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Walden University
2020

Abstract

Demographic, Lifestyle, and Psychosocial Predictors of Obesity Among Nigerian Igbo Immigrants

by

Ahamefula Arthur Duru

MPH, Walden University, 2013

MD, University of Science and Technology Montserrat, 2010

MSc, University of London, 2007

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Public Health

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May 2020

Abstract

Obesity is known as a risk factor for chronic diseases, and a contributor to health disparities among minorities and vulnerable persons. There is a paucity of data on Nigeria Igbos on obesity risks in the United States; therefore, studying obesity in this population may help policy makers tailor interventions that could reduce the prevalence of obesity. The purpose of the study was to examine the predictors of obesity among Nigerian Igbo immigrants in the United States. This study sought to examine lifestyle, psychosocial, and demographic factors as unique predictors of obesity in Nigeria Igbo immigrants. The social ecological model and acculturation theory guided this study. Data were collected from 178 participants using approved and validated questionnaires. Logistic regression and Spearman's correlation were used to analyze data through SPSS. The findings indicated that gender ($\beta = .389$, $p = .021$); daily fruit consumption ($\beta = 0.142$, $p = .023$); and daily meat/burger consumption ($\beta = .410$, $p = .047$) were significant predictors of obesity. Therefore, among the Nigeria Igbo, lifestyle (daily diet) and gender predict obesity but psychosocial (acculturation and perceived stress) did not. The social change implications from the findings of this study may include use by public health workers and policy makers to target interventions to reduce obesity among the Igbo ethnic group living in the United States.

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Dedication

This project is dedicated to my Late Parents Engr. & Mrs Jonas Chimezie Duru and my dear family and my sisters Joyce Kalu, Patience Egwere, Adannaya Duru (nee Igwe) and brothers Chimezie Emmanuel Duru, Ikenna Ugochukwu Duru, Kelechi Nwabueze Duru, Uju Leslie Duru, Iheanyi Wisdom Duru.

Table of Contents

List of Tables

Chapter 1: Introduction to the Study

Introduction

Obesity is a chronic debilitating disease worldwide and affects a high percentage of ethnic minorities in the United States causing a major health concern (Albrecht & Gordon-Larsen, 2013). In the past 30 years in the United States obesity has increased rapidly from 14% to 34% (Obisesan, 2015). The Centers for Disease Control (CDC, 2014) reported that 33% of adults in the United States are obese and more than 70% of the entire population is expected to be overweight by the year 2020.

Obesity is associated with chronic diseases like cardiovascular disorders, diabetes mellitus Type 2, polycystic ovarian syndrome, certain cancers, hypertension and stroke, all of which are leading causes of mortality in the United States (Ade, Rohrer, & Rea, 2011; Dee, Doherty, Fitzgerald, Perry & Kearns, 2014). Obesity was linked to 2.8 million deaths in 2014 (the burden of 44% of diabetes, 23% of the ischemic heart disease, and between 7% and 41% of certain cancers are attributable to overweight and obesity) worldwide (World Health Organization [WHO], 2014). An estimated 300,000 deaths per year are due to the obesity epidemic in the United States (Flegal et al., 2001). Though the CDC does not list obesity as a cause of death, obesity-related chronic diseases stood high with heart disease: 635,260, cancer: 598,038, chronic lower respiratory diseases: 154,596, stroke (cerebrovascular diseases): 142,142 and diabetes: 80,058 (CDC, 2019; National Vital Statistics Reports [NVSS], 2018).

Background of the Study

Due to increased migration to the United States in the last 30 years, it is projected that by 2030, 14.8% of the total population of the United States will be made up several ethnic groups (Obisesan, 2015; United States Census Bureau, 2015). The prevalence of obesity is much higher

in ethnic migrant groups after residing in the United States in comparison to their native cohorts who did not migrate to the United States (Gele & Mbalilaki, 2013). Many immigrants in the United States gain weight after migration due to nutrition transition, physical inactivity, socioeconomic, psychosocial, tradition and religion, body image, self-perception, and beliefs relating to food (Misra, Balagopal, Raj, & Patel, 2018; Santos et al., 2015).

Researchers on ethnic minorities in the United States have determined that immigrants are inclined to rapid changes in emphasis towards convenience food and are susceptible to increased risk of obesity (Ade et al., 2011). According to the most recent National Health and Nutrition Examination Survey (NHANES), 18.5% of children and 39.6% of adults were obese in 2017–2018 in the United States. Odgen et al. (2014), concluded that non-Hispanic blacks have the highest age-adjusted rates of obesity (48.1%), followed by Hispanics (42.5%), then non-Hispanic whites (34.5%), and non-Hispanic Asians (11.7%).

Focusing on the health risk of obesity in the immigrant community, Ade et al. (2011), Satia (2015) and Murphy, Robertson, & Oyebode (2017) noted that there is an increase in the risk of obesity-related chronic diseases amongst immigrants of different ethnic groups. Immigrant populations from different ethnic background (Latinos, first generation African-Americans, Pacific Islanders, and Asians) are vulnerable to obesity and this may be due to different predictors (Ade et al., 2011; Adedoyin et al., 2010; Albrecht & Gordon-Larsen, 2013; Gele & Mbalilaki, 2013; Jamil et al., 2014; Kirby et al., 2012; Krueger et al., 2014; Murphy, Robertson, & Oyebode, 2017). The healthy immigrant effect suggests that the initial health status of immigrants is better than that of the population of the host country.

It is important that new migrants to the United States become familiar with their particular risk factors for obesity in order to prevent excessive weight gain. The Nigerian Igbo

immigrant to the United States has not been studied as a separate population in relation to obesity; however, Obesisan et al. (2017) studied obesity in Nigerian immigrants to the United States. The researchers found a link between alcohol consumption and all obesity, as well as gender, and moderate and morbid obesity among Nigerian immigrants in the United States. The researchers were unable to show an association between the more traditional predictors of obesity such as socioeconomic status, level of physical activity, education, acculturation, diet choices, perceived stress, and obesity in this population (Obisesan, et al., 2017). Therefore, the lack of research on acculturation, perceived stress, and other potential predictors of obesity among Nigerian Igbo immigrants and their susceptibility to developing obesity creates a gap in knowledge. This gap in knowledge on the potential risk factors of obesity among this group, includes but are not limited to the roles of diet, socioeconomic status, physical activity, acculturation, and perceived stress, which have been identified as predictors of obesity among other immigrant groups (Adedoyin et al., 2010; Ade et al., 2011; Albrecht & Gordon-Larsen, 2013; Gele & Mbalilaki, 2013; Jamil et al. 2014; Kirby et al., 2012; Krueger et al., 2014).

Problem Statement

Obesity in Nigerian immigrants living in the United States and the rest of African immigrant population have been researched extensively in epidemiological studies, including studies conducted by Akorolo (2014), Chukwunonye et al. (2013), Iwuala (2015) and Obisesan (2015). Multiple factors that contribute to the prevalence of obesity have been identified, but no study has focused specifically on the heterogeneity of the predictors of obesity in the different tribal groups of Nigerian immigrant populations, often known for their different sociocultural attributes, behaviors, and lifestyles (Murphy, Robertson, & Oyebode, 2017; Oza-Frank & Narayan, 2010; Zheng & Yang, 2012). This study therefore addressed the gap identified by

studying the specific factors of lifestyle, (diet, exercise, smoking), psychosocial (acculturation and perceived stress), and demographic factors (age, gender, education, SES) (dependent variables) as predictors of obesity (independent variable) in Nigerian Igbo immigrants living in the United States for 1 year and greater. I used the data collected to asses if these variables are correlated to the prevalence of obesity in Igbos. The results obtained explains some of the health disparities seen in obese Igbo immigrant population.

Purpose of the Study

The purpose of the study was to evaluate whether lifestyle, psychosocial, and demographic factors as predictors of obesity in Nigerian Igbo immigrants. I classified these factors into three major classes: lifestyle (diet, exercise, smoking), psychosocial (acculturation and perceived stress) and demographic (gender, age, education, SES). I utilized a quantitative cross-sectional survey to examine these factors. The study adopted some questions on sociodemographic and dietary pattern from the 2018 BRFSS questionnaire to obtain measurable data on diet, exercise, SES, education, age, and gender. The questionnaires were distributed to volunteer participants of Nigerian Igbo descent. Data acquired provided demographic information and other relevant predictor factor information sought in this study (Obisesan et al. 2015). Other measurement instruments used are the Stephenson Multigroup Acculturation Scale (SMAS), and the Perceived Stress Scale (PSS) which measured acculturation levels and perceived stress level respectively (Andreou, et al., 2011; Solivan, Xiong, Harville, & Buekens, 2015; Stephenson, 2000).

Research Questions and Hypotheses

Research Question 1. Do demographic factors defined as age, gender, education, SES, measured by the Behavioral Risk Factor Surveillance System (BRFSS), predict obesity (measured as a factor of BMI) in Nigerian Igbo immigrants in the United States?

$H_0$1: Demographic factors do not predict obesity (measured as BMI) in Nigerian Igbo immigrants in the United States.

$H_1$1: Demographic factors predicts obesity (measured as BMI) in Nigerian Igbo immigrants in the United States.

Research Question 2. Do lifestyle indicators defined as diet, smoking and physical activity, measured by the BRFSS, predict obesity (measured as a factor BMI) among Nigerian Igbo immigrants in the United States?

H_0 2: Lifestyle indicators (measured by BRFSS) do not predict obesity in Nigerian Igbo immigrants in the United States.

H_1 2: Lifestyle indicators (measured by BRFSS) predict obesity in Nigerian Igbo immigrant in the United States.

Research Question 3. Do psychosocial indicators (measured by the SMAS & PSS) and defined as acculturation and perceived stress, predict obesity (measured as a factor of BMI) among Nigerian Igbo immigrants in the United States?

H_0 3: Psychosocial indicators (measured by the SMAS & PSS) do not predict obesity in Nigerian Igbo immigrants in the United States?

H_1 3: Psychosocial indicators (measured by the SMAS & PSS) predict obesity in Nigerian Igbo immigrants in the United States?

Theoretical Framework

Socioecological model (SEM) by Bronfenbrenner (1989) and acculturation theory by Schumann, 1978 was used to examine the predictors of obesity in the Nigerian Igbos. The SEM examines how environmental and individual factors interact to determine behavior and also used as a model to target such behaviors with health promotion while acculturation focuses on the process confluence among cultural heritage and cultural practices, values, and identification after migration into a new country with different cultures (Lincoln, Lazarevic, White, & Ellis, 2016). The models examined behavioral changes against the risk of obesity in Igbo Nigerian immigrants in the United States. I used the SEM in this research to sequence and categorize the predictors into four levels (i.e. individual, interpersonal, community and organizational).

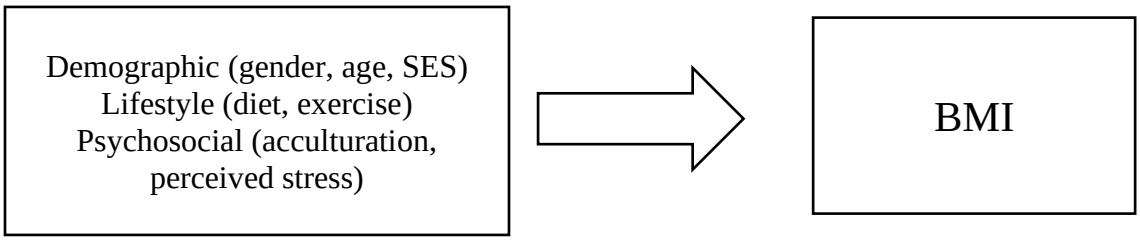

Figure 1- Potential Predictive factors of obesity among Nigerian Igbo immigrants

Socioecological Model

The SEM provided a context to examine the relationship between obesity and its possible risk factors in Nigerian Igbo immigrants. The SEM identified behavioral changes among Igbo Nigerian immigrants and categorized the predictors of obesity into different levels (individual level, interpersonal level, community, social level, and policy/enabling environment level). The socioecological model was appropriate applied to this study because it particularly examined the relationship between behaviors at societal levels. Urie Bronfenbrenner, recognized by his development of the framework (SEM) believed that there are some distinctions but intertwined

factors that shape human behavior. The SEM identifies changes in behavior in a population on various ecological levels such as: individual, organizational, and community (CDC, 2013). I applied the SEM in this study to highlight ways to initiate behavioral changes (modify social interaction, increase physical activity, and healthy eating) and improve health statuses of diverse immigrant groups by using it to identify possible social and environmental risk factors that could predispose person of common culture and beliefs to obesity, metabolic syndromes and all other related chronic diseases (Simons-Morten, McLeroy, & Wendel, 2012). The SEM is theorized to be based on multiple levels of influence, and that to understand the cause of the problems each of these levels of influences should be examined comprehensively and program planning modeled around these levels of influences to effectively prevent or reduce the prevalence of obesity.

Individual, organizational, interpersonal, community, and policy/enabling environment are five main levels of the SEM that can influence behavior (CDC, 2014).

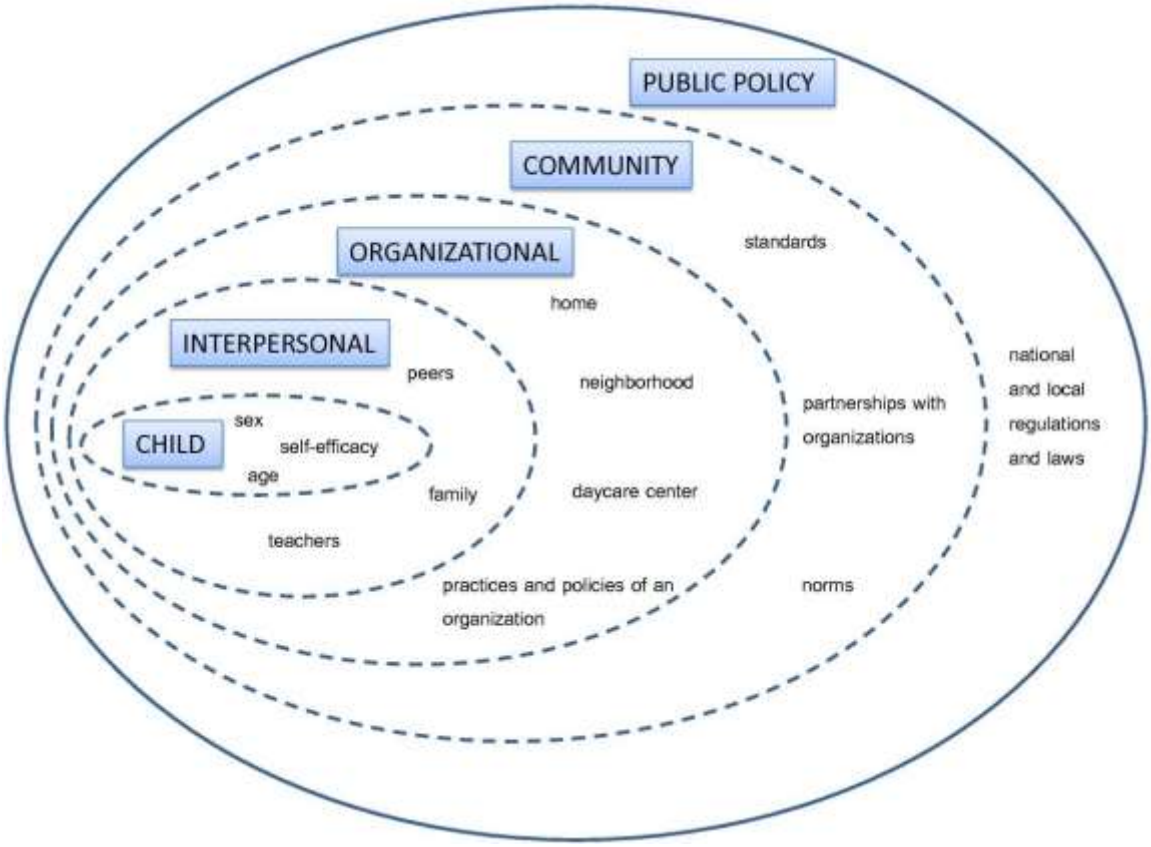

Figure 2. Socioecological model diagram.

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Acculturation Theory

Acculturation theory offers insight into multilayered and multipurpose interactions between immigrants and a dominant culture (Ngo, 2008). Obisesan (2017) and Ike-Chinaka (2013) showed that acculturation is associated to development of obesity in immigrants in the United States. Acculturation in this research will be used to show observed changes in immigrant behaviors and how these behaviors are affected by dieting, income, perception, physical

inactivity/activity, language, duration of stay, and workplace and school influences. A section of the acculturation process by Ward and Geeraert (2016) involves the attainment, preservation, and modification of cultural behaviors, values and identities associated with heritage and settlement cultures. Due to limited literature on Igbo immigrants this study would therefore examine if the common predictors of obesity i.e. perceived stress, age, gender, diet, SES, level of education, level of physical activity, smoking and acculturation are determinant factors of obesity in this group of Nigerian immigrants.

Nature of the Study

This research used quantitative cross-sectional survey design to examine obesity measured according to BMI values (dependent variable) due to acculturation, age, smoking, dieting, gender, educational level, physical activity, socioeconomic status, and perceived stress (independent variables) in Igbo immigrants living in Atlanta and Macon Georgia. Questions from Behavioral Risk Factor Surveillance System (BRFSS) questionnaire, Stephenson Multi Acculturation Scale and the Perceived Stress Scale to carry out the survey in approximately 163 volunteer immigrants of Nigerian Igbo origin residing in the Atlanta/Macon areas of the State of Georgia. The number *n* was determined using the G power statistical software by setting the effect size set at medium, f2 = 0.5, power (1-β err prob) set at 0.80, the probability level set at $p < 0.05$. The criteria for eligibility will be that participants are 18 years and above, Nigerian Igbo immigrant and have lived greater than 12 consecutive months in the United States. Recruitment and distribution of flyers were done through a network of local churches, registered societies of Nigerian immigrants such as Umu-Igbo Unite (https://umuigbounite.com/), local African food shops, hair salons and braiding shops, and barbershops.

Definitions of Terms

Acculturation: Acculturation is a complex process of socially, psychologically, and culturally adapting to the prevailing culture of a society between two when trying to balance between the two in a host culture (Rudmin, 2003).

Dietary acculturation: This is a process of assimilation to a different culture's dietary patterns by immigrants, usually the dominant one in their host environment. The process through which members of a foreign culture adopts dietary patterns of the host culture (Wandell, 2013).

Health disparity: The variations in health opportunities and disease burden in a common population based on race, gender, age, literacy, socioeconomic status (Cohen, Chávez, & Chehimi, 2010)

Nigerian Igbo immigrants: Members of an ethnic group native to the present-day south-central and southeastern Nigeria and who have migrated to the United States as naturalized citizens, legal permanent residents, or undocumented residents (Uchendu, 2010).

Obesity: Classified as a body mass index greater than 30 kg/m2 (CDC, 2019; WHO, 2014;).

Socioeconomic status: The American Psychological Association (2014) defined socioeconomic status as the social class to which an individual or group belongs, often measured by education, income, and occupation.

Behavioral Risk Factor Surveillance System (BRFSS): BRFSS is a type of survey system that is used by CDC to gather data of public health conditions and risky behaviors in the United States. population (CDC, 2014).

Body Mass Index (BMI): A mathematical method of measuring body fat calculated individual height and weight as parameters. Measured in kg/m2 (WHO, 2014).

Social support: Social support is support rendered and received individuals or group of people who share the same values and lifestyle (Schneider, 2006).

Stress: Stress is defined as an inappropriate pressure and tension that is increased and has harmful effects (CDC, 2013, Tsigos et al., 2016).

Assumptions

This study assumed that information received from participants were truthful and accurate about their personal statistics, lifestyle, and demographics (age, height and weight, sex, physical activity level, SES, Igbo tribe of Nigeria). The study also assumed that study participants were competent to understand and provided information; that all respondents are of Igbo sub ethnic group and aged 18 years and above to grant consent. These assumptions were necessary and was met in order to ensure that data collected were appropriate for the analyses performed. The assumptions ensured normality, independence, linearity, and homoscedasticity of the data collected.

Scope and Delimitations

The responses were obtained only from Nigerian Igbo immigrants, ages 18 years and older, who reside in the state of Georgia, in the United States specifically in the cities of Atlanta and Macon with high number of Nigerian immigrants. The recruitment was carried out through flyers distributed in local churches, hair salons, barbershops, social gatherings and organizations for Igbos such as Umuigbo Unite, other unique social village organizations (i.e. Onithsa ado- http://onitshaclubatlanta.com/, Amaigbo town Union- http://www.atuusa.org/; Umuchoke development union, Amaigbo youth association- http://www.atuusa.org/amaigbo-youth-association.html). The responses received from the participants via traditional USPS mail and hand to hand back delivery. I excluded participants who have resided in the United States less

than 12 consecutive months, participants who do not speak English, participants under the age of 18 years, and non-Igbos.

Study Limitations

This project used questions adapted from the BRFSS questionnaire (sections on dietary pattern and sociodemographic factors), the SMAS (acculturation and social support), and the PSS (stress level perception) to collect data from participants about demographics, acculturation, perceived stress, age, gender, diet, physical activity, and SES. Participant recall bias posed a challenge to gather accurate responses from study participants. for the study because of the increased risk of potential participant bias (Adedoyin et al., 2010; Ade et al., 2011; Ike-Chinaka, 2013; Obisesan, 2015). The recruitment location was limited to Macon and Atlanta which are the two cities with the largest population of Nigerian immigrants in the State of Georgia. The selected cities and choice of a convenience sample posed a limitation to the generalizability of results to the general population of Igbo immigrants in the United States.

Significance of the Study

The study will help inform public health and health care providers of risk factors that may place West African immigrants, particularly those of Igbo descent at risk of obesity after living in the United States for at least one year.

The social change implications of the study will help public health officials and providers understand predictors of obesity among Igbo immigrants living in the United States and can help tailor interventions around these predictors. Researchers and public health professionals may use the findings of this study to integrate a social change activity, such as develop health education materials and programs. Also, policy makers may use this to advance health policies in the fight of obesity and its risk factors/behaviors among immigrants.

Social Change Implications

One of the fastest growing population of immigrants in the United States are Nigerian immigrants (American Immigration Council, 2012). Igbos make up a significant number of Nigerian immigrants therefore understanding the factors that lead to obesity in this population will shed light into how and what needs to be addressed and how best to initiate obesity interventions such as individual- or community-level intervention (Simons-Morten, McLeroy, & Wendel, 2012). Identifying the physical environment and the societal norms may improve interventions efforts towards a decrease in disparities related to obesity in Nigerian immigrants and African immigrants in general. (Noonan, Velasco-Mondragon, & Wagner, 2016; McKenzie, Neiger, & Thackeray, 2008; Simons-Morten, McLeroy, & Wendel, 2012).

This information will be helpful and beneficial to policy makers, health professionals, educators, and organizations for use in planning and developing appropriate health interventions that will target behaviors at different levels (McKenzie et al., 2008). Because there is lack of research on obesity in Igbo migrant population residents in the United States, this research has provided insight, knowledge, and datasets that can be used for future research for obesity and other health problems in Igbo immigrant population. Ultimately the application of this research will provide a better environment for better health outcomes by reducing risks of chronic diseases and its related healthcare associated cost.

Summary and Transition

Obesity is a debilitating state of health mostly affecting minorities of different backgrounds and ethnicities of immigrants residing in the United States (Albrecht & Gordon-Larsen, 2013). Obesity has been related to several diseases like diabetes, cholesterol, heart diseases, sleep disorder, high blood pressure, stroke, metabolic syndromes and many cancerous

diseases (Ogden, Carroll, Kit, & Flegal, 2014). It is quite relevant to investigate the association between acculturation, perceived stress, diet, smoking, level of physical activity, level of education, length of stay, SES and obesity in Igbo immigrants so that targeted interventions could be introduced in the fight of obesity and to provide better health to similar groups of people. The next chapter will review existing abundant literature on obesity predictors namely acculturation factor, stress, dietary habit, physical activity, income, age, gender, and length of stay that may influence immigrant behaviors and lead to obesity in Igbos and other immigrant populations.

Chapter 2: Literature Review

Introduction

Purpose of the study was to examine the predictor of obesity among Nigerian Igbo immigrants in the United States. A look at the current epidemiology of obesity in minority populations of immigrants (first generation African Americans, Asian, Pacific Islanders, Hispanic, and European) shows that obesity is linked to morbidity and mortality according to documented evidence and what is known on the sociodemographic predictors of obesity in other immigrant populations in the United States (Barrington, Baquero, Borrell, & Crawford, 2010; Castellanos, Connell, & Lee, 2011; Guendelman, Ritterman-Weintraub, Fernald, & Kaufer-Horwitz, 2013; Hruby, & Hu, 2015; Hunte & Williams, 2009; Jasti, Chang Hyun, & Doak, 2011; Singh, Siahpush, Hiatt, & Timsina, 2011; Tseng, & Fang, 2011; Yeary et al., 2011,). The literature drew distinctions between different risk factors that predispose distinct immigrant populations to obesity and its related chronic diseases in the United States.

Literature Search Strategy

The literature search comprised of recent peer reviewed articles published between 2013 - 2019, in the following databases: Walden University Library, 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, PsycARTICLES, Health and Medical Complete, Health Sciences, Journal of the American Medical Association on google search engine, Academic Search Complete, SAGE Research Methods Online, SAGE Stats, Science Journals, Science Direct, ProQuest, ERIC, and Health Source: Nursing Edition. I did also use Google Scholar and Google search engines and the CDC, WHO and UNICEF websites.

Keywords and phrases used for searches: *Igbo Nigerian, obesity and SES, Psychosocial factors and obesity, acculturation and immigrants, ethnicity and obesity, immigration and obesity, education and obesity, racial differences in obesity in the US, physical activity and obesity, physical activity and SES, obesity in Nigerian immigrants in the US.*

The literature search turned up several articles and upon review based on year of publication I identified articles written and published between 2013 – 2019, placing emphasis on peer-reviewed articles which are available in full texts. I also selected more than 67 other articles namely. dissertations, editorials systematic reviews which were included in the literature review. Thorough scrutinization of articles were done to identify articles that met the minimum standard on theoretical foundation, method, purpose, sampling methods, population and design.

Theoretical Foundation Framework

This study used the socioecological model (SEM) (Bronfenbrenner, 1989) and acculturation theory (Schumann,1978) to examine the possible predictors of obesity in this group. The SEM examined the interaction between the environment and personal factors determine behavior. A benefit of the SEM is that it can be used as a model to target behaviors with health promotion while acculturation focuses on the process confluence among heritage, cultural and uptake of cultural practices, values, and identification after migration into a new country where culture may differ (Lincoln, Lazarevic, White, & Ellis, 2016). The models examined behavioral change and associated risk of obesity in Igbo immigrants in the United States. SEM was used to categorize the predictors into four levels: individual, interpersonal, community and organizational levels.

Social Ecological Model

Over decades, the SEM has been used to study the causes and theories that defines obesity (Lytle, 2009; Robinson, 2008). The SEM uses a framework to understand the different layers, factors and barriers that impact health towards the development of obesity, and therefore can be used to make culturally appropriate and sensitive intervention strategies for immigrants from different ethnic and social backgrounds in the United States. The use of SEM in this study was necessary because it helped to understand the variable aspects of social ecological factors that impact the health linked behaviors of immigrants from Nigerian Igbo tribe and the prevalence of obesity in this group residing in the United States.

At the interpersonal level of the SEM (referenced above in figure 1) factors that characterize an individual i.e. level of physical activity, food preferences, and overall social life have been linked to obesity (Ade, Rohrer, & Rea, 2011; Chircop et al., 2013; Kellou, Sandalinas, Copin, & Simon, 2014; Knoblock-Hahn & LeRouge, 2014; Townsend & Foster, 2013; Zive & Rhee, 2014). To control obesity and its related diseases, changes need to occur in our interpersonal, cultural, physical and organizational environment. For lasting behavioral changes to occur it is also noted that individuals should undergo these changes concurrently with environmental changes (Gentile et al., 2009; New Hampshire Department of Health and Human Services, 2010).

Changes in behavior towards a healthier lifestyle is easier when the environment is more socially accommodating (Gentile et al., 2009). Trends seen in obesity can be as a result of the social environment as this tends to have a positive or negative impact on one's behavioral changes and attitudes. Stronger social relationship can help an individual go through the phases of behavioral changes namely precontemplation, contemplation, action, and maintenance

(transtheoretical model of behavioral changes), while lack of social support is a negative influence on behaviors and health in general. Therefore, an obese individual will perform better towards behavioral change if they have a strong social support system (Acheampong & Haldeman, 2013; Ade, Rohrer, & Rea, 2011; Kelly, & Barker, 2016; Layton, Parker, Hermann, & Williams, 2009; Sutherland, 2013).

Physical inactivity is associated with the rapid increase in the prevalence of obesity in the United States because of decreased energy expenditure. Normal weight individuals tend to engage in physical activity in contrast to overweight and obese individuals. Sedentary lifestyle and unhealthy dietary choices cause increase in body weight resulting in obesity and other related diseases such as type II DM, some types of cancers and heart diseases. Blanchard et. al (2005) suggested that the epidemic trends of obesity are linked to the social environment which promotes obesity causing behaviors. Social environment, social support, and social relationships strongly influence the adoption of a healthier lifestyle, physical activity, and dietary changes, all of which results in decrease in body weight (Harley, 2009; Thomas, 2009; Kelly, & Barker, 2016).

Hunte, & Williams, (2009); Cuevas, Ortiz, & Ransome, (2019), examined the association between perceived discrimination and obesity in a population-based multiracial, and multiethnic group. They examined how perceived discrimination affects body fat accumulation and increase in waist circumference using multivariate multinomial logistic regression and logistic regression. They found that in an ethnically diverse environment those who perceived chronic discrimination in Polish, Jewish, and Italian whites were 2-6 times more likely to have increased waist to hip circumference than Polish, Jewish, and Italian whites who did not experience chronic discrimination. This affirms the already established fact, that social environment influences the

health of the population. The better the social environment on individuals the better the health seen across the population.

Dietary changes as immigrants settle in their host nation exposes them to changes in dietary pattern and culture of foods in their new domain. These foods may contain excess calories than what is obtainable in their native country. The consumption of these high calorie foods and the changes in dietary pattern influence the individual's weight towards development of obesity (Castellanos et al., 2011; Smethers, & Rolls, 2018).

Faith based organizations and community-based organizations as part of the social environment has played a role in health maintenance of their members. Yeary et al. (2011) found that faith-based organizations adopted some physical activity exercises in a research on African American churches; they concluded that members experienced a high level of physical fitness and increased social support from other members, families and friends and these had a positive effect on the overall health of individuals and a reduced obesity prevalence. The Social Ecological Model (SEM) is used to describe the etiology of obesity and used to develop a framework for prevention. I examined the unique and relative contribution of each layer of the SEM to weight status. These layers of the SEM representing childhood, interpersonal, organizational and community was applied in this research to predict obesity in Igbo immigrants.

Acculturation Theory

To understand degree of assimilation and integration into the host environment and culture, acculturation theory was the best method to help achieve the purpose (Abraido, Armbrister, Florez, & Aguirre, 2006). Acculturation levels are associated with the levels of good or bad health seen in immigrants. It is linked to the development of obesity in minorities (Abraido et al., 2006; Ade et al., 2011; Gordon-Larsen et al., 2003). In a systematic review using

six EBSCOhost databases, Delvari et al. (2013); Kuo (2014) studied the existence of a possible relationship between acculturation measured with a standardized scale and overweight/obesity among adult migrants from low-medium income countries to high income countries. The results showed that the more immigrants are accultured to their host country the more the loose their better health. *"The healthy migrant effect"* diminishes because the host nutrition and abundance of high calorie food differs from that obtained in their native countries and within their cultures. These were particularly seen in men. The research further stated that the varying results observed for women may be due to cultural influences on body image, physical activity indulgence and healthier food choices.

Ade et al. (2011), examined acculturation and acculturation risk factors on immigrants and how it applied to overweight and obesity and came to similar conclusion that the predictors of obesity in immigrants from Africa like age at migration, years of domicile, level of physical activity, dietary habits, education, SES, were all associated with the level of acculturation and the development of obesity or overweight which added to the increased prevalence of obesity seen in the United States.

Literature Review Related to Key Variables

Health disparities in obesity has been linked to factors like cultural (ethnic), physical, socioeconomic, environmental, and social issues (Krueger, & Reither, 2015, Ruth et al. 2019). Due to limited research on Nigerian Igbos living in the United States, this research will use key variables namely lifestyle (diet, exercise, smoking), psychosocial (acculturation and perceived stress) and demographic (gender, age, education, SES) to investigate unique obesity predictors in Igbo Nigerians, as have been used to research obesity in other ethnic groups faced with health inequality (Berry, 2008). Bertera, Bertera, & Shankar, 2003; Byrd, Toth, & Stanford, 2018;

Drewnowski & Specter, 2004; Ike-Chinaka, 2013, all linked obesity to physical inactivity, acculturation, length of residence in host country, age, gender, stress, cultural perception in immigrant populations.

Socio-economic Status among Immigrants in the United States.

Bertera et al. (2003) examined socio-economic status, acculturation and its relationship to obesity in 1205 Salvadoran immigrants from the Washington, D.C area. Using language preference and length of residence to measure acculturation, while BMI was used as a standard measure for obesity, they found that obesity was positively associated to acculturation.

Obisesan et al. (2017) noted that predisposing factors of obesity in Nigerian immigrants are acculturation, physical inactivity, income, gender, age, education, SES. Duration of residence; These factors where similarly noted in Hispanic, Asians, Europeans, and African immigrants to the United States (Murphy, Robertson, & Oyebode, 2017).

The economic burden of obesity in the United States runs into billions of dollars in expenditure. Current estimates show that the costs range from $147 billion to nearly $210 billion per year in the United States and the global impact of obesity economically as assessed in 2014 was estimated to be $2 trillion or 2.8% of the global gross domestic product (GDP) (Tremmel, Gerdtham, Nilsson, & Saha, 2017). A study by Andreyeva, Luedicke, & Wang, (2014) associated obesity with an increase in job absenteeism, costing approximately $4.3 billion annually.

CDC (2014) noted that obesity contributes to the development of some chronic diseases and other metabolic syndromes leading to increased mortality. Metabolic syndrome is a collection of reversible major risk factors for cardiovascular disease and type 2 diabetes whose main diagnostic, mechanisms are decreased HDL-cholesterol, increased triglycerides, increased

blood pressure and increased fasting plasma glucose, all of which are related to weight gain, specifically intra-abdominal/ectopic fat accumulation and a large waist circumference (Han, & Lean, 2016).

First Generation African versus African American

Researches focusing on obesity in minority groups in the United States generalized African Americans as a composite of black people and didn't view them as culturally unique and different. Nigerian immigrants have also been investigated in relation to obesity but non viewed Nigerian immigrants from the three major tribes differently and as a standalone population in the studies of obesity. This is particularly important for targeted policies and solutions to combat the obesity as differences may be present in their particular risk factors (Adedoyin et al., 2010; Ade et al., 2011; Agyemang, & Powell-Wiley, 2013; Albrecht & Gordon-Larsen, 2013; Byrd, Toth, & Stanford, 2018; Gele & Mbalilaki, 2013; Jamil et al., 2014; Kirby et al., 2012; Krueger et al., 2014; Liu, et al., 2016).

It is widely believed and documented that increase in body weight and ultimately obesity in immigrant groups are strongly associated to demographic (age, sex, education level, income level, marital status, occupation, religion, birth rate, death rate, average size of a family, average age at marriage, length of stay), lifestyle (smoking, alcohol, poor diet leading, lack of physical exercise, sexual behavior and problems resulting from drug taking), and psychosocial (stress, hostility, depression, hopelessness, and job control seem associated with physical health) factors in the United States (Adedoyin et al., 2010; Schwartz, Unger, Zamboanga, & Szapocznik, 2010; Veromaa, Kautiainen, & Korhonen, 2017). Overwhelmingly these factors form part of the acculturation changes leading to obesity observed in immigrants as they integrate themselves into their new society (Jamil et al., 2014).

African Americans (including immigrant blacks) are disproportionately affected by obesity (Skinner et al. 2014; Mckernan et al. 2014). Krueger et al. (2014), Goulao et al. (2015) researched obesity in immigrants of different ethnicities Asian, Hispanic, African, Pacific Islander, and European immigrants after arrival in the United States and reported a consistent positive association between BMI and time since immigration (duration of habitation). Goulao et al., (2015) found a link between immigration and food consumption. They established that food and beverages play a key role in maintaining social and cultural connections among immigrants and that as the duration of habitation into host countries continues to grow food consumption among immigrants' changes in part due to acculturation and lack of availability of typical food products from their home country (Ayala, Baquero & Klinger, 2008; Lv & Cason, 2004; Méjean, et al., 2008, Paxton, 2016). These results and conclusions on research on immigrant's minority groups in the United States justifies the need for research on obesity in Igbo Nigerian immigrants in the United States as their population increases consistently.

Obesity, Migration, and Immigrants in the United States

The population of African Immigrants to the United States have increased (Akpuaka et al., 2013; Turk et al., 2015; Wilson, 2016). Between 1980 to 2010 there has been a near 75% increase in the population of African immigrants (Blanas et al., 2013). Between 2000 and 2016 more than 1 million immigrants from sub-Saharan Africa came to the United States mainly from Nigeria, Ghana, Kenya, Ethiopia, and Somalia. This was the largest number of Africans coming to the United States since the trans-Atlantic slave trade (U.S census Bureau, 2018). West African immigrants make up majority of African immigrants in the United States. with 36% while east Africans, North Africans and South Africans are 29%, 17% and 5% respectively. These large

numbers in immigrant population brings epidemiological challenges for the public health department in the United States (United States).

Obesity is a very common health issue amongst immigrants' groups in the United States (Edberg, Cleary, & Vyas, 2011). Migration is classified as a social determinant of health and due to variations in population demographics obesity prevalence and related diseases has increased, and immigrants are heavily affected as immigrants may be very vulnerable to obesity (Goulão, et al., 2015; Rechel, et al. 2013; Oza-Frank & Narayan, 2010).

Following extended length of residence between 5-15 years researchers determined that there is an increase in body weight seen in immigrants (Delavari, Sønderlund, Swinburn, Mellor, & Renzaho, 2013). Due to Healthy Immigrant Effect, newly arrived immigrants are noted to have better health statuses than the rest of the population in their host country. This is cited as a reason for the neglect of immigrant's health statuses in the past decades even though the population of immigrants keeps increasing (Domnich, Panatto, Gasparini, & Amicizia, 2012; Kennedy, Kidd, McDonald, & Biddle, 2015). A theory of (1) Positive self-selection of location by which wealthier, healthier and more educated intending migrants migrate accounted for Healthy Immigrant Effect 2) Cultural buffering: a way of curtailing or prohibiting unhealthy behaviors by immigrant culture and society and 3) Tough screening and prejudiced policies enacted by host countries also accounted for HIE (Kennedy et al., 2015; Taylor & Sarathchandra, 2016).

African immigrants have gained weight during the acculturation process and researchers have documented racial variances on the perception of weight such that overweight and obese African male immigrants are most likely to perceive their weight status as a sign of good living and prosperity in line with cultural identity than men from other ethnic backgrounds (Carter-

Pokras, Okafor, Picot, & Zhan, 2013). For example, in Moroccan communities' obesity is perceived as a sign of success and prosperity among women (Goulao, 2015).

In and around black communities there is a dominance of unhealthy food practices which have been linked to unavailability of healthy foods, and rising cost of healthy food in the communities, choices of food and eating patterns and lastly black consumer-directed marketing (a process by which business launches and examines standards of customer satisfaction and work hard to meet the consumer needs and expectations in providing goods and services to customers) (Beagan & Chapman, 2012). This may be why many fast food stores are found around inner-city neighborhoods (Beagan & Chapman, 2012).

Acculturation is defined as a process of cultural modification by an individual, group, or people by adopting or borrowing traits from another culture (Berry, 2008). (Corral & Landrine, 2008), Ike-Chinaka (2013), investigated low socioeconomic status, lack of access to health care, length of stay, physical activity, obscure perception of weight gain, and immigration status and found that length of stay and unhealthy dietary pattern accounted for more than half of obesity in African immigrants. They also opined that low SES is a trigger for behaviors that lead to obesity in immigrants adapting to life in host cultures, these behaviors are unhealthy eating habits, sedentary lifestyle, impression that excessive weight gain is a sign of prosperity as perceived by some cultures (Corral & Landrine, 2008; CDC, 2014; Delavari et. al., 2013; Ike-Chinaka, 2013).

Forty-four percent of immigrants are impoverished and live in poor neighborhoods which predisposes them to unhealthy lifestyles and obesity. It is pertinent to note that poor neighborhoods are infested with fast food restaurants and a few farm fresh markets, therefore there is a lack of healthy foods, increased crimes, poor schools and dilapidated recreational areas and parks (Delavari et al., 2013).

Ike-Chinaka (2013), examined acculturation risk factors in Nigerian immigrant children in northern California, he found that lack of physical activity, low SES, and duration of residence is solidly associated to increase in body weight and obesity in Nigerian immigrant children. He linked this to preferences in social life, food, and behavioral changes. Obesity, gender, acculturation and place of birth were significantly related to obesity in Mexican American adults aged 18 and above (Barcenas,2007). Gender was shown be a factor in the development of obesity and it is more pronounced in women than in men (Tsai, Lv, Xiao, & Ma, 2016). Obesity was linked to duration of residence in host country in a study of Mexican American immigrants (Barcens,2007). Barcens, (2007) found that there was a 2% and 1% increase in obesity in women and men respectively. Furthermore, the researchers concluded that 2nd and 3rd generation Mexican American Immigrants were more accultured to the host environment than the first-generation immigrants and therefore more obese than seen in first generation immigrants.

Ade et al. (2012) studied acculturation and obesity, results showed that obesity is positively correlated with acculturation in African immigrants, South American immigrants like Salvadoran, and Hmong immigrants from East and Southeast Asia. As already stated, the authors detailed that the causes of obesity in African immigrants were due to sedentary lifestyle, change of dietary habits with greater intake of high calorie containing foods, low SES and generally changes in overall behavior. This was also the case seen in other immigrants in the United States. However, among Asian immigrants it was evidenced that in Korean and Chinese descent immigrants that acculturation and increase in body weight were linked but not in Vietnamese immigrants (Chen, Juon, & Lee, 2012). They noted that obesity was more likely (5 folds) in immigrants who arrived early (at a younger age) into their host country than later arrivals.

Korean and Chinese male immigrants were seen to be significantly overweight and obese than their female counterparts (Chen, 2012) this is in part due to high caloric consumption; and is in contrast to immigrants of African descent in whom there was no difference in gender and obesity (Ade et al., 2012). Asian and Hispanic immigrants in California were found to consume less fruits and vegetables and have an increased intake of high calorie containing foods, therefore increasing their exposure to overweight/obesity (Unger, Reynolds, Shakib, Spruijt-Metz, Sun, & Anderson, 2004). Language and cultural barriers in new immigrants tend to lead to sedentary lifestyle, unhealthy food choices, and solitude which leads to a decrease in physical activity (Shi et al., 2015). Similar results were seen in Islanders of Haitian descent, and southern Americans from Brazil and Ecuador. Lack of social support system, increased stress levels, decreased income, solitude were among the factors that caused sedentary lifestyle and obesity in immigrants (Tovar et al., 2013). Acculturation pathways maybe different in immigrant groups who reside in the United States (Corral & Landrine, 2008). The ill effects of acculturation differ in ethnic groups, Hispanic immigrants are more burdened with high risk of type 2 DM at the prevalence of 9.7% compared to Asian immigrants who are less prone to developing Type 2 DM at a prevalence of 3.4% (Kandola, Diez-Roux, Chan, Daviglus, Jackson, Ni, & Schreiner, 2008). African immigrants are higher on the scale for acculturation risk factors like gender, age at start of residence, duration of stay in resident country, SES status (Zeigler-Johnson et al., 2013).

Obesity in Native Nigerians

Data from the WHO shows that the prevalence of overweight and obesity increased by ~20% between 2002 and 2010 in Nigeria., and in 2011 3% and 8% of men and women respectively are obese in Nigeria. Adedoyin et. al (2010). There is a consensus that there is an association between overweight and obesity prevalence in females, age, SES, and urbanization in

all major tribes in Nigeria (Akorolo, 2014). Prevalence of obesity in Nigeria is found to be very comparable to that which is obtained in industrialized countries (Kandala & Stranges,2014). Uvere, & Ene-Obong, (2013) reported that obesity rate and prevalence in Nigeria's most populated and urbanized cities are like that seen in Western countries.

Akarolo-Anthony et al. (2015), studied obesity prevalence in 1058 adults (visitors and workers) of a government worksite in Abuja (Capital city of Nigeria) using a log-binomial regression to estimate multivariable adjusted associations of determinants of overweight/obesity, the study found that the overall prevalence of overweight/ obesity (body-mass index $\geq$ 25 kg/m2) was 64% (74% of the women and 57% of the men). For women compared to men, the prevalence ratio (PR) and (95% confidence interval, CI) was 1.24 (95% CI 1.08, 1.43, p = 0.004), for overweight, and 2.54 (95% CI 2.08, 3.10, p = <0.0001), for obesity Individuals aged 40 – 49 years were more likely to be overweight or obese. Compared with the individuals in the lower socio-economic status, the PR for obesity among those in the middle and high socio-economic statuses, were 1.39 (95% CI 1.13, 1.72) and 1.24 (95% CI 0.97, 1.59) respectively, p for trend = 0.003. The results showed that 66.7% of Nigerian professionals with high SES and living in urban areas are either overweight or obese. In comparison to adults in the United Kingdom the prevalence of obesity in adult Nigerians showed no significant difference. Also, the study reported that being of older age, and female also predicted obesity and overweight independent of other factors. High and average SES were also independently associated with obesity.

Similarly, an investigation of obesity prevalence and overweight in 998 (417 females & 581 males) randomly selected adults living in the urban city of Ibadan Nigeria using socioecological model for the roles of behaviors and lifestyle on obesity outcomes, and

analyzing demographic data with a t test and chi-square while using logistic regression and multivariate analysis of variance (MANOVA) as a determinant of the variables associated with obesity showed normal weight prevalence of 8.82% (CI = 7.13%, 10.75%), overweight prevalence of 17.45% (CI = 15.12%, 19.95%), and obesity prevalence of 26.18% (CI = 23.47%, 29.03%), and a high dominance of obesity in female subjects (CI = 13.76%, 21.24%) than in the males [2.75% (CI = 1.58%, 4.43%)]; 42% of the women on examination were rated overweight as against 15% for males (Agofure et al., 2017; Olatunbosun et al., 2011). Strong associations between obesity and high SES were identified in both genders. The report also showed that alcohol consumption of greater or equal to 60 grams weekly also predicted obesity. They found obesity in Nigerians to be similar to results from industrialized nations.

Anyabolu & Okoye (2017) investigated, the prevalence of obesity in a heterogenous sample of 294 subjects in Nigeria. Mean values were compared using ANOVA or the t-test for continuous variables, and for categorical variables comparisons were done using the chi-square goodness of fit test. Association between BMI and the independent variables (diabetes mellitus, cigarette smoking, tobacco snuff use, educational status, alcohol use, marital status, eating at home, meat consumption, night-time sleep duration, economic status, days spent on business in a week, annual leave duration, number of persons living in same apartment, number of dependents, social activities, siesta, use of Akanwu (potash), complexion, length of time spent at work daily, thickened arterial wall) were examined. All tests were two-tailed with $P < .05$ taken as statistically significance. They reported a high prevalence of overweight (prevalence of 35.4% (women 61.5%, men 38.5%)) and obesity (prevalence of 33.3% (women 87.8%, men 12.2%)). They researchers noted that common amongst the obese and overweight participants were

cardiovascular problems, few children/dependents in household, increased sleep duration, high meat consumption, marital problems, diabetes mellitus were common.

Ayandele, Eze, & Umuerri, (2017) studied the prevalence of obesity in rural vs urban residents in 866 respondents (44% rural residents and 54% urban residents') who resided in the Jesse (rural) and Warri (urban)) in delta state Nigeria. The sample comprised respondents in male: female ratio of 1:1(Jesse) and 1:1.5 (Warri); mean age (± standard deviation [SD]) was 47.1 (±19.0) years and 38.9 (±12.2) years, and mean BMI (±SD) was 22.64 (±3.52) kg/m2 and 24.89 (±5.14) kg for rural and urban populations, respectively. The study results showed that obesity and overweight were more prevalent in the urban areas (20.9%) as against the rural area with a prevalence of 10. 9% and that female respondents in both cities had a greater degree of obesity than that seen in men. In both cities however middle-aged men 40-64 years of age had the highest prevalence of obesity. Also, in this age group in both areas the differences in BMI (≥25 kg/m2) was statistically significant (Chi-square [$\chi 2$] = 22.055, df = 1, $P < 0.001$). The urban–rural differences in the association between educational status and prevalence of obesity was significant (≤primary: $\chi 2 = 18.970$, df = 1, $P < 0.001$; secondary: $\chi 2 = 9.064$, df = 1, $P = 0.003$).

Kandala, & Stranges, (2014), analyzed data collected from 27,967 women aged 15–49 years, based on the 2008 Nigerian Demographic and Health Survey (NDHS). They collected socio-demographic data from different states in Nigeria and with the Bayesian geo-additive mixed model, mapped out the geographic distribution of overweight and obesity at the state-level, while controlling for individual accounting and individual-level risk factors. Descriptive statistics, chi-square tests and t tests were used to analyze the differences observed across ethnic groups in the study. Results showed that the prevalence of obesity/overweight is significantly

associated with higher education status, higher wealth index, urban residence and increase in age. There was also a striking variation in overweight/obesity prevalence across ethnic groups and state of residence, the highest being in Cross River State, in south-eastern Nigeria [2.32 (1.62, 3.40)], the lowest in Osun State in south-western Nigeria [0.48 (0.36, 0.61)]. The researchers explained the variations in prevalence seen in the study was as a result of variations in lifestyles, level of urbanization and westernization, wealth distribution, access to food supply and increasing presence of fast food chains and outlets in these states. Therefore, this explains why Cross River State and its capital Calabar known to be a tourist hub in Nigeria, with a large presence of international visitors has shifted its local lifestyle and dietary pattern to align with a slow adoption to westernization, expansion of the fast food restaurants, dietary modifications toward heightened intake of energy-dense processed foods. This therefore has had an effect on the increase in body weight and obesity prevalence. Finally, all studies referenced above supports each other's notion that there is a level of obesity prevalence in Nigeria just as in industrialized countries (Kandala, & Stranges, 2014),

Acculturation Process of Nigerian Igbo Immigrants in the United States

Acculturation is defined by deviations in one's culture, that happens when mostly migrants and native-born minorities modify their culture to align with the majority culture of a plural society (Sam, 2000). Every ethnic/racial group of immigrants' experience acculturation differently, such that their adaption into the culture can be predicted by some sociodemographic variables like age, education, residency, length of residency, SES, and income.

Ndika, (2013) studied acculturation process among (n =104) first generation Nigerian immigrants in the United States, the research used acculturation as the dependent variable with five levels (integration, assimilation, separation, assimilation and separation, assimilation and

integration), while the independent variables where sociodemographic factors and psychological factors (depression, anxiety, stress and self-efficacy). Correlation matrix was used to examine the relationship between the dependent and independent variables. Seven variables (sex, residential area, length of residency, influences on choice of destination in the country, stressful immigration experience, social support, and self-efficacy) were correlated very strongly with acculturation. Details from the research showed the preferred acculturation style of Nigerian immigrants in the United States is in line with their cultural backgrounds.

Since the 1970's Nigerian immigrants have been migrating to the United States. Nigerian immigrants make up about 15% (324,000) of the total population of immigrants which stands at 2.1 million (Commodore-Mensah et al., 2015). Acculturation is an unavoidable process seen as unique to every immigrant group even though similarities may exist. Similarities exist due to cultural norms, religious beliefs and sociodemographic factors. Nigerian immigrants integrate into their host environment for reasons such as intermarriages between populations in their host country, less traditional ways of life and embrace of western culture, dietary modifications in line with host country's food and cultural practices (Obisesan, 2015). For this reason's immigrants tend to gain weight following immigration.

Immigrants living in the United States who have accultured to their new environment are noted to have a variation in their cultural, ethical and religious beliefs in a departure from the beliefs of their counterparts who may are less accultured (Nobles & Sciarra, 2000). Eevidence suggests that the younger an immigrant is prior to migration the more acculturated they become, and they tend to prefer their newly found environment and culture (Nobles & Sciarra, 2000).

Some Nigerian immigrants work long hours in blue collar jobs after migration to make a living and to maintain/help their families abroad. These long hours of work do negatively affect

their health and acculturation style and may predispose them to obesity. Cook and Gazmararian (2018) in a cross-sectional study using the BRFSS in 4678 adults living in Georgia to evaluate the association between long work hours and leisure-time, physical activity and obesity after controlling for confounding. Results of this study showed that occupational activity acts as an effect modifier between physical activity and long work hours, and that employees in intermediate activity occupations were at the greatest risk for obesity when working long hours.

Generally, length of stay in immigrants is said to be positively correlated and a strong determinant to the degree of acculturation and assimilation towards cultural identity, religion and intermingling with the rest of the population (Tan, 2014). The magnitude of obesity and overweight in Nigerian (Igbo) immigrants have been understudied as a stand-alone entity of immigrants from all African immigrants in the United States. The need to study this subgroup of Nigerian immigrants for their particular risk to obesity and overweight necessitated this research.

Psychosocial Factors Related to Obesity

Social prejudice surrounds the affliction of obesity, like HIV/AIDS a significant social tendency to stigmatize people that are affected are very readily seen within our everyday societal interactions. In younger obese women the tendency and risk of developing major depressive disorder following constant depressive mood is high (Halverson, 2019; van der Merwe, 2007). Due to the importance attributed to physical appearance, people who are overweight or obese are almost always faced with discrimination in their societies (Nieman & LeBlanc 2014).

The degree of obesity or overweight positively correlates with severe deterioration in psychological health. As a result, Individuals whose BMI are greater than 40 have been branded and labeled stupid, lazy, ambitionless, persons with no confidence, lack of self-esteem and emotional wrecks (Owens, 2003). Carpenter, et al. (2000), noted that overweight women and

men who are underweight are at an increased risk of suicide. They also stated that in obese women the likelihood of the thought of suicide is 26% more than women who are of normal weight, and the likelihood of suicide attempt was 56% higher than average weight women.

Perceived Stress and Obesity

Psychologically Stress is any uncomfortable "emotional experience accompanied by predictable biochemical, physiological and behavioral changes" (Blundell & Gillert, 2001). Its effects vary and may cause changes in eating habits (Blundell & Gillett, 2001). Variations in eating habits maybe detrimental to health and overeating is a precursor to weight gain (Blundell & Gillett, 2001). Stress is associated with medical illnesses (internal), from the environment (external), anxiety, low emotional state, negative feelings of one's self, which in all can impact behavior and health (Drewnowski & Specter, 2004). A clear distinction exists between stress and the perception of stress. Perceived stress is an internal and mental feeling or thought that an individual seems to be undergoing within himself about how much stressful situations that they are dealing with over a period.

Perceived stress incorporates feelings about the uncontrollability and unpredictability of one's life, how often one has to deal with irritating hassles, how much change is occurring in one's life, and confidence in one's ability to deal with problems or difficulties (Cohen, S., Kamarck, & Mermelstein, 1983; Lazarus, & Folkman, 1984; Vancampfort, 2017). Daniel et al. (2006) described perceived stress as an inner feeling associated with cultural, social, environmental, and socioeconomic factors that directly impact one's experiences and feelings. Drewnoski & Specter (2004) showed that stress may have an impact on the eating habits of an individual and also their food choices. Rohrer & Rohland (2004), Stressful conditions are associated with irregular eating behaviors and food choices which may lead to overweight and

obesity (Rohrer & Rohland, 2004). The perception of stress by an individual is an evaluation of stressful experiences being dealt with, cognitive appraisal and coping strategies with the stressors (Drewnowski & Specter, 2004). Obesity causing behaviors such as consumption of high caloric foods and drinks, dietary restrain, and eating disorder can be predicted by stress (Daniel et al.,2006; Rohrer & Rohland,2004).

A cohort study of 6404 Danish nurses who belonged to the workforce between 1933-1999. ANOVA and $\chi 2$ tests were used to test for differences between predisposed nurses and other nurses; a standard F test was used to test for interactions between workload variables (busyness, speed, and influence in job), familial predisposition, and weight gain. Statistical analyses were done with SPSS version 11.0 (SPSS Inc., Chicago, IL). The study results highlighted that individuals with increased workload are more susceptible to the feeling of stress than those with reduced or low workload (Overgaard et al., 2006; Gamborg, Gyntelberg, & Heitmann, 2006).

Sammel et al. (2003), BMI and stress levels in women of African American descent and women of Caucasian descent showed an association between increase in body weight (BMI), stress, and anxiety. They determined that the level of stress is correlated to increase in body weight in both demographics. In checking the association of social stressors to increase in body weight, they determined that decreased exercise, low SES, lack of social support, low state of mental health is associated to the level of the stressor. Nigerian immigrants have experienced stressful conditions in the past and no study has exclusively examined how migration related stress and the perception of stress has affected their body weight, however Obisesan (2017) stated that migration related stress and increase in consumption of fattening foods increased body weight measured by BMI.

Diet and Obesity in Immigrant Populations

Dietary habits differ in different ethnic and cultural groups, some of the factors that predict diets in diverse groups of people are their cultural and ethnic diversity, background, environmental factors, SES, mental, functional, and behavioral factors (Wen, Kowaleski-Jones, & Fan, 2013). Obisesan (2015) stated that immigrants in the United States were affected by environmental, psychosocial, psychological and social factors (Wen et al., 2013). Castellanos et. al (2011) examined the risk of obesity in Latino groups in the United States by looking at socio-demographic factors. Results showed that increased consumption of high calorie food, fizzy drinks and decreased consumption of vegetables and fruits increased weight in Latino male immigrants in the United States.

Tseng and Fang (2011) found that stress, acculturation, social and environmental factors positively correlated to weight gain in Chinese females who are accultured in their host country, with stress determined to be the best predictor of obesity in Chinese immigrants.

Obesity and Physical Activity in Immigrant Populations

Physical inactivity has been linked to increase in body weight in immigrants and indigenous people (Lokuruka, 2013). As immigrant arrive their host country, everything is new and fresh and the lifestyle is a bit confusing, they tend to withdraw and assume a sedentary lifestyle known to be a predictor for increased body weight (Drummond, Mizan, Burgoyne, & Wright, 2011). Rinaldo, & Khyatti, (2014) determined that a Significant association exists between living a sedentary lifestyle and changes in eating habit towards unhealthy consumption of high calorie foods.).

Gualdi-Russo et al. (2014) In a cross-sectional study of migrants from North Africa to Europe found that time unavailability, unawareness of exercise benefits, lack of interest in

exercising were amongst the factors that predisposed North African immigrants to overweight and obesity. Similar results were seen in immigrants in the United States even though a high percentage of immigrants knew the benefits of participating in physical activity. Russo et al. (2014) found that migration to Europe was a vital risk factor for obesity in immigrants. The prevalence of obesity was found to be more in children born to immigrants than children born to natives (Singh, Kogan, & Yu, 2009), other studies like Rothe et al. (2010) noted that weather conditions where a predisposing factor to overweight and obesity as immigrants from Africa accustomed to tropical weather found it hard to engage in physical activities due to differences in weather conditions. As children copy from their parents it was discovered that level of physical activities shown by parents of children of immigrant's families of Hispanic origin was likely to explain the decrease physical activity in their children as their parents do not engage in physical activity or have low or no interest in physical activities (Brisson et. al, 2011).

Socioeconomic Status and Obesity in Immigrant Population

Socioeconomic status defined as the social standing or class of an individual or group. It is often measured as a combination of education, income and occupation. SES impact physical activity in many populations (Berger, Der, Mutrie, & Hannah, 2005; Stalsberg, & Pedersen, 2018). The factors that determine SES have been investigated as a standalone entity. Research into education and income shows that overweight and obesity are more prevalent in less educated and low-income earners, therefore these suggests that individuals and immigrants or groups with low income and education are more susceptible to obesity (Abrams, Cohen, Rai, & Rehkopf, 2013). People on the lower scale of SES are more likely have less finances to afford life in good neighborhoods with an abundance of exercise facilities, recreational parks, fresh market shops. They may also be unable to afford sporting equipment's, register for gym memberships or

engage in social networks that promote fitness and exercise cultures, these factors are seen in immigrants who have taken a long journey to make a better living in their host countries, while persons of high SES are able to achieve this. These factors have been related to obesity and its associated diseases in minorities, (Shi, Zhang, Van Meijgaard, MacLeod, & Fielding, 2015). Due to unaffordability of healthy foods by low income earners and locations/distances of farm fresh markets, immigrants who live in poorer neighborhoods are more likely to eat from fast food restaurants due to their proximity to their communities. This leads to increase in body weight and consequently obesity (Müller, Enderle, & Bosy-Westphal, 2016;Shi, Zhang, Van Meijgaard, MacLeod, & Fielding, 2015).

Obisesan (2015) researched educational level, age, gender, income, type of job, physical activity, SES and dietary habits found that low SES is a predicting factor for weight gain and obesity in immigrant population and communities, in combination with dietary choices, physical inactivity etc. Investigating SES against obesity using the BRFSS questionnaire Ade, et al. (2011), found lower income to be a predisposing factor to obesity in African American women against that found in white women who potentially earn higher. Furthermore, Layton et al. 2009 & Shi et al. (2015) supported the opinion that increased income increases perception of health status and health awareness in immigrants.

Length of Stay and Obesity in Immigrant Population

The longer a migrant stay in the host country of migration the more the health status depreciates (Hamilton, 2015; Ro, 2014; Sacnhez-Vaznaugh et al., 2008; Yeh et al., 2009). Mensah et al. (2016) used a multivariable logistic regression to examine the association between length of United States residence and cardiometabolic risk (CMR) factors, the research detailed that the greater the length of residence in the United States the greater the predisposition to a

higher prevalence of cardiometabolic risk (CMR) factors in Immigrants. CMR includes hypertension, overweight/obesity, diabetes mellitus, and hyperlipidemia. All these factors are linked to sedentary lifestyle, unhealthy eating habits, low income, and other factors of acculturation (Ro, 2014; Torres & Wallace, 2013). Ro (2014) also stated that length of residence and obesity in Asian immigrants are positively related, also in the same light length of residence (≥15 years) was positively associated with prevalence of overweight, among adult immigrant population in a cross-sectional study of the association between length of residence and overweight among adult immigrants in Portugal (da Costa, Dias, & Martins, 2017).

Oza-Frank & Narayan (2017), in their cross-sectional research using a multivariate - adjusted prevalence and odds ratio (OR) to estimate associations between the length of residence and overweight among United States immigrants by region of birth and age at arrival found that there is a link between the length of residence and overweight, the odds of being overweight were three times higher in migrants from Mexico, South America, Europe, Russia, Africa and the Middle East residing in the US for >15 years than those who have been residing in the United States for <5 years. They referred to the adoption of new lifestyle in the United States as a predisposing factor to obesity in immigrants with longer duration of residence. Koya & Egede (2007), opined that immigrants from diverse culture and ethnicity were at increased odds of developing obesity, hyperlipidemia, and cigarette smoking habit as their length of residence increased with those who have been resident for time ≥15 years were more likely to be obese (OR 1.31, 95% CI 1.03–1.65), have hyperlipidemia (OR 1.59, 95% CI 1.14–2.22), and be smokers (OR 1.39, 95% CI 1.04–1.85). Length of residence ≥15 years was associated with decreased odds of sedentary lifestyle (OR 0.63, 95% CI 0.47–0.84). Length of residence ≥15

years was not associated with odds of having diabetes (OR 1.40, 95% CI 0.78–2.51) or hypertension (OR 1.21, 95% CI 0.86–1.71).

Increased length of residence associated with obesity have been seen in immigrant population (Afable et al., 2015). In this literature review differences have been observed in length of residence and its effect on risk of diseases developed by immigrants that predisposes immigrants to obesity and its associated diseases in different ethnicities. Therefore, this calls for a unique research on Nigerian Igbo immigrants to the United States since there is limited research exists on these sociodemographic group.

Age of Migration and Obesity

Roshania et al. (2008) looked into obesity in immigrants (n = 6421) to determine if overweight/obesity prevalence is associated with age of arrival in the United States, they used a multiple regression analysis to test the effects of duration of stay/age of arrival in 6421 adult immigrants, their results showed a relationship between overweight/obesity prevalence and duration of stay varied by age at arrival ($P < 0.001$) to the US. The results of the study highlighted that Immigrants < or = 20-years old at arrival who had resided in the United States > or = 15 years were 11 times (95% confidence interval: 5.33, 22.56) more likely to be overweight/obese than immigrants < 20-years old at arrival who had resided in the United States < or = 1 year. By comparison, there was no difference in overweight/obesity prevalence by duration among immigrants who arrived at >50 years of age. Antecol & Bedard (2006) concluded same for age of arrival and obesity in their study titled “Unhealthy assimilation: Why do immigrants converge to American health status levels?” The study determined that at younger ages on arrival to the United States immigrants have a higher risk of overweight and obesity than those who arrived in later ages. Choi (2012) stated that at younger age of arrival the greater

acculturation, assimilation, dietary changes consumption, and greater social network occurs in an immigrant than those who arrive at a later age greater than 20 years. He stated that living as an undocumented immigrant in fear of deportation have an increased risk of obesity due to lack of access to healthcare, good paying jobs, lack of health insurance and unaffordability of healthy foods.

Literature Related to the Research Design and Methodology

Various studies like Ade et al. (2011); Albrecht & Gordon-Larsen (2013), Gele & Mbalilaki (2013) Jamil et al. (2014), Kirby et al. (2012), McCubbin & Antonio (2012), Krueger et al. (2014), Paxton (2016) and Vancampfort (2017) have employed logistic regression as a preferred method of analysis for cross-sectional data, that includes lots of independent variables on the probability of obesity and overweight results in a population of immigrants.

Vander Veen (2015) examined obesity and its related health problems in Black African immigrants who reside in the United States in a quantitative correlational survey. The researcher looked to see if there was a relationship between obesity outcomes, resilience, obesity related health risks and acculturation in this sub group of immigrants, the purpose of the research was to examine if there is a significant relationship between acculturation and obesity and obesity health risk symptoms and if resilience could determine how acculturation affected the other variables (obesity and obesity health risk symptoms) in black African immigrants.

The study was performed in three metropolitans' cities in the United States and a convenience sample of 55 people who fit the demographic were recruited in the quantitative correlational survey research. The results of the study showed that higher levels of acculturation were linked to higher levels of obesity health risk and obesity, but that resilience decreased the obesity health risk and obesity in this subgroup of immigrants who are highly accultured. The

study limitation was a reduced power due to a small sample size and also accuracy and truthfulness of data collected from participants due to the fact that the Weight-Related Symptom Measure (Patrick et al., 2004) were sensitive in nature and partakers in the research may have felt uncomfortable with coming forth with the true information. Data was retrieved for food consumption frequency, immigration statuses, smoking, socio-economic standings, alcohol ingestion, and some demographic factors (i.e. age, black African immigrant). The author measured BMI by WHO classification (BMI between 18-24 normal weight, 25-29 overweight, 30-35 moderately obese, and 35 and above morbidly obese). For analysis of data, descriptive statistics was used for every variable and chi-square test of independence was used to examine the links between categorical independent variables (education, income level, medical care, resilience and acculturation) and categories of obesity, and obesity health risk factors. Then using multiple logistic regression to investigate if a relationship exists between the independent and dependent variables in order to compare the means, variances and measures of central tendency they found association between immigration status, years of residency and obesity. Also, the results indicated that gender was not a significant contributor of obesity and morbid obesity in the participants. Additionally, the results finally showed that other independent variables such as education, income level, medical care, and mental distress were not significant risk factor for obesity in African- American immigrants in the United States.

Summary and Conclusion

Obesity have been researched extensively in the past and still being researched. This literature review adds to the growing knowledge and abundance of literature on obesity. The wide-ranging literature review is a summary of peer reviewed scholarly articles in the study of obesity in a diverse range of cohorts (Nigerian natives and immigrants in United States and other

western countries, other immigrants and minorities, Asians, Latinos etc.). There is a complex interaction between obesity and risk factors that lead to obesity (age, race, gender, environment, social). The causes of obesity and outcomes of obesity are unique and differ in different populations. Similar studies synthesized above have not differed greatly regarding obesity risk factors and its prevalence worldwide. This chapter identified a gap in literature by looking at obesity risk factors and obesity prevalence in Nigeria "Igbo" immigrants (Igbo's are a subset of Nigerian immigrants and the third largest tribe in Nigeria) so that prevention could be tailored to their unique risk factors. The completeness of this chapter now allows this research to proceed into the methodology of the research.

Chapter 3: Research Method

Introduction

The purpose of the study was to examine the predictor of obesity among Nigerian Igbo immigrants in the United States. The study evaluated lifestyle, psychosocial, and demographic factors that may predict obesity in Nigerian Igbo immigrants. These factors are classified into three major divisions: lifestyle (diet, exercise, smoking), psychosocial (acculturation and perceived stress) and demographic (gender, age, education, SES). The remainder of the chapter will describe the research design and approach to the study, methodology including instrumentation and operational measures, and planned statistical analyses.

Research Design and Approach

The study will employ a quantitative, cross-sectional research design with a primary data collection approach. This research will look at the relationship between the multiple variables (i.e. gender, age, food choices, physical activity level, perceived stress and acculturation) and how they affect or lead to obesity in Nigerian Igbo immigrant population resident in the United States. The PSS, SMAS, and questions adapted from the BRFSS were used to gather data on independent variables (i.e. stress perception by individuals, acculturation, food choices and dieting, SES, level of physical activity, age at immigration, height and weight) as against the dependent variable obesity.

Use of a cross-sectional research design approach was the most appropriate to answer the research questions and the associations/correlations between the variables and obesity (Obisesan, 2015). According to Creswell (2013) quantitative cross-sectional approach, is quicker, less expensive, and efficient. Other research methods would require longer time and expenditure and would not be the best method for the study. Quantitative method was the most effective method

in this research for investigating acculturation, perceived stress, age, gender, diet, SES, and level of physical activity) of obesity in Nigerian Igbo immigrant population in the United States. In this research, I employed the use of bivariate analysis, chi-square goodness of fit, cross-tabulation, spearman's correlation, logistic regressions and descriptive analysis to evaluate the association between the variables (dependent and independent).

A significant limitation of the cross-sectional design is that it is time constrained to a specific period when the investigation is being done therefore researchers maybe unable to identify the order of events to that point. This means that causality cannot be established (Setia, 2016; Szklo & Nieto, 2014). In addition, with the cross-sectional study another limitation is the probability of the presence of prevalence versus incidence bias, because cross-sectional studies measure prevalence and not incidence, therefore long term exposure to the variables being measured leans toward overrepresentation of the degree of association to the outcome while those exposed for a shorter period of time to the same variables may underrepresent the degree of association to the outcome being evaluated (obesity) in this study (Ocean University of China, n.d.).

Primary data was collected with the use of the questions taken from the BRFSS questionnaire, SMAS, and PSS. The choice of the quantitative cross-sectional method is that it is quick, inexpensive and an efficient method of approach for a study such as this; and also the quantitative method was the best and most effective method to study the variables perception of stress among immigrants, age, gender, SES, diet choices, acculturation, and level of physical activity as it affects these subset of Nigerian (Igbo) immigrants in the United States.

Research Methodology

Target Population

The study sample population was drawn from a pool of a convenient sample of Nigerian Igbo immigrants who reside in the state of Georgia and are 18 years of age and above. Approximately 376,000 Nigerian immigrants and their children live in the United States with Georgia being the fourth largest city with Nigerian immigrants (Migration Policy Institute, 2018).

Sample Size Calculation

This research needed a minimum of 163 participants. The use of an adequate sample size ensured representativeness and generalizability to the wider population, this also reduced the probability of selection bias and increased confidence and acceptability of study results (Schutt, 2011). Calculation of the sample size was done using G*Power analysis.

Power Analysis: Using a G* power analysis I calculated that 163 participants were an appropriate sample size for this study and would reflect the target population and reduce any potential bias. In consideration of eight predictor variables, and setting the effect size set at medium 0.50, power (1-β err prob) set at 0.80, the probability level set at $p< 0.05$, the sample size calculation came to a figure of 163. To reject or fail to reject the hypotheses, the level of significance (α err prob) was used. To determine statistical significance, in the case of a 95% probability, 163 participants was enough to find a statistical effect (effect size of 0.50) between variables where alpha = 0.05 (Raudenbush & Liu, 2000). The following results were gathered from G* power analysis using G*power software version 3.1.9.2 for an F tests - Multiple Regression: Special (R^2 increase).

Analysis: A priori: Compute required sample size, Input: Effect size $f^2 = 0.50$, α err prob = 0.05, Power (1-β err prob) = 0.80, Numerator df = 8, Number of predictors = 8, Output: Noncentrality parameter $\lambda = 24.000000$, Critical F = 2.0002077, Denominator df = 151.

Total sample size = 163, and Actual power = 0.80. This study will utilize a convenience sampling method for participants with the existing written surveys (BRFSS, SMAS, and PSS).

Recruitment of Participants

Study participants were recruited by giving out flyers and cards in local Nigerian stores, beauty and barber shops, local Nigerian restaurants, African food stores, libraries, Nigerian international churches based in United States (i.e. winners chapel international- https://www.winnerschapelga.org/, Redeemed Christian Church of God- http://rccgthehouseofglory.org/), cultural events, local association meetings and gatherings. Convenience sampling is advantageous because of the proximity of the sample population, feasible, easy and time friendly (doesn't take a lot of time), and cheap to carry out. In this study (Creswell, 2013). Lastly, participation was voluntary, and participants could drop out of the study if they chose to without any form of penalty. The eligibility criteria consist of being a Nigerian immigrant from the Igbo tribe, 18 years or older, understand and speak English, and have resided in the United States for twelve consecutive months or greater. To compensate for nonresponses, uncompleted questionnaires, missing data, and sampling bias, I targeted and collected data from 220 respondents.

Instrumentation and Operationalization of Constructs

Questions taken from the BRFSS were used to collect information of behavioral risk factors. Usually used by researchers to identify health risks factors and to evaluate existing policies and procedures (CDC, 2018). This study used questions retrieved from the dietary and

demographic sections of the 2018 BRFSS questionnaire which was most appropriate because of its wide-ranging contents that allowed for the capture of information on obesity predictors.

The other instruments that were used are SMAS, and PSS. The SMAS, used as an important instrument that provides a framework for understanding between- and within-ethnic group differences (Stephenson, 2000). It has been widely used to look at acculturation and obesity within multiethnic groups (Chinaka, 2013; Soliman, 2008).

The Perceived Stress Scale (PSS) developed in 1983 is based upon Lazarus's original transactional model (Cohen, et al., 1983) and it is widely used to measure stress perception in individuals. It is employed as a measure to determine the extent to which situations in one's life are sensed as stressful. The scale also includes several direct queries about current levels of experienced stress. At least a junior high school level of education in the community is the minimum level of education required before the PSS can be used in community samples (Cohen, 1994).

Measurement of Variables and Operationalization

The method of linking the concepts of a research to the observations made is known as operationalization. It is the process of defining variables into measurable entities like what's measured, how and why it's being measured, what rules guided the assignment of values to the observations and the interpretation of the values (Check, & Schutt, 2012).

Both the socioecological model and acculturation theory will guide this study; these are the theoretical framework on which this study was established. The framework will examine the factors that results in obesity in Nigerian Igbo immigrants in the United States. The hypothesis of this study is that the outcomes of obesity in this subset of Nigerian immigrants in the United States may be different on the basis of level of education, SES, length of residence, diet choices,

gender, age, and level of physical activity indulgence. The dependent variable in this study is obesity calculated as BMI of 30 or greater (BMI ≥30) will be measured from the questions contained in the BRFSS questionnaire. The independent variables are acculturation, age, dieting, gender, educational level, physical activity, socio-economic status, length of stay and perceived stress.

Reliability and Validity of Instrument

Reliability is the degree of consistency of results of a measurement and validity or accuracy denotes the extent to which a measurement tool is accurate in its measurements (Creswell, 2013). The BRFSS has been used in different study populations in the United States, and it is known to be moderately valid and reliable in predicting relationships between the dependent and independent variables (Obisesan, 2015; CDC, 2013; Park, & Sherry, 2011).

SMAS is also known to be valid and reliable. It has been used in several studies as well. Cramm et al. (2012) interviewed 296 patients at risk for cardiovascular diseases who are 65 years and older, recently discharged from hospital and living in their environment three months after discharge. In these study by Camm et al. (2012) reliability and validity of the SMAS was tested in these subjects by structural equation modelling. The results showed that in SMAS and SMAS-S in patients at risk for CVD demonstrated that the instruments were reliable. Their test of validity was done after excluding 12 items and the test resulted in a good fit index for the SMAS and SMAS-S, they examined the correlation between SMAS subscale scores and overall well-being scores as measured by Social Product Function (SPF-IL) and also used the Cantril's ladder as a way to estimate the construct validity, the results of the estimate showed that all SMAS subscales of the original and short version significantly correlated with SPF-IL scores (all at $p \leq 0.001$) and Cantril's ladder (for the cognitive well-being subscale $p \leq 0.01$; all other subscales at

$p \leq 0.001$). From the results they determined that the SMAS and SMAS-S were valid and reliable instruments that can be used to measure acculturation. The SMAS will be used in this study to measure acculturation as a function of the degree of immersion in a dominant society (the United States).

The PSS is known as psychometric test used to measure the perception of stress in research study participants. Perception of stress is a measure of the degree to which situations in one's life are appraised as stressful. Lee (2012) confirmed the internal reliability, factorial validity, and hypothesis validity. Between the 12-item PSS, the 10-item PSS and the 4-item PSS, the 10-Item PSS did the best in evaluation of perception of stress among subjects while the 4 item PSS did poorly in comparison to the 10 and 12 item PSS (Lee, 2012). This study will utilize the 10-item PSS to measure perceived stress level in participants.

In this research I have obtained permission to use the above listed instruments and I have affixed it to the appendix section. I also have attached sample BRFSS, PSS and SMAS questionnaires that will be used for data collection in the study.

Data Collection

Data were collected by hand and mail in questionnaires. The questionnaires comprised of three parts. Part A- BRFSS questionnaire (20 questions), Part B- SMAS questionnaire (30-32 questions) and Part C- PSS questionnaire (10-15 questions).

Flyers and cards will be distributed in local Nigerian stores, beauty and barber shops, local Nigerian restaurants, library, Nigerian international churches based in United States (i.e. winners chapel international- https://www.winnerschapelga.org/, Redeemed Christian Church of God- http://rccgthehouseofglory.org/), cultural events, local association meetings and gatherings. The flyers will have a section for intended participants contact information. Participants followed

instructions to return the filled-out questionnaires at the location where they picked it up or mail it back to me using my contact email information as indicated on the flyers.

The research over sampled the number of participants in order to get enough completed questionnaires to meet the required number needed for the study. Follow up reminders were sent to participants encouraging them to complete the questionnaires. There were no incentives to increase response rate.

Data Analysis Plan

The BRFSS (adapted questions) collected information on age, gender, SES, length of stay, diet, and physical activity; the SMAS collected data on food choices and preferences, use of language, length of stay and SES (measured as a factor of income); lastly the PSS collected data on participants perception of stress level (in BMI).

Descriptive statistics were used to summarize the characteristics of this immigrant population. SPSS v25 were used to calculate percentage distribution, central tendencies and frequency distribution (Gerstman, 2008). Statistical correlation was used to analyze the associations between the independent variables and obesity, and to answer the research questions and test for hypotheses. A positive correlation means both variables simultaneously increase in movement and in same direction, while a negative correlation means the variables go in opposite directions (Burns & Grove, 2007; Creswell, 2013) as one increases the other depreciates.

Logistic regression was the most appropriate statistical method for this research as it measured obesity as a dichotomous categorical variable, and it was used to examine the association between the likely predictors of obesity. Odds ratio was used to try to establish a causal relationship if one exists between precise independent variables and obesity the dependent variable (Bewick, Cheek, & Ball, 2005; Field, 2009).

Research Questions and Hypotheses

Research Question 1. Do demographic factors defined as age, gender, education, and SES (measured by the BRFSS) predict obesity (measured as a factor of BMI) in Nigerian Igbo immigrants in the US?

$H_0$1: Demographic factors do not predict obesity (measured as BMI) in Nigerian Igbo immigrants in the United States?

H_A2: Demographic factors predicts obesity (measured as BMI) in Nigerian Igbo immigrants in the United States?

Statistical test for bivariate analysis of each individual demographic variable: Simple logistic regression and Spearman's correlation.

The null hypothesis will be rejected if $p < .05$.

Research Question 2. Do lifestyle indicators defined as diet, smoking and physical activity, measured by the BRFSS predict obesity (measured as a factor BMI) among Nigerian Igbo immigrants in the United States?

$H_0$2: Lifestyle indicators (measured by BRFSS) do not predict obesity in Nigerian Igbo immigrants in the United States?

H_A2: Lifestyle indicators (measured by BRFSS) predicts obesity in Nigerian Igbo immigrants in the United States?

Statistical test for bivariate analysis of each individual lifestyle variable: Simple logistic regression and Spearman's correlation.

The null hypothesis will be rejected if $p < .05$.

Research Question 3. Do psychosocial indicators (measured by the SMAS & PSS) and defined as acculturation and perceived stress, predict obesity (measured as a factor of BMI) among Nigerian Igbo immigrants in the US?

$H_0$3: Psychosocial indicators (measured by the SMAS & PSS) do not predict obesity in Nigerian Igbo immigrants in the United States?

H_A3: Psychosocial indicators (measured by the SMAS & PSS) predicts obesity in Nigerian Igbo immigrants in the United States?

Statistical test for bivariate analysis of psychosocial variable (stress): logistic regression and Spearman's correlation.

The null hypothesis will be rejected if $p < .05$.

A multivariate logistic regression model simultaneously analyzed the effect of age, gender, level of education, socio-economic status, length of stay, diet (weekly consumptions of fruits, veggies, meat, alcohol) and level of physical activity on the likelihood of obesity.

Table 1. Classification of variables, hypotheses, and statistical tests

Research Questions	Hypothesis	Dependent Variables	Independent Variables	Bivariate Analysis	Multivariate Analysis
RQ1. Do demographic factors measured by the BRFSS predict obesity (measured as a factor of BMI) in Nigerian Igbo immigrants in the US?	$H_{1o:}$ Demographic factors do not predict obesity (measured as BMI) in Nigerian Igbo immigrants in the United States? H_{1a}: Demographic factors do predict obesity (measured as BMI) in Nigerian Igbo immigrants in the United States?	Obesity	1. Age 2. SES 3. Gender 4. Level of Education	Logistic Regression	Logistic Regression
RQ2. Do lifestyle indicators measured by the BRFSS predict obesity	$H_{2o:}$ Lifestyle indicators (measured by BRFSS) do not predict obesity in	Obesity	1. Diet 2. Smoking 3. Physical activity	Logistic Regression	Logistic Regression

(measured as a factor BMI) among Nigerian Igbo immigrants in the US?	Nigerian Igbo immigrants in the United States? $H_{2a:}$ Lifestyle indicators (measured by BRFSS) do predict obesity in Nigerian Igbo immigrants in the United States?				
RQ3. Do psychosocial indicators predict obesity (measured as a factor of BMI) among Nigerian Igbo immigrants in the US	$H_{3o:}$ Psychosocial indicators (measured by the SMAS & PSS) do not predict obesity in Nigerian Igbo immigrants in the United States? $H_{3a:}$ Psychosocial indicators (measured by the SMAS & PSS) do predict obesity in Nigerian Igbo immigrants in the United States?	Obesity	1. Acculturation factors a. Food b. Language c. SES d. Length of Stay 2. Stress level	Logistic Regression	Logistic Regression

Table 1, 1

Ethical Considerations

Participation was voluntary and participants were made aware of a choice to withdraw from the study if they wanted to. To avoid any potential bias, the study did not include participants that personally know to me from the community of Nigerians. The BRFSS, SMAS, and PSS questionnaires are surveys that have been used in similar studies and were distributed to participants via a hand-in and pick up/drop off method. Some questionnaires were mailed back to me using my home address and email. The surveys instruments used in this research have been tested and approved for use by the CDC, NIH, and United States Department of Health. This research has also received approval for the use of the instruments for this study. Prior to data collection from human participants, an application and approval for the study was received from Walden Institutional Review Board (IRB) (approval number 09-26-19-0336428) with an

expiration date of September 25, 2020. To protect participants personal information and maintain confidentiality all personal identifiers were removed. All participants signed an informed consent form that explained the study purpose/procedures and any potential risks.

Threats to Validity

All instruments used in this research have been validated previously. No threats to the validity of the study was detected.

Summary and Transition

This chapter provided guided information on the design and methodology of the research. The research is a quantitative cross-sectional study that examined the predictors that may lead to obesity in Nigerian Igbo immigrants older than 18 years of age living in the United States.

The independent variables are acculturation, perceived stress, age, gender, diet, socioeconomic status, and level of physical activity, level of education while the dependent variable is obesity. The BRFSS, the SMAS, and the PSS were instruments used to collect data. Data analysis was carried out using descriptive statistics, cross-tabulation, chi-square, multiple logistic regressions, and Spearman's correlation. The hypotheses, ethical considerations, and threats to the validity of this study has been explained in this chapter. This chapter's completeness allowed the research to proceed to results of the analysis performed in the study.

Chapter 4: Results

Introduction

The purpose of the study was to examine the predictor of obesity among Nigerian Igbo immigrants in the United States. This chapter is a presentation of the results and findings of the research. The results from the analysis of data on sociodemographic and demographic factors, dietary patterns, SES, acculturation, perceived level of stress, age, diets, length of stay, physical activity as potential predictors of obesity in Nigerian Igbo immigrant population.

Data Collection and Data Management

I introduced the research on social groups page of Nigerian community with an invitation flyer and distributed some flyers at Nigerian gatherings, hair salons, barbershops, and African stores in and around Atlanta and Macon. The flyer introduced the research, its purpose, and its significance to the health of Nigerian immigrants in the United States on Nigerian Igbo immigrants' who reside in the United States. Contained in the flyer also, was my contact information for interest persons to reach out to me. Survey packets were mailed to 220 people who indicated interest to participate in the study. The survey packets contained three different survey questionnaires namely the BRFSS, the PSS and the SMAS. Participants were asked to mail back the survey questionnaires in one free stamped addressed envelope back to me within 3 weeks of receipt. All packets were hand distributed in the locations as mentioned above and some were mailed out on the 1st of October 2019.

Data came from 198 Nigerian Igbo immigrants who live in the United states and 178 qualified for inclusion because their BMI could be calculated from the survey questionnaires. Data was analyzed to find a potential link between prevalence obesity and predictors of obesity (demographic, Lifestyle, and Psychosocial) among Nigerian Igbo population.

A total of 220 survey questionnaires delivered to the respondents by a hand-in method at barbershops, African hair salons, African food stores, churches and social meetings and gatherings and a few (19) by regular USPS postage to participants who responded to the survey flyer. Out of the 220 survey packets, 198 (90%) responses was received back. In review of 198 of the surveys 178 (90%) reported information on height and weight and 11 persons (5.5%) admitted not knowing what the height and weight values are, 9 (4.5%) others were excluded because 6 persons were not born in Nigeria and the other 3 resided out of state. Female respondents 42% Male respondents 58%. Data was input in SPSS (V25.0) for data analysis by transcribing the paper format.

A convenience sample of 178 Nigerian Igbo immigrants who met the inclusion criteria were examined from the two big cities in Georgia (Atlanta and Macon) with the highest numbers of Nigerian immigrants United States.

Descriptive Analysis

Descriptive statistics were used to summarize the characteristics of this immigrant population. SPSS v25 was used to analyze data and calculate percentage distribution, central tendencies and frequency distribution (Gerstman, 2008). Statistical correlation (Spearman's) was used to analyze the associations between demographic, lifestyle, and psychosocial Predictors and obesity, and to answer the research questions and test for hypotheses. A positive correlation means both variables simultaneously increase in movement and in same direction, while a negative correlation means the variables go in opposite directions (Burns & Grove, 2007; Creswell, 2013) as one increases the other depreciates.

Logistic regression was the most appropriate statistical method for this research as it measured obesity as a dichotomous categorical variable, and it was used to examine the

association between the likely predictors of obesity. Odds ratio was used to try to establish a causal relationship if one exists between precise independent variables and the dependent variable obesity (Bewick, Cheek, & Ball, 2005; Field, 2009).

The independent variables are demographic and socio demographic variables (age, gender, SES (level of education, employment status), lifestyle variables (diet and physical activity), and psychosocial variables (acculturation and perceived stress). Participants self-reported weight and height was used to calculate BMI according to WHO recommendation and classified as such. Formula used BMI = weight in Kilograms/ height in meters (squared).

Table 2. The WHO Classification of weight status using BMI

Weight Status	**BMI**
Normal weight	If BMI is 18.5 to 24.9
Overweight (not obese)	If BMI is 25.0 to 29.9
Class 1 (low risk) obesity	If BMI is 30.0 to 34.9
Class 2 (moderate risk) obesity	If BMI is 35.0 to 39.9 (≥203lbs)
Class 3 (high-risk or extreme) obesity	If BMI is ≥ 40.0 (≥ 271 lbs)

For the purpose of this research the Class 2 and Class 3 weight category was combined as moderate/morbid obesity if the value of the BMI was greater or equal to 35 kg/m^2. That is, any weight ≥ 203lbs (WHO, 2019).

Table 3. Distribution of BMI Category of Study Participants

Variable	Weight Category	Frequency	Percent
Normal weight	<25.00	72	38.1
Overweight	25.00-29.99	49	26.0
Obese	30.00-34.99	29	15.3
Moderate obesity	35.00-39.99	18	9.5
Morbid obesity	≥40.00	10	5.3
		178	94.2

The table shows that approximately two-thirds (67.9%) of the participants were not obese and a third were obese (32.1%). Of the 178 participants, twenty-eight of them (15.7%) were moderately/morbidly obese with BMI ≥ 35.

Table 4. Distribution of BMI Category of Study Participants

Obesity Category	Weight Category	Frequency	Percent
Not obese	<30	121	67.9
Obese	>30	57	32.1
Not Moderate/Morbid obesity	<35	150	84.3
Moderate/Morbid obesity	≥35	28	15.7
Total		178	100.0

Table 5. Distribution of Intensity of Physical Activity Reported by Participants

Intensity and Duration of Physical Activity	**Frequency N**	**Percent %**
10-Minute Moderate Activity		
Yes	112	62.9
<1	62	55.4
1-2	39	34.8
3-5	8	7.1
> 5	3	2.7
No	43	24.1
Don't know/Not sure	12	6.74
Total	167	93.74
10-Minute Vigorous Activity		
Yes	91	51.1
<1	46	50.5
1-2	30	33.0
3-5	5	5.5
>5	10	11.0
No	69	38.8
Don't know/Not sure	6	3.4
Total	166	93.3
20 Minute Exercise Category per Week		
<1	22	
1-2	11	
3-5	8	
>5	12	
Mean	1.884	
Median	1.000	

Standard deviation	2.049
Minimum	0.000
Maximum	15.000

Note. 10-minute moderate PA n=112, 10-minute vigorous PA n=91, 20-minute PA n=53

Sociodemographic Characteristics of Participants

Four sociodemographic characteristics of the sample (N=178) are presented in Table 2. Almost two-thirds (63.4%) of the sample were male and about half (46.7%) of the participants were between ages 31-45. The range of household income was between $10,000 and $75,000 with over a fourth (27.5%) of the participants reporting between $25-$35 thousand dollars and another fourth between $35-$50,000 (25.8%). Level of education is from grade 1 to 4-year college or higher. There were no participants with grade 1 through 8 level of education

Table 6. Sociodemographic Characteristics of Participants

Participant Characteristics	Frequency N	Percent %
Gender		
Male	113	63.4
Female	65	34.6
Age (years)		
18-30	51	28.7
31-45	83	46.7
46-65	38	21.3
>65	6	3.3
Education Level		
Grades 1 through 8 (Elementary)	0	0
Grade 12 or GED (High School Graduate)	3	1.7
College 1-3 years (Some College/Technical)	9	5.0
College 4 years or more (College Graduate)	166	93.3
Annual Household Income		
$10,000 to < $15,000	14	7.9
$15,001 to < $20,000	21	11.8
$20,001 to < $25,000	35	19.7
$25,001 to < $35,000	49	27.5

$35,001 to < $50,000	46	25.8
$50,001 to < $75,000	13	7.3

Note. N=178

The table below (Table 7) shows three categories of diet which are consumption of meat and burger, fruit consumption and consumption of green vegetables, these variables were measured with the BRFSS each subcategorized into daily, weekly or monthly consumption. Daily meat consumption had the highest number of consumers (157) and monthly green vegetables were consumed by the least number of participants (19). The least mean was recorded for meat/burger consumption for weekly, with some participants consuming up to 5 in a week. Green vegetable consumption was recorded with the highest mean (3.77) and 98 was recorded as the highest consumption seen on a monthly count. The frequencies per day, per week and per month are a classification of subject's frequency of foods, for meat/burger consumption. One hundred and fifty-seven (157) participants reported daily consumption.

Table 7.Distribution of Meat, Fruit and Vegetable Consumption in Diet of Participants

Variable	n	Median	Mean	SD	Low	High
Meat/Burger daily	157	2.00	1.33	0.558	0.00	4.00
Meat/Burger per week	131	2.00	1.27	0.698	0.00	5.00
Meat/Burger per month	135	2.00	1.33	0.724	0.00	20.00
Fruits- Times per day	171	3.00	2.69	0.860	0.00	5.00
Fruits-Times per week	135	3.00	2.80	0.860	0.00	15.00
Fruits-Times per month	42	3.00	3.10	0.880	0.00	24.00
Green Vegetables per day	98	1.00	2.67	0.770	0.00	4.00
Green Vegetables per week	72	3.00	3.61	1.380	0.00	25.00
Green Vegetables per month	19	3.00	3.77	0.880	0.00	98.00

Table shows the mean values for acculturation subfactors. Perceived stress scale (PSS) scores were calculated based on guidelines published by Cohen (1988). Highest mean was

recorded for Perceived stress (23.50) while diet was shown to have the least mean for these variables. Adapted Scoring methodology for PSS

Scores ranging from 0-13 are designated low stress level.

Scores ranging from 14-26 are designated moderate stress level.

Scores ranging from 27-40 designated high stress level.

Perceived stress scale (PSS) scores were calculated based on guidelines published by Cohen (1988). Table 12 shows that 163 participants reported their perceived stress level (Mean=23.5, SD = 3.3). PSS was missing in 15 cases. The mean score for perceived stress was 23.5002

Table 8. Distribution of Acculturation Factors and Perceived Stress

Sub-factor	Mean	S.D.	Minimum	Maximum
Food and Dietary (meat, Fruits, & Veggies)	1.50	0.497	1.0	2.0
Language	1.93	0.563	1.0	2.0
Income	3.72	2.721	1.0	7.0
Length of Stay	12.00	2.016	1.0	21.0
Perceived Stress	23.50	3.300	8.0	47.1
Education	33.40	2.667	8.0	24.0
Physical Exercise (20 mins)	1.88	2.049	1.0	15.0

Note. N=178

Cross-tabulations between Demographic, Lifestyle, and Obesity

The table below shows the *p-values* of the variables after crosstabulations of the demographics and lifestyle characteristics of subjects. The model indicated that gender ($p = .015$ and education ($p = .036$) are significant with respect to predicting obesity in study participants. Therefore, since $p < .05$, the null hypothesis was rejected for these two variables. No values were recorded for elementary grade education since there were no participants in this category.

Table 9. Crosstabulations of Association between Demographic, Lifestyle Characteristics and Obesity

Demographic and Lifestyle Characteristics	Normal Weight BMI <25	Overweight BMI 25-29.99	Obese BMI 30-34.99	Moderate Obesity BMI 35-39.99	Morbidly Obese BMI ≥ 40	*p*
Gender						
Female	28.0	19.1	35.3	8.8	8.8	.015
Male	48.2	32.7	4.5	10.9	3.6	
Education						
Elementary	0.0	0.0	0.0	0.0	0.0	
High School/GED	66.7	0.0	0.0	33.3	0.0	.036
Some College/Tech.	0.0	33.3	22.2	11.1	33.3	
College Graduate	41.6	27.9	16.8	9.3	4.34	
Household Income						
$10,000 to < $15,000	31.2	34.4	21.8	12.5	0.0	
$15,000 to < $20,000	40.9	0.0	0.0	27.7	31.8	
$25,000	31.3	50.0	15.6	3.2	0.0	.400
$35,000	56.5	10.8	23.9	6.5	2.1	
$50,000	50.0	10.0	10.0	10.0	20.0	
$75,000 or higher	50.0	0.0	0	50.0	0.0	
Length of Stay						
< 10 years	28.5	28.5	28.5	8.5	4	.697
10-20 years	35.5	30.1	14.4	12.2	7.7	
21-30 years	35.7	28.6	35.7	0.0	0.0	
31-50 years	0.0	0.0	25.8	25.0	23.8	
Green Vegetable Consumption						
Daily						
< 1	35.3	27.6	17.6	0.0	29.5	.398
1-2	24.0	30.0	30.0	16.0	0.0	
3-5	30.0	25.0	25.0	20.0	0.0	
More than 5	36.3	27.3	18.2	18.2	0.0	
Weekly						
< 1	42.8	14.3	14.3	14.3	14.3	.287
1-2	35.7	28.6	25.0	3.5	7.2	
3-5	25.0	33.3	0.5	5.8	4.2	
More than 5	35.7	14.3	35.7	14.3	0.0	
Monthly						
< 1	71.4	0.0	0.0	0.0	28.6	.319
1-2	0.0	0.0	0.0	100.0	0.0	
3-5	100.0	0.0	0.0	0.0	0.0	
More than 5	0.0	28.6	0.0	0.0	71.4	
Fruit Consumption						
Daily						
< 1	23.0	28.8	23.0	15.4	9.6	.910
1-2	36.8	24.2	20.0	14.7	5.3	
3-5	20.0	30.0	20.0	30.0	0.0	
More than 5	23.0	0.0	30.7	38.5	7.8	
Weekly						

< 1	23.6	30.0	29.1	16.4	0.0	0.572
1-2	40.65	38.5	12.1	7.7	1.05	
3-5	18.2	9.1	54.5	18.2	0.0	
More than 5	12.5	12.5	37.5	37.5	0.0	
Monthly						
< 1	33.3	66.7	0.0	0.0	0.0	0.229
1-2	11.8	35.3	23.5	29.4	0.0	
3-5	26.8	26.8	23.2	17.9	5.4	
More than 5	20.4	30.5	22.0	16.9	10.1	
Burgers or Meat Consumption						
Daily	14.7	26.5	29.4	20.6	8.8	.293
< 1	22.7	19.5	29.3	13.3	15.2	
1-2	18.1	18.1	30.3	21.2	12.1	
3-5	12.5	12.5	25.0	37.5	12.5	
More than 5						
Weekly	14.2	28.6	28.6	28.6	0.0	.347
<1	27.7	16.6	16.6	27.7	11.4	
1-2	16.9	20.8	26.5	16.9	18.9	
3-5	21.7	26.1	19.6	26.1	6.5	
More than 5						
Monthly						
<1	16.7	33.3	16.7	16.7	16.7	.857
1-2	0.0	40.0	40.0	0.0	20.0	
3-5	18.0	18.0	30.0	22.0	12.0	
More than 5	16.1	23.2	17.8	25.1	17.8	
Physical Activity 20 Minutes per week						
<1	15.9	26.2	26.2	20.2	11.7	.448
1-2	33.0	27.0	22.0	9.0	9.9	
3-5	14.0	9.1	23.0	32.0	22.0	
>5	0.0	23.6	26.4	50.0	0.0	
Moderate X 10 minutes Per week						.
<1	23.4	21.0	30.0	18.0	7.6	345
1-2	12.0	9.3	28.6	24.0	26.0	
3-5	10.0	50.0	12.0	18.0	0	
>5	6.1	17.2	12.0	9.2	5.6	
Vigorous Activity X 10 Minutes per week						
<1	22.1	23.2	25.5	23.2	6.0	.505
1-2	19.0	22.0	29.1	21.9	8.0	
3-5	16.0	26.9	24.0	20.4	13.6	
>5	11.9	7.0	22.1	12.2	9.4	
Smoking						
<1	14.1	17.1	16.7	15.2	6.6	.413
1-2	18.0	23.0	11.9	7.7	14.7	
3-5	22.2	11.0	21.1	13.9	10.2	
>5	5-5	9.9	27.0	19.5	15.4	

Note. N =178; Pearson Chi-Square ($\chi 2$).

Multivariate Logistic Regression

Research Questions and Hypotheses

Research Question 1. Do demographic factors defined as age, gender, education, SES as measured by the BRFSS predict obesity (measured as a factor of BMI) in Nigerian Igbo immigrants in the US?

$H_0$1: Demographic factors do not predict obesity (measured as BMI) in Nigerian Igbo immigrants in the United States?

H_A2: Demographic factors do predict obesity (measured as BMI) in Nigerian Igbo immigrants in the United States?

Statistical test for bivariate analysis of each individual demographic variable: Simple logistic regression.

The binary logistic regression model indicated that sociodemographic factors did not predict change in behavior leading to obesity (Table 10). Only one covariate, gender was significant ($\beta = .389$, $p = .021$). Therefore, since $p < .05$, the null hypothesis was rejected for gender. There is an association between gender and obesity in Nigerian Igbo immigrants. The odds of obesity are .389 times more likely in males than females when gender is considered while controlling for weekly consumption of fruit and daily consumption of burger/meat.

Table 10. Binary Logistic Regression Analysis of Sociodemographic Factors and Obesity

							95% C.I. for EXP β	
	β	S.E.	Wald	df	Sig.	Exp (β)	Lower	Upper
Gender	0.389	0.364	1.192	1	0.021	0.689	0.366	1.554
Education	-0.212	0.378	0.291	1	0.624	0.847	0.488	1.897
Income	-0.068	0.100	0.511	1	0.568	0.956	0.811	1.337
Age	-0.442	0.199	4.548	1	0.141	0.691	0.470	0.977
Stay	0.004	0.032	1.383	1	0.288	1.115	0.997	1.201
Constant	1.472	.225	37.911	1	0.000	0.299		

Note. Variables entered: Gender, Age, Education, Income, Stay.

The binary logistic regression model indicated that sociodemographic factors did not predict change in behavior leading to moderate/morbid obesity (Table 11). Therefore, since $p > .05$, the null hypothesis was not rejected; there is no association between sociodemographic factors and change in body weight leading to obesity. However, gender was found to be significant (0.035).

Therefore, since $p < .05$ for gender the null hypothesis was rejected; there is an association between gender and moderate/morbid obesity. The odds of moderate/morbid obesity are 0.266 times more likely in males than in females when gender is considered while controlling for weekly consumption of fruit and daily consumption of burger/meat. Therefore this means that being male is protective against moderate/morbid obesity since the OR < 1.

Table 11.Binary Logistic Regression Analysis of Sociodemographic Factors and Moderate/Morbid Obesity

							95% C.I. for EXP β	
	β	S.E.	Wald	df	Sig.	Exp (β)	Lower	Upper
Gender	1.479	0.691	4.901	1	0.035	0.266	0.083	0.984
Educ	-0.585	0.397	1.743	1	0.202	0.719	0.303	1.512
Income	-0.151	0.11	1.89	1	0.189	0.887	0.726	1.086
Age	0.016	0.201	2.643	1	0.993	1.113	0.699	1.553
Stay	0.038	0.047	0.412	1	0.561	1.047	0.988	1.102
Constant	0.727	2.459	.199	1	0.824	1.978		

Note. Variables entered: Gender, Age, Education, Income, Stay.

Research Question 2. Do lifestyle indicators defined as diet, smoking and physical activity, measured by the BRFSS predict obesity (measured as a factor BMI) among Nigerian Igbo immigrants in the United States?

$H_1$0: Lifestyle indicators (measured by BRFSS) do not predict obesity in Nigerian Igbo immigrants in the United States?

H_A2: Lifestyle indicators (measured by BRFSS) do predict obesity in Nigerian Igbo immigrants in the United States?

Statistical test for bivariate analysis of each individual lifestyle variable: Simple logistic regression.

The logistic regression model (Table. 12) indicated that two covariates, weekly fruit consumption (β = 0.115; p = .006) and daily burger/meat consumption (β = 0.415, p = .047) were significant at $p < .05$. Therefore, since $p < .05$, the null hypothesis was rejected; there is an association between some lifestyle factors and obesity in the research of Nigerian Igbo immigrants. The odds of obesity are .115 and .489 times more likely for weekly consumption of fruit and daily consumption of burger/meat respectively while controlling for gender.

Table 12.Binary Logistic Regression Analysis of Lifestyle Factors and Obesity

							95% C.I. for EXP β	
	β	S.E.	Wald	df	Sig.	Exp (β)	Lower	Upper
20 Minutes Physical Activity	-0.155	0.124	2.303	1	0.142	0.863	0.722	1.059
10 Minutes Moderate Activity	-0.088	0.376	0.052	1	0.869	0.946	0.502	1.991
10 Minutes Vigorous Activity	0.178	0.303	0.288	1	0.623	1.193	0.685	2.075
Vegetable Consumption Daily	0.222	0.183	0.401	1	0.533	1.110	0.874	1.696
Vegetable Consumption Weekly	0.142	0.198	0.505	1	1.023	1.311	1.021	1.762
Vegetable Consumption Monthly	-0.108	0.135	0.667	1	0.402	0.761	0.616	1.163
Fruit Consumption Daily	0.319	0.060	0.304	1	0.510	1.201	0.501	2.217
Fruit Consumption Weekly	0.115	0.288	0.110	1	0.006	0.822	0.399	0.642
Fruit Consumption Monthly	0.133	0.399	0.082	1	0.822	1.022	0.617	2.512
Meat Consumption Daily	0.410	0.388	1.412	1	0.047	0.543	0.417	0.449
Meat Consumption Weekly	0.288	0.335	1.118	1	0.297	1.442	0.813	2.432
Meat Consumption Monthly	-0.153	0.344	1.222	1	0.552	1.277	0.484	1.415
Smoking Daily	0.579	0.251	5.315	1	1.032	1.844	1.174	3.119
Smoking Weekly	0.020	0.139	0.029	1	0.886	1.023	0.849	1.431
Smoking Monthly	0.018	0.059	0.105	1	0.843	1.109	0.939	1.208

Constant	1.611	2.744	.355	1	0.667	3.374

Note. Logistic Regression: Variables entered: Physical activity (20 Minutes), Moderate and Vigorous Activity (10 Minutes). Vegetable Consumption (Daily, Weekly, Monthly), Fruit Consumption (Daily, Weekly, Monthly), Meat Consumption (Daily, Weekly, Monthly), Smoking (Daily, Weekly, Monthly).

The binary logistic regression model (Table 13) indicated that daily meat/burger (β = 1.330, p = .019) and monthly meat/burger consumption (β = -1.233, p = .014) were significant p < .05. The null hypothesis was rejected for daily meat/burger and monthly meat/burger consumption. Therefore, there is an association between some lifestyle factors and moderate/morbid obesity in the research of Nigerian Igbo immigrants. The odds of obesity are 1.33 and 4.233 times more likely for daily consumption of meat/burger and monthly consumption of burger/meat, respectively.

Table 13. Binary Logistic Regression Analysis of Lifestyle Factors and Moderate/Morbid Obesity

							95% C.I. for EXP β	
	β	S.E.	Wald	df	Sig.	Exp (β)	Lower	Upper
20 Minutes Physical Activity	-0.228	0.162	2.21	1	0.162	0.810	0.617	1.104
10 Minutes Moderate Activity	0.101	0.447	0.062	1	0.881	1.121	0.500	2.569
10 Minutes Vigorous Activity	0.098	0.395	0.056	1	0.852	1.107	0.555	2.341
Vegetable Consumption Daily	0.602	0.254	6.235	1	0.110	1.658	1.122	2.749
Vegetable Consumption Weekly	-0.211	0.298	0.688	1	0.537	0.965	0.712	1.303
Vegetable Consumption Monthly	-0.222	0.149	2.119	1	0.167	0.742	0.513	1.118
Fruit Consumption Daily	-0.011	0.085	0.115	1	0.881	0.887	0.722	1.086
Fruit Consumption Weekly	0.268	0.213	3.712	1	0.310	1.364	1.032	1.977
Fruit Consumption Monthly	0.594	0.301	5.002	1	0.319	0.506	0.199	1.113
Meat Consumption Daily	1.330	0.492	6.908	1	0.019	4.102	1.595	6.338
Meat Consumption Weekly	-0.087	0.316	0.088	1	0.724	0.893	0.616	1.677
Meat Consumption Monthly	4.223	0.442	6.668	1	0.014	0.393	0.191	0.812
Smoking Daily	0.602	0.329	5.447	1	0.039	2.086	1.335	3.764
Smoking Weekly	-0.075	0.449	0.019	1	0.634	0.744	0.502	1.711
Smoking Monthly	0.099	0.455	0.137	1	1.168	0.561	1.003	2.194
Constant	-0.391	0.195	4.892	1	0.038	0.654		

Note. Logistic Regression: Variables entered: Physical activity (20 Minutes), Moderate and Vigorous Activity (10 Minutes). Vegetable Consumption (Daily, Weekly, Monthly), Fruit

Consumption (Daily, Weekly, Monthly), Meat Consumption (Daily, Weekly, Monthly), Smoking (Daily, Weekly, Monthly).

Research Question 3. Do psychosocial indicators (measured by the SMAS & PSS) and defined as acculturation and perceived stress, predict obesity (measured as a factor of BMI) among Nigerian Igbo immigrants in the US?

$H_0$1: Psychosocial indicators (measured by the SMAS & PSS) do not predict obesity in Nigerian Igbo immigrants in the United States?

H_A2: Psychosocial indicators (measured by the SMAS & PSS) do predict obesity in Nigerian Igbo immigrants in the United States?

Statistical test for bivariate analysis of psychosocial variable (stress): logistic regression.

The binary logistic regression model (Table 14) indicated that psychosocial factors, acculturation, and stress did not predict obesity in this sample of Nigerian immigrants for acculturation (β =.233; p = 0.517), and stress (β = -0.113, p = .442). Therefore, since p > .05, the null hypothesis was not rejected; there were no significant associations between psychosocial factors and obesity in the research.

Table 14. Binary Logistic Regression Analysis of Psychosocial Predictors and Obesity

							95% C.I. for EXP β	
	β	S.E.	Wald	df	Sig.	Exp (β)	Lower	Upper
Acculturation	0.223	0.240	0.411	1	0.517	1.252	0.770	1.655
Perceived Stress	-0.113	0.159	0.560	1	0.442	0.697	0.718	1.305

Note. Variables Entered: Acculturation & Perceived Stress

The binary logistic regression model (Table 14) indicated that psychosocial factors, acculturation, and stress did not predict moderate/morbid obesity in this sample of Nigerian immigrants. Acculturation (β = -0.603; p = 0.599); stress (β = -0.222, p = .199). Therefore, since

$p > .05$, the null hypothesis was not rejected; there were no significant associations between psychosocial factors and moderate/morbid obesity in the research participants.

Table 15. Binary Logistic Regression Analysis of Psychosocial Predictors and Moderate/Morbid Obesity

	β	S.E.	Wald	df	Sig.	Exp (β)	95% C.I. for EXP β Lower	Upper
Acculturation	-0.603	0.210	5.053	1	0.245	0.599	0.169	0.712
Perceived Stress	-0.222	0.163	2.465	1	0.199	0.769	0.600	1.128

Note. Variables Entered: Acculturation & Perceived Stress

Using the spearman's correlation model, I analyzed the effect of age, gender, level of education, socio-economic status, length of stay, diet (weekly consumptions of fruits, veggies, meat, alcohol) and level of physical activity on the likelihood of obesity. For gender, the correlation was not significant for obesity but was significant for morbid/moderate obesity the values were gender and obese/not obese (coeff = .088, p = .354), gender and moderate/morbid obesity (coeff =.169, p = .021). Education was not found to be significant in relation to obesity with the spearman's but was seen to be significant with morbid/moderate obesity (coeff = .185, p = .035), daily consumption of vegetable was also found to be significant with morbid/moderate obesity (coeff = .313, p = .002.)

Weekly vegetable consumption and daily cheeseburger consumption were found to be significant with obesity outcome, (i.e. weekly vegetable consumption (coeff = .163, p = .044); daily cheeseburger consumption (coeff = .477, p = 0.12) respectively.

Conclusion

This study focused on investigating the prevalence of obesity and its predictors in a sample of 220 Nigerian immigrants in the Georgia a south eastern state in United States with a high prevalence of obesity. I was able to calculate the BMI of 178 participants from the survey. Seven predictor variables, gender, level of education, age, socio-economic status as income, length of stay, diet, and level of physical activity, were evaluated against obesity with a binary (univariate and multivariate) logistic regression model and Spearman's correlation model. Diet (daily burger consumption and weekly fruit consumption) showed statistical significance with obesity while gender and diet (daily and monthly burger consumption) were the only predictor variables that showed statistical significance with moderate and morbid obesity. These results support the hypotheses that gender and diet are predictors of obesity. This brings chapter 4 to conclusion and then a transition into chapter 5 for interpretations of results, recommendations for future research and implications for social change.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

The purpose of this study was to examine the predictor of obesity among Nigerian Igbo immigrants in the United States. The overgeneralization of obesity predictors in immigrants prompted the need to investigate obesity in this research. Even though researchers have inferred to what is already known and drawn conclusions commonly applied to all populations on obesity, the overgeneralization of risk factors in immigrants reduces the chances of identifying new and other likely predictors of obesity unique to a particular population (Harvard School of Public Health, 2014a; Singh et al., 2011; Zheng & Yang, 2012). Obesity is a significant public health problem in the United States and its prevalence stood at 39.8% with 93.3 million United States adults affected in 2015-2016 (CDC, 2019). Obesity cost an estimated $147 billion in 2008 in medical related expenditure (Finkelstein, E. A., Trogdon, J. G., Cohen, J. W., & Dietz, W. (n.d.)). The medical cost for people with obesity was $1,429 greater than that of a normal weighted individual. The continued rise in obesity prevalence calls for a need to know how obesity affects different population of immigrants to identify their particular risk factors and to tailor treatment unique to them (CDC, 2014; Finkelstein et al., 2012).

Obesity leads to stroke and heart diseases, an increase in knowledge of obesity risk factors in different populations will also target associated chronic diseases (International Risk Governance Council, 2010; Mackenbach et al., 2014; Ogden et al., 2014). A critical element in the fight against obesity is to identify the differences in causation in a diverse population of immigrants in the United States (Florez, 2011; Oza-Frank & Narayan, 2010).

Ethnic minorities and immigrant populations are mostly affected by obesity in the United States Non-Hispanic blacks have the highest age-adjusted prevalence of 46.8% (CDC, NCHS,

2019). The multifaceted interaction between demographic, lifestyle, and psychosocial predictors of obesity, remains largely unknown in different immigrant population in the United States (Averett et al., n.d.; Barrington et al., 2010; Blanchard, 2009; Caprio, Daniels, Drewnowski, Kaufman, Palinkas, Rosenbloom, & Schwimmer, 2008; Castellanos et al., 2011; Drummond et al., 2011; Gele & Mbalilaki, 2013; Harvard School of Public Health, 2014a; Jasti et al., 2011; Martinez et al., 2012; McCubbin & Antonio, 2012; Oza-Frank & Narayan, 2010; Sharkey et al., 2011; Wen et al., 2013; Zheng & Yang, 2012). The Behavioral Risk Factor surveillance system shows the differences in the prevalence of obesity by geographical location; surveillance studies show that states (Alabama, Arkansas, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina and Tennessee amongst others) in the stroke belt of the United States are most affected.

Collection of data was done by mail in, hand in hand, and outreach handed questionnaires. The data was sorted for completeness and accuracy and then transcribed into SPSS for analysis. The test of association between individual variables (gender, level of education, socio-economic status, length of stay, diet, smoking, level of physical activity, acculturation and perceived stress) against the outcomes of obesity were carried out with Spearman's correlation. The "enter" method of the bivariate logistic regression was employed to examine the effect of age, gender, level of education, socio-economic status, length of stay, diet, smoking, psychosocial variables (acculturation and perceived stress) and level of physical activity on the probability of these variables predicting obesity outcomes in the sample population. The logistic regression analysis results in this research showed no statistically significant association when age, level of education, socio- economic status, length of stay, acculturation, perceived stress and, level of physical activity on the outcome of obesity in the

sample population of Nigerian Igbo immigrants. Gender and diet (weekly consumption of fruit), however, showed statistical associations with obesity while Gender was also found to predict morbid and moderate obesity, as daily and monthly burger consumption also showed statistical significance to obesity.

Interpretation of the Findings

This study was done to investigate the prevalence of obesity in immigrant Igbo Nigerians who have resided in the United States greater than a year, the research goes further also to investigate the role of each variable (lifestyle, (diet, exercise, smoking), psychosocial (acculturation and perceived stress), and demographic factors (age, gender, education, SES and length of stay) on the probability of predicting obesity in this subsection of Nigerian immigrants. The research sought to fill the gap in knowledge on the plausible heterogeneity of predictors of obesity in the population of immigrants in the United States. The choice of Nigerian "IGBO" immigrant was taken because there an abundant number of studies on Nigerian immigrants and the general African American population as a whole, and none has specifically looked into Nigerians as a collection of people from three major tribes namely Hausa, Yoruba and Igbo, with unique characteristics stemming from their different choices of food, clothing, language and norms and beliefs with an overwhelming majority of Igbos adopting the Christian faith while the two major others are inclined to Islamic religion amongst others. The population of Nigerian immigrants in the U.S has always been studied alongside the general African American population (Ade et al., 2011). This study was guided by questions that seek to provide the underlying information on probable risk factors in the Nigerian Igbo immigrant population which could shed light on the prevalence of obesity in this population. The prevalence of obesity was 39.8% and affected 93 million adults in the U.S (CDC, NCHS, 2016) comprising of Hispanics

(47.0%), non-Hispanic blacks (46.8%) with the highest age-adjusted prevalence of obesity, non-Hispanic whites (37.9%) and non-Hispanics Asians (12.7%). A prevalence of 32.0% was found in this study of 178 immigrant Igbo Nigerians. This number was determined to be less than the prevalence seen in Non-Hispanic whites (NHW), greater than that seen in non-Hispanic Asians (NHA) and lower than that seen in Hispanics and non-Hispanic blacks (NHB) adults in the United States.

Logistic regression was performed to ascertain the effects of gender, level of education, socio-economic status, and length of stay on the likelihood that participants will be obese. In the analysis employing logistic regression all variables except gender and diet (weekly consumption of vegetables) showed no effect with obesity. Gender, daily consumption of fruits and Burger had increased odds greater than 1.0. Therefore, the result was consistent with other studies that found gender and certain diets are significant predictors of obesity in some populations. African males were seen to have higher odds (OR = 1.63, CI = 1.36, 1.96) of obesity against their male counterparts in a study by Borders, Rohrer, and Cardarelli (2006). African American males were also found to be overweight at age of 55 and older after considering predisposing and behavioral factors than African American women of same age (Bouzas, Bibiloni, & Tur, 2019; Powell, Jesdale, & Lemon, 2016; Shankar, Nanda, Bonney, & Kofie, 2000). Similarly, the study by Zeigler-Johnson et al. (2013) found substantial gender differences in the prevalence of obesity in several ethnic groups with a p value of <0.001; they concluded that there were increased odds of obesity in males of African American descents, Hispanic origin, and European origin, but they found that Asian females had a higher prevalence of obesity compared to their male counterpart. Ade et al. (2011) saw no statistically significant association between gender and obesity and in a sample of African immigrants. Contradictory to all these research females of Nigerian Igbo

origin have a higher prevalence of obesity than their male counterparts, this was in line with a study by Choi (2011) who found comparable results, of a higher prevalence of obesity, and moderate/morbid obesity in female in their research. No statistical significance was found between obesity and education in the sample of my study.

This study found no statistical significance between level of education and obesity or moderate/morbid obesity in the sample of Nigerian Igbo immigrants. Similarly, Odgen et al. in their analysis of data 2011-2014 (2017) found that obesity prevalence was lower among college graduates than among persons with less education for non-Hispanic white women and men, non-Hispanic black women, and Hispanic women, but not for non-Hispanic Asian women and men or non-Hispanic black or Hispanic men. The association between obesity and educational level is complex and differs by sex, and race/non-Hispanic origin.

A systematic review of 289 articles that reported on 410 populations in 91 countries found that educational attainment influenced obesity. The review documented that an inverse association was common in countries that have higher income while a positive association was more likely in countries with poor income (Cohen A.K, Raj M, Rehkopf D.H, & Abrams B, 2013). Higher obesity prevalence was found in women with lower education than in males with higher education in a study by Barrington et al. (2010).

There was no effect found for socioeconomic status (measured as a function of household income) and obesity in this study. The result was in line and consistent with other studies like Salsberry and Reagan (2009) that concluded that no association was found between obesity in African American women, but in Mexican American women and non-Hispanic white women low SES was associated with weight gain in mid-life. Odgen et al. (2005-2008) reported that among men, obesity prevalence is generally similar at all income levels, however, higher income

non-Hispanic black and Mexican American men are more likely to be obese than those on a low-income bracket. They also reported that women who earn higher income are less likely to be obese than low income women earners, but most obese women are not low income.

Newton et al. (2017), reviewed 219 literatures that studied with obesity and SES, and their results showed that there was a consistent association between SES and obesity among women (summary OR: 1.35, 95% CI: 1.04, 1.76), but not among men (summary OR: 0.92, 95% CI: 0.60, 1.40). Ade et al. (2011) in their research came to similar conclusion that no significant association was seen between SES (income) and obesity and extreme obesity. Obayashi et al. (2007) found that when age is considered there is an increased risk for obesity observed in low income women earners increased in low-income women (OR = 2.21) and women of middle-income (OR = 1.71) when compared to women who are high scale earners. in comparison to high-income women. There was no association of obesity and earning found by this research.

When looking into length of stay, I found that no statistically significant association could be made between length of stay and obesity. Also, Ade et al. (2011) did not find any association between duration of residence and obesity in immigrants from Africa as a whole. This is in contrary to the finding on Hispanic Americans by Kaplan et al. that found that length of stay greater than 15 years was associated with obesity in long staying migrants that recently arrived migrants of the same origin and that it may be due to acculturation factors like sedentary lifestyle, and unhealthy diet practices. The prevalence of obesity among those with 0 to 4, 5 to 9, 10 to 14, and ≥ 15 years of residence in the United States was 9.4%, 14.5%, 21.0%, and 24.2% when the logistic regression analysis was adjusted for smoking, physical inactivity, self-assessed health, chronic conditions, functional limitations, unspecific psychological stress, several sociodemographic characteristics, and access to healthcare services. Another study by Roshania

et al. (2008) found that age of arrival had a varied result on the prevalence of obesity in the United States in all immigrants ($p < 0.001$). Immigrants ≤ 20-years old at arrival who had resided in the United States ≥ 15 years were 11 times (95% confidence interval: 5.33, 22.56) more likely to be overweight/obese than immigrants < 20-years old at arrival who had resided in the United States ≤ 1 year. Oza-Frank & Nayaran (2010) in their study found that the odds of being overweight were three times higher in migrants from Mexico, South America, Europe, Russia, Africa and the Middle East residing in the United States for >15 years than their counterparts residing in the United States for < 5 years.

No association was found between psychosocial variable (acculturation and perceived stress) and obesity in this study. Commodore-Mensah et al. (2015) noted in their study that acculturation increases the risk of cardio metabolic diseases and that they were prevalent in African immigrants after adjusting for region of birth, poverty income ratio, age, and sex, in the United States for ≥10 years and were more likely to be overweight/obese (odds ratio [OR], 1.19; 95% CI, 1.10–1.29). Perceived stress was noted to be associated with obesity in a study by Junne et al. (2017), they noted that five factorial model of 'potentially obesity-related stressors' ('drive for thinness', 'impulse regulation', 'ineffectiveness', 'social insecurity', and 'body dissatisfaction') resulted in a total variance explanation of adjusted $R^2 = 0.616$ for males and adjusted $R^2 = 0.595$ for females for perceived stress. In other words, this means that these five stressors contribute to obesity in males and females but with a variation.

Daily consumption of fruit and daily consumption of burger were found to have a statistically significant association with obesity, also daily/monthly burger consumption was had a statistically significant association with moderate and morbid obesity in the population of Nigerian Igbo immigrants. Ade et al. (2011), concluded in their study that there was a link or

effect seen between food consumption and morbid obesity. Garcia et al. (2012) found that among the behavioral factors, fast food consumption exerted the largest influence on higher levels of obesity. These remained after controlling for several social and demographic characteristics. Therefore, the link between burger consumption, obesity, moderate and morbid obesity cannot be overstated.

In contrast this was not the conclusion found in some other studies that found that low consumption of fruits and veggies was associated with increase rate of obesity. A study in Canada by Vanessa et al. (2003) found at strong gradient in obesity prevalence between Canadian health regions where there is low consumption of fruits and vegetables. However, another study found that there was no association between consumption of fruits and vegetables to decrease in body weight when the total intake of calories did not decrease in Scottish adults (Whybrow, Harrison, Mayer, and Stubbs, 2006). No association or effect was seen between Obesity and physical activity. Vanessa et al. (2003) found that physical activity without reduction in intake of calories does not result to weight loss in adults who were studied in Canada. Jackicic et al. (2018) was of the conclusion that including physical activity as a vital lifestyle behavior to modulate obesity. The result of the finding is a direct contradiction to other studies that have concluded that physical activity limits the acquisition of obesity or weight gain (Gordon-Larsen et al., 2008; Hemmingsson & Ekelund, 2006; Ladabaum, Mannalithara, Myer, & Singh, 2014). The results of a cohort study by Golubic et al. (2013) investigating the relationship between body weight and physical activity, the researchers concluded that weight gain was a significant determinant of future physical inactivity.

Two theories guided this research, the acculturation theory and the socioecological framework. The theoretical constructs of this research is in alignment to results and findings of

this study, that is to say that several personal and environmental factors exists and interrelate to influence behavior of individuals contributing to the development of diseases such as obesity in the Nigerian Igbo immigrant population.

In consideration to the result of this research in Nigerian Igbo immigrant population other factors that lead to obesity should be considered to give credence to the development of obesity that is not explained by the factors detailed herein, like length of stay, acculturation, SES, physical inactivity and the others factors that have been referenced in other researches as factors that may predict obesity in immigrants in the United States as these are not linked to obesity outcome in this research. Socioecological resilience to obesity seen as an extension of Socioecological theory may be used to explain how precise physiognomies in Nigerian immigrants intensifies their resilience to obesity, even though they possess certain risk factors that may lead to obesity (Ball et al., 2011; Brogan et al., 2012).These resilience are adaptive capacity in the socio ecological systems that deal with changes in our environment.

Limitations of the Study

As I did this study and analyzed the results there is a need to generally consider the limitation of the tools and theories used in this study. The gathering of information using the BRFSS questionnaire has limitations even though that it is said to be mostly reliable. The BRFSS relies on information reported directly by the respondent and it is subject to measurement errors, recall bias (response error) and may be subject to selection bias, as only two cities in Georgia with a large population of Nigerians reside. This is a serious limitation of this study.

The BRFSS questionnaire used here Many of the survey questions depended heavily on the ability of the participants to recall their patterns of diet and physical activities precisely, therefore leading to biases in what they remember or not remember. These directly means a lack

of objectively and directly measuring of weight and height, and subsequently calculated BMI may lead to an erroneous report on the prevalence of obesity in the sample population. The BRFSS questionnaire used in this study was not altered in its content and was taken from various years of the BRFSS samples from the CDC website, its use in this research allowed for the evaluation of other potential predictive obesity variables like sub-acculturation factors.

This study used the cross-sectional survey method which has limitations and its use for this survey which was appropriate was not spared of that in investigating the sample population and the factors that contribute obesity prevalence. Cross sectional studies cannot be used to analyze behavior overtime and does not help in determining cause and effect therefore there was limited ability to conclude that there is a cause and effect relationships between gender, level of education, socio-economic status, length of stay, diet, socio-economic status, and level of physical activity, and obesity outcomes in the sample population of Nigeria Igbo immigrants (Carlson, & Morrison, 2009). This therefore limited this study to precisely conclude that gender, age, level of education, socio-economic status, length of stay, diet, acculturation, perceived stress and level of physical activity resulted in the obesity in the sample population (Carlson, & Morrison, 2009). Using a convenience sample also posed a significant limitation to this study. The convenience sampling method is not a representation of the entire population of Nigerian Igbo immigrants as it only collected data from two cities in Georgia from Igbo migrants to the United States. Therefore because of this the results of this study cannot be generalized to entire population of Igbo immigrants. Also, there is not an equal proportion of male to female participants in the study. The study had 47 more male participants to the 71 females in the study. This could have contributed distorted the result by having more male affected by obesity and therefore increasing their prevalence. However, the results of the study are significant and could

demonstrate that there is a relationship between gender, diets and obesity and gender, diets and moderate/morbid obesity. This necessitates a need to develop targeted intervention programs to limit the prevalence of obesity in the population studied.

Recommendations

From the findings of this study and what is known in the abundance of existing literature on predictors of obesity suggests that some predictors of obesity are not applicable to all immigrant populations in the United States. Also, there are unknown factors that may determine obesity in different populations. This suggests that there may be specific variables or other interactive predictors that may increase the exposure and vulnerability to obesity after immigration, beside well- known predictors of obesity that we don't know. Other suggestions to the unknown are: 1) Is obesity a temporary situation and is it influenced by improving SES, 2) would obesity vary if one moves to a different geographical location within the United States? 3) Does socio cultural dynamics influence obesity in immigrants, and does it call for investigations?

The Nigerian Igbo immigrant population is a unique population and since there are unanswered questions, therefore, for future research investigators/academics should focus on a more comprehensive study that will provide a more complete and in-depth study of what exists in the Nigerian Igbo immigrant community in the United States. One suggested way researchers can do this is by carrying out longitudinal studies which would allow for the tracking f obesity outcomes relative to varying predictive factors that may influence variable clusters, because longitudinal studies are repeated observations of same variables over time they can examine obesity outcomes relatively to length of stay, change in socio-economic status and acculturation since this are time factors. Also, researchers can randomize a study population of Nigerian Igbo's rather than using convenience samples to study obesity outcomes in the United States because of

the generalizability of randomized studies. Also, researchers could also study the differences in obesity outcomes as it relates to immigrants born in Nigeria who have migrated to the United states against those who are of Nigerian parents but born in the United states. This could show a clear understanding of the effects of acculturation in the population, if there are differences associated with place of birth. Future researchers should also consider increasing the length of time for data collection, which would allow more participants to access the survey. Researchers should also include more participants in the study from different states in the United States with a high number of Nigerian immigrants. Other methods of data gathering can also be used, for example face-to-face interviews and online questionnaires which will enable more participants to access the questionnaires timely and conveniently.

Implications for Social Change

One of the fastest growing population of immigrants in the United States are Nigerian immigrants (American Immigration Council, 2012). Igbos make up a significant number of Nigerian immigrants therefore understanding the factors that lead to obesity in this population has shed light into how and what needs to be addressed and how best to initiate obesity related interventions like individual or community level intervention (Simons-Morten, McLeroy, & Wendel, 2012). Identifying the physical environment and the societal norms may improve interventions efforts towards a decrease in disparities related to obesity in Nigerian immigrants and African immigrants. (McKenzie, Neiger, & Thackeray, 2008; Simons-Morten, McLeroy, & Wendel, 2012).

This information contained in this study can be used by policy makers, health professionals, educators, and organizations for use in planning and developing appropriate health interventions that will target behaviors at different levels (McKenzie et al., 2008).

Since there is limited research on obesity in Igbo migrant population resident in the United States this study has provided insight, knowledge and datasets that can be used for future research for obesity and other health problems in Igbo immigrant population. This research will be a source of better healthcare outcome with its application in the reduction of metabolic syndrome and chronic disease therefore reducing associated healthcare cost and improving quality of life. Researchers could rely on the results of this study to target socio-demographic and socio-ecological factors that lead to obesity in Igbo's by making policies that target these factors specifically, also develop health education programs tailored to this population (Markowitz, Friedman, & Arent, 2008). Lastly a more culturally adapted food questionnaire may be used by researchers who wants to investigate further into this kind of population to capture the effects of the dietary pattern and foods unique to this population. This will be more helpful to understand their unique predictors as a many of the people still eat the food that are purchased from African shops that are unique to them.

Conclusion

This research studied obesity prevalence and the predictors of obesity in a population of Igbo's immigrants to the United States, a tribe and one out the three biggest tribes from Nigeria who have unique ways of life. Variables that were studied in this research are age, gender, level of education, socio-economic status, length of stay, level of physical activity, acculturation, and perceived stress level. The results showed an association between Gender and diet (weekly consumption of fruits) and obesity, and gender (weekly consumption of burger) and moderate and morbid obesity. The results and the predictors of obesity in many other populations may not be the same as the ones that predispose this group to obesity. The results are therefore non homogenous for all population. The likelihood of generalizing the predictors of obesity in

immigrant populations may mask the uniqueness of obesity in different immigrant population and may result in a one size fits all policy/interventions from policy makers and researchers. This would inherently be a mistake in combating obesity in different populations as they may uniquely differ.

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From: Mehtälä, Anette <anette.mehtala@jyu.fi>
Sent: Monday, January 28, 2019 4:15 PM
To: Ahamefula Duru
Subject: Re: Permission to use Image/diagram

Hello Ahamefula Duru,
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Anette Mehtälä

Ahamefula Duru <ahamefula.duru@waldenu.edu> kirjoitti 28.1.2019 kello 22.34:

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Appendix B: Survey Instruments-BRFSS, SMAS & PSS

Questions Contained in Survey Instruments (BRFSS, SMAS & PSS)

Questions adapted from the Behavioral Factor Surveillance System Questionnaires (BRFSS)

1. Are you an immigrant from Nigeria? Yes or No

2. If yes what tribe are you?
   A. Igbo
   B. Hausa
   C. Yoruba
   D. Other

2. What is your age in years ¬_____?

4. What is your gender
   A. Male
   B. Female

5. How Long have you been in the United States in months _____?

6. What is your annual household income from all sources?
   A) $10,000 to less than $15,000
   B) $15,000 to less than $20,000
   C) $20,000 to less than $25,000
   D) $25,000 to less than $35,000
   E) $35,000 to less than $50,000
   F) $50,000 to less than $75,000
   G) $75,000 or more

7. What is your weight without shoes in Pounds (Lb) _____ or Kilogram (Kg_____)?

8. How tall are you without shoes? Feet (ft)_____, Inches (in)_____.

For questions 9 to 16 please answer by designating a numerical value to the number of times (i.e. frequency) you consumed or indulged in the activity in relation to the question asked.

9. Not including fruit-flavored drinks or fruit juices with added sugar, how often did you drink 100% fruit juice such as apple or orange juice?
   A. ____ times per day
   B. ____ times per week
   C. ____ times per month
   D. Never
   E. Don't recall

10. How many times in the past month (30 days) did you (say per week) eat Veggies?

A. ¬____ Per Day
B. ____ Per Week
C. ____ Per Month
D. Do not know/Not sure
E. Refused/do not recall

11. Not including juices, how often did you eat fruit? You can tell me times per day, times per week or times per month.
A) _____Per Day
B) _____Per Week
C) _____Per Month
D) Never
E) Do not know/Not sure
F) Refused

12. How often do you eat hamburgers, cheeseburgers, or meat loaf?
A) ____Per Day
B) ____Per Week
C) ____Per Month
D) Never
E) Do not know/Not sure
F) Refused

13. Not counting carrots, potatoes, or salad, how many servings of vegetables do you usually eat? (For example, a serving of vegetables at both lunch and dinner would be two servings.)
A. ____Per Day
B. ____Per Week
C. ____Per Month
D. Never
E. Do not know/Not sure
F. Refused

14. On a weekly average, how many times did you exercise at least 20 minutes (vigorously) hard enough to breathe fast, speed up your heart rate, or work up a sweat_____?

15. Now, thinking about the moderate activities you do, when you are not working, in a usual week, do you do moderate activities for at least 10 minutes at a time, such as brisk walking, bicycling, vacuuming, gardening, or anything else that causes some increase in breathing or heart rate?
A. Yes
B. No
C. Do not know/ Not sure

16. How many days per week do you do these moderate activities for at least 10 minutes at a time?
    A) ____Per week
    B) Do not do any moderate physical activity for at least 10 minutes at a time?
    C) Do not know/Not sure

17. How often in the past 12 months would you say you were worried or stressed about having enough money to pay your rent/mortgage? Would you say you were worried or stressed?
    A) Always
    B) Usually
    C) Sometimes
    D) Rarely
    E) Never

18. How often in the past 12 months would you say you were worried or stressed about having enough money to buy nutritious meals? Would you say you were worried or stressed?
    A) Always
    B) Usually
    C) Sometimes
    D) Rarely
    E) Never

19. How often do you get the social and emotional support you need from any source?
    A) Always
    B) Usually
    C) Sometimes
    D) Rarely
    E) Never

Stephenson Multigroup Acculturation Scale (SMAS) (Stephenson, 2000)

Below are several statements that evaluate changes that occur when people interact with others of different cultures or ethnic groups.

1) I understand English, but I'm not fluent in English.
    1. False
    2. Partly False
    3. True
    4. Partly true

2) I am informed about current affairs in the United States
    A. False
    B. Partly False

C. True
D. Partly true

3) I speak my native language with my friends and acquaintances from my country of origin.
A. False
B. Partly False
C. True
D. Partly true

4) I have never learned to speak the language of my native country.
A. False
B. Partly False
C. True
D. Partly true

5) I feel totally comfortable with (Anglo)American people.
A. False
B. Partly False
C. True
D. Partly true

6) I eat traditional foods from my native culture.
A. False
B. Partly False
C. True
D. Partly true

7) I have many (Anglo)American acquaintances.
A. False
B. Partly False
C. True
D. Partly true

8) I feel comfortable speaking my native language.
A. False
B. Partly False
C. True
D. Partly true

9) I am informed about current affairs in my native country.
A. False
B. Partly False
C. True
D. Partly true

10) I know how to read and write in my native language.
   A. False
   B. Partly False
   C. True
   D. Partly true

11) I feel at home in the United States.
   A. False
   B. Partly False
   C. True
   D. Partly true

12) I attend social functions with people from my native country.
   A. False
   B. Partly False
   C. True
   D. Partly true

13) I feel accepted by (Anglo) Americans.
   A. False
   B. Partly False
   C. True
   D. Partly true

14) I speak my native language at home.
   A. False
   B. Partly False
   C. True
   D. Partly true

15) I regularly read magazines of my ethnic group.
   A. False
   B. Partly False
   C. True
   D. Partly true

16) I know how to speak my native language.
   A. False
   B. Partly False
   C. True
   D. Partly true

17) I know how to prepare (Anglo) American foods.
   A. False
   B. Partly False
   C. True

D. Partly true

18) I am familiar with the history of my native country.
A. False
B. Partly False
C. True
D. Partly true

19) I regularly read an American newspaper.
A. False
B. Partly False
C. True
D. Partly true

20) I like to listen to music of my ethnic group.
A. False
B. Partly False
C. True
D. Partly true

21) I like to speak my native language
A. False
B. Partly False
C. True
D. Partly true

22) I feel comfortable speaking English.
A. False
B. Partly False
C. True
D. Partly true

23) I speak English at home.
A. False
B. Partly False
C. True
D. Partly true

24) I speak my native language with my spouse or partner.
A. False
B. Partly False
C. True
D. Partly true

25) When I pray, I use my native language.
A. False
B. Partly False
C. True

D. Partly true

26) I attend social functions with (Anglo) American people.
A. False
B. Partly False
C. True
D. Partly true

27) I think in my native language.
A. False
B. Partly False
C. True
D. Partly true

28) I stay in close contact with family members and relatives in my native country.
A. False
B. Partly False
C. True
D. Partly true

29) I am familiar with important people in American history.
A. False
B. Partly False
C. True
D. Partly true

30) I think in English.
A. False
B. Partly False
C. True
D. Partly true

31) I speak English with my spouse or partner.
A. False
B. Partly False
C. True
D. Partly true

32) I like to eat American foods.
A. False
B. Partly False
C. True
D. Partly true

Perceived Stress Scale

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate by circling how often you felt or thought a certain way.

Date _____ Age _____ Gender (Circle): M F Other

Key: 0 = Never 1 = Almost Never 2 = Sometimes 3 = Often 4 = Very Often

1. In the last month, how often have you been upset because of something that happened unexpectedly? 0 1 2 3 4
2. In the last month, how often have you felt that you were unable to control the important things in your life? 0 1 2 3 4
3. In the last month, how often have you felt nervous and "stressed"? 0 1 2 3 4 4.
4. In the last month, how often have you felt confident about your ability to handle your personal problems? 0 1 2 3 4
5. In the last month, how often have you felt that things were going your way? 0 1 2 3 4
6. In the last month, how often have you found that you could not cope with all the things that you had to do? 0 1 2 3 4
7. In the last month, how often have you been able to control irritations in your life? 0 1 2 3 4
8. In the last month, how often have you felt that you were on top of things? 0 1 2 3 4
9. In the last month, how often have you been angered because of things that were outside of your control? 0 1 2 3 4
10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them. 0 1 2 3