

2017

# Dietary Acculturation and Obesity in African Immigrant Adults

Stella Chinyere Onuoha-Obilor  
*Walden University*

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# Walden University

College of Health Sciences

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Stella Onuoha-Obilor

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2017

Abstract

Dietary Acculturation and Obesity in African Immigrant Adults

by

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MPH, Walden University, 2015

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Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Public Health

Walden University

November 2017

## Abstract

Racial/ethnic groups are disproportionately affected by obesity and other risk factors for chronic diseases. African immigrants are an increasing segment of the U.S. population at greater risk for obesity than other immigrants living in the United States. Public health organizations that aid immigrants could benefit from information about changing dietary patterns. The purpose of this study was to explore the association between dietary acculturation and obesity among African immigrant adults living in the United States, controlling for length of stay, English proficiency, region of residence, and other sociodemographic factors. Acculturation theory guided this study. The research design was quantitative cross-sectional with secondary data from 798 adult immigrants of African origin who completed the New Immigrant Survey. Forward stepwise logistic regression analyses indicated that when controlling for sociodemographic factors, dietary acculturation was a significant predictor of obesity. Language proficiency, income, marital status, childhood living environment, and age were statistically significant predictors of obesity. Findings may be used by clinicians, dieticians, and other health care professionals to develop obesity prevention and control strategies that specifically serve African immigrants to prevent obesity and its associated deadly complications.

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## Dedication

This work is dedicated to Almighty God who made a way for me when there seemed to be no way. Now I can joyfully say that I know that thou oh God favors me because you never allowed my enemies to triumph over me (Psalm 41:11). I also dedicate this work to my mom Lolo Patricia Okachanma Pius Onuoha and my brother His Royal Highness, Eze, Dr. Charles Obinna Onuoha (Eze Udo III of Osu-Ama- Isiala-Mbano, Imo State of Nigeria) in honor of their memories and the good life that they gave to me. My mom, a young widow, was able to give all her children better lives that her parents could not afford. Mom I will forever love you. To you my late big brother Onyeze nkem, words and time will fail me if I begin to narrate how you transformed my life. You made me to understand that education is the biggest investment one could ever make in life. You invested in me big time and made me the richest medical student while I was in medical school. You once told me that the lives of educated people and those of the uneducated are two parallel lines that can never meet. I wish you were alive today to see me make you proud again. I will continue to live the legacy you left behind, and I will continue to live your words. I am indebted to you and I strongly believe that you did not invest in vain. Finally, this work is dedicated to the entire staff of Visiting Nurse Service of New York Choice Health Plans under the amiable leadership of Dr. Hany Abdelaal (president, VNSNY CHOICE) and Corriisa Sanford-Faber (director, Quality Management Department –CHOICE). Dr. Hany, your leadership attributes are second to none, and your humility is infectious. You gave me attention and allowed me to interview you for my leadership class. Your leadership created a wonderful work-life balance, and that played a major role in the success of my study.

## Acknowledgments

God, I thank you for your faithfulness, mercies, and kindness throughout my academic journey and my dissertation process at Walden University. My special thanks go to the best chair in the entire world, Dr. Mary Lou Gutierrez. You not only played the role of a chair, but you went above and beyond to provide me the best mentorship, guidance, and counseling that money could not have bought. Your timely, thorough, detailed, and constructive feedback navigated me faster in my dissertation journey. I am indebted to you. Thank you, Dr. Gwendolyn Francavillo, my committee member for your swift reviews and valuable contributions. Thanks to my university research reviewer, Dr. Michael Furukawa, for your timely review and contributions to the success of my study. Thank you, Dr. Nancy Rea. Walden University has a team with a winning culture and a culture of start to finish. To all my instructors, thank you for contributing to making me the best scholar-practitioner I can be.

To my dear husband, Paschal Obilor Sr. (chairman), thank you for your unwavering support. I promised myself that I will not fail you and I am glad today that I have delivered. My chairman I hope you are happy and proud of your beautiful wifey. My adorable children, Maryshawantel Chiamaka, Alicia Chinemerem, Chelsea Chidinma, and Paschal Nnaemeka, Jr., thank you all for being my cheerleaders. The need to provide you better lives navigated me all the time and fueled me even in my weakest moments. I vowed not to disappoint you or be a bad example in academics, behavior, and life in general. Kids, you all believed in me, and I did not disappoint you. As I promised, here is the delivery and this is the day that the Lord Has made, let us rejoice and be glad in it (Psalm 118:24).

Thank you Chief Ignatius Obilor my father in-law for your constant inspiration. My phone conversation with you will never end without you asking about my studies. You are a rare gem daddy. To my mother in-law Chief Beatrice Obilor, thank you so very much. My warmest thanks go to my wonderful siblings, the best in the whole wide world: Mrs. Christian Anumaka, Agile Lady Love Onuoha (Odibeze), the crowned Prince Festus Onuoha, Honorable Princess Miriam Onuoha (Mama SUREP) , Mrs. Nneoma Gift Anakor, and Mr. Desmond Onuoha. Thank you my sister in-laws Oluchi and Ify. My special thanks go to my uncle and his wife, Chief Romanus Ofoegbu and Lolo Ngozi Ofoegbu. You believed in me and I am glad today that I did not disappoint you.

I was fortunate to work at Affinity Health Plan under your transformational leadership. You allowed me to interview you for my leadership class assignment. Mr. Bertram Scott, you are a servant leader and your leadership style resonates with mine. You are very influential. Thank you for your continued excellent work of giving back to the society.



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## Section 1: Foundation of the Study and Literature Review

The population of African immigrants living in the United States has increased rapidly in the last three decades (Akpuaka, Clarke-Tasker, Nichols-English, Daniel, & Akpuala, 2013; Turk, Fapohunda & Zoucha, 2015; Wilson, 2016). As of 2010, there were 1.4 million African-born immigrants living in the United States. Evidence from research indicates that transition to the United States exposes immigrants to new lifestyle habits that have an impact on their health (Perez-Escamilla, 2016). Despite the growing population of African immigrants, examination of how the acculturation process within this community influences their health behavior and outcomes is sparse. The purpose of this study was to examine how dietary acculturation among African immigrants relates to obesity patterns within this population.

Obesity is a health condition typified by presence of excessive amount of fat in the body (Hernandez, Kimmelman, Fergusson, Grimshaw, & Hackam, 2013). Obesity is a complex disorder that is a product of genetic, cultural, social, and environmental factors. Obesity is a risk factor for many chronic diseases including cardiovascular illnesses, diabetes, cancer, kidney malfunction, chronic system inflammation, and fatty liver disease (Hernandez et al., 2013; Isasi et al., 2015; Stenholm et al., 2016). By establishing a link between acculturation process and obesity, the results of this study may contribute to improving programs aimed at addressing obesity among African immigrants residing in the United States. Reduction in obesity may help to reduce the prevalence of chronic illness within this population.

Section 1 presents the foundation of the study and literature review. Section 1 includes the problem statement, purpose of the study, research questions and hypotheses, theoretical foundation of the study, nature of the study, literature review, assumptions, scope and delimitations, significance, summary, and conclusion. Section 2 includes the research design and rationale, methodology, threats to validity, and summary. Section 3 presents the data collection of secondary data set, results, and summary. Section 4 includes a discussion of the study findings in the context of professional practice and the implications for social change. This section also includes the interpretation of the findings, limitation of the study, and recommendations.

### **Problem Statement**

Evidence from studies of immigrants to the United States indicated that dietary acculturation negatively influences dietary intake and dietary patterns, placing immigrants at increased risk for diet-related chronic diseases (Okafor, Carter-Pokras & Zhan, 2014; World Health Organization [WHO], 2014a). African-born immigrants who undergo Western dietary acculturation are more likely to increase dietary intake of high fat (Okafor et al., 2014; Tseng, Wright, & Fang, 2015). In addition, dietary acculturation is associated with lower consumption of legume fiber and fruits and vegetables, and greater consumption of cereal fiber, sugar-sweetened beverages, red meat, convenience canned foods, and starchy foods (Croom & Morrel, 2011; Lesser, Gasevic, & Lear, 2014; Serafica, 2014; Okafor et al., 2014). The WHO (2014a) reported that upon arrival to the United States, Hispanic, Asian, and African immigrants tend to have better health than their U.S.-born counterparts do. However, these health advantages decrease over time as

immigrants acculturate to U.S. society and adopt the unhealthy dietary patterns associated with lifestyle in their host country. African immigrants who develop moderate diet changes are more likely to have poorer self-rated health (Okafor et al., 2014). Transition to the United States exposes immigrants to new lifestyle habits that have an impact on their health (Baker et al., 2012; Perez-Escamilla, 2016). This shift in diet is associated with increased risk of obesity, heart disease, and diabetes (WHO, 2014b).

In addition to the influence of dietary acculturation, length of stay in the United States, English language proficiency, and income are associated with health risks. Length of stay is associated with higher prevalence of type 2 diabetes, hypertension, and cardiovascular disease compared to counterparts who did not immigrate (Lesser et al., 2014; Perez-Escamilla, Rafael & Predrag, 2016; Renzaho & Burns, 2016). Although length of stay and acculturation are associated with unhealthy dietary practices, Van Hook et al. (2015) and Serafica (2013) noted that among immigrants with income levels above the poverty threshold, acculturation was associated with lower dietary glycemic index, lower starch intake, and greater fruits and non-starchy vegetable intake compared to immigrants with lower socioeconomic status. In addition, immigrants with greater English language use have higher socioeconomic status, alcohol consumption, physical activity, and perceived health and less abdominal obesity compared to immigrants with lower or no English proficiency (Lesser et al., 2014; Okafor et al., 2014). Unhealthy eating and reduced physical activity are the main contributory factors associated with obesity.

Despite the growing population of African immigrants, studies addressing how the acculturation process within this community influences health behavior and outcomes are sparse. In addition, studies have not addressed the settlement patterns of African immigrants by region of the country or simultaneously controlled for all demographic factors. This study filled the literature gap by addressing the role of dietary acculturation, English proficiency, and region of the country as key independent predictors of obesity. Using a multivariate analysis, I controlled for length of stay in the United States and demographic factors (age, gender, income, education, and ethnicity) in African immigrant adults (see Croom & Morrel, 2011; Okafor et al., 2014; Tseng et al., 2015; WHO, 2014a).

### **Purpose of the Study**

The purpose of this study was to examine the association between dietary acculturation, English proficiency, region of residence, sociodemographic factors, and obesity among African immigrant adults residing in the United States.

### **Significance**

This study was significant because obesity is at epidemic levels in most of the populations of the United States, obesity carries several risks of chronic disease, and ethnic populations of immigrants who arrive with healthy lifestyles soon develop dietary habits that predispose them to obesity and chronic disease. As of 2012, about 34.9% of adults older than 18 years were obese in the United States, with highest prevalence identified in the non-Hispanic African American population (Lesser et al., 2014). Most of the literature on dietary acculturation and health outcomes addressed Asian and Hispanic



populations; however, fewer studies on African immigrants and their changes in dietary patterns have been conducted.

The population of African immigrants living in the United States has increased rapidly in the last three decades (Akpuaka et al., 2013; Turk et al., 2015; Wilson, 2016). According to the Pew Research Center (2015), as of 2013 there were 1.8 million African-born immigrants living in the United States, an increase of 41% since 2000. Foreign-born Africans come from all over the continent, but the most common countries of origin for African immigrants are Nigeria, Ethiopia, Egypt, Ghana, and Kenya (Pew Research Center, 2015). In addition to dietary acculturation, region of the United States where African immigrants settle affects availability of culture-specific foods. African immigrants are more likely to settle in the South (38%) where diets high in saturated fat, sodium, and sweet drinks are prevalent. Over a quarter of African immigrants (27%) are likely to settle in the Northeast, 18% in the West, and 17% in the Midwest. New York, California, Texas, Maryland, and New Jersey each have at least 100,000 thousand African immigrants (Pew Research Center, 2015).

The positive social change implications from this study included information to encourage future health-promotion strategies targeted to African and other immigrants to prevent consumption of unhealthy foods and create awareness of the importance of retaining ethnic diet and identifying availability of cultural food sources. The results of this study may contribute to positive social change by helping to inform clinicians, dietitians, and health care professionals to develop community health educational

programs that can specifically serve the African immigrant adults in reducing obesity and preventing obesity-related chronic diseases.

### **Framework**

The theoretical framework for this study was acculturation theory, which indicates that when an individual engages in a new culture, he or she is likely to lose the original culture. Serafica (2013) reported that acculturation to a host culture depends on the level of acculturation of the prior home culture. Individuals who have low affinity to their original culture and beliefs are more likely to acculturate to the culture of their host country. Individuals who do not have a strong affinity to their traditional foods will be early adopters to the diet of their host country. Similarly, when people move from one culture to another, aspects of their cultural identities are modified to accommodate information about and experiences within the new culture. According to Okafor et al. (2014), this process of cultural transition and adjustment to new life changes is referred to as acculturation. Acculturation theory provided evidence to support behaviors influencing health of adult African immigrants. Regev-Tobias et al. (2012) reported that upon arrival to the United States, African immigrants are healthier; however, 5 to 10 years after migration, immigrants tend to gain more weight and become either overweight or obese. Acculturation theory provided a lens to examine how dietary acculturation influences obesity among adult African immigrants.

### **Research Questions and Hypotheses**

The quantitative research questions of this study addressed to what extent dietary acculturation affects weight gain among African immigrants in the United States while

adjusting for other risk factors. Operationalization of variables is described in the methodology section.

Research Question 1: Is there a relationship between dietary acculturation and obesity among African immigrant adults residing in the United States?

- Ho1: There is no relationship between dietary acculturation and obesity among African immigrant adults.
- Ha1: There is a relationship between dietary acculturation and obesity among African immigrant adults.

Research Question 2: Is there a relationship between dietary acculturation and obesity among African immigrant adults residing in the United States, controlling for length of stay and region of residence in the United States, English language proficiency, and sociodemographic factors (age, gender, income, education, and ethnicity)?

- Ho2: There is no relationship between dietary acculturation and obesity among African immigrant adults after adjusting for length of stay and region of residence in the United States, English language proficiency, and sociodemographic factors.
- Ha2: There is a relationship between dietary acculturation and obesity among African immigrant adults after adjusting for length of stay and region of residence in the United States, English language proficiency, and sociodemographic factors.

### **Nature of the Study**

The study included a quantitative cross-sectional research design using a secondary data set to examine the relationship between dietary acculturation, region of residency, English proficiency, and obesity among African immigrant adults who reside in the United States. The dependent variable was obesity (overweight/obese), and the independent variables were dietary acculturation, English proficiency, age, gender, income, education, and ethnicity (country of origin). Statistical analysis consisted of logistic regression models to predict the odds of being obese by dietary acculturation, region of residency, and English proficiency while controlling for length of stay and demographic factors.

### **Literature Search Strategy**

The aim of this literature review process was to identify articles that addressed the subject of acculturation and its impact on health behaviors and outcomes, to synthesize knowledge, and to identify gaps. The search was conducted in several databases simultaneously: Walden University Library and Walden Library Books, PubMed, CINAHL Plus with Full Text, MEDLINE with Full Text, Cochrane Database of Systematic Reviews, Dissertations & Theses, Dissertations & Theses at Walden University, ProQuest Central, SAGE Knowledge (formerly Encyclopedias), SAGE Research Methods Online, SAGE Stats, Science Journals, Science Direct, ProQuest, ERIC, and Health Source: Nursing Edition. I also used the Google Scholar and Google search engines and the WHO and UNICEF websites.

The following key terms were used for the literature search: *acculturation and health behavior, African immigrants' health status, African immigrants & dietary practices, dietary habits, healthy immigrant effects, and dietary acculturation.*

Although I conducted an open-ended search for this literature review, emphasis was placed on peer-reviewed articles published between 2012 and 2016, available in full text, and written in English. Different types of articles were considered, include primary research, systematic reviews, opinion papers, editorials, and dissertations. Articles were scrutinized for the purpose, theoretical foundation, method, design, population, sample, and findings.

### **Literature Review Related Dietary Acculturation and Obesity**

The number of African immigrants living in the United States has increased in the past three decades (Akpuaka et al., 2013; Turk et al., 2015; Wilson, 2016). According to Blanas et al. (2013), the population of African immigrants living in the United States increased by more than 75% between 1980 and 2009. Akpuaka et al. (2013) reported that there are over 1.4 million African immigrants living in the United States. Gambiano, Trevelyan, and Fitzwater (2014) reported that out of the 1.6 million African immigrants living in the United States in 2010, 36% were from Western Africa, 29% from Eastern Africa, 17% from Northern African, and 5% from Southern African. The growth of the population of African immigrants has created new epidemiological challenges for the public health sector in the United States.

Despite continued growth of the immigrant population, immigrants' health has been overlooked for many decades due to the perceived healthy immigrant effect (HIE).

HIE is a widely cited phenomenon supported in the literature in which newly arrived immigrants tend to have better health status than their host population (Domnich, Panatto, Gasparini, & Amicizia, 2012; Kennedy, Kidd, McDonald, & Biddle, 2015). Some of the reasons associated with the HIE phenomenon include positive self-selection of locations where healthier, more educated and wealthier people tend to migrate, cultural buffering in which the native cultures of immigrants tend to prohibit unhealthy behaviors, and stringent screening and discrimination policies applied by host countries (Kennedy et al., 2015; Taylor & Sarathchandra, 2016).

New evidence, however, suggests that not all groups of immigrants manifest the HIE equally as it appears to be strongest among adults and less strong among children, adolescents, and the elderly (Kobayashi & Prus, 2012). HIE also varies according to the immigrant's country of origin with those born in Europe, Australia, and the United States recording stronger HIE compared to those who originate from Asia, South America, and Africa. Domnich et al. (2012) found that HIE does not cut across the life course of immigrants because immigrants tend to lose the health advantage over time and experience deteriorating health.

African immigrants living in the United States struggle with various health challenges. Akpuaka et al. (2013) found that, like African Americans, immigrants from Western African have high incidence of prostate cancer. Blanas et al. (2013) found that HIV infection rates among African immigrants are 6 times higher than the estimated prevalence in the general population. Venters and Gany (2012) found that although African immigrants arrive in the United States with high risk of infectious disease, their

state of health is generally better than those of African Americans of the same age. However, these immigrants develop risk factors for chronic illnesses such as hypertension, coronary artery disease, cancer, and diabetes with time (Venters & Gany, 2012).

In a qualitative study involving Ethiopian and Somali immigrants living in Central Ohio, Shipp, Franci, Fluegge, and Asfaw (2014) found that chronic conditions such as blood pressure and diabetes type 2 were of greater concern to these communities than infectious diseases. Participants also reported that stress and anxiety, limited understanding of the United States health care system, lack of medical insurance, lack of transportation, and communication barriers barred members of these communities from accessing and using health care services. In their study addressing occurrence of cardiovascular risk factors among six African immigrant groups living in Minnesota, Sewali et al. (2015) found that 55% of the participants were either overweight or obese and had a hypertension prevalence rate of 8%. Although these figures are below the national average, they indicate a high prevalence of lifestyle conditions within the immigrant community.

Evidence indicates that most of the lifestyle-related health outcomes affecting African immigrants living in the United States are because of acculturation. Seaman (2013) explained that in most African communities, people have limited access to high-calorie processed foods and sedentary lifestyles. The transition to the United States exposes African immigrants to new lifestyle habits that put their health at risk. Venters and Gany (2012) also reported that one of the major adjustments that African immigrants

make when they get to the United States is in their nutritional options. These immigrants adapt to high-calorie foods with low nutritional value. Turk et al. (2015) also found that many activities, foods, and behaviors in the United States were perceived as unhealthy by a sample of Nigerian immigrants. Most immigrants from African countries find life in the United States demanding with most immigrants having at least two jobs to make ends meet. This hectic lifestyle tends to encourage families to adapt to takeout food and eat-on-the go habits.

Despite the growing population of African immigrants and health challenges that they experience, studies addressing how the acculturation process influences the health behavior of this population are sparse. Integrative reviews by Agbemenu (2016) led to identification of only 10 articles discussing the health of African Americans and only one study by Okafor, Carter-Pokras, Picot, and Zhan (2013) linking health patterns of this population to the acculturation process. However, the study by Okafor et al. (2013) was limited to one indicator of acculturation, English proficiency and self-reported health. Therefore, additional and more robust research on cultural background and acculturation was necessary to inform strategies for mitigating health risks facing African immigrants living in the United States.

### **Acculturation Definition and Measures**

Acculturation occurs when members of a minority group adopt the behavioral patterns and traditions of the dominant group (Vargas & Jurado, 2016). Nguyen and Benet-Martinez (2013) defined acculturation as the process of learning and adapting to a new culture. It is an individual rather than a group level phenomenon where change



affects individuals at different rates and levels (Maupome, Marino, Aguirre-Zero, Ohmit, & Dai, 2015). There is no consensus when it comes to measuring acculturation.

According to Reynolds, Sodano, Ecklund, and Guyker (2012), there are two main models of conceptualizing and measuring acculturation: the unilinear and bilinear models. The unilinear perspective conceptualizes acculturation as a continuum in which an individual identifies with his or her native culture or the culture of the host communities. This model has acculturation and enculturation on extreme ends, and biculturalism at the midpoint (Baker et al., 2012; Han, Berry, Gui, & Zheng, 2015). This model asserts that acculturation occurs when one abandons his or her culture in exchange for the cultural practices of the dominant group.

On the other hand, the bilinear perspective conceptualizes acculturation and enculturation as distinct phenomena with acculturation viewed as level of association with the host culture and enculturation viewed as level of association with the native culture (Nguyen & Benet-Martinez, 2013). This model suggests that abandoning culture of birth and substituting it with the dominant culture is not the only path to acculturation as it is possible for the two cultures to coexist. The model asserts that to accurately measure acculturation, the instrument needs to assess the extent to which an individual is oriented to the host culture, as well as the extent to which he or she is oriented to the native culture (Dalisay, 2012). The interaction between the dominant and indigenous cultures may result in four outcomes: assimilation (inclination to the dominant culture, integration/ biculturalism (inclination to both cultures), separation (inclination to the indigenous culture, and marginalization (inclination to neither culture) (Fox, Merz,

Solorzano, & Roesch, 2013; Han et al., 2015). Measuring tools based on the bilinear model involves two separate scales for assessing acculturation and enculturation.

ARASMA-II is an example of a tool developed using the bilinear model.

The two models of acculturation were tested empirically in several studies. Capiello (2016) found that the bilinear model comprising three dimensions (cultural behaviors, ethnic identity, and values) had better fit when compared to the unilinear model comprising similar dimensions. Han et al. (2015) also found that the four acculturation strategies based on the bilinear model were effective in predicting resilience among the Qiang community in the aftermath of the 2008 Chinese earthquake. The bilinear model was also supported by Dalisay (2012) who found that continued use of native language media by immigrants did not predict acculturation. Most immigrants keep some aspects of the native culture while acquiring some norms, values, and habits of the host society. Although the bilinear model is accepted as the most proper conceptualization of acculturation, most measures use the unilinear perspective. Fox et al. (2013) recommended the Latent Profile Analysis (LPA) technique to analyze data to establish the acculturation style within a given population.

Serafica (2014) divided the approaches commonly used to measure dietary acculturation into three categories: single-item measures, acculturation scales, and food-based assessments. Single-item measures provide a general assessment of acculturation and may focus on items such as language proficiency, length of stay, and generation level. Acculturation scales are used to measure distinct aspects of exposure to the host community while food-based assessments focus on items such as dietary intake patterns.

Maupome et al. (2015) noted that most scales designed to measure acculturation focus on behavioral dimensions of the acculturation process such as language preference and language proficiency. Maupome et al. recommended that to produce broader and more exact measures of acculturation, scales should complement behavioral dimensions with psychological dimensions such as ethnic self-identification.

Scales for measuring acculturation in specific groups of immigrants were developed. Scales such as the Short Acculturation Scale for Hispanics (SASH) and the Cultural Identity Scale for Latino adolescents were developed specifically for use on Hispanic immigrants (Maupome et al., 2015; Perez-Escamilla, 2016). On the other hand, scales such as the Asian American Multidimensional Acculturation Scale and the East Asian Acculturation Measure (EAAM) were developed specifically for use on Asian immigrants (Baker et al., 2012; Serafica, 2014). There is no specific scale for measuring acculturation among African immigrants living in the United States. Studies addressing the applicability of general scales to this population are also sparse. Johnson-Agbakwu, Flynn, Asiedu, Hedberg, and Breitkopf (2016) tried to adapt the Bicultural Involvement Questionnaire (BIQ) and test its suitability in measuring the acculturation process among female immigrants from East and Central Africa. Findings indicated that the subscales of the modified BIQ had acceptable Cronbach's alpha scores, which indicated that the subscales were reliable measures of acculturation among female African immigrants.

Several studies addressing the relationship between acculturation and health included proxies to conceptualize acculturation rather than acculturation scales. One of the most common proxies used to measure acculturation was length of stay. Regev-

Tobias et al (2012) found that after an average of 14 years in Israel, female Ethiopian immigrants increased their BMI from 19-20 kg/m<sup>2</sup> to 24.9 kg/m<sup>2</sup>. The study also revealed limited consumption of folate, calcium, fiber, vegetables, fruits, and dairy products (Regev-Tobias et al., 2012). Consumption of simple sugar in this population increased while energy expenditure declined. Tseng et al. (2015) also found that length of stay was significantly associated with acculturation and increased intake of high energy diet, fat, and sugar, as well as decreased dietary moderation scores among Chinese immigrants in the United States. However, the change in dietary habits during the duration of study was small, and the health impact of dietary habits was not established.

In another study, Isasi et al. (2015) found that Hispanics who were born in the United States or had lived in the country for more than 20 years were more likely to have high incidence of obesity than those who had lived in the country for less than 20 years. This finding also suggested that length of stay is a good proxy for measuring acculturation. However, the study was specific to the Hispanic American immigrant population; hence, the findings might not apply to African immigrants. Other indicators commonly used as proxy indicators of acculturation include ethnic social relations, English language proficiency, media language preference, knowledge of American politics, and preference for using English in social interaction (Dalisay, 2012; Vargas & Jurado, 2016). Lee, O'Neill, Ihara, and Chae (2013) challenged the use of English proficiency as a proxy for acculturation as immigrants from some countries move to the United States when they already have mastered the English language.

## **Dietary Acculturation**

Dietary acculturation refers to the process that leads to the adoption of eating habits/patterns of the host by a group of immigrants (Castellanos, 2014). Dietary acculturation is one type of acculturation, and a complex, dynamic, and multidimensional process. Most studies that focus on assessing dietary acculturation use food-based measures as opposed to single-item proxies such as length of stay, language use and preference, or the acculturation scales (Hook et al., 2015; Smith & Franzen-Castle, 2012). In their study, Hook et al. (2015) examined factors that influence dietary acculturation among Mexican child immigrants. The authors found that acculturation indicators were strongly associated with the Americanization of the children's diets. This finding suggests that indicators of acculturation in general can also be effective measures of dietary acculturation.

The association between general acculturation and change in dietary habits among immigrants was confirmed in the study by Lesser, Gasevic, and Lear (2014) where they addressed how acculturation influences dietary patterns among South Asian immigrants living in Canada. Dietary acculturation was measured using a questionnaire assessing perceived changes in food preparation, dietary patterns, and nutrition. General acculturation was measured using length of stay in Canada. Results revealed that compared to more recent immigrants, those who had stayed longer in the country had increased odds of adopting dietary patterns of the host such as stir frying and microwaving of food.

In his systematic review, Serafica (2014) assessed measures used to assess dietary acculturation in the Asian American population. According to Serafica, there are three major approaches for measuring dietary acculturation: use of single item measures of general acculturation such as length of stay, use of acculturation scales, and use of food-based assessments. In general, studies that use acculturation scales use those developed for measuring acculturation .. However, there are scales which were specifically developed to measure dietary acculturation among specific populations. For instance, the study by Vargas & Jurado (2016) used the Dietary Acculturation Scale for Filipino Americans (DAQFA) to measure dietary acculturation among Filipino immigrants living in the United States.

### **Dietary Acculturation and Health**

The relationship between acculturation and health is well documented in the existing body of literature. For example, Serafica (2014) found that Asian immigrants in the United States tend to adopt Western dietary patterns. Some changes in dietary patterns were positive such as reduction in sodium intake among Koreans immigrants, which reduces the risk for hypertension. There were also changes in diet that negatively affect health, such as lower consumption of vegetables and potassium, higher consumption of fats and sugar, and increase in frequency of food consumption (Serafica 2014). Allen et al. (2014) found that acculturation had a direct effect on smoking and dietary behaviors of residents of low-income households in Boston Metropolitan Area. The study, however, did not find a significant relationship between acculturation and physical activity.

The influence of acculturation on dietary habits of immigrants was noted in the Mexican food-based and physical activity guidelines (Perez-Escamilla, 2016). These evidence-based guidelines recognize that immigrants have higher levels of vulnerability to food insecurity and changes in dietary habits due to the acculturation process. Baker et al. (2012) found that bicultural individuals from the Asian American community had greater psychological well-being when compared to those inclined to the Asian culture and those inclined to the Western culture.

Jonsson et al. (2013) found that increased host country language proficiency was associated with an increase in leisure time physical activities (LTPA) among female immigrants in Sweden. Jonsson et al. (2013) also suggested the existence of a positive link between level of acculturation, health behaviors, and outcomes of immigrants. Lee et al. (2013) found that immigrants who spent more than one year in the United States were more likely to report a negative change in health than those who were in the United States for less than one year. Health of immigrants is inversely correlated with length of stay in the United States. The odds of reporting negative change in health were 2.69 times for those who had stayed for 1-5 years, 5.24 times for those with a length of stay of 6-10 years, 6.20 times for those with a stay of 11-15 years, and 6.61 times for those who had stayed for more than 15 years. Lee et al. (2013) also found that a significant change in diet and low English proficiency were associated with a negative change in health. The present study not only supports the existence of a significant link between acculturation as measured by length of stay and health of immigrants, but also suggests dietary change is an important pathway in this relationship.

The studies discussed above focused on effect of acculturation in general on health of immigrants. However, the study by Smith and Franzen-Castle (2012) focused on dietary acculturation and its effect on health. The study established that dietary acculturation was a significant predictor of blood pressure among immigrant children. However, the study by Smith and Franzen-Castle was significantly different from my study because it focused on immigrant children and assessed effect of dietary acculturation on blood pressure rather than obesity. Okafor et al. (2014) examined the association between dietary acculturation and health within the African immigrant adult population, and found that immigrants who reported moderate change in diet after entry to the United States had higher odds of rating their health as poor than immigrants who reported low dietary change. Although Okafor et al. (2014) assessed dietary acculturation among African immigrants; they did not relate this variable to obesity but rather the self-reported health of the immigrants.

### **Dietary Acculturation and Obesity**

The specific focus of the present study is to examine the relationship between acculturation and obesity among African American immigrants. Focus on obesity is informed by the fact that obesity is a major risk factor for other chronic illnesses including cardiovascular diseases, diabetes, some cancer forms, fatty liver disease, and kidney failure (Isasi et al., 2015; Stenholm et al., 2016). There are several studies examining the relationship between acculturation and obesity, but results from these studies are not consistent. Vargas and Jurado (2016) found that greater acculturation was associated with increased BMI and waist circumference among Filipino Americans



immigrants by increasing caloric intake, percentage fat intake, and percentage carbohydrate intake.

Similarly, Griffith et al. (2014) found that the BMI of African adolescent immigrants living in Melbourne Australia was associated with parents' acculturation patterns. Adolescents whose parents adopted the integration acculturation strategy had lower BMI than those whose parents used other strategies. In their systematic review, Goulao, Santos, and Carmo (2015) found that BMI was positively associated with length of stay of immigrants. Underlying causes for increase in BMI after immigration include change in physical activity and nutrition, genetic susceptibility, and social factors. Although 25 out of the 39 reviewed studies focused on immigrants living in the United States, only six studies mentioned African immigrants.

Paxton et al. (2016) used the qualitative approach to examine change in dietary habits among recent immigrants from West Africa. The immigrants' diet before entry to the United States was characterized by high amount of root tubers, fruits, vegetables, and vegetable oil, moderate amount of fish and meat, and low sugar. Despite efforts to keep this traditional diet, there were signs that these immigrants were adopting the Western dietary patterns (Paxton et al., 2016). The children of the immigrants were more likely to adopt the Western eating habits. Participants also reported a drastic increase in weight after living for a few years in the United States. The study offers some evidence on the association between change in dietary habits and increases in weight.

Isasi et al. (2015) found that there was no significant relationship between acculturation and obesity among adult Hispanic immigrants living in the United States.

The study established that prolonged exposure to the environment in the host communities, rather than acculturation increases the risk for obesity among Hispanic immigrants. Tovar et al. (2013) also found that there was no statistically significant relationship between acculturation as measured by length of stay in the host country and the feeding style of recent immigrants. Feeding styles was, however, associated with obesity among mothers and children who had less than five family meals per week. Tovar et al established that obesity was a major problem among recent immigrants with 25% of the children in this population being obese and 20% being overweight.

Creighton et al. (2012) found that acculturation measures partly explained reduced intake of fruits among second and third generation Blacks and Mexicans. However, social and linguistic acculturation measures did not explain obesity differences among immigrants from different ethnic/national backgrounds with varying length of stay in the country. The finding suggests that the relationship between length of stay and obesity among immigrants may be attributed to other environmental factors rather than acculturation. Ro et al. (2015) found that although immigrants' length of stay in the United States was significantly associated with increased obesity, the inclusion of behavioral variables did not change the significance and magnitude of the relationship between length of stay and obesity patterns. The findings led to the conclusion that the relationship between obesity and length of stay is not simply an issue of acculturation. However, the study only examined the effect of three health behavior variables: alcohol use, smoking, and exercise; hence, does not provide a comprehensive conclusion on

whether the acculturation process can explain the link between obesity and immigrants' length of stay.

In their systematic review focusing on evidence about acculturation and obesity among adult immigrants in developed countries, Delavari et al. (2013) found that there were some inconsistencies regarding the direction of the relationship between the two variables. Six out of the nine articles that were included in the review found a positive relationship between level of acculturation and obesity while the remaining three articles found that higher acculturation was negatively associated with BMI/obesity.

### **Acculturation and Socioeconomic Status**

Literature suggests that several factors mediate or moderate the relationship between acculturation and health behaviors of immigrants. One of these factors is social economic status. Allen et al. (2014) found that the financial resources of immigrants had a considerable influence on the strength of the relationship between acculturation and health habits. Immigrants exposed to material hardship were more likely to have their health behaviors influenced by the acculturation process. Isasi et al. (2015) also found that Hispanic immigrants with a household income of less than US \$40,000 per year had more incidents of extreme obesity than those with a household income of more than US \$40,000 per year. This finding also highlighted the role that socioeconomic status play in the relationship between acculturation and health.

In their study, Lee et al. (2013) found that there was a stronger relationship between negative change in health status and length of stay among uninsured immigrants when compared to those who have health insurance. This finding also highlighted that

socioeconomic status is a significant modifier of the relationship between acculturation and health. Delavari et al. (2015) also found that Iranian immigrants of middle income status perceived Australia as an unhealthier food environment when compared to immigrants of lower and higher income status. The region of residents in the immigrant home country and religion also had an impact of the experiences of the Iranian immigrants in the Australian context. Immigrants who came from small towns and cities and were Muslims were more likely to perceive the Australian environment as physically active and healthier.

According to Gambino, Trevelyan, and Fitzwater (2014), over 25% of African immigrants came into the United States as asylum seekers or refugees as results of conflicts in Sudan, Liberia, Somalia and other countries. Due to the involuntary nature of their relocation and exposure to pre-migratory violence, these immigrants tend to be poorer than their hosts and immigrants who came into the country out of their own choices. According to Shipp et al. (2014), the involuntary immigrants are also more likely to have limited access to health, high illiteracy level, limited access to diet, and lower level of resilience.

### **Age and Acculturation**

Another factor that linked to the acculturation process is age of immigrants. Delavari et al. (2015) found that there was a statistically significant relationship between age of Iranian immigrants living in Australia and their acculturation strategy. Results showed that most young immigrants had adopted the assimilation acculturation strategy while older immigrants had adopted the integration strategy. The study also established

that the acculturation process was modified by reason for migration. In another study, Serafica (2014) also found that Asians who migrate to the United States at an older age and live in metropolitan areas are more likely to maintain traditional dietary patterns. This finding not only highlights the moderating effect of socioeconomic condition, but also that of age.

The age factor was also evident in Rafieyan et al. (2014), where it was found that most Iranian students (80.28%) on a one-semester exchange program in the United States adopted the integration acculturation strategy followed by the assimilation strategy (76.8%). Only 16.32% of the students adopted the separation strategy while 9.53% exhibited the marginalization strategy. In their study focusing on immigrants living in Australia, Menigoz, Nathan, and Turrell (2016) found that men who arrived in the country as adolescents, and both men and women who arrived as children had higher BMI than other categories of participants. This finding also suggested that age at migration influences the acculturation patterns of individuals, and modifies the relationship between acculturation and health.

In a qualitative study by Turk, Fapohunda, and Zoucha (2015), one of the participants reported that their children often prefer unhealthy American foods, but she always try to balance these foods with native African dishes. This finding also highlighted that age may play a role in moderating effect of acculturation on dietary behavior. The study by Jonson et al. (2013) showed that the women who migrated to Sweden at early age (18- 34 years) were more likely to participate in physical activities than those who migrated at advance age (35-65 years). The study also established that the

immigrants' country of origin was also significantly associated with participation in physical activity and language proficiency. This finding suggested that immigrant ethnicity/ cultural background can also be an important moderating variable in the relationship between acculturation and health behavior.

### **Ethnicity/ Nationality/ Race and Acculturation**

It has been hypothesized that immigrant's ethnicity, nationality, and racial background also modify the acculturation process and it influences immigrant's health. This hypothesis is supported in the study by Sewali et al. (2015) where it was found that there were major differences in occurrence of cardiovascular risk factors and health behaviors across immigrants from six African countries. Immigrants from Liberian and Kenya had the highest prevalence of diabetes and hypertension risk factors while those from Somalia had the lowest. Liberians had the greatest tendency to engage in health protective behaviors than immigrants from the other five countries. Griffith et al. (2014) also found that African Adolescent immigrants living in Melbourne whose parents came from rural areas had higher BMI than those whose parents came from urban areas. This finding suggested that not only does ethnicity influence the acculturation process and health of immigrants, but also the pre-migration living environment.

In their study examining acculturation and obesity among Hispanic immigrants, Isasi et al. (2015) found that prevalence of obesity varied across various Hispanic ethnic groups with Puerto Rican recording the highest incidents and South American having the lowest. Menigoz et al. (2016) also found that men from the Middle East, North African, and Oceania regions had significantly higher BMIs than Australian born men while those

from Asia and North- West Europe has significantly lower BMIs than Australian-born men. In their systematic review of literature, Goulao et al. (2015) found that change in weight among Asian immigrants varied across different ethnic groups/ nationalities. Chinese immigrants living in Western countries recorded little change in weight while Indian immigrants did not record any change in weight. There was a significant and positive change in BMI among immigrants from Vietnam and Turkey.

### **Gender and Acculturation**

Another factor that is believed to influence the acculturation process and its impact on health is the gender of participants. The gender effect was evident in the study by Menigoz et al. (2016) where it was found that while BMI of male immigrants varied across ethnic groups, female immigrants from all ethnic groups and nationality had lower BMI than Australian-born women. Ro et al. (2015) also found that female immigrants had higher risk for obesity with prolonged length of stay while males had higher risk for overweight. In addition, physical inactivity was positively correlated with length of stay among female immigrants, but not in males. These findings led to the conclusion that gender is an important moderator of the acculturation process among immigrants living in the United States.

In their systematic review, Goulao et al. (2015) found that there were differences in the pattern of change in BMI between genders in studies conducted among Hispanic immigrants. In one of the studies, males were found to have higher BMI in the long-term than in the short-term immigrants, while females recorded higher BMI in all length of stay. Another study revealed that male immigrants from sub-Saharan Africa had greater

probability of misperceiving their weight status than men from other regions. Griffith et al. (2014) also found that gender was significantly related to the BMI of adolescent immigrants from sub-Saharan Africans living in Melbourne, Australia.

In their qualitative study, Tiedje et al. (2014) also found that there were gender differences in the eating practices of adult and adolescent immigrant groups of Mexican, Cambodian, Somali, and Sudanese origin. Women from these groups were more likely to eat traditional and healthier foods prepared at home than their male counterparts because the later tend to spend more time away from home. Some studies have, however, given conflicting results about the influence of gender on the acculturation process. For instance, Lee et al. (2015) found that there was no statistically significant interaction between gender and acculturation variables among immigrants living in the United States.

### **Definitions**

*African immigrants*: Individuals of African descent who were born outside the United States and have migrated to the United States (Cole, 1995).

*Body mass index (BMI)*: A measurement universally used to classify overweight and obesity in adults. BMI is calculated as weight in kilograms divided by the square root of height in meters (CDC, 2005).

*Demographic factors*: Factors including age, gender, ethnicity, and marital status that influence the acculturation process (Shipp et al., 2014).

*Dietary acculturation*: The process by which immigrants adopt new dietary practices.



*Immigrant*: A person who is allowed to enter the United States lawfully and intends to permanently reside in the country.

*Overweight and obesity*: Abnormal fat accumulation that may be associated with some chronic diseases (WHO, 2005).

*Socioeconomic factors*: Factors including household income, occupation, place of residence, and level of education that influence the acculturation process (Allen et al., 2014).

### **Assumptions**

The following assumptions were made in this study:

1. The New Immigrant Survey (NIS) 2003 data set was a cross-sectional study carried out using a probability sampling technique.
2. The length of stay was an accurate measure of acculturation among African immigrants. Length of stay was not an actual but a proxy measure for acculturation. The use of this measure was necessary because the study included secondary data that were not derived from acculturation scales. Although the validity of this measure among African immigrants was not tested, it has been confirmed among other groups of immigrants (Goulao et al., 2015).
3. The information that was collected through the NIS was accurate. This assumption was founded on the rationale that the NIS study included records from the United States. Immigration and Naturalization Services, which

mitigated the limitation associated with the use of self-reported measures in collected data.

4. Participants in this study told the interviewers the truth concerning the various variables used for the study.
5. The data set had enough cases and variable for unbiased study of the variables of interest.
6. Missing data occurred in a completely random manner, and their absence did not bias the study even if a listwise or casewise data deletion technique was used in data management (Langkamp, Lehman, & Lemeshow, 2010).

### **Limitations**

The limitations of this study are listed below:

- 1 This study was a secondary data analysis; therefore, some variables that may have added value to the study were not included in the data set.
- 2 Missing data may have affected the inferences drawn from this study; I could not modify the data set to ensure removal of missing data.
- 3 This data set was collected more than 13 years before the study, and the experience of African immigrants may have changed. The quality of the data set was dependent on the researchers and field workers who collected the primary data, the statisticians and data clerks who uploaded the data into the system, and the capacity of the staff who watched over the NIS data set. I did not have the opportunity to assess the capacity of these individuals, but

assumed that they did accurate work at the different phases of development, collation, and data management.

- 4 Information bias resulting from varying levels of recall capacities of the respondents (who may have had different levels of health literacy) may have negatively impacted the findings of the study.
- 5 The quality of the data set may have been affected by the various manipulations of the data set over the past 13 years.

### **Scope and Delimitations**

This study was based on 2003 NIS data. I examined dietary acculturation and obesity among African immigrant adults who reside in the United States and evaluated the association between socioeconomic and demographic factors and obesity. There was no primary data collection or contact with the participants in the original study. In addition, there was a time gap between the time the study was conducted and the time this secondary analysis took place. The delimitations of this study included the following:

- 1 This study was delimited to a quantitative cross-sectional study. There were neither control groups for comparison nor interventions for temporal analysis.
- 2 The study was a secondary data analysis without any opportunity for primary data collection. Therefore, only variables available in the data set were analyzed.
- 3 The study was delimited to the variables present in the data set selected for this study.

- 4 The study was delimited by the number of questions in the data collection tools as well as the sample size used for the national study.
- 5 The study was also delimited to the information collected by the data collectors when the study took place.
- 6 The study was delimited by time of data collection and by the findings in the 2003 NIS dataset when the study was done.

### **Significance**

This study addressed the relationship between acculturation and obesity among African immigrants living in the United States. The study was significant in a number of ways. First, findings of this study may provide evidence regarding how the acculturation process influences the health of African immigrants. The findings may indicate a significant association between acculturation and obesity, and may indicate how this association is influenced by other factors such as age, gender, ethnicity, and socioeconomic status. The evidence may be used to develop more effective policies and programs for preventing obesity and other chronic illnesses in this population.

In addition, this study advanced the body of literature related to acculturation and obesity. The literature review process indicated that there is a reasonable body of literature addressing the relationship between obesity and acculturation. However, these studies provided conflicting findings regarding the significance, magnitude, and the direction of the relationship between the two variables. The current study may clarify this inconsistency by providing additional evidence regarding the relationship between acculturation and obesity. The review process also indicated that most of the studies

addressing the link between acculturation and obesity did not focus specifically on African immigrants. Vargas and Jurado (2016) focused on Filipino Americans, Isasi, Ayala, Sotres-Alvarez, Madanat, Peneda, & Scheiderman (2015) and Creighton, Goldman, Pebley, & Chung (2012) focused on Hispanic immigrants, Ro, Geronimus, Bound, Griffith, & Gee . (2015) focused on Hispanic immigrants, and Tovar et al. (2013) focused on Brazilian, Latino, and Haitian immigrants: Griffith, Mellor, Green, & Renzaho (2014) examined the link between acculturation-related factors and obesity among African immigrants, but the study was conducted in Melbourne Australia. Consequently, there was gap in knowledge regarding how the acculturation process influences patterns of obesity among African immigrants. This study addressed this gap.

In addition, this study advanced research on acculturation and obesity by raising new questions and identifying areas for future research. This study led to the generation of new information and queries that may form the basis for future studies. For instance, by establishing the existence of a significance relationship between acculturation and health, this study paved the way for new studies addressing pathways of these relationships. The purpose of this study was to examine the association between dietary acculturation, English proficiency, region of residence, and obesity among African immigrant adults residing in the United States. This study was significant because obesity is at epidemic levels in most of the population of the United States, obesity carries several risks of chronic disease, and ethnic populations of immigrants who arrive with healthy lifestyles soon develop dietary habits that predispose them to obesity and chronic disease (Seráfica, 2014) As of 2012, about 34.9% of adults older than 18 years were obese in the

United States with highest prevalence identified in the non-Hispanic African American population (Lesser et al., 2014). Most of the literature on dietary acculturation and health outcomes was on Asian and Hispanic populations; however, few studies on African immigrants and their change in dietary patterns have been conducted.

The population of African immigrants living in the United States has increased rapidly in the last three decades (Akpuaka et al., 2013; Turk et al., 2015; Wilson, 2016). According to the Pew Research Center (2015), as of 2013, there were 1.8 million African-born immigrants living in the United States, an increase of 41% since 2000. Foreign-born Africans come from all over the continent, but the most common countries of origin for African immigrants are Nigeria, Ethiopia, Egypt, Ghana, and Kenya (Pew Research Center, 2015). In addition, to dietary acculturation, region of the United States where African immigrants settle affects availability of culture-specific foods. Increasingly, African immigrants are more likely to settle in the South (38%) where diets high in saturated fat, sodium, and sweet drinks are prevalent. Over a quarter of African immigrants (27%) are likely to settle in the Northeast, 18% in the West, and 17% in the Midwest. New York, California, Texas, Maryland, and New Jersey each have at least 100,000 African immigrants.

The positive social change implications from this study include information to encourage future health-promotion strategies targeted to African and other immigrants to prevent consumption of unhealthy foods and create awareness of retaining ethnic diets and identifying availability of cultural food sources. The results of this study may contribute to positive social change by helping to inform clinicians, dietitians, and health

care professionals to develop community health educational programs that can specifically serve the African immigrant adults in reducing obesity and preventing obesity-related chronic diseases.

### **Summary and Conclusion**

This section addressed dietary acculturation and the association between acculturation and health behavior, income, age, ethnicity, culture, dietary practices, and county of origin. In addition, I presented the purpose of the study, the nature of the study, the research questions and hypothesis, a detailed literature review, and the limitations, delimitations, and assumptions of the study. The section also included a description of the social change impact of the study.

Section 2 focuses on the methodology used for this inquiry. I describe the setting of the study, the data source, the population, the operationalization of variables, and the data analysis plan. Details of the data management processes for this secondary data analysis approach are included, and ethical issues and threats to validity are explained.

## Section 2: Research Design and Data Collection

The purpose of this study was to examine the association between dietary acculturation, English proficiency, region of residence, and obesity among African immigrant adults residing in the United States. In this section, I describe the research design, methodology, operationalization of variables, threats to validity, ethical considerations, and data management process.

### **Research Design and Rationale**

I used a quantitative cross-sectional research design. The approach to this inquiry was to carry out a retrospective secondary data analysis using the data set from the New Immigrant Survey (NIS, 2003). NIS is a survey of new legal immigrants residing in the United States and is funded by the U.S. Department of Health and Human Services, Eunice Kennedy Shriver National Institute of Child Health and Human Development, and the National Institutes of Health (Massey, 2011). According to Cheng and Phillips (2014), a cross-sectional quantitative study using secondary data is both cost and time effective and efficient. Secondary data collection and analysis can be faster when compared to primary data collection and analysis, saving time and money and avoiding duplication of efforts. In addition, secondary data allow for analysis of large data sets that could not be possible from individually collected data. This study design also minimizes ethical issues associated with primary data collection and ensures the protection of the confidentiality of the participants.



## **Methodology**

### **Target Population**

The target population for this study included all adult (18 years and above) immigrants of African origin who received an admission to legal permanent residence between May and November of 2003. This is the population from which the sample for the NIS was drawn. This population included immigrants who had arrived in the United States with documents acquired abroad, as well as those who were already living in the country with temporary nonimmigrant visa (Princeton University, 2017). Although NIS interviews were conducted on the primary adult respondents, their spouses, and their biological children, my study included only data collected from the primary respondents.

### **Sampling and Sampling Procedures**

A representative sample of new immigrants was selected by the NIS researchers from electronic administrative records from the United States Citizenship and Immigration Services (Princeton University, 2017). The list of immigrants admitted to the legal permanent resident status between May and November 2003 was used as the sampling frame. The population was stratified per visa category. Four strata were created: diversity principals, employment principals, spouses of United States citizens, and other immigrants.

A geographical sampling design was employed by the NIS researchers based on analysis of the immigrant residence information. The analysis revealed that 89% of the immigrants in the sampling frame resided in 85 metropolitan statistical areas (MSAs) and 4-6% lived in the top 38 counties (Jasso, Massey, Rosenzweig, & Smith, 2005). The

geographical sampling methods included all of the top 85 MSAs and all of the top 38 counties, and an additional 10 MSAs and 15 counties were selected from the rest of the country. Selection of participants from each stratum was done using a random-number statistical routine in which each immigrant received a sampling number and then a certain number of cases was taken from each stratum.

The final sample used in the NIS included 8,573 adults, 4,334 spouses, and 810 biological children between 8 and 12 years of age (Princeton University, 2007). My study included only the primary adult respondents. Because the focus of my study was on immigrants of African origin, immigrants from other continents were eliminated from the sample. Immigrants from North Africa were also eliminated from the sample because they were bundled together with immigrants from the Middle East in the data coding. After the elimination process and deletion of cases with missing data that could not be imputed, the sample size was reduced to 798 adult immigrants of African origin.

Two versions of NIS data were available for use: the public data set and the restricted-use contractual data set. The former includes general information collected during the survey while the latter contains confidential information that can potentially lead to identification of survey respondents (Princeton University, 2017). For my study, the public data set was obtained. The only requirement to obtain this data set was to complete an online registration form that enabled me to log in to the NIS website as a registered user.

### **Justification for the Effect Size, Alpha Level, and Power Level Chosen**

I used the minimum effect size, which allowed for greatest external validity because the sample was derived from a stratified multistage cluster survey. The alpha level of 0.5 was used to reduce type 1 error, and the power level of 80% reduced type 2 error. The sample size available from the NIS of 798 African adult immigrants provided a higher power than the required 80%.

### **Instrumentation and Operationalization of Constructs**

Data were collected by the National Immigrant Survey researchers. The survey was a detailed instrument that comprised of 15 sections focusing on different issues: Section A Demographic, Section B Pre-Immigrant Experiences, Section C Employment, Section D Health, Section E Insurance, Section F Health Care Utilization and Daily Activity, Section G Income Part 1, Section H Assets and Income Part II, Section I Transfers, Section J Social Variables, Section K Migration, Section L Parent/Guardian, Section M HOME, Section N Appendix, and Section R Interviewer Comments. The instrument was developed following a pilot study conducted in 1996. Findings from the pilot study validated the soundness of the research design and highlighted the need to contact sampled immigrants as soon as possible after admission to permanent residence. The computer-assisted personal interviewing (CAPI) technique was used to administer the questionnaire.

CAPI entails the use of portable computing devices to capture, store, and transmit data during an interview (Trott & Simpson, 2005). The term *personal* means the technology is administered by the interviewer rather than the respondent. When the

technology is administered by the respondent, the technique is referred to as computer-assisted self-interviewing. According to Seary, Zhang, and Hang (2014), the CAPI technique presents various advantages such as minimizing item nonresponse and enhancing efficiency and accuracy of data entry by eliminating manual entry. This technique was particularly suitable for the NIS as the elimination of manual entry of data led to significant cost reduction and time saving. Because the questionnaire was also very detailed, the technique minimized cases of skipping items.

**Dependent variable.** The main outcome variable in this study was obesity as measured by BMI. This variable was computed from the self-reported height and weight of the participants. For purposes of descriptive analysis, BMI was treated as a categorical variable in which a BMI below 18.5 was categorized as underweight, 18.5-24 was normal, 25-29 was overweight, and 30 and above was obese. For the regression analysis, BMI was treated as continuous variable.

**Key independent variable.** The main independent variable was dietary acculturation, which was measured by examining the similarity between diets that participants normally consume in the United States and what they were used to in their home countries. In the NIS, participants were asked to rate the similarity on 10-point scale with 1 signifying little similarity and 10 indicating a high level of similarity. These data were used to compute the diet acculturation variable. In this new variable, diet similarity scores between 1 and 3 were coded as 3 indicating a high level of dietary acculturation, similarity scores between 4 and 7 were coded as 2 indicating a moderate level of dietary acculturation, and similarity scores above 7 were coded as 1 indicating

low levels of dietary acculturation. The use of food-based measures was based on the rationale that these measures focus specifically on assessing dietary acculturation rather than acculturation in general.

**Sociodemographic factors.** Allen et al. (2014) suggested that the relationship between acculturation and health is influenced by several confounding variables (. My study focused on socioeconomic factors such as income, living environment in the country of origin, and employment, as well as demographic factors such as age, gender, marital status, and ethnicity. The operational description of variables is presented in Table 1.

Table 1

*Operational Description of Variables*

<b>Variable</b>	<b>Short Description</b>	<b>Response Categories</b>	<b>Variable Type</b>
<b>Dietary Acculturation</b>			
Diet similarity	Similarity between diet taken in US and home country diet	1 = Completely different 10 = Exactly the same	Ordinal
Diet Acculturation	Computed from the diet similarity scores above: 1-3= 3(High Acc.) 4-7=2 (Moderate Acc.) 8-10=1 (Low Acc.)	1= Low Acculturation 2=Moderate Acculturation 3=High Acculturation	Ordinal
<b>Obesity</b>			
Obesity	Body Mass Index	0 = BMI less than 30 1 = BMI equal or more than 30	Binomial
<b>Sociodemographic</b>			
Gender	Gender of participant	1 = Male 2 = Female	Nominal
Age	Age of participants	18 - 77 years	Ratio
Age group	Year born by groups	1 = Before 1940 2 = 1940- 1944 3 = 1945-1949 4 = 1950- 1954 5 = 1955- 1959 6 = 1960-1964 7 = 1965- 1969 8 = 1970- 1974 9 = 1975- 1979 10 = 1980 or later	Ordinal
Ethnicity	Country of origin	69 = Ethiopia 152 = Nigeria 306 = Sub Saharan Africa	Nominal
Education	Years of school completed	0 - 29 years	Continuous
Education	Years of school completed by group	1 = Less than 5 years 2 = 5- 9 years 3 = 10- 14 years 4 = 15- 19 years 5 = 20 years and more	Ordinal
Income	Respondent average annual income	0 - 1,980,037.13	Continuous
Income	Respondent average annual income by category	1 = 10,000 or less 2 = 10,000.01- 20,000 3 = 20,000.01- 30,000 4 = 30,000.01- 40,000 5 = 40,000.01- 50,000 6 = More than 50,000	Ordinal
State of Residence	Participant's state of residence	1 = California 2 = Florida 3 = Illinois	Nominal

		4 = New Jersey 5 = New York 6 = Texas 7 = New England 8 = Middle Atlantic 9 = South Atlantic 10 = East South Central 11 = East North Central 12 = West North Central 13 = West South Central 14 = Mountain 15 = Pacific 16 = Non-Continental U.S.	
Marital Status	Participant's current marital status	1 = Married 2 = Living together in a marriage-like relationship 3 = Separated 4 = Divorced 5 = Widowed 6 = Never married and not living in a marriage-like relationship	Nominal
Childhood living environment	Childhood living environment	1 = Rural area 2 = Urban area	Nominal
Length of stay	Participant's length of stay in the United States by group	1 = 2 years or less 2 = 3-5 years 3 = 6-8 years 4 = 9-11 years 5 = 12 years or more	Ordinal
Length of stay	Participants length of stay	0 - 54 years	Continuous
<b>Language Proficiency</b>			
Respondent English	How good was the respondent's English (question directed to interviewer)	1 = Very good 2 = Good 3 = Fair 4 = Poor 5 = Not interviewed in English	Ordinal
Understand spoken English	How well do you understand spoken English?	1 = Very well 2 = Well 3 = Not well 4 = Not at all	Ordinal
Speak English	How well do you speak English?	1 = Very well 2 = Well 3 = Not well 4 = Not at all	Ordinal

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The variables were divided into three main categories: independent variable, dependent variable, and sociodemographic factors. The independent variable was dietary acculturation. This variable was computed from the diet similarity data. The dependent variable was obesity. This variable was measured using participants BMI data. BMI was treated as a dichotomous variable where those with a BMI of 30 and above were considered obese and those with BMI of less than 30 were considered not obese. The sociodemographic variables were treated as control variables.

### **Data Analysis Plan**

The Statistical Package for Social Science (SPSS) Version 21 was used in the analysis of this secondary data set. Because the data were available in separate files, data on the variables of interest were identified and merged. Data were analyzed using both descriptive and inferential techniques. Descriptive statistics such as percentages and means were used to characterize the sample by demographic and socioeconomic factors. Cross-tabulation and chi-square analysis were used to examine the relationship between dietary acculturation and sociodemographic variables on the one hand and obesity patterns on the other. The hypotheses of the study were tested using the logistic regression technique.

### **Research Questions and Hypotheses**

Research Question 1: Is there a relationship between dietary acculturation and obesity among African immigrant adults residing in the United States?

- Ho1: There is no relationship between dietary acculturation and obesity among African immigrant adults.



- Ha1: There is a relationship between dietary acculturation and obesity among African immigrant adults.

Research Question 2: Is there a relationship between dietary acculturation (independent variable) and obesity among African immigrant adults residing in the United States, controlling for length of stay and region of residence in the United States., English language proficiency, and sociodemographic factors (age, gender, income, education, and ethnicity)?

- Ho2: There is no relationship between dietary acculturation and obesity among African immigrant adults after adjusting for length of stay and region of residence in the United States, English language proficiency, and sociodemographic factors.
- Ha2: There is a relationship between dietary acculturation and obesity among African immigrant adults after adjusting for other risk factor.

### **Threats to Validity**

Validity refers to the quality of being sound or accurate (Henderson et al., 2013).

A valid study delivers conclusions that are well-founded and accurately represent the real situation within the study population. NIS data-set has been validated several times in the past. However, there are a few threats to validity of this study. There may be some level of content and construct validity threats. In addition, as a secondary data analysis, there are limitations to construct validity, limited number of variables available for analysis with absence of some essential variables, inherent bias, missing data, and unaccounted errors in data collection. In addition, as NIS data-set were collected in 2003, there could

be significant changes to the current situations in African immigrant adults and their dietary practices. There are various threats that could have affected the validity of NIS data-set. The first threat is lack of measurement technique that can secure consistent results (Sorrel et al., 2016). This threat is significant because of the characteristic of the subjects. Since the study targeted new immigrants, there is a high probability of finding subjects with little proficiency in English. This would have affected their understanding of the questions. To overcome this threat, the instrument was translated into other languages and participants asked to respond in the language of their choice. The interviewers were also trained as a measure for enhancing observer reliability. The interviews were also set on dates and time, as well as, environment that were convenient to the subjects to enhance situational reliability. The second potential threat was failure to obtain a representative sample. Lack of representative sample reduces the generalizability of findings obtained in each study; hence, affects the external validity of the study (Fortin & Smith, 2013). This threat was, however, minimized by utilizing a relative large sample. A large sample increases the probability of the sample possess key attributes of the population (Drost, 2012). The use of random methods of selecting participants also increased the chances of having a representative sample. Random methods of sampling eliminate selection bias giving all members of the population an equal chance of being recruited into the sample (Buedo & Miller, 2010). The division of the population into strata based on visa category and geographical location also enhanced the representativeness of the sample.

Another factor that posed a threat to the validity of the study was reliance of self-reported measures. The study utilized self-reported measures to assess all variables including BMI, dietary acculturation, and socioeconomic factors. According to Short et al. (2009), the use of self-reported measures exposes a study to the problems of exaggeration, poor introspection capability, nonresponse and self-selection, and poor memory. In their study, Elgar and Stewart (2008) found that although that was a high correlation between self-reports and body measurements, on average, measured weight was 2.33 kg more than self-reported weight and measured height was 0.88 cm less than self-reported height. This study highlighted the dangers of using self-reports in measuring health variables that have a high level of stigma such as weight.

The use of the CAPI technique may have compounded the problems of misrepresentation of facts and nonresponse as the presence of the interviewer may have threatened the respondents' privacy. Some respondent may have been inclined not to answer sensitive questions or to provide less than accurate information on sensitive issues. These threats were minimized through use of multiple items to measure variable to control for a particular response style, and guaranteeing privacy and confidentiality to participants. Random sampling also helped to reduce response bias. Survey reweighting was also used to address non-response bias. According to Kizilcec (2014), the survey reweighting technique eliminates non-response bias by weighing responses according to the respondents' likelihood to respond.

### **Ethical Procedures**

This study involved indirect research with human subjects as it entailed analysis of secondary dataset looking at key variables collected in the 2003 NIS survey. Although Independent Review Board (IRB) approvals were obtained by the primary data collector before data was collected. Ethical approvals were received from Walden University Institutional Review Board (Walden IRB approval number: 06-22-2017-0413179) before proceeding to data retrieval, analysis and report. Protection of the privacy and confidentiality of the subject was one of the important ethical issues that had to be observed. I had to agree to various terms aimed at protecting the privacy and confidentiality of participants before I could access data from NIS. The first requirement was that the I would respect the confidentiality of the participants by not attempting to any person in the data. The second requirement was that the researcher should direct other persons interested in the data to the NIS; at no time, should the data be handed over to a third party. Some variables that could lead to the identification of participants such as resident addresses were left out of the data provided to the researcher as an additional measure for protecting the privacy and confidentiality of participants.

Another ethical obligation that I was asked to fulfill as requirement for accessing the data entailed appropriately acknowledging the source of the data. Although the NIS data is available for public use, it is the intellectual property of the New Immigrant Survey Trustees of Princeton University. As a sign of respect to the intellectual property holder, I was asked to correctly cite the data in in all publications. The NIS survey team was also expected to adhere to several ethical requirements during the data collection

process. One of the ethical requirements was respect for participants' autonomy. To fulfill this requirement, the NIS team sought informed consent from potential respondents before proceeding with the data collection exercise. Participants who were not willing to proceed with the study were left out while those who wished to drop out before the interview was complete were also allowed. Respondents were also informed of the right not to respond to questions with which they were not comfortable.

To protect the confidentiality and privacy of participants, the NIS data set was stored in two versions: the public use dataset and the restricted dataset. Fields and variables that could lead to the identification of survey respondents were either removed or subjected to some sort of transformation such as categorization of continuous variables or top coding in the public-use dataset. This public-use dataset was then made easily accessible to users. The restricted dataset comprises of data with high disclosure risk; hence, access to this dataset is limited. Users who want to access the restricted dataset are subjected to a rigorous vetting process.

### **Summary**

In Section 2 of this study I elaborated on the research design (cross-sectional quantitative approach of inquiry), rationale and methodology of the study. I described the target population (adult African immigrants who were admitted to permanent resident status between May and November 2003), study area, secondary data set management technique, sampling and sampling procedure, instrumentation, and operationalization of constructs. In describing the instrumentation and operationalization of constructs, the operationalization of the variables was described by explaining the dependent and

independent variables and their means of measurement, data collection and management techniques, and data analysis plan. I have discussed threats to validity and ethical considerations and procedures. In the next section, I present the results and findings of this study. In section 3, the descriptive and demographic characteristics of the sample, representativeness of the sample of the study population, basic univariate, bivariate, and multivariate analyses were presented.

### Section 3: Presentation of the Results and Findings

The purpose of this study was to examine the association between dietary acculturation and obesity among African immigrant adults residing in the United States. The relationship between dietary acculturation and obesity among African immigrant adults was examined while controlling for length of stay, place of residence, and sociodemographic factors. To actualize the purpose of this study, two key research questions were answered; (a) whether there was a basic relationship between dietary acculturation and obesity among African immigrant adults residing in the United States, and (b) whether this relationship persisted controlling for length of stay, region of residence in the United States, English language proficiency, and sociodemographic factors.

In this section, I present the results of the secondary data analysis of the NIS 2003 analyzed using SPSS Version 21. Descriptive and inferential analysis and conclusions are reported in this section. I conclude with a summary of findings from the data analysis.

### **Results**

#### **Sociodemographic Characteristics of Adult African Immigrants**

The sociodemographic traits of 798 African immigrant adult respondents were analyzed. This population is relatively young with mean age of 34.5, ranging from 18 to 77 years of age. Their socioeconomic status based on their education indicated that they were on average high school educated and with some college education; the mean number of years in school was 13.9. Personal characteristics indicated that immigrants were more likely to be male (56.0%), married (54.0%) or never married (34.6%).

Immigration patterns indicated that the sample was more likely to have immigrated from Ethiopia (26.1%) and Nigeria (22.5%), and on average had been living in the United States for five years. Unfortunately, it was not possible to determine the specific country of origin for most of the immigrant as only immigrants from Ethiopia and Nigeria were assigned a separate code. While African immigrants are concentrated in large cities such as New York (8.4%), Texas (7.9%), New Jersey (6.5%), and California (6.3%), as a group they tend to live along the Atlantic side of the country (South Atlantic 17.0%, Middle Atlantic 16.8%, New England 6.3%).

### **Dietary Acculturation**

Dietary acculturation was the independent variable of the study. The majority of the respondents (44.9%) had a moderate level of dietary acculturation. Based on how this variable was computed, this finding implies that 44.9% of the participants rated between 4 and 7, the similarity between the diet they consume in the United States and what they used to consume in their home country. About 29.6% of the participants gave a rating of 3 and below suggesting an elevated level of deviation between the current diets and what they were consuming in the home country. About a fourth (25.6%) reported a high level of similarity (rating of 8 and above) suggesting low level of dietary modification after coming to the United States.



Table 2

*Sociodemographic Characteristics of African Immigrants in the United States*

<b>Characteristics of Participants</b>	<b>Frequency</b>	<b>Mean (S.D.)</b>
Age in Years [Range: 18-77 years]		34.5 (0.41)
Education in Number of Years of School [Range: 0-29]		13.9 (0.15)
Income (U.S. \$) [Range: 0-1.98M]		\$24402 (3056)
Median Income		\$3600
Length of Stay in the U.S. in Years [Range: 0-54]		5.2 (0.32)
Dietary Acculturation		
Low Dietary Acculturation	25.6%	
Moderate Dietary Acculturation	44.9%	
High Dietary Acculturation	29.6%	
Gender		
Male	56.0%	
Female	44.0%	
Marital Status		
Married	54.0%	
Living together in marriage-like relationship	2.0%	
Separated	3.1%	
Divorced	3.1%	
Widowed	2.8%	
Never Married or living with partner	34.6%	
Country of Origin		
Ethiopia	26.1%	
Nigeria	22.5%	
Other Country in Sub-Sahara Africa	51.4%	
Current State/Region of Residence		
South Atlantic	17.0%	
Middle Atlantic	16.8%	
New York	8.4%	
West North Central	8.3%	
Texas	7.9%	
New Jersey	6.5%	
California	6.3%	
New England	6.3%	
East North Central	5.8%	
Pacific	4.3%	
Florida	3.9%	
Illinois	3.7%	
Mountain	3.1%	
East south Central	1.4%	
West South Central	0.3%	

### Obesity Status

As a dependent variable, obesity was measured as a binomial variable (not obese/obese). Mean values of BMI are presented in Table 3. Sample obesity prevalence was 29.7% as measured by participants BMI of 30 or greater. The mean BMI for the sample was 28.34, which suggests that a majority of the participants were overweight. There were no obesity prevalence differences between men and women. Ethiopians had the lowest mean BMI and Nigerians the highest at 30.337. The rest of sub-Saharan African groups were slightly below Nigerians.

Table 3

*Mean BMI by Gender and Ethnic Group*

<b>Characteristic</b>	<b>N</b>	<b>Mean BMI +/- (S.E)</b>
All African Immigrants	798	28.34
<b>Gender</b>		
Male	447	28.259 +/- (0.32)
Female	351	28.433 +/- (0.402)
<b>Ethnic Groups</b>		
Ethiopian	199	25.127 +/- (0.39)
Nigerian	172	30.337 +/- (0.42)
Sub-Saharan Africa	427	29.026 +/- (0.29)

### Sociodemographic and Immigration Characteristics by Obesity Status

Obesity status varied by ethnicity, marital status, income, language proficiency, and length of stay in the United States. Significant differences by ethnicity ( $p = .000$ ) included Nigerian (45.9%) and Sub-Saharan African immigrants (33.0%) were 4 and 5

times more likely to be obese compared to Ethiopians (8.5%). Those that were married (34.1%) were twice as likely to be obese ( $p = .000$ ) compared to those who were never married (18.5%), but rates were highest among those who were cohabiting (56.3%). Obesity status by income had a broader distribution where over half of those earning \$20 to \$30 thousand per year and those earning \$40 thousand or more were obese compared to the other income groups. Language proficiency indicated that those with less language proficiency were more likely to not be obese ( $p = .000$ ); only 16.2%% of those with poor proficiency and 10.2% of those who did not interview in English were not obese compared to those with fair, good or very good English proficiency. Finally, length of stay in the United States was associated with obesity ( $p = .000$ ) where at 3-5 years of stay over 37.5% of African immigrants are obese and by 9 years or longer in the United States nearly half of the immigrants are obese.

Table 4

*Sociodemographic and Immigration Characteristics by Obesity Status*

Sociodemographic Factor	Not Obese		Obese		Total		<i>p</i>
	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	
<b>Gender</b>						798	.436*
Male	69.1%	309	30.9%	138	56.0%	447	
Female	71.8%	252	28.2%	99	44.0%	351	
<b>Ethnicity</b>						798	.000**
Ethiopia	91.5%	182	8.5%	17	24.9%	199	
Nigeria	54.1%	93	45.9%	79	21.6%	172	
Sub-Sahara Africa	67.0%	286	33.0%	141	53.5%	427	
<b>Marital Status</b>						798	.000**
Married	65.9%	286	34.1%	148	54.4%	434	
Cohabitation not married	43.8%	7	56.3%	9	2.0%	16	
Separated	60.0%	15	40.0%	10	3.1%	25	
Divorced	56.0%	14	44.0%	11	3.1%	25	
Widowed	63.6%	14	36.4%	8	2.8%	22	
Never married	81.5	225	18.5%	51	34.6%	276	
<b>Education</b>						798	.031**
Less than 5 years	76.3%	29	23.7%	9	4.8%	38	
5-9 years	74.3%	26	25.7%	9	4.4%	35	
10-14 years	74.2%	265	25.8%	92	44.7%	357	
15-19 years	67.2%	211	32.8%	103	39.3%	314	
20 years or more	55.6%	30	44.4%	24	6.8%	54	
<b>Income</b>						798	.000**
\$10,000 or less	78.6%	397	21.4%	108	63.3%	505	
\$10,000.01-\$20,000	64.8%	46	35.2%	25	8.9%	71	
\$20,000.01-\$30,000	49.1%	28	50.9%	29	7.1%	57	
\$30,000.01-\$40,000	68.6%	24	31.4%	11	4.4%	35	

\$40,000.01- \$50,000	53.3%	8	46.7%	7	1.9%	15	
More than \$50,000	50.4%	58	49.6%	57	14.4%	115	
<b>Year of Birth</b>						798	.000**
Before 1940	64.0%	16	36.0%	9	3.2%	25	
1940-1944	66.7%	10	33.3%	5	1.9%	15	
1945-1949	73.7%	14	26.3%	5	2.4%	19	
1950-1954	50.0%	19	50.0%	19	4.8%	38	
1955-1959	57.4%	35	42.6%	26	7.7%	61	
1960-1964	52.4%	33	47.6%	30	8.0%	63	
1965-1969	60.8%	76	39.2%	49	15.8%	125	
1970-1974	72.3%	115	27.7%	44	20.1%	159	
1975-1979	82.7%	139	17.3%	29	21.2%	168	
1980 or later	84.0%	100	16.0%	19	15.0%	119	
<b>English Proficiency</b>						798	.000**
Very Good	60.2%	231	39.8%	153	48.1%	384	
Good	72.0%	121	28.0%	47	21.1%	168	
Fair	79.1%	72	20.9%	19	11.4%	91	
Poor	83.8%	31	16.2%	6	4.6%	37	
Interview not in English	89.8%	106	10.2%	12	14.8%	118	
<b>Length of Stay</b>						798	.000**
2 years or less	78.4%	380	21.6%	105	60.8%	485	
3-5 years	62.5%	50	37.5%	30	10.0%	80	
6-8 years	67.6%	46	32.4%	22	8.5%	68	
9-11 years	51.6%	16	48.4%	15	3.9%	31	
12 years or more	51.5%	69	48.5%	65	16.8%	134	
<b>Dietary Acculturation</b>						798	.056**
Low	70.1%	143	29.9%	61	25.6%	204	
Moderate	74.0%	265	26.0%	93	44.9%	358	
High	64.8%	153	35.2%	83	29.6%	236	

\*Fisher's Exact Test 1-sided; \*\*Pearson Chi-Square 2-sided

## **Inferential Statistical Analyses**

Logistic regression was carried out to examine to what extent covariates predicted the odds of being obese. To achieve a binomial distribution and test the hypotheses using logistic regression models, obesity was derived from the BMI values where 1 = obese (30 and higher), 0 = all other observations. The odds ratio is represented in the logistic regression model tables by the column titled  $\text{Exp}(\beta)$  which is the exponentiation of the  $\beta$  coefficient. The odds ratio is easier to interpret than the  $\beta$  coefficient (in log-odds units). Significance of the predictor/ explanatory variables was tested using the Wald test. The Wald test is also called the Wald Chi-Squared Test and is used to test whether a binary or continuous variable adds significance to the model.

The fit of each model is evaluated by the amount of variability in the dependent variable explained by the independent variables. In logistic regression, there is no true  $R^2$  like in linear regression; therefore, the models' goodness of fit was tested using the Homer-Lemeshow Test (HLT). The HLT examines whether there is any evidence of poor fit within the model (Fagerland & Hosmer, 2016). If the test yields a significant  $p$ -value ( $p < 0.05$ ), it indicates that there is evidence of poor fit within the model.

### **Research Question 1**

The first research question was: Is there a relationship between dietary acculturation and obesity among African immigrant adults living in the United States? The independent variable in this question was dietary acculturation score while the dependent variable was obesity (overweight/obese). Logistic regression analysis was carried out to examine to what extent dietary acculturation predicted obesity.

- Ho1: There is no relationship between dietary acculturation and obesity (overweight/obese) among African immigrant adults.
- Ha1: There is a relationship between dietary acculturation and obesity (overweight/ obese) among African immigrant adults.

**Model 1:  $\text{Log}(p) Y = \beta_0 + \beta_1 X_1 + \varepsilon$**

Where,  $\text{Log}(p) Y = \log$  of likelihood of being obese,  $\beta_0 = \text{constant}$ , and  $\beta_1 = \text{Beta}$  coefficient or slope for  $X_1$ , where  $X_1 = \text{dietary acculturation}$ , and  $\varepsilon = \text{error term}$ .

Logistic regression Model 1 (Table 5) has dietary acculturation score as the only predictor. Although dietary acculturation had an odd ratio of 1.147 suggesting that it increases the risk of being obese, the Wald test ( $p = 0.192$ ) indicates that the relationship between dietary acculturation and odds of being obese is not statistically significant. Results of the HLT also indicate that there is evidence of poor fit within the model ( $p=.046$ ). This model suggests that, when considered alone, dietary acculturation is not a good predictor of obesity. The null hypothesis was not rejected.

Table 5

*Model 1: Dietary Acculturation as Predictor of Obesity*

		$\beta$	S.E.	Wald	df	Sig.	Exp( $\beta$ )
Step 1	Dietary Acculturation Score	.137	.105	1.702	1	.192	1.147
	Constant	-1.143	.231	24.563	1	.000	.319

*HLT  $p = 0.000$ , n= 798*

**Research Question 2**

The second research question was: Is there a relationship between dietary acculturation and obesity among African immigrant adults residing in the United States

after adjusting for length of stay, region of residence in the United States, English language proficiency, and sociodemographic factors? The statistical test used was logistic regression. The analysis was done in a forward step-wise manner where length of stay was added to dietary acculturation in Model 2, followed by addition of language proficiency (Model 3), and addition of state of residence and sociodemographic factors (gender, education, income, age, marital status, and childhood living environment) in Model 4.

- Ho2: There is no relationship between dietary acculturation and obesity among African immigrant adults after adjusting for other risk factors.
- Ha2: There is a relationship between dietary acculturation and obesity among African immigrant adults after adjusting for other risk factor

**Model 2:  $\text{Log}(p) Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \varepsilon$**

Where,  $\text{Log}(p) Y = \log$  of likelihood being obese,  $\beta_0 = \text{constant}$ ,  $\beta_1$  and  $\beta_2 = \text{Beta}$  coefficients representing the change in slope of  $X_1 = \text{dietary acculturation}$  and  $X_2 = \text{Length of Stay}$ , and  $\varepsilon = \text{error term}$ .

As shown in Table 6, the logistic regression Model 2 includes dietary acculturation and length of stay as the predictors. The Wald Chi-Square test indicates that dietary acculturation score remained insignificant in predicting the odds of being obese ( $p = .068$ ). However, the Wald Chi-square test ( $p = 0.000$ ) indicates that length of stay is a significant predictor of the odds of being obese. The beta coefficient for length of stay was 0.317, which implies that when length of stay increased by 1 unit (year) the log of probability for being obese increased by a factor 0.317. The addition of length of stay



improved the model fit as indicated by the results of the HLT ( $p = .470$ ). These results suggest that, although length of stay in the United States. significantly predicts odds of being obese, dietary acculturation remained an insignificant predictor after the inclusion of this variable.

Table 6

*Model 2: Dietary Acculturation and Length of Stay as Predictors of Obesity*

	$\beta$	S.E.	Wald	df	Sig.	Exp( $\beta$ )
Dietary Acculturation Score	.198	.109	3.321	1	.068	1.219
Step 2 Length of Stay	.317	.049	41.334	1	.000	1.373
Constant	-1.962	.275	51.001	1	.000	.141

*HLT*  $p = .470$ ,  $n = 798$

**Model 3:  $\text{Log}(p) Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$**

Where,  $\text{Log}(p) Y = \log$  of likelihood being obese,  $\beta_0 = \text{constant}$ ,  $\beta_1, \beta_2, \beta_3 = \text{Beta}$  coefficients,  $X_1 = \text{dietary acculturation}$ ,  $X_2 = \text{Length of Stay}$ ,  $X_3 = \text{English language proficiency}$  and  $\varepsilon = \text{error term}$ .

In the third forward stepwise logistic regression model, language score was added as shown above. The Wald test of significance indicated that dietary acculturation score remained a statistically insignificant predictor of obesity ( $p = .118$ ); however, length of stay ( $p = .000$ ) and language proficiency score ( $p = .000$ ) were significant predictors of obesity. The  $\beta$  coefficient for length of stay was 0.251, which implies that when length of stay increases by 1 unit (year), the log probability of being obese increased by a factor of 0.251, and for language proficiency score,  $\beta = .370$  where for an increase of language proficiency score of 1 unit (where scores ranges from interview not in English to poor,

fair, good and very good), log probability of being obese increases by a factor 0.370. The addition of length of stay and language proficiency score improved the model fit as indicated by results of the HLT ( $p = .786$ ), which implies that there is no evidence of poor fit within the model. This model suggests that, although lengths of stay in the United States, and language proficiency jointly significantly predict the odds of being obese, dietary acculturation remained an insignificant predictor.

Table 7

*Model 3: Dietary Acculturation, Length of Stay, and Language Score as Predictors of Obesity*

	$\beta$	S.E.	Wald	df	Sig.	Exp( $\beta$ )
Step 3						
Dietary Acculturation Score	.171	.110	2.446	1	.118	1.187
Length of Stay	.251	.051	23.850	1	.000	1.285
Language Score	.370	.069	28.516	1	.000	1.448
Constant	-3.255	.382	72.422	1	.000	.039

*HLT*  $p = 0.786$ ,  $n=798$

$$\text{Model 4: Log}(p) Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \varepsilon$$

Where,  $\text{Log}(p) Y =$  log of likelihood being obese,  $\beta_0 =$  constant,  $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8, \beta_9, \beta_{10}, \beta_{11} =$  Beta coefficients,  $X_1 =$  dietary acculturation,  $X_2 =$  Length of Stay,  $X_3 =$  language proficiency,  $X_4 =$  State of Residence,  $X_5 =$  Gender,  $X_7 =$  Education,  $X_8 =$  income,  $X_9 =$  age,  $X_{10} =$  Marital Status,  $X_{11} =$  Childhood Living Environment (rural or urban), and  $\varepsilon =$  error term.

In the fourth forward stepwise logistic regression model, state of residence, and sociodemographic factors (gender, education, income, age, marital status, and childhood living environment) was added to dietary acculturation score, length of stay, and

language score. The Wald test of significance indicated that dietary acculturation score became a statistically significant predictor of obesity ( $p = 0.020$ ) after the inclusion of the additional variables. Length of stay ( $p = 0.015$ ) and English language proficiency ( $p = 0.000$ ) remained statistically significant predictors of odds for being obese. Among the sociodemographic factors, state of residence ( $p = .424$ ), income ( $p = .009$ ), marital status ( $p = .044$ ), age ( $p = .003$ ), and childhood living environment ( $p = .006$ ) significantly predicted odds for being obese when controlling for all other factors. However, gender ( $p = .509$ ) and education ( $p = .315$ ) did not significantly predict the odds for being obese. According to results of HLT ( $p = .750$ ), there was no evidence of poor fit within the model. This model suggests that, after controlling for all the nine variables, dietary acculturation becomes a significant predictor of the odds for being obese. Therefore, the null hypothesis was rejected.

Table 8

*Model 4: Saturated Model of Predictors of Obesity*

	$\beta$	S.E.	Wald	df	Sig.	Exp( $\beta$ )
Dietary Acculturation	.268	.115	5.407	1	.020	1.308
Length of Stay	.144	.059	5.917	1	.015	1.155
Language Proficiency	.410	.079	27.171	1	.000	1.508
State of Residence	-.019	.024	.640	1	.424	.981
Gender	-.116	.176	.436	1	.509	.891
Step 4 Education	-.114	.114	1.012	1	.315	.892
Income	.130	.050	6.839	1	.009	1.138
Age	.081	.040	4.063	1	.044	1.031
Marital Stats	-.121	.041	8.587	1	.003	.886
Childhood living environment	-.514	.186	7.635	1	.006	.598
Constant	-1.020	.663	2.368	1	.124	.360

*HLT p* =750, n= 798

### Summary

In this section, I presented the results of the reanalysis of NIS 2003 survey which comprised of 798 African immigrant adults. The purpose of this study was to examine how dietary acculturation among African immigrant adults predicts obesity patterns within this population. The first research question sought to establish the relationship between dietary acculturation and obesity patterns of Africa Immigrant adults. Logistic regression analysis indicated that the relationship was not significant and that there was evidence of poor fit within the model. The first null hypothesis was, therefore, not rejected. The second research question sought to determine whether dietary acculturation was a predictor of obesity among African immigrant adult controlling for length of stay, language proficiency, and sociodemographic factors. Logistic regression analysis performed in a stepwise fashion indicated that holding the other factors constant, dietary

acculturation was a significant predictor of odds for being obese. The second null hypothesis was, therefore, rejected.

In the next and final section of this study, I discussed these findings in relation to other publications on similar studies. In addition, I provide practical recommendations that will, if applied and implemented, help public health practitioners, clinicians and community health workers develop health promotion programs that will reduce and/or prevent obesity among African immigrant adults residing in the United States.

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

The purpose of this study was to examine the relationship between dietary acculturation and obesity among African immigrant adults in the United States. This section presents an interpretation and discussion of findings, limitations of the study, recommendations, implications for professional practice and social change, and a conclusion. Secondary data were collected from the 2003 NIS survey data set, and descriptive and inferential analyses were done using SPSS Version 21.

#### **Interpretation of the Findings**

##### **Obesity Status**

The dependent variable of the study was obesity. The results showed that obesity prevalence within the study sample was 29.7%. This finding was consistent with Obisesan (2015) who found that obesity prevalence among Nigerian immigrants residing in the United States was 33.6%. This prevalence was slightly higher than obesity prevalence in United States general population. According to the Ogden et al. (2015), the portion of United States adults 20 years and above who met the criteria for obesity in 2013-2014 was 36%. Therefore, findings regarding obesity prevalence among African-born Americans did not support the premise that immigrants are healthier than U.S.-born Americans.

However, obesity prevalence in the African immigrant population was considerably lower than that among African Americans. The report by Ogden et al. (2014) showed that African Americans had an obesity prevalence of 47.8% while Hispanics had a prevalence of 42.5% in 2011-2012. Asian Americans had the lowest

prevalence of 10.9%. The lower obesity prevalence among African immigrants compared to African Americans supported the healthy immigrant effect hypothesis. The phenomenon also supported the existence of a relationship between acculturation and obesity in that prolonged stay in the United States tended to increase obesity prevalence among people of African origin who settled in the country.

Obesity prevalence among African immigrant adults (29.7%) was similar to prevalence of obesity in sub-Saharan Africa. Diaw (2016) found that the prevalence of obesity in Dakar, Senegal was 35.1%. The NCD Risk Factor Collaboration (2016) also found that obesity prevalence had surpassed the 30% mark in Southern African countries. However, Diaw (2016) noted that the problem of overweight and obesity existed alongside the problem of underweight in most parts of sub-Saharan Africa. Styen and Mchiza (2014) also documented the underweight-overweight paradox in sub-Saharan Africa, noting that in countries such as Madagascar and Burundi prevalence of overweight and obesity was 40% while underweight was 50%. Zambia, Niger, Malawi, Congo, Namibia, and Zambia had an underweight prevalence of 40% while South Africa and Seychelles had an overweight and obesity prevalence of over 50% (Styen and Michiza, 2014). In Cameroon, overweight and obesity prevalence increased from 54% to 82% between 1994 and 2003 (Styen and Michiza, 2014). Statistics on obesity prevalence in sub-Saharan Africa indicated the possibility that most of the current study participants who were obese might have developed this condition before migrating to the United States.

## Research Questions

Research Question 1 was the following: Is there a relationship between dietary acculturation and obesity among African immigrant adults residing in the United States? Logistic regression analysis indicated that dietary acculturation was not a significant predictor of obesity. The HLT also indicated that there was evidence of poor fit within the model.

Research Question 2 was the following: Is there a relationship between dietary acculturation and obesity among African immigrant adults residing in the United States after controlling for length of stay, language use/proficiency, and sociodemographic factors? Forward stepwise logistic regression models indicated that dietary acculturation was a significant predictor of obesity when other risk factors (length of stay, language proficiency, gender, age, education, state of residence, childhood living environment, income, and marital status) were controlled. There was no evidence of poor fit in this model.

These findings were consistent with those from previous studies such Tovar et al. (2014) and Paxton et al. (2016), who found that alteration to the dietary patterns of immigrants had an impact on obesity pattern within the population. Paxton et al. found that many West African immigrants residing in the United States had a spike in weight after living in the country for a few years due to changes in dietary habits. However, Paxton et al.'s study was qualitative; hence, the relationship between the two variables was not tested using statistical methods. Tovar et al. found that it was not only the change in dietary pattern that had an impact on obesity, but also the change in physical activity.



My study, however, focused on examining the effect of dietary changes on obesity without considering change in physical activities.

Tovar et al. (2014) also found that dietary acculturation varied across immigrant groups with certain populations of immigrants displaying higher levels of acculturation than others. Wimmer and Soehl (2014) found that the level of acculturation was usually lower among immigrants whose native culture was more divergent from the mainstream culture. Delavari et al. (2015) also found that acculturation patterns among Iranian immigrants living in Australia were not associated with the BMI and waist circumference of the immigrants. The explanation given was that, on its own, acculturation pattern does not have a direct effect on obesity. Rather, obesity as an outcome is a complex phenomenon that is influenced by a combination of factors that include acculturation, socioeconomic and demographic characteristics of immigrants, and immigrants' background (Delavari et al., 2015). This explanation can also hold in the current study because, despite the lack of a statistically significant relationship between dietary acculturation and immigrants' obesity patterns, the overall model that combined dietary acculturation and sociodemographic variables was statistically significant.

Another factor that could explain the lack of a significant association between obesity and dietary acculturation is the possibility that most of the obesity cases among participants might have developed before they arrived in the United States. Other researchers such as Diaw (2016), the NCD Risk Factor Collaboration (2016), and Steyn and Mchiza (2014) showed that obesity prevalence in most parts of sub-Saharan Africa had surpassed the 30% mark. Therefore, it is plausible that a good portion of the 37.2%

of the current study participants who were obese had developed this condition before arriving to the United States. Dietary acculturation would have had a more significant predictive power if the study considered changes in BMI after arriving in United States rather than BMI in general.

Although dietary acculturation was not significantly related to obesity patterns, the findings from this study indicated that various factors such as language proficiency had a significant relationship with prevalence of obesity among African adult immigrants. Language proficiency had a positive relationship with obesity implying that an increase in English language proficiency was associated with an increase in the immigrant's likelihood of becoming obese. This finding was not consistent with Lee et al. (2013) who found that language proficiency may not reflect adoption of unhealthy practices, but may affect immigrants' state of health by influencing access to health care, variety of food, recreation and exercise facilities, and other facilities. Baker et al. (2015) also found that children of foreign-born mothers with low English proficiency were more likely to be obese than those of foreign-born mothers with high English proficiency. Findings from these studies indicated that English proficiency was an indicator of acculturation. Salinas et al. (2014) explained that English proficiency is a major determinant of functional integration in the United States. Individuals who have high English proficiency have greater opportunity of being integrated in a wide range of functions including diverse occupations and recreational activities. However, language proficiency may not reflect the degree of acculturation among immigrants. Salinas et al. called for distinction between the language proficiency and language preference. Language preference is a

more accurate indicator of cultural affiliation. The current study included language proficiency because language preference variables had a lot of missing data.

Both the Pearson chi-square test and the Wald test showed that length of stay in the United States had a statistically significant relationship with prevalence of obesity among African immigrant adults. This finding was consistent with Lee et al. (2013) who found that increased duration of stay was associated with greater odds of reporting poorer state of health among immigrants residing in the United States. It also consistent with Gele and Mbalilaki (2013), who found that Somali immigrants who had stayed in Norway for more than 14 years had the highest BMI mean of 27.7, and their chance of being overweight/obese was 7 times higher than those who had stayed in the country for less than 4 years. The most plausible explanation regarding the relationship between length of stay and obesity is that longer stay leads to prolonged exposure of immigrants to the mainstream culture increasing the probability for acculturation. Lee et al. explained that although length of stay in the United States may be attributed to some positive effects on health such as access to better quality health care, the net effect is usually negative.

I also found a significant relationship between age of participants and obesity. This was consistent with earlier studies such as Lee et al (2013), Delavari et al. (2013), and Sufyan (2012). Lee et al. found that the age of immigrants was statistically associated with greater probability of reporting negative change in health. Delavari et al. found that immigrants' age at arrival in the United States was statistically related to unhealthy weight gain. Although the current study addressed age of participants at the time of

interview instead of age at arrival, findings were closely related because age at arrival is a function of participants' age at interview and length of stay, both of which were examined in the current study. Regression analysis showed that the relationship between age and obesity was positive, which means that an increase in age increases the odds for being obese. This finding is in line with previous studies such as Sufyan, who found that the BMI of immigrants increased with older age.

Income was also statistically correlated with obesity patterns in the study sample. Bivariate analysis showed that immigrants with high income were more likely to be obese than those with low income. This finding was not consistent with previous studies such as Allen et al. (2014), who found that immigrants exposed to material hardship were more likely to have their health behaviors influenced by the acculturation process. Isasi et al. (2015) also found that Hispanic immigrants with a household income of less than U.S. \$40,000 per year had higher extreme obesity than those with a household income of more than U.S. \$40,000 per year. A possible explanation of the positive association between income and obesity among African immigrant adults is that income within this population is positively associated with length of stay in the United States. To confirm whether this was the case in the study sample, income data were correlated with participants' length of stay in the United States. The Pearson correlation test indicated that there was a positive and statistically significant relationship between income and length of stay ( $p = 0.000$ ,  $r = 0.141$ ). This implied that immigrants who have higher income are more likely to have stayed in the United States for a longer period. Length of stay was, in turn, positively correlated with obesity.

The nutritional transition theory can also provide a useful explanation for the positive correlation between income and obesity. This theory posits that when the income and purchasing power of a community changes, individuals tend to shift from unrefined plant-based diets to highly processed animal based foods (Popkin et al., 2012). This theory is reinforced by a nationally representative study involving 1008 women in Kenya, where it was found that obesity was highly prevalent among women with high socioeconomic status (Steyn & Mchiza, 2014). Results also showed that women with high socioeconomic status had higher mean energy intake than their counterparts with low socioeconomic status. Amare et al. (2012) also supported the theory as they found that income had a positive correlation with BMI among Ethiopians residing in urban areas. Income was also positively correlated with frequency of consumption of most foods.

Contrary to previous studies such as Gele and Mbalilaki (2013), Obisesan (2015), and Toselli et al. (2014), the current study did not establish the existence of a statistically significant relationship between gender and obesity. The inconsistency may be attributed to the differences in the population targeted in these studies. Unlike the current study that incorporated data from immigrants from different African countries, the study by Obisesan focused on immigrants from Nigeria. On the other hand, Gele and Mbalilaki focused on Somali immigrants residing in Oslo, Norway and not in the United States. Toselli et al. focused on immigrants from North Africa, who were not included in the current study. These differences in the population of study may explain the inconsistency in the findings of these studies. The current study did not also establish the existence of a

significant relationship between obesity and other sociodemographic variables such as state of residence, education, and marital status.

There was a statistically significant relationship between obesity status and the immigrant living environment either in the United States or in the home country. This was consistent with Adeboye et al. (2102) who found that, in Africa, urban dwellers have a higher prevalence of obesity than those living in rural environments. The findings was also inconsistent with Hook et al. (2014) who found that Hispanic immigrants who lived in Hispanic dominated neighborhoods were less likely to suffer from obesity than their counterparts who lived in Caucasian dominated neighborhoods. Findings also contradicted Befort (2012) who found that rural residents in the United States have higher obesity prevalence than their urban counterparts. The finding was also inconsistent with DiRocco and Cuvi (2014) who found that families in rural areas were also undergoing nutritional transition in the same manner as families in urban areas.

### **Limitations of the Study**

Several strengths typify this study including a large and nationally representative sample. However, several factors constrain the study. One of these factors is the use of self-reported data regarding weight and height of participants. As established in a study by Elgar and Stewart (2008), self-reports are not very good measures of weight and height as participants tend to exaggerate their measurements. Results of the study revealed that, on average, participants reported 2.33 kg less than their actual weight and 0.88 cm more than their actual height. The participant's memory also limits the accuracy

of self-reported measure of height and weight. It is possible for participants to not recall the exact weight and height measurement.

Another factor that may have constrained the study is the use of BMI as the only measure of obesity. Although BMI is accepted as a standard measure for obesity, it is not a perfect measure. The main feature that defines obesity as a medical condition is the presence of excess amount of fats in the body (Hernandez et al., 2013). On the other hand, BMI is the ratio of body weight to an individual's height in meters squared. This measure does not distinguish the weight caused by body fats, and that caused by muscles mass, bone density, and the overall body composition (Ashwell et al., 2014; Ashwell & Gibson, 2015; Hajian-Tilaki & Heidari, 2015). Muscle mass and bone density vary from one individual to another. Similarly, muscle mass accounts for a greater proportion of body weight than fats. Consequently, the weight used in the calculation of BMI may not necessary reflect presence of excessive amount of fats in the body.

The third factor that might have affected the quality of study is how dietary acculturation was measured. The NIS study utilized the food similarity approach of measuring dietary acculturation where the diet consumed by immigrants in the U.S was compared with diets that the use to take in their home country. Although this approach is effective in determining changes in food consumed by immigrants, it ignores other aspects of dietary acculturations such as change in food preparation method, and alteration in frequency and timing of meals. For instance, a given immigrant might be used to taking beef in their home country which he or she continues to take in the United

States However, the method of preparing the beef may change. Such a change may not be reflected in the food similarity approach.

The cross-sectional nature of the data used in this study may also have limited the study's power to infer a cause-effect relationship between study variable. The cross-sectional design was effective in describing the existing situation within the African immigrant population in terms of obesity prevalence, dietary acculturation, and various sociodemographic variables. However, the fact that data was collected at only a single point in time hinders the ability to determine with certainty that there exists a causal link between language proficiency, length of stay, income, age, and obesity prevalence within African immigrant adult population. The study cannot also conclude with certain that the relationship between gender, education level, length of stay, and dietary acculturation among African adult immigrants is of a cause-effect nature.

The current study also utilizes language proficiency instead of language preference as one the control variables. Literature suggests that language preference is a more salient indicator of acculturation than language proficiency (Salinas et al., 2014). In addition, the current used data from the first wave of the NIS conducted in 2003: hence, most of the data captured is for immigrants who came to the country before 2000. In fact, the participants' average length of stay in US at the time of the NIS interviews was 5 years. According to United States Census Bureau, a huge proportion of African immigrants residing in the United States are recent arrivals with most of them arriving after the year 2,000 (Gambiano et al., 2014). It is not clear whether the NIS data reflect the characteristic of these new cohorts of African immigrants.



Another limitation of the study is that it considered the BMI of participants rather than change in BMI after they arrived in the United States. Consequently, the study was able to determine obesity prevalence with the population, but was not able to discern whether these cases of obesity developed before or after the immigrant came into the US. It is possible that a significant portion of the immigrant might have developed obesity in the home countries; hence, their condition may not be attributed to dietary acculturation.

### **Recommendations**

A significant limitation in the current study entailed the use of self-reported data of height and weight. Future studies should address this limitation by using investigator-measured rather than self-reported weight and height data. The quality of data on obesity may also be enhanced by including other measurement approaches such as waist circumference, waist circumference-to-height ratio, and waist-to-hip ratio. In fact, studies by Ashwell et al. (2014) and Ashwell and Gibson (2015) found that waist circumference-to-height ratio is a more effective predictor of years of life lost and early health risk respectively. Hajian-Tilaki and Heidari (2015) also found waist circumference and waist circumference-to-height ratio are slightly better predictors of diabetes than BMI. In addition, future studies should use compare dietary acculturation to change in BMI as opposed to BMI in general to eliminate effect of cases where obesity had already developed before the immigrant arrived in the United States.

In examining dietary acculturation, the current study used the food similarity approach where the food items consumed by participants in the U.S was compared to the food items they used to take in their home country. Future study should consider other

factors such as eating patterns (home versus dining) and mode of food preparation. Studies such as O'Sullivan and Amirabdollahian (2016) have established that immigrants from low income countries tend to adopt irregular eating patterns after arriving in high income countries. The study also established increased consumption of frozen foods and food purchased from fast food outlets. Assessment of dietary acculturation can also be improved by including measures that reflect change in the amount food consumed and frequency of food intake as these patterns also significant determinants of obesity.

The current study considered language proficiency instead of language preference. Future studies should consider investigating the strength and direction of the relationship between language preference, diet acculturation, and obesity among African immigrants. Future researchers should also focus on examining the cohort of immigrants that arrived in the United States after 2000. According to the Pew Research Institute, the population of African immigrant rose from 881,000 in 2000 to 1.8 million in 2013 (Anderson, 2015). This implies that most of the immigrants of African origin now living in the United States arrived in the country after the year 2000. It is not clear whether this new cohort of African immigrant differ significant from the pre-2000 cohort in terms of dietary patterns, obesity prevalence, and sociodemographic variables.

Although obesity prevalence was high among African immigrants, results show that these patterns are not significantly related to the dietary patterns and dietary acculturation within the population. This finding implies that there are other factors that have a more salient effect on obesity in the African immigrant population than change in dietary patterns. One of the factors mentioned in the body of literature is change in the

pattern of physical activities (Lee et al., 2013; Kukaswadia et al., 2014). Future studies should consider examining changes in physical activity among African immigrants residing in the United States, and how these changes related to obesity patterns within the population. Future researchers should also investigate whether there are other factors or combination of factors that have a significant effect on obesity prevalence among African immigrant adults.

### **Implication for Professional Practice and Social Change**

Results have revealed that obesity prevalence among African immigrant adults residing in the United States is 29.7%. This finding establishes that obesity is a growing problem with the population of African Immigrants living in the United States It implies that the African immigrant adult population should be of interest to stakeholders in the public health field when it comes to design and implementing programs aimed at preventing and reducing obesity. To address the problems associated with obesity in the country effectively, future programs should also target the African immigrant population.

Other factors that were significantly associated with obesity prevalence were length of stay in the US and income. In line with expectation, length of stay was positively correlated with prevalence of obesity. Length of stay was also statistically correlated with dietary acculturation and amount of income, which explains the positive association between income and obesity prevalence. This finding implies that, to effectively address dietary acculturation and obesity among African immigrants, intervention programs should begin at the earliest time possible after the immigrant enters the United States. Stakeholders in the public health sector should focus on reaching new

immigrants at the earliest time possible before their dietary habits are changed, and obesity set in.

The bivariate analysis also revealed that education level is significantly and positively associated with dietary acculturation among African adult immigrants. This finding has two major implications. The first implication is that programs aimed at reducing dietary acculturation should target those with higher levels of education. Stakeholders in the public health field may want to design programs that are tailored to the needs of immigrants with higher levels of education to enhance reach within this population.

Findings of this study highlight the importance of the subject of nutritional transition in the sub-Saharan African countries. Countries in sub-Saharan Africa are still in initial stages of nutritional transition. Their diets are still dominated by vegetables, whole-grain cereals, and other unrefined food with little composition of fat and animal products. These diets are associated with low obesity prevalence. Stakeholders in the global public health arena should direct attention towards preventing nutritional transitions in these countries. Popkin et al. (2012) argues that it is possible to prevent and even reverse nutritional transition in societies through measures such as high taxation of unhealthy foods, subsidization of healthy food items, and education and awareness.

### **Conclusion**

This study examined the relationship between dietary acculturation and obesity pattern among African immigrant adults residing in the United States. Results showed that there is no statistically significant association between dietary acculturation and

obesity. However, with other risk factors (age, gender, education, state of residence, education, marital status, childhood living environment, length of stay, and language proficiency) the relationship between dietary acculturation and obesity patterns becomes significant. Length of stay, language proficiency, age of participants, and income were found to have a statistically significant relationship with obesity. Understanding sociodemographic factors related to obesity among African immigrants can improve interventions and programs aimed at addressing this problem within the population. Findings of this study suggests that to enhance the effectiveness of intervention aimed at addressing obesity among African immigrants, stakeholders must pay attention to issues of income, age, and length of stay.

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