African Americans Before and After Implementation of the ACA, National Health Interview Survey data, 2011-2017

	Diabetes Screening (adults age 40-70)			Cholesterol Screening (adults age 20-85)			Hypertension Screening (adults age 18-85)		
	OR	**p**	**95% CI**	**OR**	**p**	**95%**	**OR**	**p**	**95%**
ACA									
Pre-ACA	REF	REF	REF	REF	REF	REF	REF	REF	REF
Post-ACA	0.95	0.403	0.87-1.05	1.33	0.000	1.22-1.45	1.32	0.000	1.19-1.48
Nativity/Immigration Status									
U.S.-born African American	REF	REF	REF	REF	REF	REF	REF	REF	REF
Immigrants (citizen)	1.09	0.342	0.90-1.32	1.07	0.359	0.91-1.26	0.91	0.333	0.75-1.09
Immigrants (non-citizen)	0.87	0.310	0.68-1.12	0.66	0.000	0.56-0.79	0.51	0.000	0.41-0.64
Marital Status									
Not Married	REF	REF	REF	REF	REF	REF	REF	REF	REF
Married	1.33	0.000	1.20-1.46	1.25	0.000	1.15-1.36	1.30	0.00	1.16-1.45
Sex									
Male	REF	REF	REF	REF	REF	REF	REF	REF	REF
Female	1.24	0.000	1.14-1.36	1.69	0.000	1.56-1.82	2.35	0.000	2.12-2.60
Education									
Advanced Degree	REF	REF	REF	REF	REF	REF	REF	REF	REF
College	0.97	0.843	0.78-1.22	0.98	0.896	0.80-1.20	0.89	0.458	0.67-1.19
Some College	0.93	0.509	0.77-1.13	0.79	0.011	0.66-0.94	0.68	0.005	0.52-0.88
High School	0.67	0.000	0.54-0.82	0.62	0.000	0.52-0.75	0.48	0.000	0.37-0.63
Less than High School	0.70	0.001	0.56-0.86	0.54	0.000	0.44-0.65	0.45	0.000	0.34-0.59
Age									
18-26	------	------	------	REF	REF	REF	REF	REF	REF
27-39	------	------	------	1.63	0.000	1.45-1.82	1.09	0.229	0.94-1.25
40-49	REF	REF	REF	2.68	0.000	2.36-3.05	1.49	0.000	1.26-1.75
50-59	1.27	0.000	1.14-1.41	3.96	0.000	3.46-4.53	2.02	0.000	1.69-2.43
60-64	1.76	0.000	1.53-2.02	6.19	0.000	5.15-7.45	2.70	0.000	2.15-3.40
65-70	1.91	0.000	1.68-2.17	8.77	0.000	7.27-10.58	4.19	0.000	3.30-5.32
71-85	-----	-----	-----	11.17	0.000	9.24-13.49	5.50	0.000	4.36-6.94
Income									
<100% FPL^	REF	REF	REF	REF	REF	REF	REF	REF	REF
<200% FPL	1.30	0.000	1.16-1.45	1.35	0.000	1.23-1.47	1.22	0.001	1.09-1.38
>200% FPL	1.62	0.00	1.43-1.84	1.82	0.000	1.61-2.04	1.75	0.000	1.49-2.04
Region									
Northeast	REF	REF	REF	REF	REF	REF	REF	REF	REF
Midwest	1.09	0.275		0.75	0.011	0.63-0.89	0.74	0.009	0.59-0.93
South	1.12	0.094	0.92-1.29	0.76	0.022	0.65-0.89	0.70	0.001	0.57-0.86
West	1.28	0.011	0.98-1.28	0.58	0.001	0.48-0.71	0.67	0.002	0.52-0.86
Health Status									
Excellent	REF	REF	REF	REF	REF	REF	REF	REF	REF
Very Good	1.16	0.031	1.01-1.34	1.13	0.009	1.03-1.25	1.16	0.015	1.02-1.32
Good	1.43	0.000	1.25-1.64	1.34	0.000	1.20-1.49	1.29	0.000	1.13-1.46
Fair/Poor	2.25	0.000	1.94-2.63	2.24	0.000	1.98-2.52	2.49	0.000	2.10-2.95

Pre-ACA years= 2011-2013. Post-ACA years= 2014-2017. ^Federal Poverty Level (FPL)

Table 3-C. Diabetes, Cholesterol and Hypertension Screening with Interaction of Affordable Care Act and Nativity among Immigrants of African Descent and U.S.-Born African Americans Before and After Implementation of the ACA, National Health Interview Survey data, 2011-2017

	Diabetes Screening (adults age 40-70)			Cholesterol Screening (adults age 20-85)			Hypertension Screening (adults age 18-85)		
	OR	**p**	**95% CI**	**OR**	**p**	**95% CI**	**OR**	**p**	**95% CI**
ACA									
Pre-ACA	REF	REF	REF	REF	REF		REF	REF	REF
Post-ACA	0.95	0.376	(0.86-1.05)	1.37	0.000	(1.24-1.50)	1.37	0.000	(1.21-1.54)
Nativity/Immigration Status									
U.S.-born African American	REF	REF	REF	REF	REF	REF	REF	REF	REF
Immigrants (citizen)	1.06	0.643	(0.80-1.41)	1.28	0.020	(1.03-1.57)	0.99	0.979	(0.78-1.26)
Immigrants (non-citizen)	0.86	0.432	(0.61-1.23)	0.72	0.001	(0.58-0.88)	0.61	0.000	(0.48-0.78)
Immigrants (citizen) x post-ACA	1.04	0.813	(0.73-1.48)	0.75	0.043	(0.56-0.99)	0.85	0.398	(0.59-1.22)
Immigrants (non-citizens) x post-ACA	1.01	0.944	(0.62-1.66)	0.88	0.429	(0.64-1.20)	0.74	0.130	(0.51-1.08)

Pre-ACA years= 2011-2013. Post-ACA years= 2014-2017 following implementation of the Affordable Care Act. ^Federal Poverty Level (FPL). OR -odds ratio. CI-confidence interval
**Model also controlled for marital status, age, sex, income, education, U.S. region of residence and self-reported health status. Results available upon request.*

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