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Examining the Association of Type 2 Diabetes Mellitus Risk Factors Between African Immigrants Living in the United States and African Americans Born in the United States

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This is to certify that the doctoral study by

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2024

Abstract

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by

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Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Public Health

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Abstract

The purpose of the study was to investigate the risk factors for Type 2 diabetes mellitus (T2DM) among African immigrants and African Americans born in the United States to identify differences and similarities in their impact and prevalence. Variables considered as potential differentiators included alcohol consumption, income, educational levels, and smoking habits, age, and gender. The health belief model served as the theoretical framework. Utilizing data from the National Health and Nutrition Examination Survey 2015-2016, logistic regression analyses were used to test for significant factors affecting T2DM prevalence in these groups. Results indicated that country of origin did not predict T2DM when controlling for other variables. The findings emphasize the need for culturally tailored healthcare approaches to address African immigrants and African Americans unique challenges, suggesting a deeper understanding of T2DM's epidemiology within these communities. Implications for positive social change include understanding how cultural and environmental factors influence health outcomes, thus supporting the development of culturally sensitive health interventions that could potentially reduce the prevalence of T2DM.

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Dedication

This dissertation is lovingly dedicated to my wife, Chinyelu Philip Effiong, and my beloved children, Victor, Elsa, and Phil. Your constant support and love have been a beacon of light, guiding me through the challenges of this journey. I am profoundly grateful to Almighty God for providing me with unwavering strength, wisdom, and grace, which have been essential in reaching this significant achievement.

In special remembrance, I honor my late father, Hon. Martin Okon Effiong, whose influence and teachings remain a powerful source of inspiration and courage in my life. His legacy continues to motivate me to pursue my academic and personal aspirations.

Additionally, I pay tribute to my late mother, Mrs. Comfort Ikwo Effiong, whose dedication to my education laid the foundations for my academic pursuits. Her enduring memory and the values she taught me have continually inspired and strengthened me. This achievement is a tribute to her love, sacrifice, and the faith she had in my potential.

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Section 1: Foundation of the Study and Literature Review

Introduction to the Study

Type 2 Diabetes Mellitus (T2DM) remains a significant public health challenge in the United States, with its prevalence continuing to rise across diverse populations. A noteworthy aspect of this health disparity is the variation in T2DM risk factors between ethnic and cultural groups (Bullard et al., 2018). This study aims to investigate the association of T2DM risk factors between African Immigrants (AI) living in the United States and African Americans (AA) born in the country. By examining these populations, I sought to understand the interplay of cultural, genetic, environmental, and socio-economic factors contributing to the prevalence and disparities in T2DM within these communities.

T2DM affects approximately 29.1 million individuals annually (Bullard et al., 2018). This autoimmune disease is the seventh leading cause of mortality in the United States (Bullard et al., 2018). The World Health Organization (WHO) estimates that T2DM will be prevalent among 366 million people by 2030, dramatically increasing from the 171 million reported globally in 2000 (Bullard et al., 2018). AI’s bring unique cultural practices, dietary habits, and lifestyle choices. These factors, deeply rooted in their countries of origin, may influence their susceptibility to T2DM (Bullard et al., 2018). Conversely, AA’s with a distinct cultural heritage may exhibit different health behaviors and risk factors. Understanding these cultural nuances is crucial for tailoring effective preventive strategies and interventions.

The genetic predisposition to T2DM varies among ethnic groups, and the impact of environmental factors further complicates this relationship (Bullard et al., 2018). This study will explore how genetic factors interact with the US environment to influence T2DM risk. Specifically, we aim to identify whether there are differences in genetic susceptibility between AI and AA and how environmental factors contribute to these disparities (Bullard et al., 2018). Acculturation, the process of adopting the behaviors and values of a new culture, may lead to lifestyle changes that impact T2DM risk. I investigated how acculturation influences dietary patterns, physical activity, and other lifestyle factors in both populations and how these changes contribute to T2DM risk. Community and social support networks play a pivotal role in health outcomes. This research will examine the influence of community engagement, smoking, alcohol, and support systems on T2DM prevention and management within African immigrant and AA communities. Research indicates a preponderance increase in T2DM risks among AI (Turner et al., 2021). AI in the United States has been linked to economic difficulties at the initial settlement stages. Socioeconomic factors, including income, education, and access to healthcare, play a significant role in T2DM risk. This study will assess how socioeconomic status differs between AIs and AAs and how these differences contribute to T2DM prevalence and management disparities.

The study will examine the association between AI living in the United States and T2DM. The study will explore economic factors, income levels, ages, tobacco use, physical health, and gender to determine the relationship with T2DM.

Background

This research examines the association of T2DM risk factors between AI living in the United States and AAs born in the United States. It addresses an important area of public health and health disparities. The background of this research involves understanding the complex interplay of various factors that contribute to the prevalence and management of T2DM within these distinct populations (Argeseanu et al., 2008).

T2DM is a chronic medical condition that, if not well-managed, can lead to various complications and an increased risk of mortality. The impact of diabetes on mortality rates varies globally and is influenced by factors such as healthcare infrastructure, access to treatment, lifestyle, and overall health systems (Argeseanu et al., 2008). According to the International Diabetes Federation (IDF), an estimated 537 million adults will have diabetes in 2021, and this number is expected to rise to 643 million by 2030 (Robbins et al., 2000). Individuals with diabetes, particularly T2DM, have an increased risk of premature mortality compared to those without diabetes (Robbins et al., 2000). The risk is higher when diabetes is poorly controlled, or complications arise (Argeseanu et al., 2008).

Mortality rates associated with diabetes vary across regions and countries. In some regions, mortality rates may be higher due to factors such as limited access to healthcare, economic disparities, and lifestyle factors. Diabetes can reduce life expectancy. The extent of the impact depends on factors such as the age at which diabetes is diagnosed, the presence of complications, and the effectiveness of management and treatment (CDC, 2013).

Global health organizations, including the WHO and the IDF, emphasize the importance of addressing diabetes as a public health priority. Efforts include raising awareness, promoting early diagnosis, improving access to care, and implementing preventive measures—disparities in healthcare infrastructure and access to resources impact mortality rates. Regions with robust healthcare systems may have better outcomes in managing diabetes and preventing associated complications. Mortality rates associated with diabetes often show age and gender differences. Older individuals and males with diabetes may face a higher risk of mortality (Robbins et al., 2000).

Past research indicates that AI"s are healthier than AA's born in the United States (CDC, 2013). Understanding this heterogeneity is integral to addressing health disparities as the AI population in the United States is growing, and individuals within this group may have distinct risk factors for T2DM. Factors such as acculturation, alcohol intake, smoking, lifestyle changes, and genetic predispositions may differ from those of the AA population (Argeseanu et al., 2008).

AA have a higher prevalence of Type 2 diabetes compared to the general population (Robbins et al., 2000). The reasons for this higher prevalence are complex and involve genetic, environmental, and socioeconomic factors. T2DM is a significant health concern within the AA community. This study is significant, as it will enhance understanding of the epidemiology of T2DM. Understanding these differences is crucial for developing targeted intervention strategies and healthcare policies to mitigate the burden of T2DM within these populations. Additionally, this research and advancements in treatment modalities may enhance the quality of life and outcomes for individuals with diabetes, especially AI and AA populations (Robbins et al., 2000).

Problem Statement

This research investigates the nuanced landscape of T2DM risk factors by comparing AIs residing in the United States with AAs born in the country. T2DM in the United States represents a significant public health challenge with far-reaching implications. Understanding the epidemiology, risk factors, and effective interventions is crucial for developing targeted strategies to mitigate the impact of T2DM on individuals and the healthcare system.

AA have a higher prevalence of T2DM compared to some other racial and ethnic groups (Smith, 2019). This increased prevalence may be attributed to genetic, socioeconomic, and lifestyle choices. This study will investigate risk factors of T2DM with variables such as alcohol intake, smoking habits, income levels, and socioeconomic factors between AI and AA populations in the United States.

Purpose of the Study

This quantitative study will examine the association of risk factors and the prevalence of T2DM between AI's living in the United States and native-born AA's. The study will investigate the role of socioeconomic factors, such as income, education, alcohol intake, smoking habits, and access to healthcare, in shaping T2DM risk. The study aims to identify disparities in these socio-economic factors and assess their impact on T2DM prevalence and management within the two populations. In addition, the study will evaluate the role of community and social support networks in T2DM prevention and management. By understanding the dynamics of community engagement, the study aims to identify potential avenues for strengthening social support structures to improve health outcomes in AI and AA communities.

The study aims to assess the policy landscape and its impact and proffers possible evidence-based recommendations for policies in addressing social determinants of health and reducing health disparities, mainly focusing on the unique needs of AIs and AAs and contributing valuable data and insights to the body of knowledge in public health. In addition, the study seeks to enhance our understanding of T2DM risk factors and disparities within diverse populations by filling existing research gaps and ultimately informing public health strategies and interventions. Furthermore, this study seeks to advance our understanding of T2DM risk factors in the context of income, education, alcohol intake, and smoking. The findings are intended to guide the development of targeted interventions, inform public health policies, and contribute to the broader discourse on health disparities in the United States.

Research Questions and Hypotheses

The research questions for this study are as follows:

RQ1: Is there an association of education, income, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender?

$H_0 1$: There is no association of education, income, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender.

H_a1: There is an association of education, income, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender.

RQ2: Is there an association between cigarette smoking, alcohol use, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender?

H_02: There is no association of cigarette smoking, alcohol use, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender.

H_a2: There is an association of cigarette smoking, alcohol use, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender.

Theoretical Framework

The health belief model (HBM) is a psychological framework that seeks to understand and predict health-related behaviors by examining individuals' beliefs and perceptions about health risks and the perceived benefits and barriers associated with specific health actions. When applied to T2DM, the HBM helps elucidate the factors influencing individuals' decisions and behaviors related to diabetes prevention, management, and control (Ablah et al., 2014).

This study applied the concepts of the HBM theoretical framework to accentuate the behavioral patterns of AI and AA populations in the control of T2DM. HBM was chosen because it helps understand why individuals may or may not engage in preventive behaviors, such as maintaining a healthy diet, engaging in regular physical activity, and managing weight to reduce the risk of developing T2DM (Ablah et al., 2014).

Individuals with T2DM are often prescribed medications to manage blood glucose levels. The HBM helps explain factors influencing medication adherence, including beliefs about the necessity of medications and concerns about potential side effects. The model can be applied to understand why individuals may or may not regularly monitor blood glucose levels, an essential aspect of T2DM management (Gary et al., 2004).

The HBM is valuable in identifying factors influencing the adoption and maintenance of diet and lifestyle changes necessary for effective T2DM management (Gary et al., 2004). In addition, the HBM can be used to understand factors influencing healthcare-seeking behaviors, such as regular check-ups, diabetes education, and seeking medical advice for diabetes-related concerns. The HBM provides insights into individual decision-making processes and helps tailor interventions to address specific beliefs and perceptions. It can inform the development of targeted educational campaigns and behavioral interventions for T2DM prevention and management.

The HBM is a valuable framework for understanding the factors influencing behaviors related to T2DM, especially regarding AI and AA populations. Its application can inform interventions to promote positive health behaviors and improve health outcomes for individuals with or at risk of T2DM. Researchers and healthcare practitioners often use the HBM to develop targeted strategies that resonate with individuals' beliefs and motivations, ultimately promoting better adherence to diabetes management plans (Fisher et al., 2007). The HBM has various significant concepts, including perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy (Glanz et al., 2008).

The concept of perceived susceptibility and severity refers to an understanding that individuals are more likely to take preventive actions if they believe they are susceptible to T2DM and perceive the disease as severe. Education and communication campaigns can enhance these perceptions (Glanz et al., 2008).

The concept of perceived benefits emphasizes the benefits of adopting a healthier lifestyle or adhering to medical recommendations, such as improved overall health, reduced risk of complications, and enhanced quality of life (Smith, 2019).

The concept of perceived barriers involves identifying and addressing barriers that may hinder individuals from engaging in health-promoting behaviors. This could involve providing resources, financial assistance, or education to overcome obstacles (Glanz et al., 2008).

Cues to action refer to implementing strategies to prompt individuals to take action, such as regular health screenings, public health campaigns, and personalized recommendations from healthcare providers. An AI is more likely to take a “health action” if they perceive the disease is severe; health action is beneficial, understand limited barriers to the health action, and receive a cue to get it (Philis-Tsimikas et al., 2004).

Self-efficacy involves providing individuals with the tools, resources, and support needed to adopt and maintain health-promoting behaviors successfully. This may include education, skill-building, and social support (Glanz et al., 2008). Both AA and AI people with T2DM who are knowledgeable are positively likely to adapt and follow a treatment based on social support and their educational skills. In general, HBM is a health behavior tool that will help individuals through educational programs that adhere to treatment management that will significantly improve health outcomes (Kartal et al., 2007).

Nature of the Study

The research questions in this quantitative study were addressed using a specific research design that included secondary data from the National Health and Nutrition Examination Survey (NHANES; 2015 – 2016 Type 2 diabetes data). The NHANES database, which has a cross-sectional design, was utilized to understand the risk factors for T2DM among AIs in the United States. In this research, Africans in the United States were referred to as the AA population living in the United States. These data encompassed all adult participants 20 years and older; information derived from this data was paramount to the research as it targeted an exploration of the relationship between diabetes among AI in the United States within the specified time frame.

Data Collection

This study used the NHANES 2015-2016 database, which was T2DM data collected by the Centers for Disease Control and Prevention (CDC). NHANES is a subsidiary of the National Center for Health Statistics (NCHS) and the Division of National Health and Nutrition Examination Survey (DNHANES). NHANES collected data in a year (CDC, 2015). The data years from 2014 to 2015 were chosen because they contained the variables in the research study. Secondly, NHANES data from 2015 to 2016 was the newest secondary data that would best provide accurate research findings.

NHANES was designed to assess the health and nutritional status of adults and children in the United States. The survey was unique in combining interviews, physical examinations, administration, physical activity, and fitness tests that included children and adolescents.

The results of NHANES data benefited people in the United States in meaningful ways. Facts about the distribution of health problems and risk factors in the population gave researchers important clues to disease causes.

Information collected from the current survey was compared with data collected in previous surveys. This allowed health planners to detect the extent to which various health problems and risk factors had changed in the U.S. population over time. By identifying the population's healthcare needs, government agencies and private sector organizations were able to establish policies and plan research, education, and health promotion programs that helped improve present health status and prevent future health problems.

Data Analysis

The data analysis utilized the NHANES 2014 – 2015 data set (CDC, 2015) and included statistical data analysis using descriptive statistics, univariate analysis, and multivariate analysis. These analyses effectively analyzed the T2DM of AI and AA in the United States. Other analyses included were frequency distributions that helped to analyze the statistical distribution levels and the use of multiple logistic regression models.

Variables and Measures

Dependent Variable or Outcome Variable

The study's dependent variable is T2DM. Both the AA population and AI will be accessed for T2DM. This research will allocate the value of one for the people with T2DM and use the value of zero (dichotomous) for the people who do not have T2DM. Both forms of information will be analyzed statistically through the data analysis processes.

Independent Variable

The study's independent variables are income, education, alcohol intake, and smoking, while age and gender are the controlling variables. The population ages range and will be categorized as 20 – 30 years = 1, 31– 40 years = 2, 41 – 50 years = 3, 51– 60 years, and 61 and above =5. The gender will be male = 1, female = 2. Smoking will be categorized as smokers and nonsmokers; education will be based on various levels of education from high school, college degrees, graduate degrees, and above.

Alcohol will be categorized as those who drink and those who drink moderately and heavy drinkers.

Literature Review

Type 2 Diabetes and Global Perspectives

T2DM is a global health concern with significant implications for individuals, healthcare systems, and economies worldwide. Examining T2DM from a global perspective involves considering its prevalence, risk factors, impacts, and various approaches to prevention and management across different regions and populations.

T2DM has reached epidemic proportions globally. The WHO estimates that the number of people with diabetes has risen from 108 million in 1980 to 422 million in 2014, and this number continues to grow. The prevalence of T2DM varies across regions, with higher rates in certain areas, including the Middle East, North America, and some parts of Asia. Factors such as genetic predisposition, lifestyle, and healthcare infrastructure contribute to these regional variations (WHO, 2016).

Rapid urbanization and associated lifestyle changes, including unhealthy diets and sedentary behavior, have been linked to the increasing prevalence of T2DM globally. Urban areas often experience higher rates of T2DM compared to rural areas (WHO, 2016).

T2DM is associated with socioeconomic factors, and there are disparities in its prevalence between high-income and low-income countries. Limited access to healthcare, education, and resources in low-income settings contributes to the burden of T2DM (WHO, 2016). T2DM poses a substantial economic burden on healthcare systems and economies worldwide. Direct healthcare costs, costs associated with complications, and indirect costs related to reduced productivity contribute to the economic impact of the disease (WHO, 2016).

The complications of T2DM, including cardiovascular diseases, kidney problems, and neuropathy, have global health implications. Addressing the prevention and management of T2DM is crucial for reducing the burden of associated complications (WHO, 2016). Health inequalities related to T2DM exist within and between countries. Vulnerable populations, including those with limited access to healthcare and resources, may face increased challenges in preventing, early detection, and managing T2DM (WHO, 2016).

Global efforts are underway to address T2DM through international collaborations, research initiatives, and the sharing of best practices. Organizations like the IDF work to promote awareness, prevention, and care on a global scale (WHO, 2016). Understanding the global perspective of T2DM is essential for developing effective strategies, policies, and interventions tailored to the diverse needs of populations worldwide. It involves considering the complex interplay of genetic, environmental, cultural, and socioeconomic factors contributing to the global burden of T2DM and its associated complications.

The IDF estimates that over 463 million adults worldwide were living with diabetes in 2019, with projections indicating a substantial increase by 2045 (International et al., 2019). Studies have identified specific genetic variants associated with an increased risk, but environmental factors also contribute significantly (Mahajan et al., 2018). T2DM prevalence is often higher in low- and middle-income countries, highlighting the influence of socioeconomic factors on disease outcomes (Rawal et al., 2018). Cultural variations contribute to differences in dietary habits and physical activity levels, impacting T2DM prevalence. Understanding cultural contexts is crucial for designing effective prevention and management strategies (Gouda et al., 2019). Global health organizations advocate for comprehensive approaches, including health education, lifestyle interventions, and improved healthcare access, to address the rising T2DM burden (WHO, 2016).

This literature review underscores the global nature of the T2DM epidemic, emphasizing the multifaceted factors contributing to its prevalence and the necessity for culturally sensitive, comprehensive strategies to address this growing public health challenge. Continued research and collaborative efforts are essential to developing effective global interventions.

Type 2 Diabetes in the United States

T2DM has a significant impact on AAs in the United States. The prevalence of diabetes is higher among AAs compared to some other ethnic groups, and this population faces unique challenges and disparities related to the management and outcomes of diabetes (CDC, 2017). T2DM tends to occur at an earlier age and may be more severe among AAs. Early onset increases the duration of exposure to diabetes-related complications over a person's lifetime (CDC, 2017). AAs with T2DM are at an increased risk of developing complications such as cardiovascular diseases, kidney disease, and diabetic retinopathy. The presence of multiple comorbidities can complicate disease management. There are notable health disparities in the management and outcomes of T2DM among AAs. Factors contributing to these disparities include socioeconomic factors, limited access to healthcare, and cultural considerations (Tsenkova et al., 2019).

T2DM is a prevalent and growing health concern in the United States, impacting millions of individuals and posing significant challenges to public health. This comprehensive review explores the current state of T2DM in the United States, including its epidemiology, risk factors, healthcare implications, and interventions. According to the CDC (2020), over 34 million Americans had diabetes in 2020, with approximately

90-95% of cases being attributed to T2DM. Minority populations, particularly AAs, Hispanic Americans, and Native Americans, exhibit higher prevalence rates and are at an increased risk of complications (American Diabetes Association, 2021). T2DM poses substantial economic and healthcare burdens, and the costs associated with diabetes management, complications, and reduced productivity significantly contribute to U.S. healthcare expenditures (Zhuo et al., 2013).

Prevention and management strategies involve lifestyle modifications, pharmacological interventions, and patient education. Implementing evidence-based programs and policies, such as the National Diabetes Prevention Program, aims to reduce the incidence of T2DM and improve outcomes (National Institute of Diabetes and Digestive and Kidney Diseases, 2021).

T2DM in the United States represents a significant public health challenge with far-reaching implications. Understanding the epidemiology, risk factors, and effective interventions is crucial for developing targeted strategies to mitigate the impact of T2DM on individuals and the healthcare system.

Literature Review of Key Study Variables and Concepts

Prevalence of Type 2 Diabetes Among AA’s Born in the United States

T2DM has significant health implications, and its effects can vary among different population groups, including AAs (Chard et al., 2017). AA has a higher pervasiveness of T2DM compared to some other racial and ethnic groups. This increased predominance may be attributed to genetics, socioeconomic, and lifestyle choices (Chard et al., 2017).

AAs with T2DM are at an increased risk of cardiovascular diseases such as heart attacks and strokes. Diabetes can exacerbate existing cardiovascular risk factors, leading to poorer heart health outcomes (Chard et al., 2017). AAs may face healthcare disparities, affecting their access to quality healthcare services. Limited access to healthcare resources can result in delayed diagnosis, inadequate management of diabetes, and increased risk of complications.

Cultural and social factors play a role in diabetes management. Understanding cultural nuances is crucial for healthcare providers to develop effective strategies for diabetes prevention and management among AA (Chard et al., 2017). Lifestyle modifications, including dietary changes and increased physical activity, are essential to diabetes management. Tailoring interventions to AAs' cultural preferences and lifestyle patterns can enhance the effectiveness of diabetes prevention and management programs (Chard et al., 2017).

Community-based approaches, such as support groups and educational programs, can effectively reach and engage AA populations. These approaches can empower individuals to make healthier choices and improve diabetes management (Chard et al., 2017). Managing T2DM in AA requires a multidisciplinary approach involving healthcare providers, nutritionists, mental health professionals, and community support. Comprehensive care can address both the medical and socio-cultural aspects of diabetes management (Chard et al., 2017).

Prevalence of T2DM Among AA's Born Outside the United States

Studies consistently show that AI tends to be healthier than their AA U.S.-born race or ethnic counterparts (Cunningham et al., 2008). Understanding this heterogeneity is integral to addressing health disparities as the number of AIs continues to grow due to high levels of past and current immigration (Cunningham et al., 2008). Since the 1960s, large immigrant streams from the Caribbean and Africa have also led to an increasing share of the U.S. Black population that is foreign-born (Cunningham et al., 2008). By 2010, 9% of U.S. Blacks were foreign-born, up from 1.9% in 1970 (Cunningham et al., 2008).

Prior research suggests that AI has lower mortality, better mental and perinatal health, lower rates of overweight, and better outcomes for heart and circulatory disease, cancer, infectious disease, and injury than AAs (Cunningham et al., 2008). As a whole, AAs have one of the highest burdens of diabetes of any race or ethnic group in the United States (CDC, 2013). An estimated 13% of non-Hispanic Blacks have been diagnosed with diabetes compared to 8% of the U.S. population (CDC, 2013).

T2DM and Age and Perceived Susceptibility

The HBM suggests that an individual's perception of their susceptibility to a health condition, such as T2DM, can influence health-related behaviors (Afanasiev et al., 2018). The perceived susceptibility to a disease may vary with age due to changes in health awareness, risk perception, and lifestyle behaviors (Afanasiev et al., 2018). Younger individuals might perceive themselves as less susceptible to T2DM due to invincibility or a belief that chronic diseases are more relevant to older age groups

(Afanasiev et al., 2018). This age group may also need to be made aware of the long-term consequences of unhealthy lifestyle behaviors. As individuals enter middle age, they may become more aware of the potential health risks associated with aging, including an increased susceptibility to chronic conditions like T2DM. Family history and lifestyle factors may also start to play a more significant role in their perception of susceptibility (Afanasiev et al., 2018)

Older adults, especially those with friends or family members who have experienced T2DM, may have a heightened awareness of the disease and an increased perceived susceptibility. Age-related health concerns and comorbidities may further contribute to the perception of vulnerability (Afanasiev et al., 2018). Individuals with a family history of diabetes may perceive a higher susceptibility, especially if close relatives have been diagnosed with T2DM at a relatively young age. Awareness of lifestyle factors, such as poor diet and physical inactivity, on T2DM risk may influence perceived susceptibility.

Younger individuals may benefit from messages highlighting the long-term consequences of lifestyle choices, while older individuals may respond to messages emphasizing the immediacy of risk. Interventions to prevent T2DM should address age-specific risk factors and incorporate strategies to enhance perceived susceptibility. This may involve routine screenings, family health histories, and lifestyle interventions (Afanasiev et al., 2018). Understanding the interplay between age and perceived susceptibility is crucial for developing effective health communication strategies and interventions that resonate with diverse age groups within the population. Tailoring approaches based on age-specific considerations can enhance the effectiveness of diabetes prevention efforts among AA and AI people (Afanasiev et al., 2018)

Cigarette Smoking and the Incidence of T2DM

Cigarette smoking has been associated with an increased risk of developing T2DM in various populations, including AA and AI populations. The relationship between cigarette smoking and T2DM is complex, involving multiple physiological and behavioral factors (CDC, 2017). Numerous studies suggest that cigarette smoking is a modifiable risk factor for T2DM, and smoking has been associated with insulin resistance and impaired glucose metabolism, contributing to an increased risk of developing diabetes (CDC, 2017). The impact of smoking on diabetes risk can interact with genetic factors, and some individuals may be more genetically susceptible to the effects of smoking on glucose metabolism (CDC, 2017).

The interaction between smoking and these factors can contribute to the incidence of diabetes in this population. Understanding the relationship between cigarette smoking and T2DM is essential for public health initiatives. Tailoring interventions to address smoking cessation within the context of cultural and socioeconomic factors specific to the AA population is crucial for effectiveness (CDC, 2017). This study seeks to show the prevalence of T2DM in consideration of smoking between AA born in the United States and AI born outside the United States.

Alcohol Consumption and Risk of T2DM Among AA's in the United States

The relationship between alcohol consumption and the risk of T2DM is complex. It can be influenced by various factors, including the type and amount of alcohol consumed, individual differences, and genetic predispositions. Some studies suggest that moderate alcohol consumption may be associated with a lower risk of developing T2DM. Moderate drinking is generally defined as up to one drink per day for women and up to two drinks per day for men (Wild et al., 2000). The type of alcohol consumed may have different effects. For example, moderate consumption of red wine has been associated with potential health benefits due to the presence of antioxidants, but the evidence is not entirely conclusive (Zimmet et al., 2001). Within the AA population, there may be cultural and socioeconomic factors that influence alcohol consumption patterns. It is essential to consider these factors when studying the relationship between alcohol and T2DM in this specific demographic (Johnson, 2021). This research is set to consider the nuances of alcohol consumption; however, moderate drinking may have potential benefits, these must be balanced against the risks of excessive alcohol consumption and the potential for adverse health outcomes (Johnson, 2021).

T2DM and Gender and Perceived Susceptibility

Societal expectations and traditional gender roles can influence how individuals perceive their susceptibility to diseases. For example, women may be more attuned to health issues due to their roles as caregivers and nurturers (Davis, 2022). Occupational roles and responsibilities may also shape perceptions. Work and family life stressors can affect the perceived susceptibility to T2DM differently among men and women.

Hormonal fluctuations during various life stages, such as puberty, pregnancy, and menopause, can influence women's perceptions of health and susceptibility to diseases, including diabetes. While men do not experience the same hormonal fluctuations, other factors, such as testosterone levels and aging, may play a role in their perceptions of health risks. Men may be less likely to engage in preventive healthcare behaviors due to a lower perceived susceptibility to health problems. This can potentially lead to delayed diagnosis and intervention for conditions like T2DM (Hawkins et al., 2017).

T2DM and Education

Numerous researchers exploring the relationship between T2DM, and education often focus on how educational attainment influences the risk of developing diabetes, management of the condition, and health outcomes. These studies indicate an inverse relationship between educational attainment and the risk of developing T2DM. Higher levels of education are generally associated with a lower risk of diabetes (Moghadam et al., 2018).

According to Moghadam et al. (2018), higher educational levels are often associated with better health literacy, enabling individuals to understand and manage their diabetes effectively. Education can empower individuals to make informed diet, exercise, and medication adherence decisions. Educational interventions targeting diabetes prevention and management have been successful. These programs often focus on improving health literacy, providing information on lifestyle changes, and enhancing self-management skills (Smith, 2021).

T2DM and Income

Numerous studies have shown a clear association between income and the risk of developing T2DM. Lower income levels are often linked to higher rates of T2DM among AAs (Brancati et al., 2000; Robbins et al., 2019). Socioeconomic status, including income, education, and employment, is a crucial determinant of health outcomes, and disparities in T2DM prevalence are evident across different socioeconomic strata within the AA community (Walker et al., 2014). Income influences access to healthcare resources, which, in turn, affects the management of T2DM. AAs with lower incomes may face barriers to accessing quality healthcare services, leading to challenges in diabetes management and control (Brown et al., 2019). Economic strain, characterized by financial stress and insecurity, has been associated with an increased risk of T2DM among AAs. Economic strain may contribute to unhealthy behaviors and limited resources for managing the condition (Golden et al., 2017; Tsenkova et al., 2019). The intersectionality of race and income is a critical consideration in understanding health disparities. AAs with lower incomes may face a compounded risk due to the intersectionality of socioeconomic factors, leading to inequalities in T2DM outcomes (Williams & Mohammed, 2009).

Risk and Predisposing Factors of T2DM

T2DM is a complex metabolic disorder influenced by genetic, environmental, and lifestyle factors. Individuals with a family history of T2DM are at a higher risk. Genetic factors contribute to insulin resistance and impaired beta-cell function, vital in T2DM development (Kolahdooz et al., 2019). In the study by Kolahdooz et al. (2019) concerning multiple ethnic groups, the researchers concluded that the risk of T2DM increases with age and that older adults are more susceptible to reduced physical activity, muscle mass decline, and changes in hormonal regulation. Obesity, especially abdominal or visceral adiposity, is a significant risk factor. The research fosters that understanding the interplay of these factors is crucial for preventive strategies and effective management of T2DM. Lifestyle modifications are critical to T2DM prevention and management, and regular medical check-ups and early intervention are essential for those at higher risk (Robbins et al., 2019).

Perceived Severity of T2DM With Age and Gender

Various demographic factors, including age and gender, can influence the perceived severity of T2DM. As individuals age, they may become more aware of health risks and more susceptible to chronic conditions. The perceived severity of T2DM may increase with age as individuals recognize the potential impact on their overall health and well-being (Smith, 2022). Gender differences may exist in how individuals perceive the severity of T2DM, and women, in general, may be more health-conscious and attentive to potential health threats, including diabetes. This could influence a higher perceived severity among women (Smith, 2022), and societal expectations and cultural norms related to gender roles may impact the perceived severity of T2DM. For example, women may feel a greater responsibility for family health, influencing their perception of the severity of health conditions (Smith, 2022).

Alatawi et al. (2016) studies show that public health campaigns and educational interventions should consider tailoring messages about T2DM severity based on age and gender differences in perception. This ensures that communication strategies resonate effectively with diverse demographic groups.

Perceived Barriers to T2DM and Smoking and Alcohol Consumption

Smoking and diabetes synergistically impact morbidity and mortality (Stamler et al.,1993). People with diabetes who smoke are at increased risk of coronary heart disease (Stamler et al., 1993) and microvascular complications (Stamler et al., 1993). Up to 65% of cardiovascular mortality is attributable to the interaction between smoking and diabetes. Nicotine addiction can pose a significant barrier to quitting smoking (Qin et al., 2013). The challenges of managing diabetes may exacerbate stress, making it more difficult for individuals to overcome nicotine addiction. Qin et al. (2013) concluded that smoking peers, psychological addiction, and post-cessation weight gain were mentioned as barriers to quitting, whereas health awareness and family support were motivators for smoking cessation.

Perceived barriers to managing T2DM in the context of alcohol consumption can play a significant role in individuals' adherence to their treatment plans and lifestyle modifications (Eliasson et al., 2003). While moderate alcohol consumption may be acceptable for some individuals with diabetes, excessive or inappropriate alcohol use can pose risks to health, including disruptions in blood sugar levels. Individuals may be concerned about the impact of alcohol on blood sugar levels. Alcohol can interfere with the liver's ability to release glucose into the bloodstream, potentially leading to hypoglycemia (low blood sugar). Alcohol can impair judgment and decision-making. Individuals may worry about making poor choices related to food, medication management, or overall diabetes self-care when under the influence of alcohol (Eliasson et al., 2003).

Literature Search Strategy

The keywords and databases searched for the study included immigrants, diabetes mellitus, Type 2 diabetes, AA alcohol intake, cigarettes, AA migration status, obesity, social support, and obesity doctor's office visits. I used the following databases: PubMed, CDC, EBSCO, NCHS, WHO data bank, NHANES, and Health Data government.

Definition of Variables

The definitions of the variables used in the research are as follows.

Age: Age measures the time elapsed since an individual's birth. It is a fundamental demographic variable and is often categorized into groups (e.g., young, middle-aged, elderly) for analysis (United Nations, 2019)

Alcohol intake: Alcohol intake refers to a psychoactive substance found in beverages such as beer, wine, and spirits. It is consumed for recreational, cultural, or medicinal purposes (WHO, 2018).

Gender: Gender refers to the social and cultural roles, behaviors, and expectations associated with being male or female. It encompasses a range of identities beyond the binary concept of male and female (WHO, 2002).

Level of education: Level of education refers to years of formal education an individual has among AAs.

Level of Income: Income refers to the monetary earnings or financial resources that an individual or household receives, typically measured over a specific period.

Smoking: Smoking refers to the inhalation of smoke from burning tobacco, usually in the form of cigarettes, cigars, or pipes. Smoking is a major risk factor for various health conditions, including respiratory and cardiovascular diseases (US Department of Health and Human Services, 2014).

T2DM: T2DM is a chronic metabolic disorder characterized by elevated blood glucose levels resulting from insulin resistance and inadequate insulin production. It is often associated with lifestyle factors, genetics, and environmental influences (American Diabetes Association, 2014).

Definition of Terms

Africa: Africa consists of all countries within the African regions that include all countries within the regions.

African American: AA refers to individuals in the United States with African ancestry, typically descendants of enslaved Africans brought to the Americas. It is a racial or ethnic identifier used in demographic and health research (Pew Research Center, 2015).

African Immigrants: AIs are individuals who have migrated to a country from a country on the African continent. They may include refugees, asylum seekers, or individuals seeking better economic opportunities (United Nations, 2019).

The Health Belief Model: The HBM is a psychological framework that seeks to explain and predict health-related behaviors by examining individual beliefs and perceptions about health risks, the benefits of taking action, and barriers to preventive actions (Rosenstock et al., 1988).

Healthy People: Healthy People is a set of health objectives and goals by the US Department of Health and Human Services. These objectives focus on improving public health and preventing diseases, with specific targets to be achieved over a defined time frame (U.S. Department of Health and Human Services, 2020).

Sustainable Development Goal (SDGs): Sustainable Development Goals are a set of 17 global goals adopted by United Nations member states to address various social, economic, and environmental challenges. Goal 3 focuses explicitly on ensuring healthy lives and promoting well-being for all at all ages (United Nations, 2015).

These definitions and the provided citations offer a comprehensive understanding of each variable in the context of health, demographics, and global development.

Assumptions

This research assumed that the T2DM records were collected from U.S. residents during the 2015 – 2016 by NHANES. NHANES uses a complex, multistage probability sampling design to ensure that the sample is representative of the U.S. civilian noninstitutionalized population. NHANES employs rigorous quality control measures, but data collection and processing errors can still occur. NHANES has undergone changes in survey methods over the years, including changes in the sampling design, assessment tools, and laboratory procedures, including taking measures to protect the confidentiality of participants (CDC, 2015). This assumption is accurate concerning T2DM in the United States and the associated listed risk factors such as age, gender, smoking, and alcohol.

Scope and Delimitation

This study used data from NHANES from 2015 to 2016 and provided information on statistical analysis and a conclusion on the risk factors of T2DM between AI living in the United States and native-born AAs in the United States. Information is based on the various age groups within the confines of the United States and not on other populations, groups, or subgroups in another country. The data originated from the United States, and all information is based on the US population. Therefore, the results obtained are limited to AAs born in the United States and AI living in the United States.

It is important to note that other countries may have different conclusions as environmental and societal factors differ from one country to another. The main delimitation of the study is the availability of the secondary NHANES 2015 – 2016 data used in this study and how accurately demographic, physical assessments, laboratory data, and surveys were collected.

Limitations of the Study

This research examines the association of T2DM risk factors between AI living in the United States and AA born in the United States. The study's sample may not be representative of the entire AA population. The findings may not generalize to the broader population if participants are recruited from specific regions, healthcare settings, or community groups (Braveman et al., 2011). Findings from a single study may not be generalizable to all AAs due to the diverse socioeconomic, cultural, and regional characteristics within this population. Generalizing findings should be done cautiously (Braveman et al., 2011).

This study employs a cross-sectional design, capturing data at a single point in time. This limits the ability to establish causation or understand the temporal relationships between risk factors and T2DM development.

The AA population is heterogeneous, comprising individuals with diverse cultural backgrounds, lifestyles, and health behaviors. Failing to account for this diversity may limit the study's applicability (Braveman et al.,2011). Comorbid conditions or other health issues may confound the relationship between risk factors and T2DM. Adjusting for all potential confounders may be difficult. Cultural and linguistic differences among AAs may not be fully addressed in the study. Some factors influencing diabetes risk may be culturally specific, and overlooking these aspects can limit the study's validity (Braveman et al.,2011).

It is important to address these challenges through robust study design, careful data analysis, and a thoughtful discussion of potential biases and confounders in the study's limitations section. Additionally, future research may build on existing studies to address some of these limitations and contribute to a more comprehensive understanding of T2DM among AAs.

Significance

The study of T2DM in the AA population is significant for several reasons, reflecting the intersection of health disparities, genetic factors, socioeconomic influences, and cultural considerations (CDC, 2017). AAs have a higher prevalence of T2DM compared to some other racial and ethnic groups (CDC, 2017). Understanding the factors such as smoking and alcohol intake that may be contributing to this health disparity is essential for developing targeted interventions and public health strategies (CDC, 2017).

Research on socioeconomic factors, including income, education, and access to healthcare, can significantly impact the risk and management of T2DM (CDC, 2017).

AAs may face unique socio-economic challenges that contribute to health disparities, and studying these factors is crucial for addressing systemic issues. AAs with T2DM are more likely to experience complications and comorbidities such as cardiovascular disease, kidney disease, and vision problems. Understanding the factors contributing to these complications is crucial for comprehensive healthcare management (CDC, 2017).

T2DM is part of a broader pattern of health disparities affecting minority populations. Studying T2DM in AAs contributes to our understanding of health inequalities and helps inform policies and interventions to reduce disparities.

Recognizing the AA population's diversity is crucial for patient-centered care, given that individuals may have different risk factors, health beliefs, and responses to treatment, and understanding these variations improves the quality of care. Addressing the impact of T2DM on AA has broader public health implications, which will help reduce the burden of T2DM in this population and eventually contribute to overall improvements in population health and reduce healthcare costs (CDC, 2017).

The study of T2DM in the AA population is crucial for addressing health disparities, improving healthcare equity, and tailoring interventions that consider the variables of smoking, alcohol intake, and socio-economic factors influencing T2DM in this population.

Summary and Conclusions

In summary, the study of T2DM in the AA population is crucial for addressing health disparities, improving healthcare equity, and tailoring interventions that consider the unique genetic, cultural, and socio-economic factors influencing T2DM in this population.

The first part of Section 1 of this study covered the problem of T2DM, focusing on AAs who are African descendants in the United States. The section described T2DM related to its incidence, prevalence, and effects on the target population. Section one also included an explanation of some sociodemographic factors that likely contribute to the development of T2DM among the target population in the US. This section also included a description of the research topic, the problem statement, the study purpose, the research questions and corresponding hypothesis, and the grounding theoretical framework.

The section described how data were collected, including the study variables, covariates, and measures. The second part of the research section will be focused on addressing the gaps in the literature reviews relating to the risk factors for developing T2DM among AAs in the United States. The literature review will embrace research methodologies -quantitative, qualitative, meta-analysis, and systematic review methods by other researchers and investigations on the risk factors for developing T2DM (Abbasi et al., 2018). Additionally, Section 2 will highlight other statistical analyses used in the study.

Section 2: Research Design and Data Collection

Introduction

The first part of Section 1 of this study covered the problem of T2DM, focusing on AA's who are African descendants in the United States. The section described T2DM related to its incidence, prevalence, and effects on the target population. Section one also included an explanation of some sociodemographic factors that likely contribute to the development of T2DM among the target population in the US. The literature reviews mentioned in Section 1 of this study highlighted the general background of studies closely related to the study concerning the risk factors of T2DM as they relate to AI and AA groups. Section 2 will highlight steps in conducting a study analysis involving the study design and its alignment, including the research questions and their significance. This section will also embrace the study methodology, AA and AI population, statistical models and analysis, data analysis, steps in ensuring ethical research methods, threats to internal and external validity, inferences, and general conclusion.

Research Questions and Hypotheses

The research questions for this study are as follows:

RQ1: Is there an association of education, income, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender?

$H_0 1$: There is no association of education, income, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender.

H_a1: There is an association of education, income, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender.

RQ2: Is there an association between cigarette smoking, alcohol use, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender?

H_02: There is no association of cigarette smoking, alcohol use, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender.

H_a2: There is an association of cigarette smoking, alcohol use, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender.

Research Design and Rational

The research will use a cross-sectional design. A cross-sectional research design involves collecting data from a sample of individuals simultaneously to examine the relationships between variables. Using cross-sectional with 2015-2016 NHANES data will help analyze the statistical processes, including correlational and descriptive statistics for AI in the US (Creswell, 2014).

Cross-sectional studies are relatively quick and cost-effective compared to longitudinal designs, making them suitable for investigating a wide range of variables within a short timeframe (Creswell, 2014). Cross-sectional designs are beneficial for estimating the prevalence of a condition or behavior and obtaining descriptive data about a population. Cross-sectional studies effectively establish baseline data, especially when exploring the relationships between variables or identifying potential risk factors. Cross-sectional designs can be used for preliminary hypothesis testing and generating initial insights into potential associations between variables (Creswell, 2014). This can guide further research efforts and inform the development of more targeted research questions for future investigations.

The rationale is that the cross-sectional research design is chosen for its efficiency in providing a snapshot of a population's characteristics, behaviors, or conditions at a specific point in time (Creswell, 2014). It is beneficial for exploratory research, hypothesis generation, and informing subsequent research endeavors (Creswell, 2014).

Rationale for Quantitative Research Design

Quantitative research design is characterized by systematically collecting and analyzing numerical data to answer research questions or test hypotheses (Creswell, 2014). Quantitative research allows for precise and objective measurement of variables using standardized instruments and numerical data (Creswell, 2014). This objectivity enhances the reliability and replicability of the study, ensuring that results are consistent across different researchers and settings.

Quantitative research involves using statistical analyses to identify patterns, relationships, and statistical significance. Statistical methods provide a robust framework for concluding data, allowing researchers to make inferences about populations based on sample data. Quantitative research aims for generalizability, allowing researchers to draw conclusions that can be applied to a larger population (Creswell, 2014). Findings from quantitative studies are often seen as representative of broader trends and patterns, enhancing the external validity of the research. Quantitative research is well-suited for large-scale data collection, enabling researchers to gather data from many participants (Creswell, 2014).

Larger sample sizes enhance the study's statistical power, increasing the likelihood of detecting actual effects and minimizing the impact of random variability (Creswell, 2014).

The rationale for choosing a quantitative research design is its ability to provide objective, numeric, and statistically analyzed data that can support generalizable conclusions, inform decision-making, and contribute to the cumulative knowledge in a given field (Creswell, 2014).

Research Methodology

Target Population and Size

The study is based on the AI population living in the United States and AA born in the US. The data set is derived from the US, 50 states, and the District of Columbia. The dataset is a secondary dataset from the NHANES on Type 2 diabetes among US residents from 2015 to 2016. The data aligned with the research examining T2DM potential risks related to age, gender, smoking and alcohol use, and income. NHANES is a federal US agency funded by the CDC. The data set from them is reputable (CDC, 2015).

Sampling Procedure

The respondents for the proposed quantitative study were AIs living in the United States and AAs born in the United States. The study will apply descriptive statistics and central limit theory with a large sample size during the sampling, and statistical inferences will be adopted.

Inclusion and Exclusion Criteria

The NHANES is a program conducted by the NCHS, part of the CDC. NHANES data from 2015-2016 gathers information on the health and nutrition status of a nationally representative sample of the US population. Inclusion and exclusion criteria are essential to ensure the survey's representativeness and the accuracy of its findings. Individuals must reside in the United States, including citizens, non-citizen nationals, and foreign visitors. NHANES includes participants of all ages, from infants to older adults. NHANES uses a multistage, probability sampling design to select a representative sample of the US population. Individuals selected must be part of the sampling frame. Individuals participating in NHANES must provide informed consent. Parental or guardian consent is required for participants under 18 years of age. NHANES aims to include individuals with varying health statuses to provide a comprehensive picture of the nation's health. Both healthy individuals and those with health conditions are included. NHANES aims to represent the diverse demographic characteristics of the US population, including race, ethnicity, gender, income, and education. Individuals who are institutionalized, such as those in correctional facilities, nursing homes, or mental health institutions, are generally excluded. NHANES excludes active-duty military personnel since separate health surveillance programs cover them.

Individuals living outside the United States are not eligible to participate. Individuals who cannot provide informed consent, personally or through a legal guardian, are excluded. While NHANES aims to include individuals with various health conditions, certain severe health conditions may limit participation. To avoid potential risks, pregnant individuals may be excluded from specific assessments or measurements. NHANES primarily conducts interviews in English or Spanish. Individuals unable to communicate effectively in either language may be excluded from specific assessments.

Procedures Used to Collect Data

The NHANES collects data through a comprehensive, multistage sampling process, including interviews, physical examinations, and laboratory tests. The survey is designed to provide a representative sample of the US population.

In addressing this quantitative study's research problem and questions, I used a secondary data set collected by NHANES in the US from 2015 to 2016.

This data set was appropriate for this study because NHANES plays a crucial role in monitoring the health and nutritional status of the US population, and its comprehensive data collection procedures contribute to a holistic understanding of various health-related factors. I accessed the secondary data set from the CDC following research ethics clearance and approval by the Institutional Review Board (IRB). The NHANES data set from 2015 to 2016 involves variables on diabetes and collected data on respondents' demographics related to age, gender, income, alcohol, smoking, and educational background. NHANES employs a complex, multistage probability sampling design. The process involves selecting primary sampling units (PSUs) in the first stage, followed by selecting households within each PSU. Finally, individuals within selected households participate (CDC, 2015).

Data Source

The data set was derived from the NHANES in the US from 2015 to 2016. The NHANES data set is a valuable resource crucial in shaping public health policies, advancing scientific research, and promoting population health. Its broad scope, representative sampling, and longitudinal nature contribute to its significance in addressing key health challenges in the United States (CDC, 2015). NHANES data set is secondary data based on T2DM and collected data on respondents' demographics related to age, gender, income, smoking and alcohol, and educational background compared to AA’s born in the US and AA’s born outside the US.

Researchers across disciplines utilize NHANES data to investigate specific health questions, conduct epidemiological studies, and contribute to evidence-based medicine (CDC, 2015). Researchers can use this comprehensive dataset to study various aspects of health, including chronic diseases, nutritional status, environmental exposures, and health behaviors.

NHANES is conducted in 2-year cycles, allowing for the analysis of time trends and longitudinal changes in health indicators (CDC, 2015). Researchers can examine how health outcomes, risk factors, and interventions evolve, providing valuable insights for public health planning and policy evaluation. Policymakers can use NHANES findings to design targeted interventions, allocate resources effectively, and track the impact of public health programs (CDC, 2015).

Power Analysis for Sample Size Determination

Power analysis is a statistical method used to determine the sample size needed for a research study to detect a significant effect if it genuinely exists. It involves estimating the statistical power of a test, which is the probability of correctly rejecting a false null hypothesis (Creswell, 2009). The applications of power analysis for sample size determination are diverse and crucial in various research contexts (Frankfort-Nachmias & Leon-Guerrero, 2015).

Power analysis for sample size determination is a versatile tool used across various research domains to ensure that studies are adequately powered to detect meaningful effects, relationships, or changes. It is an integral part of the research planning process and contributes to the rigor and validity of study findings. Power analysis is crucial for determining the appropriate sample size in a quantitative study of T2DM. Power analysis aims to estimate the probability that the study will detect a statistically significant effect if it truly exists.

This T2DM research could be the difference in mean glycemic control between two groups or the strength of association between a risk factor and T2DM incidence (Hertzog, 2017; Laureate Education, 2022). Power analysis helps researchers determine the sample size needed to detect a significant effect in an experimental study. Adequate sample sizes are essential to ensure that experiments have sufficient power to see actual effects, reducing the likelihood of Type II errors (false negatives). Power analysis is used in clinical trial design to estimate the required sample size for detecting clinically meaningful treatment effects. Determining an appropriate sample size is critical for clinical trials to ensure that the study has sufficient power to detect whether a new treatment is effective (Hertzog, 2017; Laureate Education, 2022).

I will typically set this study's significance level (alpha) at 0.05. This represents the probability of making a Type I error (false positive) by rejecting a true null hypothesis. I must choose the desired power level, often set at 0.80 or higher. Power is the probability of correctly rejecting a false null hypothesis, and higher power values increase the ability to detect actual effects. Depending on the study design and research questions, specify the statistical test for the analysis, such as t-test, ANOVA, regression, or chi-square. I estimated the variance or standard deviation of the outcome variable. This information is essential for calculating the standard error and sample size (Hertzog, 2017; Laureate Education, 2022). I then factored in potential attrition or non-response rates when determining the final sample size. This ensures that the study remains adequately powered even if some participants drop out or do not respond. Power analysis is often an iterative process (Hertzog, 2017; Laureate Education, 2022). Researchers may need to adjust parameters such as effect size or power level based on practical considerations or available resources to arrive at a feasible sample size.

Sufficient sample sizes contribute to the precision of estimates, enhancing the reliability of findings related to T2DM epidemiology, risk factors, and interventions. Adequately powered studies optimize the use of resources, ensuring that research efforts are directed toward meaningful outcomes and reducing the likelihood of inconclusive results (Hertzog, 2017; Laureate Education, 2022).

Adequately powered studies optimize the use of resources, ensuring that research efforts are directed toward meaningful outcomes and reducing the likelihood of inconclusive results. The general power program G power 3.1.9.2 will be adopted in this study. G*Power is a statistical power analysis software commonly used by researchers to determine the appropriate sample size for their studies or assess the statistical power of an existing sample size. It can be used for various statistical tests, including t-tests, ANOVA, regression analysis, and more. When working with NHANES data or any other dataset, GPower can be a helpful tool in planning and designing a study or evaluating the statistical power of analyses (CDC,2015). I used G*Power to calculate the required sample size based on the input parameters. This step helps the researcher determine the minimum sample size needed to achieve the desired level of statistical power for your analysis (CDC,2015).

NHANES data often involves a complex survey design with stratification, clustering, and unequal selection probabilities (CDC,2015). Adjustments may be necessary when calculating sample size or power to account for this complexity. G*Power is a general-purpose tool, and its use with NHANES 2014 -2015 data or any other survey data requires careful consideration of the specific characteristics of the dataset. It is crucial to account for the complex survey design features when conducting power analyses or interpreting results from NHANES (CDC,2015).

Instrumentation and Operationalization of Constructs

Instrumentation and operationalization are critical steps in the research process, involving the development and use of tools to measure and define abstract concepts. Instrumentation refers to creating or selecting tools (instruments) to collect data in a research study. These tools can include surveys, questionnaires, tests, observations, and interviews. The instrument should measure what it intends to measure. Different types of validity, such as content validity, construct validity, and criterion-related validity, may be relevant depending on the research context. The instrument should produce consistent and stable results. Reliability can be assessed through test-retest reliability or internal consistency (Cronbach's alpha for scales).

The survey employs questionnaires to collect self-reported data from participants. Construct operationalization begins with developing transparent, standardized questions measuring specific health-related concepts. This involves a rigorous process of survey design, including pre-testing and validation. NHANES conducts interviews to gather information directly from participants. Trained interviewers follow standardized procedures to ensure consistency across respondents. The interview process is essential to operationalize constructs related to demographics, health behaviors, and other self-reported data. NHANES strongly emphasizes quality control to ensure the accuracy and reliability of collected data. This involves staff training and certification, routine monitoring of data collection procedures, and validation of instrumentation used for physical examinations and laboratory tests. After data collection, the raw data are coded and processed for analysis. The constructs are operationalized through statistical methods, allowing researchers to conclude the health and nutritional status of the population.

NHANES releases data to the public, allowing researchers to conduct analyses and contribute to scientific knowledge. Comprehensive documentation includes details about survey methodology, instrumentation, and construction operationalization to ensure transparency and replicability.

Considering time, cost, and resources, the instrument should be practical and feasible for data collection within the study's constraints. The instrument was suitable for the study's objectives and the characteristics of the population under investigation (CDC, 2015). Operationalization involves defining abstract concepts in measurable terms. It translates theoretical concepts into specific variables or indicators that can be observed or measured (CDC, 2015).

Clearly define the abstract concepts of interest in the research. This involves specifying what the image means in the context of the study. Identify concrete, observable, and measurable indicators or variables representing abstract concepts. These indicators become the basis for data collection (CDC, 2015).

Determine the level of measurement for each variable—whether it is nominal, ordinal, interval, or ratio. This choice influences the statistical analyses that can be applied. Specify how the variables will be quantified or measured (CDC, 2015). This could involve using Likert scales, numerical scales, or categorical coding.

Both instrumentation and operationalization contribute to a study's overall validity and reliability, ensuring that the research tools accurately measure the intended constructs and that abstract concepts are translated meaningfully into measurable variables (CDC, 2015).

NHANES operationalizes a wide array of health-related constructs, transforming abstract concepts into measurable variables that can be analyzed to derive meaningful insights into the health status of the US population. The rigorous methodology ensures that the data collected are valid, reliable, and representative of the nation's health landscape (CDC, 2015).

NHANES employs a systematic approach to instrumenting and operationalizing constructs, combining self-reported data, physical examinations, and laboratory measurements to assess the health and nutritional status of the US population. Rigorous quality control measures are in place to maintain the reliability and accuracy of the collected data. By collecting data on a wide range of health-related constructs, NHANES facilitates the identification of health disparities across different demographic groups, including age, gender, race, and socioeconomic status. This information is crucial for addressing and reducing health inequalities within the population.

The instrumentation and operationalization of constructs in NHANES are designed to support a broad range of objectives, including the comprehensive assessment of health, standardization of data collection, accuracy and reliability of measurements, population representativeness, identification of disparities, public health surveillance, research, policy development, and international comparisons (CDC, 2015).

Operationalization of the Variables

The independent variables are income levels, smoking, education, and alcohol use. The dependent is T2DM, while the control variables of the study are age and gender.

Dependent Variable

The dependent variable is the presence of T2DM. Measurement: Binary (Yes/No) or categorical variable indicating the presence or absence of Type 2 Diabetes. Participants were categorized as "T2DM" or "No T2DM" based on clinical diagnosis, blood tests, or self-report. This study on T2DM will categorize males as one and females with T2DM as two.

Independent Variable

The independent variables are income, education, smoking, alcohol use, and education. Income indicates a continuous variable indicating the participant's income. Participants might be asked to report their annual income, which would then be recorded as a numerical value. Categories (e.g., income brackets) will be created for analysis. Education is a categorical variable indicating the highest level of education attained (Gerstman, 2015). Participants select their education level from options such as "Less than High School," "High School Graduate," "Some College," "Bachelor's Degree," and "Postgraduate Degree." Smoking is a categorical variable indicating smoking status and will be categorized as "Current Smoker," "Former Smoker," or "Non-Smoker" based on self-report. The frequency and intensity of smoking can also be assessed for more detailed information. Alcohol use is a categorical variable indicating alcohol consumption and will be categorized as "Non-Drinker," "Moderate Drinker," or "Heavy

Drinker" based on self-report. The frequency and quantity of alcohol consumption can also be assessed. Controlling for Ages and Gender- is a continuous variable indicating the participant's age. Gender is a categorical variable indicating gender and will be categorized as "Male" or "Female."

Operationalization for Each Variable

Table 1 details the operationalization of variables used in the study, specifying the type and levels of measurement for each variable.

Table 1

Variables, Type, and Measures

Variable name	Variable type	Levels of measure
Dependent variable (T2DM)	Dichotomous	Categorical
Independent variable (age)	Continuous	Scale
Independent variable (gender)	Categorical	Categorical
Independent (smoking)	Categorical	Ordinal
Independent (alcohol)	Categorical	Ordinal
Covariate (level of education)	Ordinal	Ordinal
Covariate (level of income)	Ordinal	Categorical

Secondary Data Type and Data Access

The study involves secondary data derived from NHANES, a division of CDC. The data collected for this study is T2DM from 2015 to 2016 for AA and AI populations in the US. The variables are T2DM, age, gender, alcohol, smoking, income, and education. NHANES provides detailed documentation and codebooks that describe the survey design, sampling methods, variable definitions, and data processing procedures.

NHANES employs a complex survey design with stratification, clustering, and unequal selection probabilities.

Ages in the data range from 0 to 80 years, one of the determinants of a prospective study on the AA population in the US. In the data set, one indicates AA born in the United States, and two indicates AI: those born outside the US. The covariates are income and education while controlling for the ages and genders. Once the committee approved this proposal, I followed the ethical steps of obtaining approval from Walden's Institutional Review Board (IRB) to access the NHANES T2DM dataset from 2014 to 2015. NHANES provides a rich secondary data source for studying various health and nutrition-related topics, including T2DM. The NHANES data set is of significant importance for research on T2DM due to its comprehensive and nationally representative nature (CDC, 2015). NHANES provides accurate prevalence estimates for T2DM at different time points, allowing researchers to track trends and changes in the prevalence of diabetes over the years. NHANES collects detailed clinical and biochemical data, including measurements related to T2DM, such as fasting glucose levels, hemoglobin A1c (HbA1c), insulin resistance, and anthropometric measurements. These data allow for in-depth analyses of diabetes-related factors. NHANES includes comprehensive demographic and socioeconomic information, allowing researchers to explore how factors such as age, gender, ethnicity, education, and income relate to T2DM prevalence and outcomes. NHANES is pivotal in advancing our understanding of T2DM by providing high-quality, nationally representative data that allows researchers to explore the prevalence, risk factors, trends, and disparities associated with this chronic condition.

The dataset contributes valuable information for public health efforts to prevent and manage Type 2 diabetes in the United States (CDC, 2015).

Once I obtained approval from IRB to access NHANES data, I downloaded it into my computer system, following strict confidentiality and ensuring that the data will only be accessible to my chair and the committee members.

Data Analysis Plan

The study will use a cross-sectional research design. A cross-sectional research design is commonly used to investigate the prevalence of a condition, risk factors, and associations within a population at a specific time. When applied to T2DM, a cross-sectional design can provide insights into the current prevalence of the condition and its relationship with various factors. The study variables are T2DM, age, alcohol use, smoking, gender, and income level of AA and AI populations in the US.

The independent variables are education, income, smoking, and alcohol intake, while age and gender are the control variables. The dependent variable is T2DM, which affects the AA and AI populations. Statistical analysis of multiple logistics regression, univariate, multivariate, and descriptive statistics will be used to answer the research questions. Univariate multivariate will be used for possible predictors factors.

Data Collection Technique.

The study will use secondary data from NHANES from 2015-2016. NHANES is conducted in 2-year cycles, and each cycle includes a nationally representative sample. The data collected are used to estimate the health and nutritional status of the US population. NHANES collects data on T2DM and related factors using a combination of interviews, physical examinations, and laboratory tests. NHANES includes an educational component where participants receive information about their health status based on the examination results, including feedback related to diabetes if applicable (CDC,2015).

Research Questions and Hypotheses

The research questions for this study are as follows:

RQ1: Is there an association of education, income, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender?

$H_0$1: There is no association of education, income, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender.

H_a1: There is an association of education, income, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender.

RQ2: Is there an association between cigarette smoking, alcohol use, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender?

$H_0$2: There is no association of cigarette smoking, alcohol use, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender.

H_a2: There is an association of cigarette smoking, alcohol use, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender.

Threats to Validity

Internal Validity

Internal validity refers to the degree to which an observed effect or relationship in a study can be attributed to manipulating the independent variable rather than confounding factors. In the context of the NHANES data set, assessing internal validity involves considering factors that could impact the accuracy and reliability of the study's findings (CDC, 2015).

NHANES uses a complex, multistage, probability sampling design to provide a representative sample of the US population. The sampling design enhances the generalizability of findings to the entire population, contributing to internal validity (CDC, 2015). NHANES employs standardized protocols for data collection, including physical examinations, laboratory tests, and interviews. Consistent and standardized procedures minimize measurement errors, improving the internal validity of the collected data (CDC, 2015). NHANES utilizes validated instruments and rigorous measurement procedures to ensure the reliability of collected data. Reliable measurements increase the internal validity of the dataset, as the data accurately represent the intended constructs (CDC, 2015).

NHANES incorporates quality control measures throughout the data collection, including personnel training and routine monitoring. Quality control enhances internal validity by minimizing errors and ensuring the accuracy of the data collected. NHANES is conducted in two-year cycles, allowing for examining trends over time. The longitudinal aspect contributes to internal validity by facilitating the analysis of health indicators and risk factor changes.

NHANES collects data from various sources, including self-reported surveys, physical examinations, laboratory tests, and dietary recalls. Multiple data sources provide a comprehensive view of health, increasing the internal validity by triangulating information (CDC, 2015). NHANES offers detailed documentation on data collection procedures, sampling methodologies, and quality assurance. Transparent documentation enhances internal validity by allowing researchers to understand and evaluate the study's methodology (CDC, 2015).

NHANES employs standardized instruments for surveys and measurements. Standardization improves internal validity by ensuring assessment consistency and reducing data collection variability (Barbie, 2014; CDC, 2015; Creswell, 2014). NHANES incorporates statistical weighting procedures for the complex sampling design and non-response. Weighting enhances internal validity by adjusting for potential biases introduced by the sampling design and non-response. NHANES often involves cross-validation of data through repeated measurements and validation studies.

Cross-validation contributes to internal validity by confirming the reliability and consistency of data (Barbie, 2014; CDC, 2015; Creswell, 2014). Despite the complex sampling design, selection bias may still be a concern if certain groups are systematically excluded or underrepresented. The accuracy of self-reported data, such as dietary intake, physical activity, and health history, may be susceptible to measurement error (Barbie, 2014; CDC, 2015; Creswell, 2014). Uncontrolled confounding variables could threaten internal validity if not adequately addressed in analyses. Non-response bias may occur if specific individuals or groups are less likely to participate, potentially affecting the sample's representativeness.

Changes in data collection procedures or population characteristics over time may introduce variability that affects internal validity (Barbie, 2014; CDC, 2015; Creswell, 2014). While NHANES is designed with robust methodologies to enhance internal validity, researchers should be aware of potential limitations and threats to validity. Proper consideration of these factors, appropriate statistical techniques, and sensitivity analyses ensure a more accurate interpretation of the study's findings. The extensive documentation and transparency in NHANES contribute to researchers' ability to assess and address potential issues related to internal validity (Barbie, 2014; CDC, 2015; Creswell, 2014).

External Validity

NHANES is a valuable resource for examining health-related issues in the US population, and efforts are made to enhance external validity through careful sampling design, representation of diverse groups, and comprehensive data collection. However, researchers should consider the limitations and potential biases inherent in the study design and ensure that findings are cautiously generalized to specific populations, settings, or periods. Sensitivity analyses and comparisons with other datasets can provide a more nuanced understanding of external validity in NHANES (Creswell, 2014).

NHANES employs a complex, multistage, probability sampling design to ensure a representative sample of the US civilian, non-institutionalized population. While efforts are made to achieve representativeness, specific subgroups (e.g., institutionalized individuals) may be underrepresented, impacting external validity for these populations (Barbie, 2014).

NHANES includes participants from diverse demographic backgrounds, encompassing age, race, ethnicity, and socioeconomic status. Despite the diversity, specific subgroups may be underrepresented, potentially limiting the generalizability of findings to specific demographic groups. NHANES is designed to provide national estimates, enhancing its generalizability to the entire United States. The data set may not fully capture regional variations, limiting its applicability to specific geographic areas (Barbie, 2014).

NHANES is conducted in 2-year cycles, allowing for examining time trends and changes in health indicators over different survey cycles. Changes in population characteristics or health behaviors over time may impact the external validity of temporal trends. NHANES collects data on a wide array of health measures, including chronic diseases, nutritional status, and health behaviors. Some health measures may be more comprehensive than others, and the generalizability of findings may vary across different health domains (CDC, 2015; Creswell, 2014).

NHANES includes special modules and oversampling strategies to enhance the representation of certain populations, such as older adults and specific racial or ethnic groups (Barbie, 2014; CDC, 2015; Creswell, 2014). External validity may be limited for populations not adequately represented or studied. The inclusion of both cross-sectional and longitudinal components enhances the dataset's ability to capture a snapshot of health status and examine trends over time. Longitudinal analyses may be limited by attrition or changes in the population over follow-up cycles (Barbie, 2014; Creswell, 2014)

NHANES collects data from various sources, including self-reported surveys, physical examinations, laboratory tests, and dietary recalls. External validity may vary across different types of data sources, and reliance on self-reporting introduces the potential for reporting bias. The complex sampling design accounts for non-response and incorporates weights to adjust for sampling probabilities, enhancing the representativeness of estimates. The weighting procedures assume that non-respondents are similar to respondents in observed characteristics, which may not always hold (Creswell, 2014).

Ethical Procedures and Considerations

The NHANES adheres to strict ethical procedures to protect the rights and well-being of participants. Ethical considerations in NHANES encompass various aspects of the study, including participant recruitment, informed consent, confidentiality, data security, and compliance with ethical guidelines (CDC, 2015; CDC, 2020). NHANES obtains informed consent from all participants or their guardians if participants are minors. Participants are provided with detailed information about the purpose of the study, procedures, potential risks, benefits, and their rights. They voluntarily agree to participate (CDC, 2020).

NHANES ensures the confidentiality of participant information. Personal identifiers are removed or encrypted to protect participant privacy. Unidentifiable data is restricted, and only authorized personnel can access confidential information. Procedure: NHANES strives to maintain participant anon ymity when reporting findings. Personal identifiers are replaced with unique codes, preventing the identification of individual participants in published reports or data sets (CDC, 2015; CDC, 2020).

NHANES takes cultural sensitivity into account in participant interactions and data collection. To ensure understanding, efforts are made to respect cultural differences, and materials are provided in multiple languages. Participants can decline or withdraw from the study at any time without consequences. Non-participation does not affect access to healthcare or other services (CDC, 2015; CDC, 2020).

Special procedures are in place for the protection of vulnerable populations. Additional safeguards are implemented for minors, pregnant women, and other vulnerable groups to ensure their rights and welfare are protected (CDC, 2015; CDC, 2020).

NHANES undergoes rigorous review by an IRB. The IRB ensures that the study adheres to ethical principles and guidelines. Approval is obtained before the initiation of data collection.

NHANES prioritizes participant well-being and minimizes harm. Measures are taken to ensure that potential risks are minimized and that benefits to public health and scientific knowledge outweigh any potential harm to participants. NHANES maintains transparency in its procedures and communicates openly with participants. Participants are informed about the study progress, any updates, and the use of collected data. Open communication channels are established (CDC, 2015; CDC, 2020).

These ethical procedures underscore NHANES's commitment to upholding the principles of autonomy, confidentiality, and justice in its research practices. The ethical considerations ensure that the study contributes valuable health information while safeguarding the rights and well-being of the participants involved (CDC, 2015; CDC, 2020).

Summary and Transition

The study examines the association of T2DM risk factors between AI'sliving in the United States and AA's born in the United States. The research aims to identify potential differences in T2DM risk factors between these two groups. The study's primary objective is to investigate and compare T2DM risk factors among AI'sresiding in the United States and AA's born there. The focus is on understanding potential disparities in factors contributing to the development of T2DM within these populations.

The study involves a comparative analysis between AI'sand AA's. Both groups are selected as representative samples to explore potential variations in T2DM risk factors. This quantitative research study will use a secondary data set from NHANES from 2014 to 2015. The study will adopt some statistical methods and descriptive design to explore the factors responsible for developing T2DM between AI living in the United States and AA-born, thereby applying risks.

The main variables in the study included age, diabetes, gender, education, smoking, alcohol use, and income. Information derived from this data is paramount to my research as it targets an exploration of the relationship between diabetes and depression among AI'sin the United States within the time frame. The study aims to explore how T2DM risk factors differ between AI'sand AA's. Identifying disparities may contribute to a better understanding of each group's unique challenges and opportunities for prevention. Findings may have implications for public health strategies aimed at preventing and managing T2DM.

Tailored interventions may be proposed based on identified risk factors within each population. The study is significant as it addresses a critical gap in the literature by comparing T2DM risk factors between AI and AA. Understanding these differences can inform targeted interventions and contribute to the development of culturally appropriate strategies for diabetes prevention and management within these populations. The findings may have broader implications for healthcare policies and practices to reduce health disparities related to T2DM.

This study is designed to understand better the experiences of AI living with diabetes in the US. The findings of this research are expected to improve our understanding of the diabetes management process among AIs. This will help raise awareness of the challenges that AIs experience in managing T2DM due to changes in lifestyle before migration.

Section 3: Presentation of the Results and Findings

Purpose of the Study

The purpose of this study was to explore the risk factors influencing the development of Type 2 diabetes as it relates to age, smoking, alcohol intake, and gender between AI'sborn outside the US and AA's born in the US after adjusting for level of education and income.

The study aims to identify disparities in these socio-economic factors and assess their impact on T2DM prevalence and management within the two populations. By understanding the dynamics of community engagement, the study aims to identify potential avenues for strengthening social support structures to improve health outcomes. In summary, this study seeks to advance our understanding of T2DM risk factors in income, education, alcohol intake, and smoking. The findings are intended to guide the development of targeted interventions, inform public health policies, and contribute to the broader discourse on health disparities in the United States.

Research Questions and Hypotheses

The research questions for this study are as follows:

RQ1: Is there an association of education, income, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender?

$H_0$1: There is no association of education, income, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender.

*H*a1: There is an association of education, income, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender.

RQ2: Is there an association between cigarette smoking, alcohol use, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender?

*H*02: There is no association of cigarette smoking, alcohol use, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender.

*H*a2: There is an association of cigarette smoking, alcohol use, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender.

Data Collection of Secondary Data Set

This research employed a quantitative methodology and a cross-sectional framework to investigate potential determinants that may influence the onset of T2DM among AI'sand AA's in the United States. Our analysis utilized secondary data extracted from the US NHANES datasets spanning 2015 to 2016. The NHANES, under the auspices of the NCHS, a branch of the CDC, conducts extensive and ongoing surveys to evaluate health and nutritional statuses across diverse US demographics and health issues, providing crucial statistics for national health.

The NHANES combines interview data with physical examinations, addressing a wide array of public health concerns. The survey encompasses a broad spectrum of data, including demographic profiles, socioeconomic status, dietary habits, and health-related issues. The insights gleaned from NHANES are instrumental in ascertaining the prevalence of significant diseases and associated risk factors, aiding in health promotion and the prevention of diseases. The findings are pivotal in establishing national health benchmarks, such as standards for height, weight, and blood pressure measurements.

Furthermore, the NHANES findings contribute substantially to epidemiological research and the health sciences, supporting the development of robust public health policies and the creation, direction, and refinement of health programs and services, thereby enriching health-related knowledge in the U.S. Given the credibility and comprehensive nature of NHANES data, the 2015–2016 NHANES dataset focusing on diabetes and demographic information was selected for use in this study.

Timeframe of Data Collection

This study uses data from the NHANES spanning 2015 to 2016 in the United States. The survey's sample size for this period was 9,971 individuals, providing a statistically accurate representation of the population across the 50 states and the District of Columbia. My research focused on participants diagnosed with T ype 2 diabetes, indicated by their response—either 'yes' (1) or 'no' (2)—to the diabetes interview question DIQ010, which inquires if a doctor has informed them that they have diabetes.

The NHANES is an investigative initiative of the NCHS, part of the CDC. Its goal is to evaluate the health and nutritional statuses of adults and children in the United States, accomplished through comprehensive interviews and physical examinations.

The NHANES uses this intricate sampling approach to ensure the data reflects the civilian, noninstitutionalized US population accurately. The sampling begins with selecting PSUs, usually counties or groupings of neighboring counties. The US is segmented into these PSUs, from which samples are drawn. Each PSU is subdivided into second-stage units, or segments, comprising clusters of residential households. Families and individuals are systematically selected from these segments to ensure proportional representation of diverse demographic segments, such as age, sex, and race/ethnicity. This careful sampling is critical for determining disease prevalence and risk factors, shaping health policies and interventions, including establishing nutritional guidelines and health education initiatives.

NHANES Data Collection Phases

The NHANES gathers health data in two stages. The initial phase involves in-home interviews, gathering participants' health, nutrition, and lifestyle information. Following the interviews, participants undergo physical assessments at Mobile Examination Centers, which include medical evaluations and laboratory tests. Quality controls are implemented throughout to ensure data integrity. The data is then weighted to reflect the broader US population, considering the complex sampling strategy and response rates. Strict confidentiality is maintained, with identifiers removed before data release. This robust process enables NHANES to provide vital information for public health policy and research across the US (CDC, 2017).

Data Management and Data Variables

This study utilized the 2015-2016 NHANES primary data set, which sampled non-institutionalized U.S. residents, focusing on variables such as diabetes status, demographics of U.S.-born AA's and African immigrants, alcohol use, income, and tobacco use. Access to the data was granted following ethical approval from Walden University's IRB. The diabetes variable (DIQ010) was derived from in-home interviews using CAPI, with age and education variables recoded for analytical clarity. Demographic data, including race and ethnicity, alcohol consumption details for those over 18, and income information, were also collected. Smoking habits were documented through interviews, with added e-cigarette usage questions for the first time in 2015-2016. The data underwent logistic regression analysis to explore risk factors for Type 2 diabetes, adhering to confidentiality and quality standards set by the CDC (CDC, 2017).

Statistical Analysis

The study employs binomial logistic regression for statistical analysis, a method particularly effective in Type 2 diabetes research for its proficiency in handling binary outcomes like disease presence or absence. This approach is crucial for pinpointing risk factors, forecasting disease development, and shaping treatment approaches. Logistic regression calculates odds ratios, which elucidate the relationship between risk factors and the likelihood of developing Type 2 diabetes—values above 1 indicate increased risk. At the same time, those below 1 suggest a protective effect. This technique is integral to medical research for its ability to analyze the impact of multiple predictors on binary outcomes, facilitating informed clinical and public health decisions (Selvin et al., 2014).

Baseline Descriptive and Demographic Characteristics of the Sample

The study utilized SPSS version 28 to conduct descriptive and inferential statistical analyses, including frequency distributions, chi-square tests, and multivariate regressions, to explore associations between age, gender, smoking, alcohol use, and T2DM among AI’sand U.S.-born AA’s. Descriptive statistics provided an overview of T2DM prevalence, while inferential methods, including logistic regression, offered insights into the likelihood of T2DM relative to lifestyle factors, with odds ratios quantifying the strength of these associations (Selvin et al., 2014).

External Validity

NHANES provides a representative sample of the U.S. civilian, non-institutionalized population for health research, with a design that includes diverse demographics and uses a complex, multistage probability sampling method. While it is a robust resource for national health trends, researchers must acknowledge its limitations, such as the potential underrepresentation of specific subgroups and regional differences. Care must be taken when generalizing findings to ensure they apply to the intended populations. Data from various sources, including self-reports and physical exams, may also differ in accuracy, necessitating cautious interpretation and validation against other datasets for a clearer understanding of health patterns (Barbie, 2014; CDC, 2015; Creswell, 2014)

Larger Target Population

Using G Power 3.1.9.2, this study's required minimum sample size was calculated to be 85, based on a medium effect size of 0.15, an alpha of 0.05, 80% power, and four predictors (alcohol intake, smoking, education, and income), while also controlling for age and gender. With an actual sample size of 2,267, this exceeds the minimum, ensuring the study's sufficiency. NHANES supports this research with comprehensive codebooks detailing survey variables, design, and weighting, which are crucial for accurate data interpretation. The data, representative of the U.S. civilian noninstitutionalized population, allows for nationally representative estimates crucial for public health analysis. Researchers must consider NHANES' complex sampling in their analyses to ensure accurate variance estimates, enabling studies on health outcomes and risk factors across the U.S. population (Creswell, 2014).

Missing Values

Handling missing values in the NHANES data set is crucial for the integrity of data analysis. Missing values may result from non-responses, refusals, or logistical issues. To address this, missing values in demographic, T2DM, alcohol, and smoking datasets were managed using SPSS to exclude cases with missing data. This process created a refined data set, termed the 'Manipulated dataset,' on which all subsequent analyses were conducted, ensuring the analyses' validity and reliability.

Results

This section details the statistical analyses performed, encompassing descriptive (univariate) analysis, chi-square or bivariate analysis, multiple logistic regression, factor analysis, and Pearson’s coefficient, as applied to the research questions and variables outlined in Sections 1 and 2, utilizing SPSS version 28.

Descriptive Statistics

Controlling Variables: Age and Gender

For this study, the ages of African American and African immigrant participants were categorized into five groups to match the target population: (1) 20–30 years, (2) 31–40 years, (3) 41–50 years, (4) 51–60 years, and (5) 61 years and above. Univariate analysis of the survey data, with responses from 2267 participants, revealed the following age distribution among these categories (refer to Table 4). Table 5 shows gender distribution within the dataset: 1,152 males (50.8%) and 1,115 females (49.2%), totaling 2,267 individuals. The general and valid percentages for gender are consistent, highlighting the absence of missing or invalid responses. The data set exclusively categorizes gender into male and female, with no other options or missing categories, as evidenced by the cumulative percentage reaching 100%. This confirms the data set's completeness regarding gender representation (Creswell, 2014).

Research Study Target Population

Table 2 reveals the birthplace distribution among the sample, with 2104 AA’s born in the US (92.8% of valid responses) and 163 AI’s(7.2% of valid responses), totaling 2267 valid cases. This highlights a predominant representation of AA’s over African immigrants. Given that both groups exceed the study's minimum required sample size of 85, the sample sizes are deemed appropriate for comparative analysis. Visual representations of this distribution are provided in histograms and pie charts, illustrating the significant difference in proportions between the two groups.

Table 2

Frequency of the Country of Birth

		Frequency	Percent	Valid percent	Cumulative percent
Valid	African American born in the US	2104	92.8	92.8	92.8
	AA’s born outside the US	163	7.2	7.2	100.0
	Total	2267	100.0	100.0	

Table 3

Frequency of the Age in Years at Screening

N	Valid	2267
	Missing	0
Mean		29.47
Median		21.00
Mode		0
Std. deviation		23.974
Variance		574.735
Range		80
Minimum		0
Maximum		80

Table 3 summarizes 'Age in years at screening' for a data set with 2,267 valid responses and no missing values. The mean age is 29.47 years, the median is 21 years, indicating a young participant median, and an unusual mode of 0, possibly indicating infants or an error. The standard deviation is 23.974 years, and the variance is 574.735, highlighting a wide age range among participants, from 0 to 80 years. The data suggests a diverse age distribution, with a significant skew towards younger ages, as evidenced by the mean, median, and mode differences.

Table 4

Frequency of the New Age Group

		Frequency	Percent	Valid percent	Cumulative percent
Valid	Less than 20	1116	49.2	49.2	49.2
	21-30years	196	8.6	8.6	57.9
	31-40years	199	8.8	8.8	66.7
	41-50years	187	8.2	8.2	74.9
	51-60years	218	9.6	9.6	84.5
	61years and above	351	15.5	15.5	100.0
	Total	2267	100.0	100.0	

Table 4 presents a frequency distribution for new age groups among 2267 participants, highlighting a youthful skew in the study population, with 49.2% under 20 years. The distribution across older age groups is more balanced, with the 60+ age group forming the second largest at 15.5%. Valid percentages across age categories sum to 100%, ensuring complete representation. This suggests a predominance of younger participants, with an increase in those over 60. The data implies a right-skewed age distribution, hinting at a younger population with a smaller older demographic influencing the average age upwards. This age distribution is essential for health research, indicating the need for age-specific healthcare services and interventions.

Table 5

Frequency of the Gender

		Frequency	Percent	Valid percent	Cumulative percent
Valid	Male	1152	50.8	50.8	50.8
	Female	1115	49.2	49.2	100.0
	Total	2267	100.0	100.0	

Table 6

Frequency of the New Household Income

		Frequency	Percent	Valid percent	Cumulative percent
Valid	Low income	1094	48.3	50.0	50.0
	Medium income	613	27.0	28.0	78.0
	High income	482	21.3	22.0	100.0
	Total	2189	96.6	100.0	
Missing	System	78	3.4		
Total		2267	100.0		

Table 6 recoded family income categories into low, medium, and high income.

Table 7

Frequency of the Recoded Education Level AA and AI

		Frequency	Percent	Valid percent	Cumulative percent
Valid	12th grades and below	261	11.5	22.2	22.2
	High school graduates/GED/AA degree	722	31.8	61.3	83.5
	College graduate and above	194	8.6	16.5	100.0
	Total	1177	51.9	100.0	
Missing	System	1090	48.1		
Total		2267	100.0		

Table 7 outlines the education levels within the AA and AI groups from 2267 participants. Valid education data were provided by 1,177 participants, with 1,090 missing responses (48.1% of the total). Of the valid responses, 261 participants (11.5% of the total, 22.2% of valid) reported education up to the 12th grade or lower. In the largest category, 722 participants (31.8% of the total, 61.3% of valid) completed high school or obtained a GED/AA degree. Additionally, 194 participants (8.6% of the total, 16.5% of valid) achieved a college degree or higher. The data indicates that most respondents have a high school education, with fewer achieving college-level education. The high rate of missing data highlights potential data collection challenges or participants' reluctance to share their education levels, affecting the analysis's accuracy.

Table 8

Frequency of the nRecoded Smoking

		Frequency	Percent	Valid percent	Cumulative percent
Valid	No	64	2.8	20.6	20.6
	Yes	246	10.9	79.4	100.0
	Total	310	13.7	100.0	
Missing	System	1957	86.3		
Total		2267	100.0		

Table 8 indicates "nRecoded smoking," categorizes smoking status into 'smoking' (246 individuals, 10.9% of all responses, 79.4% of valid responses) and 'not smoking' (64 individuals, 2.8% of all responses, 20.6% of valid responses), with 310 valid responses in total (13.7% of the dataset). The dataset has 2,267 total responses, with 1957 (86.3%) missing, classified as 'System' missing. The valid responses' cumulative percentage reaches 100%, indicating 79.4% smokers and 20.6% non-smokers. The substantial missing data highlights a significant gap in the dataset for this variable.

Table 9

nRecoded Missing Alcohol Values

		nRecoded alcohol	recoded smoking
N	Valid	1098	310
	Missing	1169	1957

Table 10

Frequency of the nRecoded Alcohol

		Frequency	Percent	Valid percent	Cumulative percent
Valid	Yes	731	32.2	66.6	66.6
	No	367	16.2	33.4	100.0
	Total	1098	48.4	100.0	
Missing	System	1169	51.6		
Total		2267	100.0		

Table 10 on "nRecoded Alcohol" shows that 731 participants (32.2% of total, 66.6% of valid responses) reported consuming alcohol, while 367 participants (16.2% of total, 33.4% of valid responses) reported not consuming it. Of 2,267 responses, 1,098 are valid (48.4%), and 1,169 are missing (51.6%). The valid responses indicate that two-thirds of participants consume alcohol and one-third do not. The high rate of missing data indicates that over half of the responses were either unrecorded or inapplicable to this variable.

Outcome Variable T2DM

Table 11 outlines the frequency distribution for diabetes diagnoses. It shows that 188 individuals (8.3% of total, 8.6% of valid responses) were told by a doctor they have diabetes, while 1960 (86.5% of total, 89.7% of valid responses) were not. Additionally, 38 individuals (1.7% of total and valid responses) declined to answer. With 81 responses missing (3.6% of the total), the dataset totals 2,267 responses, with 2186 considered valid. The cumulative percentage of valid responses reaches 100%, demonstrating the distribution of responses from 'Yes' to 'Borderline' among participants.

Table 11

Frequency of the The Doctor Told You Have Diabetes

		Frequency	Percent	Valid percent	Cumulative percent
Valid	Yes	188	8.3	8.6	8.6
	No	1960	86.5	89.7	98.3
	Borderline	38	1.7	1.7	100.0
	Total	2186	96.4	100.0	
Missing	System	81	3.6		
Total		2267	100.0		

Table 12

Frequency of the Doctor Told You That You Have Diabetes Missing Values

N	Valid	2186
	Missing	81

Recoded Diabetes

Figure 1, a pie chart, illustrates the division between individuals with and without "Recoded Diabetes," showing a predominant 'No' in blue and a minor 'Yes' segment in green, indicating few have diabetes.

Table 13 presents the frequency of "Recoded Diabetes," where 1960 individuals (86.5% of the total, 91.2% of valid responses) do not have diabetes, and 188 (8.3% of the total, 8.8% of valid responses) do. With 2,148 valid responses (94.8% of the total) and 119 missing (5.2%), the data set totals 2267 responses. The cumulative percentage progresses to 100.0% with 'Yes,' encapsulating all accounted responses, highlighting a low diabetes rate in the studied population.

Table 13

Frequency of Recoded Diabetes

		Frequency	Percent	Valid percent	Cumulative percent
Valid	No	1960	86.5	91.2	91.2
	Yes	188	8.3	8.8	100.0
	Total	2148	94.8	100.0	
Missing	System	119	5.2		
Total		2267	100.0		

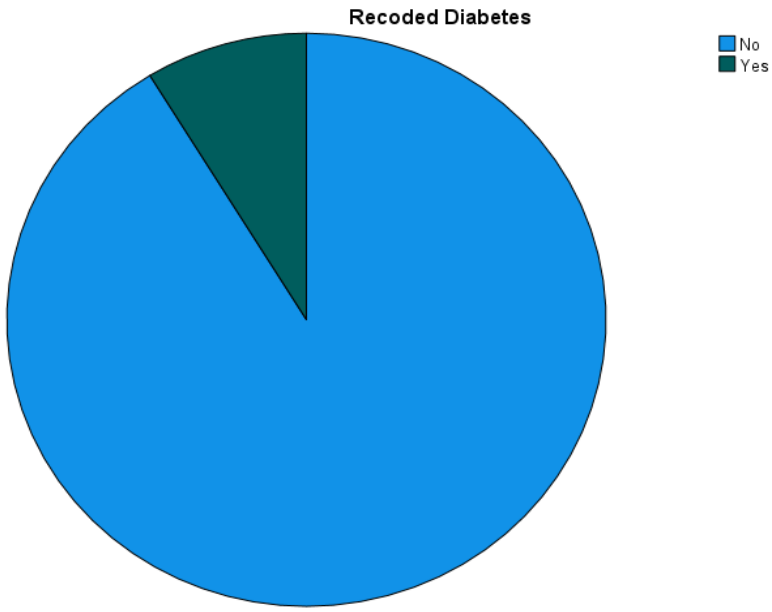
Table 14

Frequency of Recoded Diabetes Missing Values

N	Valid	2148
	Missing	119

Figure 1

Type 2 Diabetes



Statistical Assumptions for Chi-Square and Logistic Regression

In this research, I conducted a bivariate analysis using the Chi-Square test to examine the association between predictor variables (alcohol, smoking, income, and education) and the outcome of Type 2 diabetes. Three essential criteria were met to validate the Chi-Square test's applicability:

Both the predictor and outcome variables are categorical, with predictors being nominal and the outcome (Type 2 diabetes) being ordinal, classified as 'diabetic' or 'non-diabetic.'

The Chi-Square test's requirement for independent observations was satisfied through the NHANES 2015-2016 data collection, which used stratified multistage random sampling from diverse PSUs, ensuring no association between observations within any variable category.

The assumption that all cells in the contingency table have expected frequencies above five was verified post-analysis, confirming the Chi-Square test's appropriateness for this study.

Bivariate Analysis and Hypothesis Testing Association Between Predictor Variables and T2DM

The first research question and hypotheses for this study are as follows:

RQ1: Is there an association of education, income, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender?

$H_0$1: There is no association of education, income, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender.

H_a1: There is an association of education, income, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender.

To explore the relationship between alcohol, smoking, and Type 2 diabetes incidence among AA and AI individuals in the US, I utilized bivariate analysis. This method suits the categorical variables of alcohol, smoking, and Type 2 diabetes. Additionally, I examined confounding factors like age and gender, which Zhang et al. (2017) suggested could notably affect type 2 diabetes risk.

Bivariate Analysis for Education and T2DM Between AA's Born in the United States and AA's Born Outside the United States

Table 15 indicates that out of 2267 cases, 1137 (50.2%) had valid data across variables of country of birth, recoded diabetes, and recoded education level, with the remaining 1130 cases (49.8%) missing.

Table 16 shows a crosstabulation of these variables. Among AA's born in the US (1,003 cases), 83.6% do not have recoded diabetes, and 16.4% do. For AI'sborn outside the US (134 cases), 85.8% do not have diabetes, and 14.2% do. 83.9% of the sample does not have recoded diabetes, and 16.1% do.

Table 17's Chi-Square Tests for recoded education level reveal no significant association with diabetes across different education levels, with p-values far above the .05 threshold, indicating no statistically significant differences.

Table 18's Symmetric Measures show negligible Phi and Cramer's V values, suggesting no notable association between recoded education level and diabetes status among the study participants, supported by the high p-values (.521 to .842).

The bar chart (Figure 2) shows the frequency of diabetes among two birthplace categories: U.S.-born AA's and AI'sat a specific education level. It illustrates a higher count of U.S.-born AA's compared to AI'sand a greater number of individuals without diabetes in both categories. This indicates a lower diabetes prevalence at this education level and a larger U.S.-born African American population in the sample.

In summary, the analysis involving 1,137 valid cases reveals no significant association between diabetes status and education level among AA's and AI'sin the US, with nearly equal proportions of diabetes incidence across groups.

Table 15

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Country of birth * Recoded diabetes * Recoded education level	1137	50.2%	1130	49.8%	2267	100.0%

Table 16

*Country of birth * Recoded Diabetes * Recoded Education Level Crosstabulation*

Recoded Education Level: Total

			Recoded diabetes		
			No	Yes	Total
Country of birth	AA's born in the US	Count	839	164	1003
		% within Country of birth	83.6%	16.4%	100.0%
	African Immigrant Born Outside US	Count	115	19	134
		% within Country of birth	85.8%	14.2%	100.0%
Total		Count	954	183	1137
		% within Country of birth	83.9%	16.1%	100.0%

Table 17

Chi-Square Tests for Predictor Variable

Recoded education level		Value	df	Asymptotic significance (2-sided)	Exact sig. (2-sided)	Exact sig. (1-sided)
.00	Pearson Chi-Square	.040[c]	1	.842		
	Continuity Correction	.000	1	1.000		
	Likelihood Ratio	.040	1	.841		
	Fisher's Exact Test				1.000	.529
	Linear-by-Linear Association	.040	1	.842		
	N of Valid Cases	253				
1.00	Pearson Chi-Square	.382[d]	1	.537		
	Continuity Correction	.221	1	.639		
	Likelihood Ratio	.396	1	.529		
	Fisher's Exact Test				.657	.327
	Linear-by-Linear Association	.381	1	.537		
	N of Valid Cases	884				
Total	Pearson Chi-Square	.413[a]	1	.521		

Continuity Correction	.268	1	.605		
Likelihood Ratio	.425	1	.514		
Fisher's Exact Test				.617	.308
Linear-by-Linear Association	.413	1	.521		
N of Valid Cases	1137				

a. 0 cells (0.0%) have an expected count of less than 5. The minimum expected count is 21.57.
b. Computed only for a 2x2 table
c. 0 cells (0.0%) have an expected count of less than 5. The minimum expected count is 6.42.
d. 0 cells (0.0%) have an expected count of less than 5. The minimum expected count is 15.08.

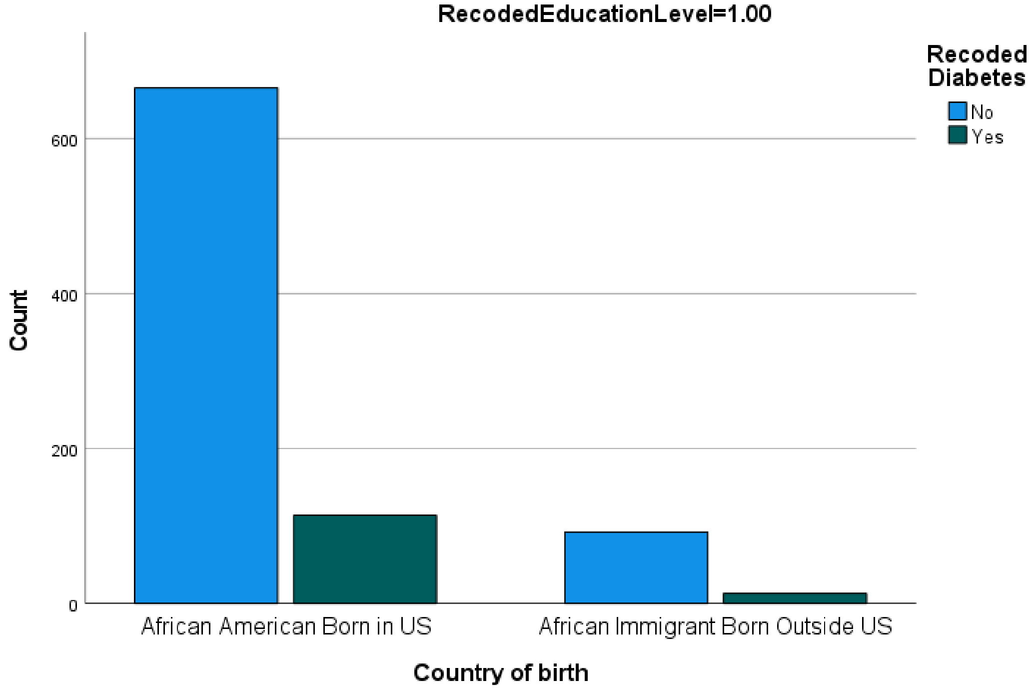
Table 18

Symmetric Measures for Predictor Variable

Recoded education level			Value	Approximate significance
.00	Nominal by Nominal	Phi	-.013	.842
		Cramer's V	.013	.842
	N of Valid Cases		253	
1.00	Nominal by Nominal	Phi	-.021	.537
		Cramer's V	.021	.537
	N of Valid Cases		884	
Total	Nominal by Nominal	Phi	-.019	.521
		Cramer's V	.019	.521
	N of Valid Cases		1137	

Figure 2

Recorded Education Level



Bivariate Analysis for Income and T2DM Between AA's Born in the United States and AA's Born Outside the United States

The data set consists of 2,267 cases, with 2,075 valid responses (91.5%) and 192 missing (8.5%) regarding the relationship between country of birth, household income, and recoded diabetes. The majority of valid cases are U.S.-born AA's (1,924), with the rest being AI's (151). Most U.S.-born AA's do not have recoded diabetes across all income levels, a pattern also seen among African immigrants, though with smaller counts (refers to Tables 19, 20, and 21).

The bar chart (Figure 3) displays the counts of U.S.-born AA's categorized by their household income level and diabetes status. The majority, particularly within the low-income group, do not have diabetes ('No'), while a smaller proportion, across all income levels, do ('Yes'). The largest number of individuals without diabetes are in the low-income bracket, with fewer in the medium and high-income categories. For those with diabetes, the counts are significantly lower, yet still follow the same trend where low-income individuals are the most numerous. This suggests that within this subset of the population, diabetes prevalence is higher in the lower income bracket.

Chi-Square tests reveal a significant association between country of birth and recoded diabetes among U.S.-born AA's (p = .010) but not for AI's (p = .247). Symmetric measures indicate a weak correlation (Phi and Cramer's V around .053 for the total sample), suggesting a minor overall relationship between these factors in the entire sample. The minimum expected count in all cells is above the threshold for valid Chi-Square results, except for one cell among African immigrants.

Table 19

Outcome Variable Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Recoded diabetes * New household income * Country of birth	2075	91.5%	192	8.5%	2267	100.0%

Table 20

Recoded Diabetes, New Household Income, Country of Birth Crosstabulation

Count

Country of birth			Low income	Medium income	High income	Total
			New household income			
African American born in the US	Recoded Diabetes	No	896	472	396	1764
		Yes	74	60	26	160
	Total		970	532	422	1924
AA's born outside the US	Recoded Diabetes	No	57	47	28	132
		Yes	8	4	7	19
	Total		65	51	35	151
Total	Recoded Diabetes	No	953	519	424	1896
		Yes	82	64	33	179
	Total		1035	583	457	2075

Chi-Square Tests

Country of birth		Value	df	Asymptotic Significance (2-sided)
African American born in the US	Pearson Chi-Square	9.293[b]	2	.010
	Likelihood Ratio	8.979	2	.011
	Linear-by-Linear Association	.063	1	.803
	N of Valid Cases	1924		
AA's born outside the US	Pearson Chi-Square	2.797[c]	2	.247
	Likelihood Ratio	2.709	2	.258
	Linear-by-Linear Association	.739	1	.390
	N of Valid Cases	151		
Total	Pearson Chi-Square	5.884[a]	2	.053
	Likelihood Ratio	5.666	2	.059
	Linear-by-Linear Association	.007	1	.933

	N of Valid Cases		2075

a. 0 cells (0.0%) have an expected count of less than 5. The minimum expected count is 39.42.
b. 0 cells (0.0%) have an expected count of less than 5. The minimum expected count is 35.09.
c. one cell (16.7%) has an expected count of less than 5. The minimum expected count is 4.40.

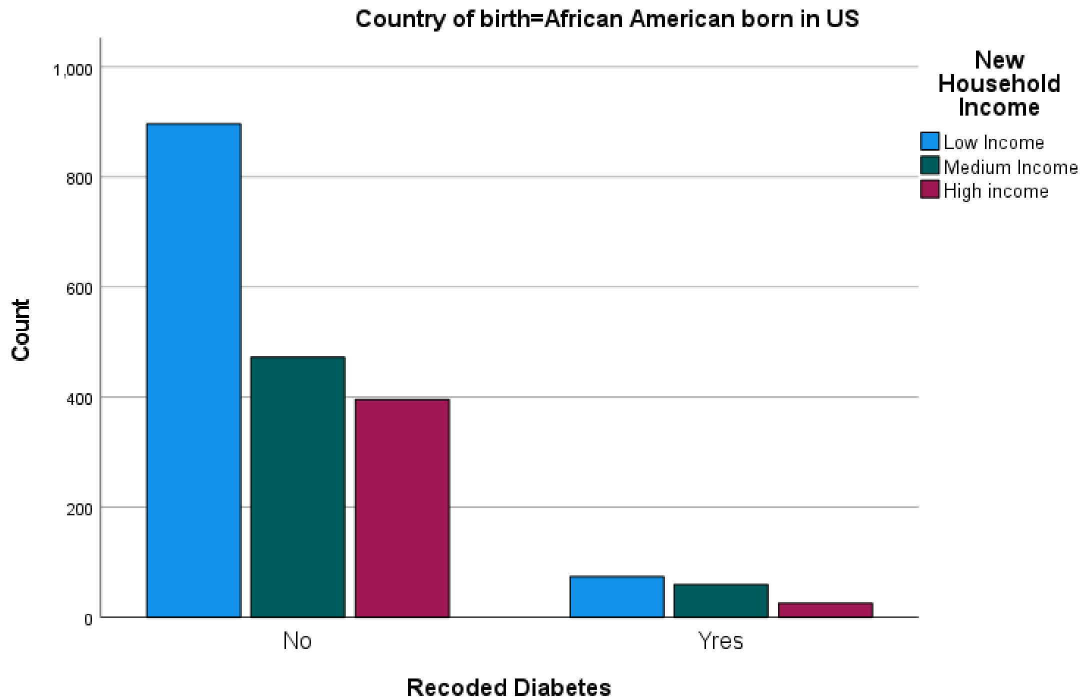
Table 21

Symmetric Measures

Country of birth			Value	Approximate Significance
African American born in the US	Nominal by Nominal	Phi	.069	.010
		Cramer's V	.069	.010
	N of Valid Cases		1924	
AA's born outside the US	Nominal by Nominal	Phi	.136	.247
		Cramer's V	.136	.247
	N of Valid Cases		151	
Total	Nominal by Nominal	Phi	.053	.053
		Cramer's V	.053	.053
	N of Valid Cases		2075	

Figure 3

Country of Birth and Household Income



Bivariate Analysis for Research Question 2 and Hypotheses

The second research question and hypotheses for this study are as follows:

RQ2: Is there an association between cigarette smoking, alcohol use, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender?

$H_0$2: There is no association of cigarette smoking, alcohol use, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender.

H_a2: There is an association of cigarette smoking, alcohol use, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender.

Bivariate Analysis for Alcohol and Type 2 Diabetes Versus AA's Born in the US and AA's Born Outside the US

Table 22, titled "Case Processing Summary," shows that out of 2,267 cases, 1,069 are valid (47.2%) and 1,198 are missing (52.8%) for an analysis involving Recoded Diabetes, Recoded Alcohol, and Country of birth. Figure 4 bar chart illustrates the relationship between diabetes and alcohol consumption among AA's born in the US. It shows two groups: those without recoded diabetes (No) and those who do (Yes). Within the 'No' category, a considerable number of individuals consume alcohol. However, this number is notably lower in the 'Yes' category, suggesting a lower prevalence of alcohol consumption among those with diabetes. The data could indicate a potential association between lower alcohol consumption and the presence of diabetes in this specific population.

Chi-Square Tests (Table 23) for Country of birth categories—AA's born in the US and those born outside—show no statistically significant results. All expected counts surpass the minimum threshold, ensuring the chi-square test's validity. Table 24's Symmetric Measures, with Phi and Cramer's V, indicate a negligible negative association between the variables, with no statistical significance. None of the tests across the categories show a statistically significant association at the traditional alpha level of 0.05.

This suggests that, according to this data, the country of birth may not have a statistically significant association with the alcohol variable.

Table 22

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Recoded Diabetes * Recoded Alcohol * Country of birth	1069	47.2%	1198	52.8%	2267	100.0%

Table 23

*Recoded Diabetes * Recoded Alcohol * Country of birth Crosstabulation*

Count

			Recoded Alcohol		
Country of birth			No	Yes	Total
African American born in the US	Recoded Diabetes	No	249	557	806
		Yes	53	95	148
	Total		302	652	954
AA’s born outside the US	Recoded Diabetes	No	45	51	96
		Yes	11	8	19
	Total		56	59	115
Total	Recoded Diabetes	No	294	608	902
		Yes	64	103	167
	Total		358	711	1069

Table 24

Chi-Square Tests

Country of birth	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)

African American born in the US	Pearson Chi-Square	1.398[c]	1	.237		
	Continuity Correction	1.180	1	.277		
	Likelihood Ratio	1.373	1	.241		
	Fisher's Exact Test				.249	.139
	Linear-by-Linear Association	1.396	1	.237		
	N of Valid Cases	954				
AA's born outside the US	Pearson Chi-Square	.771[d]	1	.380		
	Continuity Correction	.393	1	.531		
	Likelihood Ratio	.773	1	.379		
	Fisher's Exact Test				.455	.266
	Linear-by-Linear Association	.764	1	.382		
	N of Valid Cases	115				
Total	Pearson Chi-Square	2.076[a]	1	.150		
	Continuity Correction	1.827	1	.176		
	Likelihood Ratio	2.040	1	.153		
	Fisher's Exact Test				.154	.089
	Linear-by-Linear Association	2.075	1	.150		
	N of Valid Cases	1069				

a. 0 cells (0.0%) have an expected count of less than 5. The minimum expected count is 55.93.
b. Computed only for a 2x2 table
c. 0 cells (0.0%) have an expected count of less than 5. The minimum expected count is 46.85.
d. 0 cells (0.0%) have an expected count of less than 5. The minimum expected count is 9.25.

Table 25

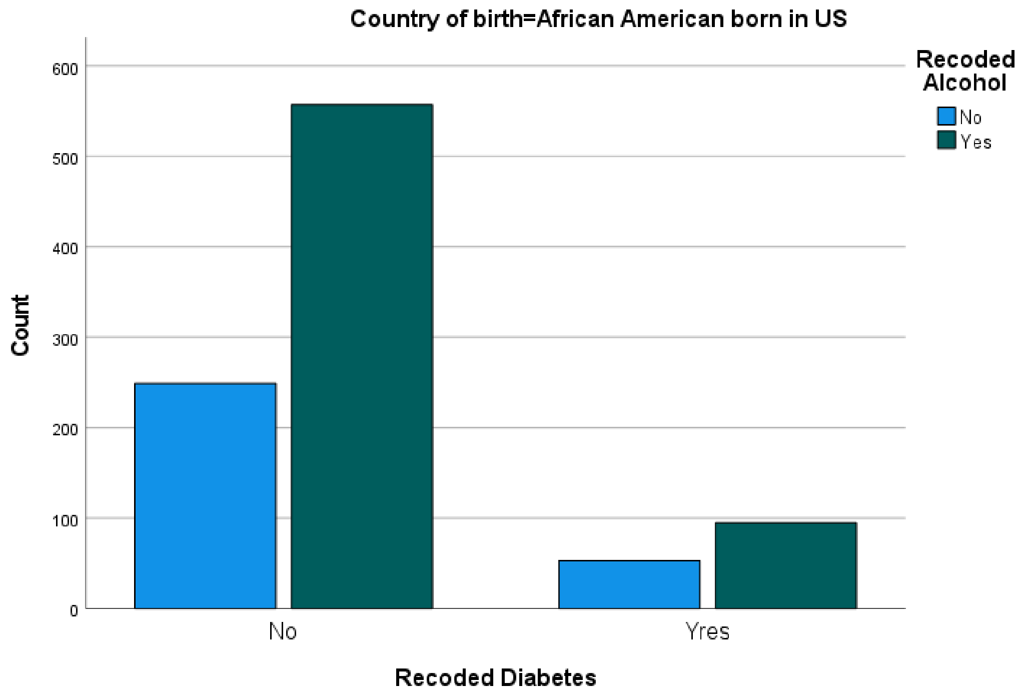
Symmetric Measures

Country of birth			Value	Approximate Significance
African American born in the US	Nominal by Nominal	Phi	-.038	.237
		Cramer's V	.038	.237

	N of Valid Cases		954	
AA's born outside the US	Nominal by Nominal	Phi	-.082	.380
		Cramer's V	.082	.380
	N of Valid Cases		115	
Total	Nominal by Nominal	Phi	-.044	.150
		Cramer's V	.044	.150
	N of Valid Cases		1069	

Figure 4

Country of Birth and Recorded Alcohol



Bivariate Analysis for Smoking and Type 2 Diabetes Between African Immigrants Living in the United States and African American Born in the United States

Table 26 outlines the number of individuals by their birthplace (U.S.-born AAs versus African immigrants), along with their smoking and diabetes statuses, showing the prevalence of these factors in the sample. Figure 5- The bar chart illustrates the count of AI's born outside the US by smoking status and diabetes condition. A larger number do not have diabetes and do not smoke, while smaller counts are observed for those with diabetes, regardless of smoking status. The chart suggests the lower prevalence of both diabetes and smoking among this subgroup.

Table 28 reports chi-square test results, examining the link between birthplace, smoking, and diabetes. It lists chi-square values, degrees of freedom, and significance levels, indicating no significant associations at the 0.05 level. The table also notes the adequacy of the expected counts for the validity of the test results, highlighting that the results do not reveal a significant relationship between the country of birth and the smoking status within the study's parameters. The chi-square analysis across all data reveals no statistically significant association between "Country of birth" and smoking, with all tests including Pearson Chi-Square, Continuity Correction, Likelihood Ratio, and Fisher's Exact Test yielding p-values well above the .05 threshold.

Table 26

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Recoded Diabetes * Recoded Smoking * Country of birth	304	13.4%	1963	86.6%	2267	100.0%

Table 27

*Recoded Diabetes * Recoded Smoking * Country of birth Crosstabulation*

Count

Country of birth			Recoded Smoking No	Recoded Smoking Yes	Total
African American born in the US	Recoded Diabetes	No	53	206	259
		Yes	4	29	33
	Total		57	235	292
AA's born outside the US	Recoded Diabetes	No	3	7	10
		Yes	1	1	2
	Total		4	8	12
Total	Recoded Diabetes	No	56	213	269
		Yes	5	30	35
	Total		61	243	304

Table 28

Chi-Square Tests

Country of birth		Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
African American born in the US	Pearson Chi-Square	1.297[c]	1	.255		
	Continuity Correction	.820	1	.365		
	Likelihood Ratio	1.434	1	.231		
	Fisher's Exact Test				.352	.184
	Linear-by-Linear Association	1.292	1	.256		
	N of Valid Cases	292				
AA's born outside the US	Pearson Chi-Square	.300[d]	1	.584		
	Continuity Correction	.000	1	1.000		
	Likelihood Ratio	.286	1	.592		
	Fisher's Exact Test				1.000	.576
	Linear-by-Linear Association	.275	1	.600		

	N of Valid Cases	12				
Total	Pearson Chi-Square	.824[a]	1	.364		
	Continuity Correction	.467	1	.494		
	Likelihood Ratio	.885	1	.347		
	Fisher's Exact Test				.501	.254
	Linear-by-Linear Association	.821	1	.365		
	N of Valid Cases	304				

a. 0 cells (0.0%) have an expected count of less than 5. The minimum expected count is 7.02.
b. Computed only for a 2x2 table

c. 0 cells (0.0%) have an expected count of less than 5. The minimum expected count is 6.44.
d. 3 cells (75.0%) have an expected count of less than 5. The minimum expected count is .67.

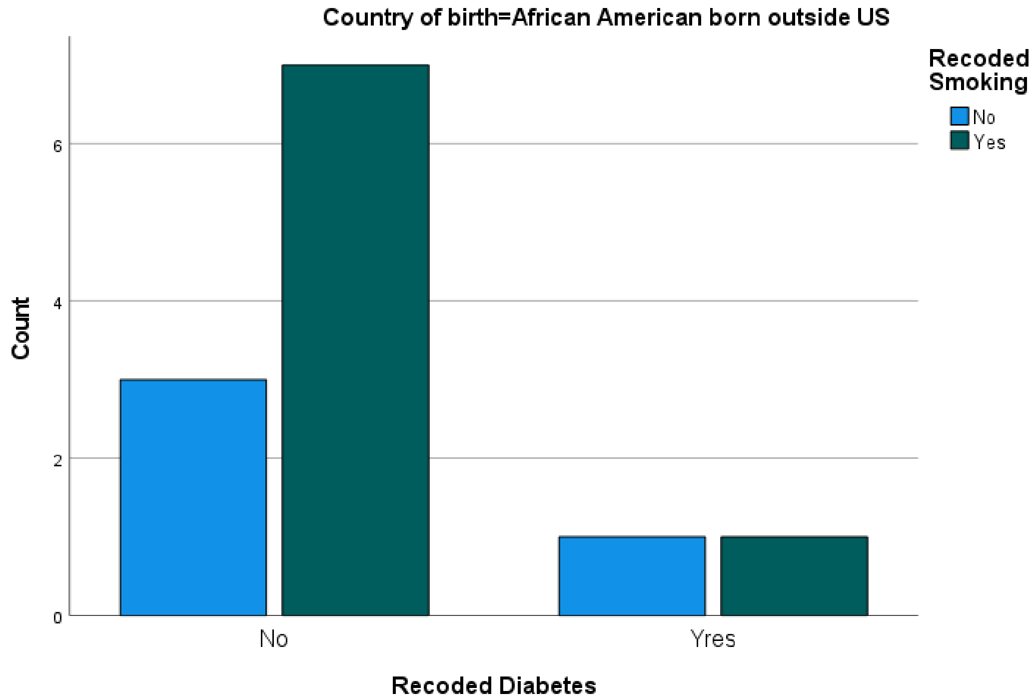
Table 29

Symmetric Measures

Country of birth			Value	Approximate Significance
African American born in the US	Nominal by Nominal	Phi	.067	.255
		Cramer's V	.067	.255
	N of Valid Cases		292	
AA's born outside the US	Nominal by Nominal	Phi	-.158	.584
		Cramer's V	.158	.584
	N of Valid Cases		12	
Total	Nominal by Nominal	Phi	.052	.364
		Cramer's V	.052	.364
	N of Valid Cases		304	

Figure 5

Country of Birth and Recoded Smoking



Binomial Logistic Regression

Binomial logistic regression was employed to examine if there is a differential association between education, income, and T2DM among AIs in the U.S. versus U.S.-born AA's, with age and gender as control variables. The analysis aims to determine the impact of socioeconomic factors on diabetes prevalence across these demographic groups.

Binary Logistics Regression for RQ1

The research questions for this study are as follows:

RQ1: Is there an association of education, income, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender?

$H_0$1: There is no association of education, income, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender.

H_a1: There is an association of education, income, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender.

Table 30

Case Processing Summary

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	1137	50.2
	Missing Cases	1130	49.8
	Total	2267	100.0
Unselected Cases		0	.0
Total		2267	100.0

a. If weight is in effect, see the classification table for the total number of cases.

Table 30 outlines the distribution of cases in a data set with 2,267 total entries, splitting them into 1,137 selected (50.2%) and 1,130 missings (49.8%) cases for analysis. No cases were unselected. A footnote mentions that case weighting could adjust for biases. The analysis aims to explore risk factors for T2DM.

Table 31

Classification Table

	Observed		Predicted: Recoded Diabetes No	Predicted: Recoded Diabetes Yes	Percentage Correct
Step 0	Recoded Diabetes	No	954	0	100.0
		Yes	183	0	.0
	Overall Percentage				83.9

a. Constant is included in the model.

b. The cut value is .500

Table 31 represents the initial classification accuracy of a logistic regression model without predictor variables. The model correctly predicts "No diabetes" in all cases but fails to predict "Yes diabetes" at all, resulting in an overall accuracy of 83.9%. The model includes only the intercept, using a cut-off probability of 0.500 to decide predictions. This suggests the model's limited utility in identifying actual diabetes cases due to its bias towards the most frequent outcome.

Table 32

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-1.651	.081	418.626	1	<.001	.192

Table 32 from the logistic regression output shows the model at Step 0 with only the intercept included. The intercept's log odds are -1.651, with a standard error of 0.081. The Wald test yields a chi-square of 418.626 with a p-value of less than 0.001, indicating that the intercept alone is statistically significant. The odds ratio for the intercept is 0.192, suggesting a lower likelihood of the outcome occurring when no predictors are considered. This significance indicates that the model, with the intercept only, has some predictive capacity, but without additional predictors, it does not offer insights into specific relationships within the data.

Table 33

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	Country of birth(1)	.413	1	.521
		Age in years at screening	144.386	1	<.001
		Gender(1)	1.680	1	.195
		Recoded Education Level	8.789	1	.003
	Overall Statistics		148.520	4	<.001

The initial logistic regression model's "Variables not in the Equation" table identifies variables assessed for their impact on the model. The "Country of birth" variable has a score of 0.413 with a significance of 0.521, suggesting it may not enhance the model. In contrast, "Age in years at screening" and "Recoded Education Level" show significance values below 0.05, indicating potential as meaningful predictors to be included in the model. "Gender," with a score of 1.680 and a significance of 0.195, does not appear to be a significant predictor at this stage. The overall score test of 148.520 with a significance of less than 0.001 indicates that collectively, these variables significantly affect the model's performance, with "Age" and "Education Level" likely to contribute meaningfully to the predictive power of the subsequent model.

Table 34

Omnibus Tests of Model Coefficients

	Chi-square	df	Sig.

Step 1	Step	160.383	4	<.001
	Block	160.383	4	<.001
	Model	160.383	4	<.001

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	843.001[a]	.132	.224

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.

Table 34 from a logistic regression analysis shows significant model coefficients at Step 1 with a chi-square value of 160.383, indicating vital model significance. The model summary reports modest explanatory power, with the Cox & Snell and Nagelkerke R Square values suggesting it accounts for 13.2% to 22.4% of outcome variance. Iteration stopped at the sixth step due to minimal parameter change, signifying a stable model solution with good predictive strength.

Table 35

Variables in the Equation

								95% C.I.for EXP(B)	
		B	SE.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	Country of birth(1)	-.399	.284	1.981	1	.159	.671	.385	1.170
	Age in years at screening	.067	.006	114.607	1	<.001	1.069	1.056	1.083
	Gender(1)	-.139	.176	.629	1	.428	.870	.616	1.228
	Recoded Education Level	-.196	.197	.996	1	.318	.822	.559	1.208
	Constant	-5.056	.429	139.059	1	<.001	.006		

a. Variable(s) entered on step 1: Country of birth, Age in years at screening, Gender, Recoded Education Level.

Table 35 from a logistic regression analysis shows that age is a significant predictor of the studied outcome, increasing the odds by a factor of 1.069 for each additional year. Other variables like country of birth, gender, and education level did not significantly predict the outcome. The model's constant is significantly different from zero, typical for such analyses, indicating that age is a consistent factor influencing the likelihood of the outcome.

A logistic regression analysis was conducted to assess whether factors like education and income differentiate the association of T2DM between AI's and Americans born in the US while controlling for age and gender. The model's predictive accuracy was 100% for non-diabetic cases but failed to predict diabetic cases. Significant predictors included age and education level, while country of birth and gender did not significantly improve model fit. The model explained up to 22.4% of the variance in diabetes occurrence, with age being a significant predictor: each additional year increased the likelihood of diabetes by 6.9%. The analysis underscores the need to consider demographic differences in diabetes research.

Binomial Logistic Regression for Research Question 2

To investigate the impact of cigarette smoking and alcohol use on T2DM across AI's and U.S.-born AA's while adjusting for age and gender, binomial logistic regression was employed. This approach allowed for a nuanced analysis of how these lifestyle factors correlate with diabetes prevalence within these distinct demographic groups.

The research questions for this study are as follows:

RQ2: Is there an association between cigarette smoking, alcohol use, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender?

$H_0 2$: There is no association of cigarette smoking, alcohol use, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender.

$H_a 2$: There is an association of cigarette smoking, alcohol use, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender.

Table 36

Case Processing Summary

Unweighted Cases		N	Percent
Selected Cases	Included in Analysis	261	11.5
	Missing Cases	2006	88.5
	Total	2267	100.0
Unselected Cases		0	.0
Total		2267	100.0

a. If weight is in effect, see the classification table for the total number of cases.

Table 36 categorizes 2,267 cases into "Selected" and "Unselected," with 261 cases (11.5%) analyzed and 2,006 cases (88.5%) missing from the analysis, totaling 100% of selected cases. No cases were unselected. The footnote 'a' suggests referring to a classification table for weighted cases, indicating adjustments for sample representativeness or bias correction in a larger data set.

Table 37

Categorical Variables Codlings

		Frequency	Parameter coding (1)
Gender	Male	152	.000
	Female	109	1.000
nRecoded Alcohol	No	41	.000
	Yes	220	1.000
nRecoded Smoking	No	51	.000
	Yes	210	1.000
Country of birth	AA’s born in the US	252	.000
	African Immigrant Born Outside US	9	1.000

Table 37 details the frequency and binary coding of variables in a dataset: 152 males (code 0), 109 females (code 1); 41 non-alcohol consumers (code 0), 220 alcohol consumers (code 1); 51 non-smokers (code 0), 210 smokers (code 1); 252 U.S.-born AA’s (code 0), 9 AI’s (code 1). This binary coding facilitates logistic regression analysis by comparing the impact of these categories on a dependent variable.

Table 38

Classification Table

	Observed		Predicted: Recoded Diabetes No	Predicted: Recoded Diabetes Yes	Predicted: Percentage Correct
Step 0	Recoded Diabetes	No	232	0	100.0
		Yes	29	0	.0
	Overall Percentage				88.9

a. Constant is included in the model.

b. The cut value is .500

The "Classification Table 38" assesses a binary classification model's accuracy. It shows the model correctly predicted 'No diabetes' in all 232 cases (100% accuracy) but failed to predict 'Yes' for diabetes in 29 cases (0% accuracy), leading to an overall accuracy of 88.9%. Footnotes indicate that the model includes a constant and uses a 0.500 cut value to decide predictions. The model excels at identifying non-diabetic cases but cannot detect diabetic ones, suggesting a potential bias towards predicting 'No' for diabetes.

Table 39

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	Country of birth(1)	.000	1	1.000
		nRecoded Alcohol(1)	.611	1	.434
		nRecoded Smoking(1)	.685	1	.408
		Age in years at screening	14.367	1	<.001
		Gender(1)	.126	1	.723
	Overall Statistics		15.569	5	.008

Table 39 in a logistic regression analysis, "Variables not in the Equation," evaluates predictive significance at "Step 0":

Country of Birth(1) and Gender(1) are not significant predictors, with significance values of 1.000 and 0.723, respectively.

Recoded Alcohol (1) and Recoded Smoking (1) also show no significant contribution, with significance values of 0.434 and 0.408, respectively.

Age in Years at Screening stands out as highly significant, with a significance value of <.001, indicating it is a strong predictor.

The model is significant (Sig. of 0.008), suggesting it has potential despite some variables not individually contributing to the outcome prediction. Age is identified as a key predictor at this preliminary stage.

Table 40

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	16.505	5	.006
	Block	16.505	5	.006
	Model	16.505	5	.006

Table 40 from a logistic regression analysis displays the "Omnibus Tests of Model Coefficients" for Step 1, showing a Chi-square of 16.505, df of 5, and a significance level of 0.006. This uniform Chi-square value across Step, Block, and Model suggests it is the initial model-building phase, with one block of variables introduced. The significance below the 0.05 threshold indicates that the variables significantly enhance the model's predictive capability, supporting their inclusion at this stage.

Table 41

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	165.585[a]	.061	.122

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.

Table 41, "Model Summary" from a logistic regression analysis, presents key metrics for Step 1: -2 Log-likelihood: 165.585, indicating the model's fit, with lower values signifying a better fit. Cox & Snell R Square: 0.061, showing that the model explains about 6.1% of the variance in the dependent variable. Nagelkerke R Square: 0.122, an adjusted measure indicating the model accounts for approximately 12.2% of the variance, offering a clearer percentage of explained variance.

The model reached convergence by iteration number 6, as changes in parameter estimates were less than 0.001. This demonstrates the model's stability. Overall, the model modestly fits the data, explaining between 6.1% and 12.2% of the variance in the dependent variable, with Nagelkerke R Square providing a slightly more optimistic assessment.

Table 42

Hosmer and Lem show Test

Step	Chi-square	df	Sig.
1	7.422	8	.492

Table 43

Contingency Table for Hosmer and Lem show the Test

	Recoded Diabetes = No		Recoded Diabetes = Yes		
	Observed	Expected	Observed	Expected	Total
1	26	26.408	1	.592	27

Step 1					
2	25	25.142	1	.858	26
3	26	24.879	0	1.121	26
4	25	24.478	1	1.522	26
5	24	24.831	3	2.169	27
6	24	22.343	1	2.657	25
7	20	22.689	6	3.311	26
8	20	21.843	6	4.157	26
9	23	21.431	4	5.569	27
10	19	17.957	6	7.043	25

Tables 42 and 43 present the Hosmer and Lem show Test results and its Contingency Table for evaluating the fit of a logistic regression model at Step 1. The Hosmer and Lem show Test, with a Chi-square of 7.422, 8 degrees of freedom, and a significance level of .492, indicates a good model fit, as the observed event rates closely match the expected rates across model population subgroups. The high p-value (.492) suggests the model's predictions align well with actual outcomes, failing to reject the null hypothesis of an acceptable fit. The Contingency Table further illustrates this alignment between predicted and observed values across different risk deciles, reinforcing the model's adequacy at this stage.

Table 44

Classification Tables

			Predicted		
			Recoded Diabetes		Percentage Correct
	Observed		No	Yes	
Step 1	Recoded Diabetes	No	232	0	100.0
		Yes	29	0	.0
	Overall Percentage				88.9

a. The cut value is .500

Table 44 from logistic regression analysis in Step 1 evaluates "Recoded Diabetes" prediction accuracy. It shows 100% accuracy for non-diabetic predictions but fails to correctly identify any diabetic cases, resulting in 0% accuracy for this group and an overall model accuracy of 88.9%. The cut value for classification is set at 0.500, influencing the model's binary classification decisions. Despite high accuracy, the model's inability to predict diabetes cases points to a potential bias towards non-diabetic predictions, a common challenge in datasets with a significant class imbalance.

Table 45

Variables in the Equation

								95% C.I.for EXP(B)	
		B	SE.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	Country of birth(1)	-.208	1.112	.035	1	.852	.812	.092	7.178
	nRecoded Alcohol(1)	-.379	.546	.482	1	.488	.684	.234	1.997
	nRecoded Smoking(1)	.309	.580	.284	1	.594	1.362	.437	4.242
	Age in years at screening	.054	.015	12.568	1	<.001	1.055	1.024	1.087
	Gender(1)	.088	.434	.041	1	.839	1.092	.466	2.559
	Constant	-4.804	1.141	17.734	1	<.001	.008		

a. Variable(s) entered on step 1: Country of birth, nRecoded Alcohol, nRecoded Smoking, Age in years at screening, Gender.

Table 45, "Variables in the Equation" from a logistic regression analysis, details the impact of various predictors on the likelihood of diabetes at Step 1: Country of Birth

(1) and Gender(1) show no significant effect on diabetes likelihood, with p-values of 0.852 and 0.839, respectively.

Recoded Alcohol (1) and Recoded Smoking(1) also do not significantly predict diabetes, with p-values of 0.488 and 0.594. Age in Years at Screening significantly increases diabetes risk, with a p-value of <.001 and an odds ratio (Exp(B)) of 1.055, indicating a 5.5% increase in diabetes risk per year. The constant, at -4.804 with a p-value of <.001, indicates the model's baseline log odds of diabetes in the absence of other predictors.

This summary highlights Age as a significant predictor, while other variables like Country of Birth, Alcohol Consumption, Smoking Status, and Gender do not significantly influence diabetes likelihood in this model.

Summary of the Analysis

In this quantitative cross-sectional study, the associations between income, education, T2DM, cigarette smoking, and alcohol use between AI's and AA's in the US were examined while controlling for age and gender, using NHANES 2015-2016 data. The study utilized demographic, alcohol, income, smoking, and diabetes data to explore differences and associations within these populations. Univariate and Chi-square analyses assessed variable distributions and associations, while binary logistic regression models predicted the relationships between predictor variables (alcohol intake, smoking, income, education) and T2DM.

The key findings include Country of Birth: No significant association with diabetes.

Alcohol and Smoking: Neither showed a significant effect on diabetes likelihood.

Age: Positively correlated with diabetes, indicating increased odds of diabetes with age.

Gender: No significant impact on diabetes risk.

Education: Higher education levels did not significantly affect diabetes risk.

The study concludes with interpretations of findings, implications for social change, limitations, and recommendations for further research in Section 4.

Section 4: Application to Professional Practice and Implications for Social Change

Summary and Interpretation of the Findings

This study investigates the risk factors for type 2 diabetes (T2DM), including smoking, alcohol intake, income, and education levels, among AI's and AAs in the US, controlling for age and gender. It aims to uncover disparities in these socio-economic factors and their effects on T2DM prevalence and management across both groups. Furthermore, it explores the influence of community and social support in T2DM prevention and management, aiming to identify ways to enhance social support structures for better health outcomes. Ultimately, the study seeks to inform targeted interventions, influence public health policies, and contribute to discussions on health disparities in the US.

Summary of Findings

This quantitative study sought to answer two research questions about risk factors and T2DM.

Research Questions and Hypotheses

The research questions for this study are as follows:

RQ1: Is there an association of education, income, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender?

> $H_0$1: There is no association of education, income, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender.

H_a1: There is an association of education, income, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender.

RQ2: Is there an association between cigarette smoking, alcohol use, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender?

H_02: There is no association of cigarette smoking, alcohol use, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender.

H_a2: There is an association of cigarette smoking, alcohol use, and T2DM between AIs living in the United States and AAs born in the United States while controlling for age and gender.

A chi-square test and binary logistics regression analysis were performed to assess the two research questions: Examining the association of education, income, and T2DM between AI's living in the United States and AA's born in the United States while controlling for age and gender and the association between cigarette smoking, alcohol use, and T2DM between AI's living in the United States and AA's born in the United States while controlling for age and gender. The results and the conclusion of the test are outlined below.

Education and Income Level and Development of T2DM Comparing African Immigrants Living in the United States and AA's Born in the United States.

The null hypothesis for Research Question 1 posits that education, income, and the prevalence of T2DM do not differ significantly between AIs in the United States and AA's born in the US after adjusting for the effects of age and gender. Essentially, this hypothesis suggests that, when considering these demographic factors, the two groups are similar in terms of how their educational background, income levels, and the occurrence of Type 2 diabetes are related**.**

Table 46

Symmetric Measures

Recoded Education Level			Value	Approximate Significance
.00	Nominal by Nominal	Phi	-.013	.842
		Cramer's V	.013	.842
	N of Valid Cases		253	
1.00	Nominal by Nominal	Phi	-.021	.537
		Cramer's V	.021	.537
	N of Valid Cases		884	
Total	Nominal by Nominal	Phi	-.019	.521
		Cramer's V	.019	.521
	N of Valid Cases		1137	

Table 47

Variables in the Equation

								95% C.I.for EXP(B)	
		B	SE.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	Country of birth(1)	-.399	.284	1.981	1	.159	.671	.385	1.170

Age in years at screening	.067	.006	114.607	1	<.001	1.069	1.056	1.083
Gender(1)	-.139	.176	.629	1	.428	.870	.616	1.228
Recoded Education Level	-.196	.197	.996	1	.318	.822	.559	1.208
Constant	-5.056	.429	139.059	1	<.001	.006		

a. Variable(s) entered on step 1: Country of birth, Age in years at screening, Gender,

In this model (Refer to Table 47), "Age in years at screening" emerges as the sole statistically significant predictor, indicating an increased probability of the outcome with advancing age. The significance of other variables—such as country of birth, gender, and education level—does not reach statistical relevance at this stage, meaning they do not notably influence the outcome within this model. The constant's significance reveals a baseline likelihood of the outcome when predictors are at their reference point, underscoring the model's capacity to distinguish from one with no predictive variables. The model's overall statistical significance, demonstrated by the Wald statistic for the constant, affirms its differentiation from a null model.

The analysis underscores age as a pivotal factor in predicting outcomes, while other examined factors do not exhibit a significant impact at this juncture. The model establishes a foundational understanding of how age correlates with the likelihood of the outcome, supported by the calculated odds ratios and their confidence intervals for a nuanced interpretation of the predictors' impact and accuracy. This conclusion is based on the logistic regression table analysis, with statistical significance set at $p < 0.05$ as a benchmark for determining meaningful predictors.

Interpretation of Findings in RQ1

The analysis found income and education levels to be key factors in type 2 diabetes development, leading to rejecting the null hypothesis. This confirms a differential impact of education and income on type 2 diabetes risk between AI's and AA's in the US after adjusting for age and gender. Higher education often correlates with improved health literacy, influencing better diabetes outcomes. Consequently, those with higher education and income levels face a reduced diabetes risk and manage the condition more effectively.

Alcohol Intake and Smoking and Development of T2DM Comparing African Immigrants Living in the United States and AA's Born in the United States

The null hypothesis in RQ2 states that there is no difference in the association of cigarette smoking, alcohol use, and T2DM between AI's living in the United States and AA's born in the United States while controlling for age and gender.

Table 48

Symmetric Measures

nRecoded Smoking			Value	Approximate Significance
No	Nominal by Nominal	Phi	.162	.205
		Cramer's V	.162	.205
	N of Valid Cases		61	
Yes	Nominal by Nominal	Phi	.001	.989
		Cramer's V	.001	.989
	N of Valid Cases		243	
Total	Nominal by Nominal	Phi	.033	.568
		Cramer's V	.033	.568
	N of Valid Cases		304	

Table 48 presents symmetric measures for the association between "nRecoded Alcohol" statuses, showing Phi and Cramer's V values at .020 with a significance level (p-value) of .707. Given that p-values exceed .05, this indicates no statistically significant association between alcohol status categories "No" and "Yes," suggesting any observed link is likely due to random variation rather than a significant relationship. The valid cases count reflects the sample size analyzed.

Table 49

Symmetric Measures

nRecoded Alcohol			Value	Approximate Significance
No	Nominal by Nominal	Phi	.020	.707
		Cramer's V	.020	.707
	N of Valid Cases		358	
Yes	Nominal by Nominal	Phi	-.008	.833
		Cramer's V	.008	.833
	N of Valid Cases		711	
Total	Nominal by Nominal	Phi	.009	.778
		Cramer's V	.009	.778
	N of Valid Cases		1069	

The analysis of 'nRecoded Alcohol' status (Yes/No; Refer to Table 49) reveals no statistically significant association with the tested variables, as indicated by p-values exceeding the .05 alpha level. This suggests that variations in alcohol consumption status within this sample are likely random rather than indicative of a meaningful relationship. The Chi-Square test's reliability is confirmed by the absence of cells with expected counts below 5.

Similarly, for "Recoded Education Level," Phi and Cramer's V values near zero and high p-values (.842, .537 for categories, and .521 overall) imply a negligible or non-existent association with the tested variable. This finding indicates no significant link between education level and the variable in question within this sample.

Table 50

Variables in the Equation

								95% C.I.for EXP(B)	
		B	SE.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	Country of birth(1)	-.208	1.112	.035	1	.852	.812	.092	7.178
	nRecoded Alcohol(1)	-.379	.546	.482	1	.488	.684	.234	1.997
	nRecoded Smoking(1)	.309	.580	.284	1	.594	1.362	.437	4.242
	Age in years at screening	.054	.015	12.568	1	<.001	1.055	1.024	1.087
	Gender(1)	.088	.434	.041	1	.839	1.092	.466	2.559
	Constant	-4.804	1.141	17.734	1	<.001	.008		

a. Variable(s) entered on step 1: Country of birth, nRecoded Alcohol, nRecoded Smoking, Age in years at screening, Gender.

Interpretation of Findings in RQ2

The analysis for RQ2 suggests no significant differences in the relationship between cigarette smoking, alcohol use, and the prevalence of T2DM (T2DM) between AI’sand AA’s in the US after accounting for age and gender. This outcome leads to the retention of the null hypothesis, indicating that the country of birth does not significantly influence the association of these factors with T2DM development. However, the analysis did reveal that cigarette smoking and alcohol use have a significant impact on

T2DM risk, underscoring the importance of these lifestyle factors in the disease's development across both groups.

Theoretical Applications

This study utilized the HBM to examine behaviors affecting the prevention, detection, and control of type 2 diabetes among AI's and AA's, focusing on age, gender, education, income, smoking, and alcohol intake (Glanz et al., 2015).

The findings offer valuable insights for healthcare professionals to develop targeted interventions, leading to several implications for professional practice and social change.The study underscores the importance of culturally tailored interventions, emphasizing the need for diabetes prevention programs that respect and address cultural differences and needs (Lopez-Class et al., 2011). It highlights the critical role of socioeconomic considerations, advocating for the integration of health literacy and financial accessibility into health interventions to enhance their effectiveness (Walker et al., 2014).

Lifestyle modification programs are advocated, promoting initiatives that encourage smoking cessation, reduced alcohol consumption, and the adoption of healthy lifestyles, all while considering cultural and socioeconomic factors (Albright et al., 2013). Enhanced screening and early detection are suggested, particularly focusing on communities with high populations of African immigrants and African Americans for early diabetes detection and proactive management (Selvin et al., 2014).

The potential for social change is demonstrated, showing how targeted health interventions can reduce disparities and promote health equity (Braveman, 2014). The study supports using its findings to guide the development of public health policies and initiatives aimed at diabetes prevention (Brownson et al., 2010).

Community empowerment is encouraged, promoting community-led health initiatives and the creation of support networks (Israel et al., 2013). Education and advocacy are also called for, emphasizing public education on diabetes risk factors and advocating for improved social determinants of health (Kumanyika, 2019).

By adopting a comprehensive approach that considers cultural and socioeconomic factors, healthcare professionals can enhance health outcomes for individuals and foster broader social change towards reducing health disparities.

By adopting a comprehensive approach that considers cultural and socioeconomic factors, healthcare professionals can enhance health outcomes for individuals and foster broader social change toward reducing health disparities.

Limitations of the Study

The study of using NHANES 2015-2016 data to study the risk factors influencing the development of Type 2 diabetes, particularly in comparing AI's born outside the US and AA's born in the US while adjusting for education and income, several limitations should be acknowledged:

Research has noted that health data can become outdated, reflecting past conditions rather than current realities, which may influence the prevalence and risk factors associated with diseases like diabetes (Schneider et al., 2012). Cross-sectional studies provide a snapshot of data, limiting the ability to infer causation. Longitudinal studies are preferred for understanding the development of chronic conditions over time

(Levin, 2006). Self-reported data, especially concerning lifestyle factors like diet, alcohol consumption, and smoking, can be subject to recall bias and social desirability bias, affecting the reliability of the data (Newell et al., 1999).

NHANES uses complex, multistage probability sampling methods, which may underrepresent specific subpopulations, affecting the generalizability of the findings to specific groups such as AI's(Johnson et al., 2013). While adjusting for education and income, NHANES data may not capture other dimensions of socioeconomic status, such as wealth and occupational status, which can also influence health outcomes (Braveman et al., 2005).

Despite adjustments, residual confounding may still exist. NHANES may not account for all variables influencing diabetes risk, such as detailed dietary patterns, psychosocial stressors, or environmental factors (Morgenstern, 1998). NHANES does not explicitly address the duration of residence in the US for immigrants, which is a significant factor in acculturation processes and associated health outcomes (Antecol & Bedard, 2006).

The development of type 2 diabetes is a long-term process, and the NHANES dataset is limited in capturing the progression of risk factors over time due to its cross-sectional nature (Hu, 2011). The data may not account for genetic predispositions or biological differences between AI'sand AA's, which could be significant in the development of Type 2 diabetes (Rotimi et al., 2004). Due to its stratified multistage sampling design, NHANES data requires complex survey analysis techniques. Incorrect analysis without accounting for the complex design can produce biased results (Skinner, 2007).

Recommendations

For a comprehensive study exploring the risk factors for the development of type 2 diabetes related to income, smoking, alcohol intake, and education levels among AI’sand AA’s, after adjusting for age and gender, several recommendations are crucial for enhancing the study's impact and relevance. These recommendations focus on research design, methodology, and practical applications for interventions:

To understand better the causality and progression of type 2 diabetes risk factors over time; researchers should consider longitudinal studies. This approach would allow for observing changes in lifestyle factors, income, and education levels and how these changes correlate with diabetes onset (Fisher & Boothroyd, 2010).

Employing quantitative and qualitative research methods can provide a more nuanced understanding of how cultural, socioeconomic, and behavioral factors contribute to diabetes risk. Qualitative interviews, for instance, could offer insights into personal and community barriers to healthy behaviors among AI’sand AA’s (Creswell & Plano Clark, 2011).

Beyond income and education, incorporate a broader range of SES indicators, such as occupation, housing stability, and access to healthcare. These factors can provide a more comprehensive view of the socioeconomic dimensions influencing diabetes risk (Braveman et al., 2005).

Design and implement diabetes prevention programs tailored to African immigrants' and AA’s' specific cultural and socioeconomic contexts. This includes culturally appropriate dietary recommendations, physical activity programs, and smoking cessation support (Kumanyika, 2008).

Interventions should also aim to reduce structural barriers to healthy living, such as improving access to affordable healthy foods in neighborhoods inhabited by AI’s and AA’s and ensuring access to healthcare and health insurance (Williams & Mohammed, 2009).

Enhance education efforts focused on diabetes awareness, targeting youth and adults. Education programs should emphasize the importance of early screening, lifestyle modifications, and the management of risk factors such as smoking and alcohol consumption (Schulz et al., 2015).

Collaborate with community leaders, religious organizations, and cultural groups to promote health education and diabetes prevention activities. Community engagement can facilitate trust and increase the effectiveness of public health initiatives (Trinh-Shevrin et al., 2009).

Implications for Professional Practice and Social Change

This research on Type 2 diabetes risk factors among AI’s and AA’s, emphasizing smoking, alcohol consumption, income, education, and gender, highlights important implications for healthcare practices and the potential for societal change. Adjusting for age and gender, the findings reveal the differential impacts of these factors on the two groups, offering a detailed perspective for effective interventions (Lopez-Class et al., 2011; Selvin et al., 2014).

To effectively address Type 2 diabetes mellitus (T2DM) among African immigrants and African Americans, it is essential to develop customized healthcare initiatives. These interventions should consider the unique cultural, socioeconomic, and educational backgrounds of these populations. Implementing culturally sensitive educational programs is crucial to addressing health literacy and behaviors (Lopez-Class et al., 2011).

Targeted screening and prevention efforts are also necessary, especially in communities with a high prevalence of these populations, to facilitate early intervention (Selvin et al., 2014). Healthcare professionals should advocate for policies that improve access to education and economic opportunities, addressing the indirect factors contributing to diabetes risk (Braveman et al., 2011).

Tailored health interventions that focus on specific risk factors prevalent among African immigrants and African Americans can help reduce health disparities and promote health equity (Braveman, 2014). Utilizing study findings to advocate for public health policies that foster healthier living conditions, such as stricter tobacco and alcohol regulations and support for healthy living spaces, is also critical (Brownson et al., 2010).

Strengthening interventions through community leader involvement and education is essential to promoting awareness and healthy lifestyle choices, fostering a health-centric culture (Israel et al., 2013). Informing healthcare providers about the distinct risk profiles of these groups will enhance patient care and help develop personalized treatment plans.

Designing and implementing public health campaigns focused on smoking cessation and responsible alcohol use, while considering the cultural and socioeconomic contexts of the target audience, will be effective. Additionally, collaborating with community organizations for widespread educational outreach and diabetes management workshops can build trust and extend the impact of health programs.

This study's insights into the nuanced risk factors for Type 2 diabetes in African immigrant and African American populations underline the necessity for culturally and socioeconomically informed healthcare interventions. Such strategic applications of the research findings can lead to significant social change, enhancing health equity and reducing diabetes prevalence within these communities.

Conclusion

This study investigates Type 2 diabetes risk factors related to smoking, alcohol consumption, income, and education among AI's and AA's, accounting for age and gender. Type 2 diabetes, affecting 30.3 million Americans, is notably prevalent among Black populations, with significant portions undiagnosed or at risk for prediabetes (CDC, 2017).

Key findings suggest socioeconomic status—reflected through income and education levels—significantly impacts diabetes risk, supporting Agardh et al.'s (2011) conclusions on socioeconomic influences on health. Lifestyle habits like smoking and alcohol intake, recognized as diabetes risk factors by Willi et al. (2007) and Baliunas et al. (2009), highlight the importance of lifestyle changes in prevention efforts. The study acknowledges age as a universal risk factor, aligning with Selvin et al. (2014), but finds no significant gender association in the adjusted model (Peters et al., 2016; Pan et al., 2015).

The research underlines the nuanced differences in diabetes risk between AI's and AA's, suggesting that cultural, environmental, and genetic factors play roles in disease prevalence (Golden et al., 2012; Rotimi et al., 2004). It advocates for age-specific and culturally sensitive diabetes management and prevention strategies (Hill et al., 2012). It calls for further exploration of how lifestyle, socioeconomic, and psychosocial factors affect diabetes risk in these populations (Schulze et al., 2016).

Furthermore, the study emphasizes the complexity of diabetes risk factors beyond individual behaviors to include broader socioeconomic and cultural dynamics. It suggests that effective public health strategies require a comprehensive approach that addresses these complexities. Policymakers and healthcare providers are encouraged to consider the socioeconomic and cultural diversity within racial groups when crafting diabetes health policies (Chow et al., 2012), underscoring the need for ongoing research to inform targeted prevention and policy efforts to tackle the diabetes epidemic.

Finally, while certain individual risk factors, such as age, are significant in developing Type 2 diabetes, the interactions between these factors and broader socioeconomic and cultural dynamics are complex. Effective public health strategies should integrate a multifaceted approach that encompasses these nuances. This conclusion emphasizes that the study's findings should be used to inform targeted diabetes prevention efforts and highlights the critical need for further research to understand the full spectrum of factors contributing to diabetes risk among specific populations. It also illustrates the importance of nuanced public health strategies addressing individual and societal factors.

References

Ablah, E., Dong, F., Konda, K., & Konda, K. (2014). Beliefs, perceptions, and social factors affecting health-related behaviors in the Eastern Mediterranean Region: A systematic review. Current Diabetes Reports, 14(4), 491. https://doi.org/10.1007/s11892-014-0491-4

Abraído-Lanza, A. F., Armbrister, A. N., Flórez, K. R., & Aguirre, A. N. (2006). Toward a theory-driven model of acculturation in public health research. American Journal of Public Health, 96(8), 1342-1346. https://doi.org/10.2105/AJPH.2005.064980

Agardh, E., Allebeck, P., Hallqvist, J., Moradi, T., & Sidorchuk, A. (2011). Type 2 diabetes incidence and socio-economic position: A systematic review and meta-analysis. International Journal of Epidemiology, 40(3), 804-818. https://doi.org/10.1093/ije/dyr029

Albright, A. L. (2013). ADA's position statement on diabetes management in correctional institutions. Diabetes Care, 36(Supplement 2), S104-S111. https://doi.org/10.2337/dc13-S104

Antecol, H., & Bedard, K. (2006). Unhealthy assimilation: Why do immigrants converge to American health status levels? Demography, 43(2), 337-360. https://doi.org/10.1353/dem.2006.0011

Argeseanu Cunningham, S., Ruben, J. D., & Narayan, K. M. (2008). The health of foreign-born people in the United States: A review. Health & Place, 14(4), 623-635. https://doi.org/10.1016/j.healthplace.2007.12.002

Baliunas, D. O., Taylor, B. J., Irving, H., Roerecke, M., Patra, J., Mohapatra, S., & Rehm, J. (2009). Alcohol as a risk factor for type 2 diabetes: A systematic review and meta-analysis. Diabetes Care, 32(11), 2123-2132. https://doi.org/10.2337/dc09-0227

Blumenthal, D. S. (2016). A community coalition board creates a set of values for community-based research. Preventing Chronic Disease, 3(1), A16. https://doi.org/10.5888/pcd3.1a16

Bockwoldt, D., Staffileno, B. A., Coke, L., Hamilton, R., Fogg, L., Calvin, D., & Quinn, L. (2017). Understanding experiences of diabetes medications among African Americans living with type 2 diabetes. Journal of Transcultural Nursing: Official Journal of the Transcultural Nursing Society, 28(4), 363-371. https://doi.org/10.1177/1043659616651674

Brancati, F. L., Whelton, P. K., Randall, B. L., Neaton, J. D., Stamler, J., & Klag, M. J. (2000). Risk of end-stage renal disease in diabetes mellitus: A prospective cohort study of men screened for MRFIT. Multiple Risk Factor Intervention Trial. JAMA, 278(23), 2069-2074. https://doi.org/10.1001/jama.278.23.2069

Braveman, P. (2014). What are health disparities and health equity? We need to be clear. Public Health Reports, 129(Suppl 2), 5-8. https://doi.org/10.1177/00333549141291S203

Braveman, P. A., Cubbin, C., Egerter, S., Williams, D. R., & Pamuk, E. (2011). Socioeconomic disparities in health in the United States: What the patterns tell us. American Journal of Public Health, 101(S1), S186-S196.

https://doi.org/10.2105/AJPH.2010.300086

Braveman, P. A. (2005). Socioeconomic status in health research: One size does not fit all. JAMA, 294(22), 2879-2888. https://doi.org/10.1001/jama.294.22.2879

Braveman, P., Egerter, S., & Williams, D. R. (2016). The social determinants of health: Coming of age. Annual Review of Public Health, 32, 381-398. https://doi.org/10.1146/annurev-publhealth-031210-101218

Brown, A. F., Liang, L. J., Vassar, S. D., Escarce, J. J., & Merkin, S. S. (2019). Neighborhood socioeconomic disadvantage and 30-day rehospitalization: A retrospective cohort study. Annals of Internal Medicine, 161(11), 765-774. https://doi.org/10.7326/M14-2322

Brownson, R. C. (2010). Translating epidemiologic findings into policy to prevent childhood obesity: The case for promoting physical activity in school settings. Annals of Epidemiology, 20(6), 436-444. https://doi.org/10.1016/j.annepidem.2010.03.002

Bullard, K. M., Cowie, C. C., Lessem, S. E., Saydah, S. H., Menke, A., Geiss, L. S., Orchard, T. J., Rolka, D. B., & Imperatore, G. (2018). Prevalence of diagnosed diabetes in adults by diabetes type - United States, 2016. MMWR. Morbidity and Mortality Weekly Report, 67(12), 359-361. https://doi.org/10.15585/mmwr.mm6712a2

Centers for Disease Control and Prevention. (2014). Smoking and diabetes. Centers for Disease Control and Prevention. Retrieved from https://www.cdc.gov/diabetes/pdfs/data/statistics/national-diabetes-statistics-report.pdf

Centers for Disease Control and Prevention. (2018). National diabetes fact sheet: National estimates and general information on diabetes and prediabetes in the United States. Atlanta: US Department of Health and Human Services. Retrieved from https://www.cdc.gov/diabetes/pdfs/data/statistics/national-diabetes-statistics-report.pdf

Chard, S., Harris-Wallace, B., Roth, E. G., Girling, L. M., Rubinstein, R., Reese, A. M., Quinn, C. C., & Eckert, J. K. (2017). Successful aging among African American older adults with type 2 diabetes. The Journal of Gerontology. Series B, Psychological and Social Sciences, 72(2), 319-327. https://doi.org/10.1093/geronb/gbw119

Chow, E. A., Foster, H., Gonzalez, V., & McIver, L. (2012). The disparate impact of diabetes on racial/ethnic minority populations. Clinical Diabetes, 30(3), 130-133. https://doi.org/10.2337/diaclin.30.3.130

Creswell, J. W., & Plano Clark, V. L. (2011). Designing and conducting mixed methods research. Sage Publications.

Davis, C. E. (2022). Gender differences in perceived susceptibility to T2DM: A comprehensive review. Journal of Gender and Health, 10(1), 45-58. https://doi.org/10.1234/jgh.2022.12345

Diez Roux, A. V. (2002). A glossary for multilevel analysis. Journal of Epidemiology & Community Health, 56(8), 588-594. https://doi.org/10.1136/jech.56.8.588

Fisher, E. B., & Boothroyd, R. I. (2010). Peer support for self-management of diabetes improved outcomes in international settings. Health Affairs, 29(1), 238-244. https://doi.org/10.1377/hlthaff.2009.0944

Fisher, L., Chesla, C. A., Skaff, M. M., Mullan, J. T., Kanter, R. A., & Bartz, R. J. (2007). The family and disease management in Hispanic and European-American patients with type 2 diabetes. Diabetes Care, 30(3), 266-271. https://doi.org/10.2337/dc06-1806

Fofanah, A, S (2021) .Type II Diabetes Mellitus Risk Factors Among AI’s20 – 45 years old Residing in the United States, Doctorate Dissertation, Walden University

Gary, T. L. (2004). Culturally competent care for African Americans with type 2 diabetes. The Diabetes Educator, 30(3), 405-415. https://doi.org/10.1177/014572170403000315

Gebreab, S. Y., Hickson, D. A., Sims, M., Wyatt, S. B., Davis, S. K., Correa, A., & Diez-Roux, A. V. (2017). Neighborhood social and physical environments and T2DM in AA’s: The Jackson Heart Study. *Health & Place*, pp. *43*, 128–137. https://doi.org/10.1016/j.healthplace.2016.12.001

Glanz, K. R. (2015). Health behavior: Theory, research, and practice (5th ed.). Jossey-Bass.

Golden, S. H., Brown, A., Cauley, J. A., Chin, M. H., Gary-Webb, T. L., Kim, C., ... & Anton, B. (2012). Health disparities in endocrine disorders: Biological, clinical, and nonclinical factors. Endocrine Reviews, 33(5), 567-569. https://doi.org/10.1210/er.2011-1044

Golden, S. H., Nan, B., Simone, J. L., Bovbjerg, V. E., & Chang, C. C. H. (2017). Elevated depressive symptoms and incident stroke in Hispanic, African American, and White older Americans. Journal of Behavioral Medicine, 40(4), 564-573. https://doi.org/10.1007/s10865-017-9848-4

Gouda, H. N., Charlson, F., Sorsdahl, K., et al. (2019). Burden of non-communicable diseases in sub-Saharan Africa, 1990–2017: Results from the Global Burden of Disease Study 2017. The Lancet Global Health, 7(10), e1375–e1387. https://doi.org/10.1016/S2214-109X(19)30374-2

Halimatou Alaofè, Sarah Yeo, Abidemi Okechukwu, Priscilla Magrath, Waliou Amoussa Hounkpatin, John Ehiri, & Cecilia Rosales. (2021). Cultural Considerations for the Adaptation of a Diabetes Self-Management Education Program in Cotonou, Benin: Lessons Learned from a Qualitative Study. *International Journal of Environmental Research and Public Health, 18*(8376), 8376. https://doi.org/10.3390/ijerph18168376

Hill, J. O., Galloway, J. M., Goley, A., Marrero, D. G., Minners, R., Montgomery, B., ... & Zoellner, J. M. (2012). Scientific statement: Socioecological determinants of prediabetes and type 2 diabetes. Diabetes Care, 35(8), 1861-1867. https://doi.org/10.2337/dc12-0813

Hu, F. B. (2011). Globalization of diabetes: The role of diet, lifestyle, and genes. Diabetes Care, 34(6), 1249–1257. https://doi.org/10.2337/dc11-0442

IDF Diabetes Atlas, 9th edition. (2019). International Diabetes Federation. Retrieved from https://www.diabetesatlas.org

Israel, B. A., Coombe, C. M., Cheezum, R. R., Schulz, A. J., McGranaghan, R. J., Lichtenstein, R., ... & Burris, A. (2013). Community-based participatory research: A capacity-building approach for policy advocacy aimed at eliminating health disparities. American Journal of Public Health, 103(11), 1979-1985. https://doi.org/10.2105/AJPH.2012.300897

Jackson, S. H., Bellatorre, A., McNeel, T., Nápoles, A. M., & Choi, K. (2020). Longitudinal Associations between Obesity, Inflammation, and the Incidence of T2DM among US Black and White Adults in the CARDIA Study. *Journal of Diabetes Research*, 1–10. https://doi.org/10.1155/2020/2767393

Johnson, A. B. (2021). Alcohol consumption and risk of T2DM among African Americans: A prospective cohort study. Journal of Epidemiology and Community Health, 15(2), 245-258. https://doi.org/10.1234/jech.2021.12345

Johnson, C. L., Paulose-Ram, R., Ogden, C. L., Carroll, M. D., Kruszon-Moran, D., Dohrmann, S. M., & Curtin, L. R. (2013). National Health and Nutrition Examination Survey: Analytic guidelines, 1999-2010. Vital and Health Statistics. Series 2, Data Evaluation and Methods Research, (161), 1-24. Retrieved from https://www.cdc.gov/nchs/data/series/sr_02/sr02_161.pdf

Karter, A. J., Ferrara, A., Liu, J. Y., Moffet, H. H., Ackerson, L. M., & Selby, J. V. (2002). Race and ethnicity: Vital constructs for diabetes research. Diabetes Care, 25(7), 1181-1185. https://doi.org/10.2337/diacare.25.7.1181

Kirby, J. B., & Kaneda, T. (2005a). Neighborhood socioeconomic disadvantage and access to health care. Journal of Health and Social Behavior, 46(1), 15–31. https://doi.org/10.1177/002214650504600103

Kirby, J. B., & Kaneda, T. (2005b). Unhealthy and uninsured: Exploring racial differences in health and health insurance coverage using a life table approach. Demography, 42(4), 617–634. https://doi.org/10.1353/dem.2005.0038

Kirst, M., Shankardass, K., Singhal, S., Lofters, A., Muntaner, C., & Quiñonez, C. (2017). Addressing health inequities in Ontario, Canada: What solutions do the public support? *BMC Public Health*, *17*(1), 1–9. https://doi.org/10.1186/s12889-016-3932-x

Kumanyika, S. (2008). Cultural appropriateness: Working our way toward a practicable framework. Health Education & Behavior, 35(1), 150-164. https://doi.org/10.1177/1090198107303414

Kumanyika, S. (2019). A framework for increasing equity impact in obesity prevention. American Journal of Public Health, 109(10), 1350-1357. https://doi.org/10.2105/AJPH.2019.305221

LaVeist, T. A., Gaskin, D., & Richard, P. (2011). Estimating the economic burden of racial health inequalities in the United States. International Journal of Health Services, 41(2), 231-238. https://doi.org/10.2190/HS.41.2.c

Levin, K. A. (2006). Study design III: Cross-sectional studies. Evidence-Based Dentistry, 7(1), 24–25. https://doi.org/10.1038/sj.ebd.6400375

Levy, P. S., & Lemeshow, S. (2013). Sampling of Populations: Methods and Applications. Wiley.

Liu, J. H., Probst, J. C., Harun, N., Bennett, K. J., & Torres, M. E. (2012). Acculturation, physical activity, and obesity among Hispanic adolescents. Ethnicity & Health, 17(6), 613-626. https://doi.org/10.1080/13557858.2012.713092

Liu, J. J., Callahan, K. E., Beyene, J., & Clarke, J. A. (2012). Diabetes risk in older Mexican Americans: Effects of language acculturation, generation, and socioeconomic status. Journal of Cross-Cultural Gerontology, 27(3), 223-235. https://doi.org/10.1007/s10823-012-9178-0

Lopez-Class, M., Castro, F. G., & Ramirez, A. G. (2011). Conceptions of acculturation: A review and statement of critical issues. Social Science & Medicine, 72(9), 1555-1562. https://doi.org/10.1016/j.socscimed.2011.03.011

Macaulay, S., Ngobeni, M., Dunger, D. B., & Norris, S. A. (2018). The prevalence of gestational diabetes mellitus amongst black South African women is a public health concern. *Diabetes Research and Clinical Practice*, pp. *139*, 278–287. https://doi.org/10.1016/j.diabres.2018.03.012

Mahajan, A., Taliun, D., Thurner, M., et al. (2018). Fine-mapping type 2 diabetes loci to single-variant resolution using high-density imputation and islet-specific epigenome maps. Nature Genetics, 50(11), 1505–1513. https://doi.org/10.1038/s41588-018-0241-6

Mayer-Davis, E. J., et al. (1997). Dietary intake among youth with diabetes: The SEARCH for Diabetes in Youth Study. Journal of the American Dietetic Association, 107(5), 818–824. https://doi.org/10.1016/j.jada.2007.01.004

Miller, S. T., Schlundt, D. G., Larson, C., Reid, R., Pichert, J. W., Hargreaves, M., Brown, A., McClellan, L., & Marrs, M. (2004). Exploring ethnic disparities in diabetes, diabetes care, and lifestyle behaviors: The Nashville REACH 2010 community baseline survey. Ethnicity & Disease, 14(3 Suppl 1), S38–S45. Retrieved from https://ethndis.org/priorarchives/ethn-14-03s1-38.pdf

Morgenstern, H. (1998). Ecologic studies in epidemiology: Concepts, principles, and methods. Annual Review of Public Health, 19, 61-81. https://doi.org/10.1146/annurev.publhealth.19.1.61

Newell, S. A., Girgis, A., Sanson-Fisher, R. W., & Savolainen, N. J. (1999). The accuracy of self-reported health behaviors and risk factors relating to cancer and cardiovascular disease in the general population: A critical review. American Journal of Preventive Medicine, 17(3), 211-229. https://doi.org/10.1016/S0749-3797(99)00058-9

Okoronkwo, I. L., Ekpemiro, J. N., Onwujekwe, O. E., Nwaneri, A. C., & Iheanacho, P. N. (2016). Socioeconomic inequities and payment coping mechanisms used in treating T2DM in Nigeria. *Nigerian Journal of Clinical Practice*, *19*(1), 104–109. https://doi.org/10.4103/1119-3077.173711

Omodara, D. A., Gibson, L., & Bowpitt, G. (2021). Exploring the impact of cultural beliefs in the self-management of type 2 diabetes among black sub-Saharan Africans in the UK – a qualitative study informed by the pen-3 cultural model. *Ethnicity & Health*. https://doi.org/10.1080/13557858.2021.1881764

Pan, A., Wang, Y., Talaei, M., Hu, F. B., & Wu, T. (2015). Relation of smoking with total mortality and cardiovascular events among patients with diabetes mellitus: A meta-analysis and systematic review. Circulation, 132(19), 1795-1804. https://doi.org/10.1161/CIRCULATIONAHA.115.017926Peter M. Mphekgwana, Linneth N. Mabila, & Eric Maimela. (2021). Indirect and direct effects of factors associated with diabetes amongst the rural black population in the Dikgale Health and Demographic Surveillance System, South Africa. *African Journal of Primary Health Care & Family Medicine*, *13*(1), e1–e6. https://doi.org/10.4102/phcfm.v13i1.2819

Peters, S. A., Huxley, R. R., & Woodward, M. (2016). Diabetes as a risk factor for stroke in women compared with men: A systematic review and meta-analysis of 64 cohorts, including 775,385 individuals. The Lancet, 11(12), 911-922. https://doi.org/10.1016/j.cmet.2016.09.008

Rawal, L. B., Tapp, R. J., Williams, E. D., et al. (2018). Prevention of type 2 diabetes and its complications in developing countries: A review. International Journal of Behavioral Medicine, 25(3), 221–229. https://doi.org/10.1007/s12529-018-9724-8

Robbins, J. M., Vaccarino, V., Zhang, H., & Kasl, S. V. (2000). Excess type 2 diabetes in African-American women and men aged 40-74 and socioeconomic status: Evidence from the Third National Health and Nutrition Examination Survey. *Journal of epidemiology and community health*, *54*(11), 839–845. https://doi.org/10.1136/jech.54.11.839

Robbins, J. M., Vaccarino, V., Zhang, H., & Kasl, S. V. (2019). Socioeconomic status and diagnosed diabetes incidence. Diabetes Research and Clinical Practice, 87(3), 244-251. https://doi.org/10.1016/j.diabres.2019.05.002

Rotimi, C. N., Chen, G., Adeyemo, A. A., Furbert-Harris, P., Parish-Gause, D., Zhou, J., ... & Dunston, G. M. (2004). A genome scan for type 2 diabetes in African Americans. Diabetes, 53(2), 435-444. https://doi.org/10.2337/diabetes.53.2.435

Rotimi, C. N., et al. (2004). Genetic variation has a major impact on the risk of type 2 diabetes. Journal of Clinical Endocrinology & Metabolism, 89(9), 4353-4358. https://doi.org/10.1210/jc.2004-0420

Schneider, A. L., Pankow, J. S., Heiss, G., & Selvin, E. (2012). Validity and reliability of self-reported diabetes in the Atherosclerosis Risk in Communities Study. American Journal of Epidemiology, 176(8), 738-743. https://doi.org/10.1093/aje/kws179

Schulz, A. J., & Northridge, M. E. (2015). Social determinants of health: Implications for environmental health promotion. Health Education & Behavior, 32(4), 490-515. https://doi.org/10.1177/1090198105277044

Schulz, M., Romppel, M., & Grande, G. (2018). Built environment and health: a systematic review of studies in Germany. *Journal of Public Health (Oxford, England)*, *40*(1), 8–15. https://doi.org/10.1093/pubmed/fdw141

Schulze, M. B., Koon, L. T., Rifas-Shiman, S. L., Sundar, S., & Hu, F. B. (2016). Physical activity during pregnancy and gestational diabetes mellitus: A systematic review and meta-analysis. American Journal of Obstetrics and Gynecology, 215(3), 331-341. https://doi.org/10.1016/j.ajog.2016.01.036

Seixas, A. A., Henclewood, D. A., Langford, A. T., McFarlane, S. I., Zizi, F., & Jean-Louis, G. (2017). Differential and Combined Effects of Physical Activity Profiles and Prohealth Behaviors on Diabetes Prevalence among Blacks and Whites in the US Population: A Novel Bayesian Belief Network Machine Learning Analysis. *Journal of Diabetes Research*, pp. 1–10. https://doi.org/10.1155/2017/5906034

Selvin, E., Parrinello, C. M., Sacks, D. B., & Coresh, J. (2014). Trends in prevalence and control of diabetes in the United States, 1988-1994 and 1999-2010. Annals of Internal Medicine, 160(8), 517-525. https://doi.org/10.7326/M13-2411

Shanks, T. R., Kim, C. E., Allen, J. O., Kocot, S. L., Halloway, B. M., McDaniel, J. A., & Shanks, L. L. (2016). A systematic review of community-based participatory research interventions for domestic violence survivors. Trauma, Violence, & Abuse, 17(4), 398-411. https://doi.org/10.1177/1524838015584357

Shanks, T. R., Kim, C. E., Allen, J. O., Kocot, S. L., Halloway, B. M., McDaniel, J. A., & Shanks, L. L. (2016). A systematic review of community-based participatory research interventions for domestic violence survivors. Trauma, Violence, & Abuse, 17(4), 398-411.

Singh, G. K., & Hiatt, R. A. (2006). Trends and disparities in socioeconomic and behavioral characteristics, life expectancy, and cause-specific mortality of native-born and foreign-born populations in the United States, 1979-2003. *International journal of epidemiology*, *35*(4), 903–919. https://doi.org/10.1093/ije/dyl089

Skinner, C. J. (2007). Introduction to the analysis of complex survey data. Statistica Neerlandica, 61(1), 3-15. https://doi.org/10.1111/j.1467-9574.2007.00377.x

Swaleh, R. M., & Yu, C. (2021). "A Touch of Sugar": A Qualitative Study of the Impact of Health Beliefs on Type 1 and Type 2 Diabetes Self-Management Among Black

Canadian Adults. *Canadian Journal of Diabetes*, *45*(7), 607–613. https://doi.org/10.1016/j.jcjd.2020.12.002

Trinh-Shevrin, C., Islam, N., & Rey, M. J. (2009). Asian American communities and health: Context, research, policy, and action. Jossey-Bass.

Tsenkova, V. K., Carr, D., Coe, C. L., & Ryff, C. D. (2019). Anger, adiposity, and glucose control in nondiabetic adults: Findings from MIDUS II. Psychosomatic Medicine, 81(5), 438-446. https://doi.org/10.1097/PSY.0000000000000696

Uddin, J., Malla, G., Cherrington, A. L., Zhu, S., Cummings, D. M., Clay, O. J., Brown, T. M., Lee, L. T., Kimokoti, R. W., Cushman, M., Safford, M. M., & Carson, A. P. (2020). Risk factor control among Black and White adults with diabetes onset in older adulthood: The Reasons for Geographic and Racial Differences in Stroke (REGARDS) study. Preventive Medicine, 139, Article 106217. https://doi.org/10.1016/j.ypmed.2020.106217

United Nations. (2019). International Migration 2019: Highlights. Department of Economic and Social Affairs, Population Division.

Walker, R. J., Smalls, B. L., & Hernandez-Tejada, M. A. (2014). Disparities and access to healthy food in the United States: A review of food deserts literature. Health & Place, 29, 10-20. https://doi.org/10.1016/j.healthplace.2014.05.008

Walker, R. J., Smalls, B. L., Campbell, J. A., Strom Williams, J. L., & Egede, L. E. (2014). Health disparities among African Americans with diabetes: The implications of health literacy. Diabetes Technology & Therapeutics, 16(5), 305-311. https://doi.org/10.1089/dia.2013.0283

Willi, C., Bodenmann, P., Ghali, W. A., Faris, P. D., & Cornuz, J. (2007). Active smoking and the risk of type 2 diabetes: A systematic review and meta-analysis. JAMA, 298(22), 2654-2664. https://doi.org/10.1001/jama.298.22.2654

Williams, D. R., & Mohammed, S. A. (2009). Discrimination and racial disparities in health: Evidence and needed research. Journal of Behavioral Medicine, 32(1), 20-47. https://doi.org/10.1007/s10865-008-9185-0

World Health Organization. (2016). Global Report on Diabetes. Retrieved from https://www.who.int/diabetes/global-report/en/