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An Examination Of Dietary Practises Of Nigerian Women In Atlanta

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ABSTRACT

AN EXAMINATION OF DIETARY PRACTISES OF NIGERIAN WOMEN IN ATLANTA

BY

OLUWASEUN BUKOLA IKUOMOLA

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Background: Sociocultural and psychological factors influence dietary practices. Poor dietary practices are among the risk factors for non-communicable diseases. There is a disproportionate rate of non-communicable diseases in the United States and Nigeria, which are among the top countries with poor dietary practices globally. Nigerians are shifting from traditional meals, which are good sources of insoluble fibers, preventing certain non-communicable diseases, to Western and unprocessed foods. They are also replacing traditional spices with bouillon.

Aims: This study (i) describes the types and frequency of consuming common Nigerian foods, (ii) determines if the length of stay in the U.S influences the frequency of consuming common Nigerian foods, and (iii) examines if health status influences dietary practices of Nigerian women in metro Atlanta.

Methods: This is an exploratory cross-sectional study using a semi-structured questionnaire administered as an online survey to obtain data on the frequency of consumption of common Nigerian foods among a convenient sample population of adult Nigerian women living in Atlanta. Other data obtained included sociodemographics, diabetes or hypertension diagnosis, and the frequency of using salt and bouillon in combination for meal preparation. Data were analyzed

using descriptive statistics, and bivariate analysis of variables to determine if differences in proportions were statistically significant at a p-value of ≤ 0.05.

Results: Rice is the most commonly consumed food by a high proportion of study participants, irrespective of health status. The length of stay of participants in the U.S did not significantly infer a difference in the frequency of consuming the most common Nigerian foods among this population. About 43.14% of study participants practice the habit of using the combination of salt and bouillon in meal preparation. The difference in the proportion of study participants who had or did not have diabetes using salt and bouillon for meal preparation was statistically significant ($p= 0.0008$). In contrast, there was no statistically significant difference in the proportion of study participants who had or did not have hypertension using salt and bouillon in combination.

Summary: This study shows that the most commonly consumed Nigerian foods eaten by Nigerian women in Atlanta are similar to those eaten by Nigerians residing in Nigeria. Although the frequency of consuming common Nigerian foods among these women differed with their length of stay in the U.S and health status, these differences appear to be statistically insignificant. Also, the daily use of salt and bouillon is observed among a considerable proportion of women in this study. Further research is needed for a larger sample size in this population with a comparative analysis on dietary practices of Nigerian women living in Nigeria.

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APPROVAL PAGE

AN EXAMINATION OF DIETARY PRACTISES OF NIGERIAN WOMEN IN ATLANTA

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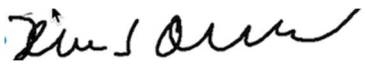

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AUTHOR'S STATEMENT PAGE

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Oluwaseun B. Ikuomola

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CHAPTER I: INTRODUCTION

1.1 Background

Sub-Saharan Africa has been experiencing a shift in disease burden from infectious diseases such as malaria, tuberculosis, and HIV, to non-communicable diseases such as diabetes, hypertension, dyslipidemia, and stroke (Gowshall & Taylor-Robinson, 2018; Gouda *et al.*, 2019). Common risk factors for these non-communicable diseases are tobacco consumption, harmful alcohol use, physical inactivity, or an unhealthy diet (WHO, 2018). Dietary practices are influenced by sociocultural and psychological factors (Shepherd, 1999). Achieving a healthy eating pattern requires adjustments in food and beverage choices (DeSalvo *et al.,* 2016).

In Nigeria, food consumption is shifting from high-fiber, low-protein, low-calorie indigenous foods to western and processed foods (Akarolo-Anthony *et al..*, 2012). In addition, the practices of adding salts to already-cooked meals, using a combination of bouillion and flavoring seasonings that contain salt, and gauging the quantity of salt in food by tasting while cooking is dominant in many developing countries such as Nigeria (Gonde & Chimbari, 2019).

Comparingly, in the United States (U.S.), most consumed foods are processed, high in saturated fats and refined sugars, with a minimal amount of fruits, vegetables, and whole grains (Paxton *et al.,* 2016). The U.S. Departments of Health and Human Services (DHHS) and Agriculture (USDA) release Dietary Guidelines for Americans every five years to recognize the importance of promoting health through diet. Remarkably, the 8th Edition, the latest edition, of the Dietary Guidelines for Americans (2015 – 2020) focuses on improving eating patterns, promoting physical activity, and preventing diet-related non-communicable diseases (NCDs).

Foreign nationals who migrate to the U.S face the stress of merging their cultural and behavioral practices, including language and food choices (Carballo & Neruka, 2001). During acculturation, stress for immigrants has been linked with alteration of eating patterns, emotional eating, haphazard planning of meals, and weight gain. Other factors influencing dietary acculturation of immigrants include hours supplied to the labor market, the individual's social environment, discrimination, household factors, residential setting, and individual income level. Another factor that influences this dietary acculturation is where immigrants settle. This substantially impacts their dietary practices and pattern, given the availability of markets that supply foreign versus American goods and services. (Gordon-Larsen *et al.*, 2003).

A number of studies have examined the dietary acculturation and practices of African immigrants in the U.S. In particular, studies on Nigerian immigrants who constitute 18% of about 2.4 million African immigrants in the U.S reported that they are inclined to eat healthy Nigerian foods and modify the preparation methods of unhealthy ones due to concerns of being predisposed to unhealthy dietary practices (Paxton *et al.*, 2006, Turk *et al.*, 2015). Although there are other studies on Nigerian immigrants, no known published studies currently exist on dietary practices of Nigerian women living in metro Atlanta, Georgia. Atlanta is one of the major U.S cities where many Nigerian immigrants live, hence a need for this research.

1.2 Objective: This study (i) describes the type and frequency of commonly-consumed Nigerian foods, (ii) determines if the length of stay in the U.S influences the frequency of consuming common Nigerian foods, and (iii) examines whether health status informs the dietary practices of Nigerian women in metro Atlanta.

CHAPTER 2: LITERATURE REVIEW

2.1 Dietary Practices and Global Disease Burden

Several studies have linked poor dietary practices to the global burden of non-communicable diseases (NCDs) (Willett & Stemfer, 2013; Micha *et al.*, 2012; Micha *et al.*, 2017). These linkages are believed to be a culmination of social, cultural, contextual, and psychological influences on food choices and nature of food consumption (Shepherd, 1999). Recommended dietary guidelines have been designed to provide some standards for planning and assessing dietary practices with essential daily nutrients sufficient to meet the nutritional needs of healthy persons (U.S. Department of Health and Human Services and U.S. Department of Agriculture [USDA], 2015; DeSalvo *et al.*, 2016). Dietary recommendations require a combination of reduced-fat intake, increased whole-grains and nuts, legumes, fruits, and vegetables, and a limit in the intake of table sugars and salt (WHO, 2020). Poor dietary practices negate the standard dietary recommendations. These include skipping breakfast, increased intake of calorie snacks, eating outside the home, low consumption of fruits, vegetables, use of supplements, and consumption of soft/soda-drinks (Otuneye *et al.*, 2017). Reports from a systematic analysis for the Global Burden of Disease (GBD) study show that the USA and Nigeria have a disproportionate rate of NCDs and are also among countries with poor dietary practices. For example, these two countries, along with other countries like India, Brazil, Russia, Germany, and Turkey, are nations with low intake of whole grains (below 125g per day), thereby contributing to dietary risk factors for NCDs and morbidity and mortality associated with NCDs (GBD 2017 Diet Collaborators: Afshin *et al.*, 2019).

2.2 Dietary Practices and Food Consumption in Nigeria

Unhealthy diet is a significant risk factor for NCDs contributing significantly to the global disease burden, directly or indirectly, through conditions such as high blood pressure, elevated blood glucose, and cholesterol levels (Estruch *et al.*, 2018; Mozaffarian *et al.*, 2011; He *et al.*, 2013; Ezzati & Riboli, 2013). Between 2007 and 2017, NCD-related mortality in Nigeria increased from 19.74% to 26.96% (IHME, 2018). Over the years, dietary practices and food consumption patterns amongst Nigerians have rapidly transitioned from traditional foods to more western ones (Akarolo-Anthony *et al.*, 2012). An example of this is the replacement of traditional spices and seasonings, such as locust beans with bouillon cubes in many homes (Onabanjo *et al.*, 2014).

The traditional diet in many Nigerian cultures is a combination of a carbohydrate-based meal and soup/sauce (See Figures 1 – 3). These carbohydrate-based meals are made from cassava, rice, cocoyam, potatoes, yam, or plantain, while the soup or stew is cooked in palm oil with a minimal amount of meat-based protein (Oboh & Olumese, 2010). Akarolo-Anthony *et al.* (2012) reported that, amongst these carbohydrate-based meals, parboiled long-grain white rice was the most commonly consumed (Figures 4 – 6), followed by fufu - made from pounded cassava - and bread amongst urbanized Nigerians. Today, the adoption of Western foods amongst Nigerians has been attributed to ease of purchase and convenience in preparation. In their study, Ene-Obong *et al.* (2013) assessed the commonly consumed food across the geopolitical zones in Nigeria. They observed that there were no fixed meals for breakfast, lunch, or supper, and meals were provided depending on individual and family preferences.

Figure 1: Egusi (Melon Seed) Soup with Semo (Wheat) Bolus

Figure 2: Seafood Okra Soup with Eba (Cassava)

Figure 3: Edikaikong (Fresh Pumpkin and Water Leaves) Soup

Figure 4: Nigerian Jollof Rice with Stewed Chicken

Figure 5: White Rice with Beef Stew

Figure 6: Nigerian Fried Rice with Fried Chicken

In Nigerian households, food consumption is communal because family members eat together. Also, in these households, women make the primary dietary decisions for the family. This level of agency and autonomy in the diet decision-making by women represents their capacity and capability to influence health outcomes for themselves and their families (Mapis, 2020). In the evaluation of the diet decision-making choices of Nigerian women in Jos, Mapis (2020) noted that food choices are shaped by factors like occupation, taste, convenience, and cost with influences

based on the preferences of their children and husbands. This finding by Mapis (2020) is similar to that of Sosa, Cardinal, Contarini, and Hough (2015) when they examined the food choices of women in Argentina. They found that income was an additional factor that influences the diet decision-making process of Argentine women.

2.3 Nigerian Foods: Nutrient and Mineral Composition

Akarolo-Anthony *et al.* (2012) studied the pattern of dietary intake among Nigerians and found that rice was the primary staple as a carbohydrate food, which was not the norm decades ago when people only consumed rice on weekends and special occasions. Following rice, bolus-centered meals are the second-most consumed carbohydrate-based food in Nigeria. A bolus is a thick paste traditionally made by boiling and then pounding a tuber (such as yam, cassava, etc) into a paste. Today, a bolus is commonly made by adding boiling water to processed starchy tubers or roots and consumed with a complementary sauce or soup made of vegetables, animal proteins, and oil. Most Nigerian bolus meals are made from tubers, grains or fruits from plants, including cassava, yam, plantain, corn, wheat, and rice (Oguntona *et al.,* 1998; Oguntona & Akinyele 2002; Afolabi *et al.,* 2004). Bolus meals like semolina or semovita (wheat-based bolus meal), eba (cassava grain bolus meal), and yam-derived bolus meals (pounded yam and amala) are the most popular choices (Akarolo-Anthony *et al.*, 2012; See Figures 1 - 6).

Morakinyo, Samuel, and Adegoke (2016) analyzed the mineral content of 25 commonly consumed Nigerian dishes. The result from Their study showed that the meals with the highest sodium content were the Cassava bolus "Eba" & Okro soup (Figure 2), Yam porridge (Figure 7) & bean, and Ogbono - African mango seed - soup (Figure 8). In contrast, the meals with the least sodium content were Yam & Egg (Figure 9), Amala lafun (white bolus from cassava flour) (Figure

10), and Pap & MoinMoin [steamed bean pudding] (Figure 11). Additionally, their study showed that the three dishes with the highest iron content were Rice & Beans, Yam porridge, and Eba & Okazi (African Joint Fir Leave) soup. Meanwhile, Jollof (tomatoes, pepper, onions) rice, Ogbono soup and Edikaikong (fluted pumpkin and water leave vegetable) soup contain the least amount of iron mineral. Zinc mineral composition was highest in Eba & Okazi, Rice and Bean, and Waina (crispy rice flour omelet); however, Yam & Egg, Pounded Yam, and Jollof rice had the least amount of Zinc. Yam porridge & bean, Amala lafun, and Eba & okro soup were reported to contain the highest amounts of Copper. At the same time, Edikaikong, Ikokore (water-yam porridge), and Tuwon Shinkafa (thick mashed rice pudding) (Figure 12) accounted for foods with the lowest Copper content. However, they discovered that Nigerian foods mostly contained insufficient levels of calcium. The exceptions were beans & plantain, yam with egg omelet, and Jollof Rice except in Vegetable Soups.

Obanla's (2014) study examined levels of fatty acid and dietary fiber in common traditional Nigerian soups and dishes and found that they were good sources of both saturated and unsaturated fatty acids. However, these foods contain high levels of saturated and trans-fatty acids compared to unsaturated fatty acids. Obanla's findings correspond with results from the evaluation of the lipid composition of Nigerian foods by Onabanjo *et al.* (2014). In addition to high dietary fat content, Nigerian foods also contain high levels of dietary fiber. However, the soluble dietary fiber is lower than insoluble dietary fiber in most soups and dishes, indicating that the consumption of these foods may protect against certain NCDs.

Figure 7: Yam Porridge

Figure 8: Ogbono Soup

Figure 9: Nigerian Yam and Fried Eggs

Figure 10: Wraps of Amala Lafun

Figure 11: Pap and MoiMoi

Figure 12: Tuwon Shinkafa

2.3 Dietary Acculturation amongst Immigrants in the U.S.

The most prominent acculturation practice for people navigating new cultural spaces is food and diet. Studies have reported that migrants are relatively healthier when they arrive in the U.S. compared to the natives. An examination of disparities in diabetes among native-born Hispanic and Asian immigrants in the U.S by Engelman & Ye (2019) supports this with emphasis on the role of the length of stay since arrival. Despite traditional diets being healthier than the ones available in their new country, immigrants are often faced with the difficulty of maintaining healthy traditional diets and dietary patterns in fast-paced environments that can foster unhealthy food consumption habits and sedentary behavior.

Immigrants from Latin and South America to the U.S attributed the shift in dietary patterns toward unhealthy living compared with their home countries to higher levels of stress, less control of their time, and less social support to prepare their desired meals (Tover *et al.*, 2013). A study by Paxton *et al*. (2016), for example, reported that, among recent West African immigrants in New York, participants mentioned having their meals outside their homes (fast food) or skipping meals, which was not the norm before they emigrated. The immigrants in the study expressed concerns about American foods as larger-sized, mostly inorganic, salty, sugary, and fatty, which they believe predisposed most of them to diagnoses of hypertension, high cholesterol, arthritis, and diabetes. This finding is similar to results from a study on South Asian immigrants in Europe, showing a substantial increase in calorie and fat intake, a reduction in carbohydrates, and a switch from whole grains to more refined sources of carbohydrates, resulting in a low intake of fiber. The study also indicated an increase in meat and dairy consumption and reduction in vegetable intake to a minimal, suggesting that these dietary changes contribute to higher risks of non-communicable diseases (Holmboe-Ottesen & Wandel, 2012).

In a photovoice exploration of Nigerian immigrants in the United States, Turk, Fapohunda, and Zoucha (2015) captured their perceptions of healthy foods. The Nigerian immigrants in this study stated that living in the U.S encourages unhealthy eating habits, thereby prompting them to choose healthy Nigerian foods while modifying some that are unhealthy due to the Nigerian method of preparation. However, in Melbourne, Australia, sub-Saharan African immigrants mentioned that their dietary shift has been through three processes: substitution, supplementation, and modification of recipes to achieve their traditional diets (Renhazo & Burns, 2006).

2.4 Dietary Patterns among African Americans

Per capita, the amount of money spent on food in the United States has steadily been on the rise for over 30 years (Smith, Ng & Popkin, 2013). The typical American foods are mostly calorie-dense, between 175-300 calories per person per day (Cafaro, Primack & Zimdahl, 2006; Smith, Ng & Popkin, 2013). Americans have been reported to make dietary choices based on food taste and cost rather than nutritional concerns, which are buttressed mainly by socioeconomic status (Glanz *et al.*, 1998, Beheshti *et al.*, 2016). In contrast, in a Pennsylvania-based study, it was examined that the eating practices of African Americans were independent of their socioeconomic statuses but somewhat dependent on their cultural practices of where and with whom food is eaten (Airhihenbuwa *et al.*, 1996).

The practice of eating "out-of-home," also referred to as "take-out" or "fast-food," has been increasingly popular in the U.S (Lachat *et al.*, 2012). Americans depend on fast-food chains such as McDonald's, Domino's Pizza, Subway, Burger King, Pizza Hut, Kentucky Fried Chicken, and Taco Bell for take-out, even though they also offer dine-in services (Bauer *et al.*, 2012).

However, out-of-home food sources also extend to vending machines, convenience stores, and coffee shops (Nago *et al.*, 2014). In a study conducted in New Orleans, Block *et al.* (2004) reported that most fast-food outlets were geographically concentrated in black and low-income neighborhoods, even after controlling for factors such as commercial activity, presence of highways, and median home values. Such concentration of unhealthy food outlets in a neighborhood has been referred to as food swamps (Cooksey-Stowers *et al.*, 2017; Carlson & Frazão, 2014). In their findings, Kant, Whitley & Graubard (2015) reported that more than half of U.S. adults consume out-of-home meals three or more times a week, and more than one-third consume two or more fast food meals in a week.

The concept of food delivery is also notable for contributing to the frequency of out-of-home food consumption over the past decade. Restaurants and fast-food outlets provide food delivery platforms for people to place orders for their food. These food delivery platforms have been associated with a surge in growth in unhealthy dietary patterns and poor food consumption amongst Americans. Stephens, Miller, and Milltello (2020) reported an association between food delivery systems with an increasing prevalence of overweight and obesity in the U.S. The COVID-19 pandemic has escalated this food delivery system with looming questions about the impact on NCDs.

The correlation between socioeconomic status and food consumption is a global phenomenon, but is especially notable in the U.S. Elmes (2018) explored how economic inequality in the United States has led to difficulty in access to nutritious food for the country's low-middle income class, thereby promoting unhealthy food consumption for survival. Policies and programs to address access to healthy food in the U.S, like the Supplemental Nutrition Assistance Program (SNAP) and the Special Supplemental Nutrition Program for Women, Infants, and Children

(WIC), are directed at low-income Americans. However, there is little evidence on how effective they are in improving healthy dietary choices, particularly given the higher cost of purchasing healthy organic foods such as fresh fruits and vegetables.

2.5 Dietary pattern of Women

Dietary patterns are often used to characterize a population's diet relative to health status and outcomes. Dietary habits of people are investigated based on data, such as principal component analysis, factor analysis, and cluster analysis, or determined by researchers through the use of dietary indices or dietary scores (Michels & Schulze, 2005). These two methods of investigating dietary patterns were reported to produce similar findings by Crozier *et al.* (2006).

Women go through life events that demand their transition into adopting social roles and taking up responsibilities such as getting married and starting a family with the expectation of having children while building a career (Wethington, 2005). These transitions, especially in family roles of marriage and motherhood, influence women's attitudes and practices, including diet (Olson, 2005). Elsgeest *et al.* (2012) conducted a study examining diet changes due to these life transitions among young women in Australia. Their research, conducted over a period of six years, indicated that transitions in living arrangements of young women influenced a change in energy intake and dietary patterns. Women living with children had a higher energy intake, high fat, sugar, meat, and cooked vegetable intake and low intake of healthy food such as Mediterranean food and fruit consumption compared with other women.

However, another study examining the major dietary patterns of young and middle-aged women in Australia identified six dietary patterns - 'cooked vegetables,' 'fruit,' 'Mediterranean-

style,' 'processed meat, meat and takeaway,' 'reduced-fat dairy' and 'high-fat and sugar foods' - associated with lifestyle factors suggesting that middle-aged (45 – 50 years) women engaged in healthier dietary practices than younger (18 – 25 years) women (Mishra *et al.*, 2010). The role of marriage in women's dietary patterns also indicated a relationship between feeling supported in a marital role and healthy dieting behaviors (Markey *et al.*, 2001).

In line with previous studies, the home food environment, which includes food availability and accessibility, meal preparation techniques, and meal locations, may also influence women's eating behaviors (Kegler *et al.*, 2014; Rosenkranz & Dzewaltowski, 2008). Raskind *et al.* (2017) stressed how a woman engages with her home food environment by considering that the factors that influence her to eat out-of-home also affect grocery shopping preferences since her purchases constitute largely the portion and types of food ultimately available in the home. Their study among women in southwest Georgia elucidated on women and their food environment relative to these factors, emphasizing differences between women with and without children in the home. Their study showed that women with children prioritized purchasing foods they believe their children would like and keep their children healthy. In contrast, women without children purchased foods based on taste preferences and cravings, affordability, and accessibility, consistent with previous scholarly findings. Food advertisements have also been studied to influence women's decisions when making food purchasing or grocery shopping for themselves and their families (Hemar-Nicolas, Gollety, Damay, & Ezan, 2015).

Aside from women's food choices being dependent on their children's preferences, women also consider their entire family's choices, for fear that they might refuse to eat healthier choices, which could result in food-wasting or spoiling (Lawrence *et al.*, 2009; Fish, Brown, & Quandt, 2015). These reasons restrict some women from trying and preparing new healthier food

choices, which may result in opting for out-of-home foods and reducing the number of times they make home meals (Kegler *et al.*, 2014).

Meal preparation and cooking time are also determinants of the dietary pattern of women. The amount of time spent preparing a meal influences the type of food cooked by women. Some studies posit that a woman is more likely to eat ready-made meals and more fruits and vegetables if the time expected for cooking is lengthy (Verlegh & Candell, 1999; Van der Horst, Brunner, & Siegrist, 2011). Moreover, women who have excellent cooking skills tend to prepare more meals. Yet, there is no evidence supporting the correlation between time spent cooking and preparing healthier meals (Chu, Addo, Perry, Sudo, and Reicks, 2012).

CHAPTER III – METHODS

3.1 Study Population and Recruitment of Participants

This study was an exploratory cross-sectional study of adult Nigerian women aged 20 years and above living in the Atlanta metropolitan area. A convenient sample of the study population was recruited to participate through both word-of-mouth and referrals from social networks (Nigerian Women Association of Georgia – NWAG), religious networks (parishes of The Redeemed Christian Church of God), professional and organizational contacts, and African stores and restaurants in Atlanta.

3.2 Study Instrument and Data Collection

This study used a semi-structured questionnaire administered as an online survey only, due to the COVID-19 pandemic restrictions, as an instrument for data collection. Consent for participation was presented as the first part of the questionnaire. The questionnaire did not include any information that could personally identify participants, and The Georgia State University Institutional Review Board approved this study.

Sociodemographic information such as age, place of birth, marital status, employment, income, level of education attained, and length of stay in the U.S were collected. In addition, health information regarding a diagnosis of diabetes or hypertension was also collected. Data on the frequency of consumption of common Nigerian foods were also collected through the questionnaire's food frequency section.

The food frequency section was a modified version of the Harvard Food Frequency Questionnaire [FFQ] (Willett *et al.*, 1985) adapted for use in numerous adult populations after validation for collection of dietary records. This FFQ has also been used among West-African

immigrants in Madrid (Delisle *et al.*, 2009). All foods in this modified FFQ were listed to include the different variants/derivatives and modes in which they may be prepared and eaten. For example, 'rice' included Jollof Rice, Fried Rice, Coconut Rice, and Plain Rice. The frequency of food consumption and combined use of salt and bouillon seasoning was scaled from 1 to 5 (1 = Never, 2 = 1 to 2 times a month, 3 = 1 to 2 times a week, 4 = 3 to 5 times a week, and 5 = Daily).

3.3 Data Analysis

Each completed questionnaire was assigned a code, and data were analyzed using SAS 9.4 statistical software (SAS Institute, Gary, NC, USA). Descriptive statistics were used to characterize the study population. Continuous variables were reported as means, standard deviation, and ranges, while categorical variables were reported as frequencies, proportions, and percentages. Variables of interest were the place of birth, marital status, employment status, level of education attained, income, length of stay in U.S, frequency of food consumption and combined use of salt and bouillon for meal preparation, and diagnoses of diabetes or hypertension.

Given the small sample size, the following variables were collapsed into two dichotomous categories for data analysis: marital status, employment status, level of education, income, and length of stay. For marital status, all participants who did not report being married were grouped as 'non-married'; for employment status, all participants who did not have full- or part-time or were self-employed were grouped as 'unemployed'; for the level of education attained, any education up to college level was grouped as 'college'; income was grouped as '≤ $40,000 or > $40,000'; and length of stay was arbitrarily stratified as '≤5years or >5 years'. Also, food consumption frequency was stratified as 'weekly or monthly' only for bivariate analysis. All foods eaten 'daily,' '3 – 5 times a week' and '1 – 2 times a week' were grouped as 'weekly.' The significance of the association between the variables of interest was determined by bivariate analysis (PROC SURVEYFREQ)

using the chi-squared test and Fisher's Exact Test. A two-sided p-value< 0.05 was considered statistically significant for all analyses.

CHAPTER IV: RESULTS

4.1 Descriptive Statistics of Study Population

A total of 111 adult Nigerian women were recruited for this study. 108 participants gave informed consent and began the survey, but 102 participants completed the survey. Participant ages ranged between 20 – 65 years, with a mean age of 39.5 years and a standard deviation (S.D.) of 12.1 years. 91% of the participants reported their place of birth as Nigeria, while others were born in the U.S., U.K., Sweden, and Asia. About 55.88% of the participants were married; 80.39% had some employment (full-time, part-time, or self); 98% had some college or post-college education, and about 33% earned $76,000 or higher. Of all participants, 53.92% have lived in the U.S for less than five years, while the remaining have lived in the U.S longer. Table 1 describes the basic demographic characteristics of the study population.

4.2 Food Consumption Frequency

The frequency of the most commonly consumed Nigerian foods was analyzed as weekly or monthly. Results (Figure 13) show that the most commonly consumed foods eaten were variants and derivatives of rice, beans, plantain, egusi [melon seed] sauce, pasta, spinach, and yam. The proportion of participants who reported eating these foods were: rice (99.02%) , beans (96.08%), plantain (96.08%), ‘egusi’ [melon seed] sauce (94.12%), pasta (93.14%), spinach (93.14%), and yam [roots & tubers] (92.15%). Upon stratification for weekly or monthly consumption, the food with the highest frequency of weekly consumption was rice (86.27%), spinach (70.59%), plantain (66.7%), pasta (50%), beans (50%), egusi [melon seed] sauce (43.14%), and yam [roots & tubers] (38.23%) respectively.

Table 1: Description of Study Population Characteristics

Characteristics	Number (%) of Participants		
Age (years)	N (%)	N = 102; Mean ± S.D 39.5 ± 12.1	Min = 20 Max = 65
20 – 30	33 (32.35)		
31 – 40	28 (27.45)		
41 - 50	15 (14.71)		
≥ 51	26 (25.49)		
Place of Birth			
Nigeria	93 (91.2)		
Others	9 (8.8)		
Marital Status			
Married	57 (55.9)		
Non-married	45 (44.1)		
Employment Status			
Employed	69 (67.6)		
Unemployed	33 (32.4)		
Education			
Up to College	50 (49.1)		
Post College	52 (50.9)		
Income			
≤ $40,000	44 (43.14)		
> $40,000	58 (56.86)		
Length of stay in the U.S			
≤ 5yrs	55 (53.9)		
> 5yrs	47 (46.1)		
Diabetes			
Yes	21 (20.6)		
No	81 (79.4)		
Hypertension			
Yes	30 (29.4)		
No	72 (70.6)		

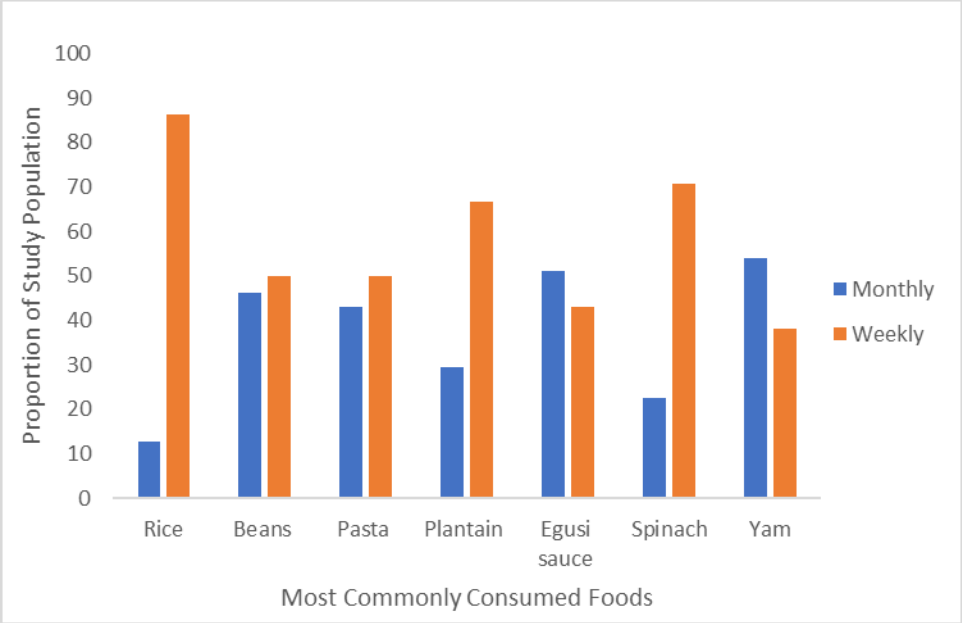

Figure 13: Proportion of study participants vs. the frequency of food consumption

4.3 Food Consumption Frequency Across Sociodemographic Factors

A cross-examination was conducted to determine if there was a significant difference between the frequency of consuming common Nigerian foods among the women in this study when stratified by variables of interest. The variables of interest were sociodemographic factors such as place of birth, marital status, employment status, education level, income, and length of stay. Results from this analysis presented in Table 2 show that there was no statistically significant difference in the frequency of consuming common Nigerian foods between the women who were born in Nigeria and other places, who were either employed or not, and who had education up to college or beyond. However, the difference between the proportion of women who consumed rice was statistically significant ($p=0.0094$) based on marital status. Also, the difference in the proportion of women who eat plantain was statistically significant based on income ($p=0.0065$) and length of stay ($p=0.0003$).

Table 2: Food Consumption Frequency by Sociodemographic factors

	FOOD CHOICES													
	Rice (n = 101)		Beans (n = 98)		Plantain (n = 98)		Egusi (Melon seed) Sauce (n = 96)		Pasta (n = 95)		Spinach (n = 95)		Yam [Roots & tubers] (n = 94)	
	W n (%)	M n (%)	W n (%)	M n (%)	W n (%)	M n (%)	W n (%)	M n (%)	W n (%)	M n (%)	W n (%)	M n (%)	W n (%)	M n (%)
Place of Birth														
Nigeria	80 (87)	12 (13.0)	47 (47.9)	43 (43.9)	62 (63.3)	28 (28.6)	39 (40.6)	50 (52.1)	46 (48.4)	41 (43.2)	64 (67.4)	22 (23.2)	37 (39.6)	50 (53.1)
Others	8 (88.9)	1 (11.1)	4 (4.1)	4 (4.1)	6 (6.12)	2 (2.04)	5 (5.2)	2 (2.1)	5 (5.3)	3 (3.2)	8 (8.4)	1 (1.1)	2 (2.1)	5 (5.3)
P		*0.8688*		*1.0000*		*1.0000*		*0.2412*		*0.6017*		*0.4473*		*0.6955*
Marital Status														
Married	54 (53.5)	3 (2.9)	35 (35.7)	21 (21.4)	37 (37.8)	19 (19.4)	28 (29.2)	28 (29.2)	27 (28.4)	27 (28.4)	46 (48.4)	10 (10.5)	25 (26.6)	30 (31.9)
Non-Married	34 (33.7)	10 (9.9)	16 (16.4)	26 (26.5)	31 (31.6)	11 (11.2)	16 (16.6)	24 (25)	24 (25.3)	17 (17.9)	26 (27.4)	13 (13.7)	14 (14.9)	25 (26.6)
P		*0.0094*		*0.0167*		*0.4108*		*0.3323*		*0.4085*		*0.0832*		*0.3541*
Employment Status														
Employed	72 (71.3)	10 (9.99)	39 (39.8)	40 (40.8)	52 (53.1)	26 (26.5)	38 (39.6)	40 (41.7)	40 (42.1)	36 (37.9)	60 (63.2)	16 (16.8)	31 (33)	44 (46.8)
Unemployed	16 (15.8)	3 (2.97)	12 (12.2)	7 (7.1)	16 (16.3)	4 (4.1)	6 (6.3)	12 (12.5)	11 (11.6)	8 (8.4)	12 (12.6)	7 (7.4)	8 (8.5)	11 (11.7)
P		*0.7066*		*0.2800*		*0.2484*		*0.2377*		*0.6807*		*0.2288*		*0.9514*
Education														
College	44 (43.6)	6 (5.9)	25 (25.5)	24 (24.5)	35 (35.7)	14 (14.3)	21 (21.9)	26 (27.1)	28 (29.5)	19 (20)	32 (33.7)	13 (13.7)	16 (17)	31 (33)
Post College	44 (43.6)	7 (6.9)	26 (26.5)	23 (23.5)	33 (33.7)	16 (16.3)	23 (24)	26 (27)	23 (24.2)	25 (26.3)	40 (42.1)	10 (10.5)	23 (24.5)	24 (25.5)
P		*0.7957*		*0.8398*		*0.6611*		*0.8243*		*0.2546*		*0.3126*		*0.1428*
Income														
≤ $40,000	37 (36.6)	7 (6.93)	26 (26.5)	17 (17.4)	36 (36.7)	7 (7.1)	20 (20.8)	24 (25)	24 (25.3)	17 (17.9)	28 (29.5)	11 (11.6)	19 (20.2)	23 (24.5)
> $40,000	51 (50.5)	6 (5.94)	25 (25.5)	30 (30.6)	32 (32.7)	23 (23.5)	24 (25)	28 (29.2)	27 (28.4)	27 (28.4)	44 (46.3)	12 (12.6)	20 (21.3)	32 (34.04)
P		*0.4231*		*0.1399*		*0.0065*		*0.9454*		*0.4085*		*0.4881*		*0.5074*
Length of Stay														
≤ 5 years	49 (48.5)	6 (5.94)	30 (30.6)	25 (25.5)	45 (45.9)	8 (8.16)	27 (28.1)	27 (28.1)	32 (32.6)	21 (22.1)	38 (40)	14 (14.73)	24 (25.5)	29 (30.85)
> 5 years	39 (38.6)	7 (6.93)	21 (21.4)	22 (22.5)	23 (23.5)	22 (22.5)	17 (17.7)	25 (26.0)	20 (21.1)	23 (24.2)	34 (35.8)	9 (9.47)	15 (15.9)	27 (27.66)
P		*0.5196*		*0.5746*		*0.0003*		*0.3529*		*0.2023*		*0.4973*		*0.3960*

4.4 Food Consumption Frequency by Health Status

A cross-examination was conducted to determine if there was a significant difference in the proportion of women and the frequency with which they consumed common Nigerian foods based on their health status (i.e having diabetes [D.M.] or not; having hypertension [HTN] or not). Results (Table 3) show that although there were differences based on having or not having diabetes or hypertension among the women in this study who consume common Nigerian foods on weekly and monthly basis, these differences were not statistically significant.

Table 3: Food Consumption Frequency by Health Status

		Rice n = 101		Beans n = 98		Plantain n = 98		Egusi [Melon seed] n = 96		Pasta n = 95		Spinach n = 95		Yam [Roots & Tuber] n = 94	
		W	M	W	M	W	M	W	M	W	M	W	M	W	M
D.M.	Yes	19 (18.8)	2 (1.98)	8 (8.16)	13 (13.3)	16 (16.3)	5 (5.1)	10 (10.4)	11 (11.5)	8 (8.4)	12 (12.6)	13 (13.7)	6 (6.3)	9 (9.6)	11 (11.7)
	No	69 (68.3)	11 (10.9)	43 (43.9)	52 (34.7)	25 (25.5)	32 (32.7)	34 (35.4)	41 (42.7)	43 (45.3)	32 (33.7)	59 (62.1)	17 (17.9)	30 (31.9)	44 (46.8)
	p	*1.0000*		*0.1490*		*0.4454*		*0.8526*		*0.1672*		*0.3877*		*0.7195*	
HTN	Yes	27 (26.7)	3 (2.97)	15 (15.3)	15 (15.3)	20 (20.4)	10 (10.2)	12 (12.5)	17 (17.7)	10 (10.5)	16 (16.8)	21 (22.1)	8 (8.42)	12 (12.76)	17 (18.1)
	No	61 (60.4)	10 (9.9)	36 (36.7)	32 (32.7)	48 (48.9)	20 (20.4)	32 (33.3)	35 (36.5)	41 (43.16)	28 (29.5)	51 (53.7)	15 (15.8)	27 (28.7)	38 (40.4)
	p	*0.7499*		*0.7882*		*0.6979*		*0.5645*		*0.0678*		*0.6106*		*0.9885*	

4.5 Frequency of Combined Use of Salt and Bouillon

The frequency of combining salt and bouillon in meal preparation was also analyzed among the study participants. The frequency of consumption was scaled as follows: Never, 1 – 2 times per month, 1 – 2 times per week, 3 – 5 times per week, and Daily. The results shown in Figure 14 indicate that only a small proportion (3.92%) of the study population never used salt and bouillon in combination for meal preparation. In comparison, 43.14%, which accounted for the

highest proportion and frequency of combined salt and bouillon usage, reported practicing this habit daily.

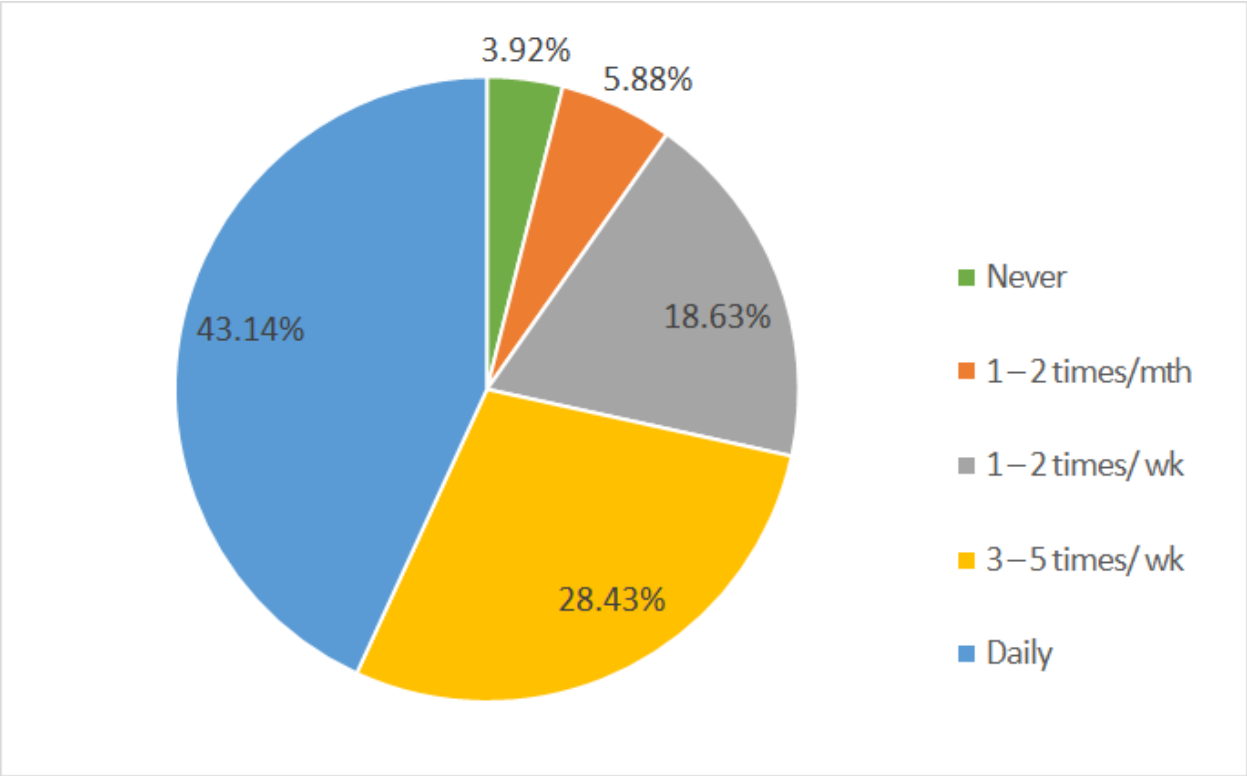

Figure 14: Frequency of combined use of salt and bouillon in meal preparation

4.6 Frequency of Salt and Bouillon Usage in Meal Preparation by Health Status

A cross-examination was conducted to determine if there was a significant difference in the frequency of using salt and bouillon in combination with the proportion of women who had diabetes and those who did not and the proportion of women who had hypertension and those who did not. Results (Table 4) show that although there were differences based on having or not having diabetes or hypertension among the women in this study who consume use salt and bouillon in

combination, these differences were only statistically significant for diabetes (p=0.0008) and statistically insignificant for hypertension (p=0.2055).

Table 4: Frequency of Combined Use of Salt and Bouillon by Health Status

		Never	1 - 2 times / month	1 - 2 times / week	3 - 5 times / week	Daily
DM	Yes	0 (0)	5 (4.90)	6 (5.88)	4 (3.92)	6 (5.88)
	No	4 (3.92)	1 (0.98)	13 (12.75)	25 (24.51)	38 (37.25)

P = 0.0008

		Never	1 - 2 times / month	1 - 2 times / week	3 - 5 times / week	Daily
HTN	Yes	2 (1.96)	4 (3.92)	4 (3.92)	9 (8.82)	11 (10.78)
	No	2 (1.96)	2 (1.96)	15 (14.71)	20 (19.61)	33 (32.35)

P=0.2055

CHAPTER IV: DISCUSSION

The primary objective of this study was to examine the frequency of consumption of common foods eaten by Nigerian women in Atlanta, Georgia, and the frequency of the combined use of salt and bouillon in meal preparation among this population. In this study of 102 participants, the results showed that rice was the most commonly consumed Nigerian food by a high proportion of Nigerian women in Atlanta. In addition, this study showed that women who have stayed less than five years in the U.S consumed more common Nigerian foods compared with those who have stayed longer than five years; the difference in their frequency of consumption was not statistically significant across the majority of the foods. This may indicate that for women in this study, the choice and frequency of commonly-consumed Nigerian foods may not be influenced by their length of stay in the U.S. This study also showed that dietary practices of the study participants were similar irrespective of health statuses. Other studies on food consumption in Nigeria have shown results similar to what was found in this study. The common foods consumed in Nigeria examined in this study have been described in studies by Oguntona *et al.* (1998, 1999, & 2002) and later modified and described in another study by Morakinyo *et al.* (2016).

In this present study, rice, beans, plantain, egusi [melon seed] sauce, pasta, spinach, and yam [roots & tubers] were the most common foods consumed by Nigerian women in Atlanta**.** The frequency of consumption of these foods was observed in the following descending order: Rice, spinach, plantain, pasta, beans, egusi [melon seed] sauce, and yam [roots & tubers]. The weekly frequency of consumption of these foods among a high proportion of study participants may be attributed to the fact that traditionally, Nigerians consume these foods in various forms. For instance, rice is often prepared fried, boiled and eaten in combination with stew or sauce, stewed

as Jollof, or prepared as coconut rice. Spinach is often prepared as a vegetable soup with palm oil and assorted meats or seafood and is often accompanied by bolus. Plantain is typically fried, grilled, or boiled and often eaten in combination with beans or rice. Lastly, pasta has become a form of convenient food in more than one-third of Nigerian homes because of its minimal preparation time (Giacco *et al.*, 2016; Ihedioha *et al.*, 2019; Onabanjo & Oguntona, 2003; Alozie & Ene-Obong 2018). In contrast, preparing beans in various forms can be time-consuming, which possibly explains the monthly frequency of this food in the study. Yams are consumed in Nigeria, and many other countries in Africa, and are imported into the U.S and sold at African stores. Yams are perceived to be costly, considering that they are sold for about $3.47/gram (Tridge, 2020). This potentially explains why yams are the most infrequently consumed (eaten monthly) among a high proportion of this study population.

The high frequency of rice consumption among this study population corresponds with results from Akarolo-Anthony *et al.* (2012) whose study of urbanized Nigerian adults living in Nigeria, shows that rice was also the most commonly consumed carbohydrate food. These findings correspond to a study conducted by Lindsay *et al.* (2014) on the dietary exploration of pregnant Nigerian immigrant women in Ireland, where it was found that traditional African dietary practices remained among pregnant Nigerian immigrants in Ireland, even though a majority of them had lived in Ireland for several years. The food consumption patterns of Nigerian women in Atlanta, Georgia, in this study compared to Nigerians in Nigeria in other studies, did not show major differences. This tendency to maintain food consumption patterns despite immigrating is not uncommon. For instance, a study conducted by Turk *et al.* (2015) explored the eating practices and physical activity of Nigerian immigrants in the U.S. ,

and they concluded that Nigerian immigrants preferred to consume the kinds of food they had before migrating but were willing to modify those that they deemed somewhat unhealthy.

Several previous studies have shown that the length of stay of immigrants in foreign spaces influences health statuses and impacts dietary acculturation. This study also sought to examine if the length of stay and other sociodemographic factors of interest (marital status, employment, income, place of birth, and education) could infer a difference in the frequency of consuming common Nigerian foods. In this study, there was no statistically significant difference between the frequency of consuming the most common Nigerian foods and factors such as place of birth, employment status, and education. In contrast, a statistically significant difference in the frequency of consuming rice was observed when marital status was accounted for. Also, a statistically significant difference in the frequency of consuming only plantain was observed when income and length of stay in the U.S were accounted for.

Globally, 7 out of 10 causes of death are associated with NCDs. According to the World Health Organization, unhealthy dietary practices such as increased blood sugar [diabetes], and increased blood pressure [hypertension] are the most common underlying modifiable risk factors for NCDs (WHO, 2020). In this study, it was important to examine any relationship between the frequency of food consumption and living with diabetes and/or hypertension among study participants (Miller *et al.*, 1992; Azeez *et al.*, 2020; Akarolo-Anthony *et al.*, 2012). Given that rice was the most frequently consumed food among the five foods that emerged in this study population, and has a high glycemic index, it was necessary to examine this relationships. Although not statistically significant, the proportion of rice consumers did not vary between those who reported being diagnosed with diabetes or not. The similarity in the proportion of frequent rice consumers among study participants may indicate that further studies with larger

sample size are needed to show whether Nigerian dietary practices are independent of health statuses. One could expect that there would be statistically significant differences in the frequency of rice consumption based on diabetes statuses, particularly given findings in another study among those with diabetes in Nigeria by Iloh *et al.* (2015), where only 22.5% adhered to overall lifestyle modifications. In this present study, we did not elicit information about whether the sample population who had diabetes ever received medical advice regarding lifestyle modifications upon diagnosis. However, the study shows a high use of salth and bouillon by study participants.

The chemical analysis of bouillon composition showed that there are considerable amounts of salt, sugar, and monosodium glutamate in these seasonings (Elemo & Makinde, 1984; Vasconcelos *et al.*, 2018). High salt levels in foods are among the risk factors for NCDs like hypertension and cardiovascular diseases (Mancia *et al.,* 2017). In Nigeria and other parts of West Africa, the dietary habit of using salt and bouillon seasoning in combination for meal preparation is on the rise (Henry-Unaeze *et al.,* 2010; Airhihenbuwa & Iwelunmor, 2012). The major bouillon seasoning brands used among Nigerian women, in particular, are Royco, Maggi, and Knorr (Mapis, 2020), and these brands are also available at most African stores in Atlanta and other cities in the United States. These bouillon seasoning brands have calcium, sodium, potassium, and magnesium contents above the National Agency's limits for Food and Drug Administration and Control, indicating the need for the monitoring of their nutrient composition given that their presence in high concentrations could be detrimental to human health over a long period (Aigberua *et al.*, 2018).

In this study, the highest proportion of those who used salt and bouillon combinations in meal preparation were daily users. Studies by Tchaou *et al.* (2013) and Ogbuagu *et al.* (2019) have established a relationship between elevated blood sugar and use of monosodium glutamate, which

is often added to bouillon seasonings as a flavor enhancer. However, this study showed a statistically significant difference (p=0.0008) in the frequency of using salt and bouillon in combination for meal preparation when the health status of having diabetes or not was accounted. Although not statistically significant, there was a difference in the frequency of using salt and bouillon in combination between women who had and did not have hypertension in this study. That there is no statistically significant difference in the frequency of using salt and bouillon in among those with hypertension may indicate that their health statuses do not influence their dietary practices despite what other studies have shown (Mancia *et al.*, 2017). This non-adherence to lifestyle modification of diet and other health promoting behaviors, was also reported by Iloh *et al.* (2014) in their study among adult Nigerians with hypertension. It is worth noting that this study did not collect information on whether participants who have been diagnosed with hypertension ever received medical advice regarding lifestyle modifications upon diagnosis.

Summary

This study shows that the most commonly consumed Nigerian foods by study participants in Atlanta in the US are similar to those shown in studies of Nigerians residing in Nigeria. Although the frequency of consuming common Nigerian foods among these women differed slightly based on their length of stay in the U.S and health status, these differences were not statistically significant for most foods examined. Also, the daily use of salt and bouillon is observed among a considerable proportion of women in this study. Further research is needed with a larger sample size in this population in Atlanta combined with a comparative analysis of dietary practices of Nigerian women living in Nigeria.

Study Limitations

This study is limited by its relatively small sample size, which may not effectively represent the sample population. The COVID-19 pandemic restricted the recruitment of and total number of participants for this study. Initial plans to personally visit churches and women's organizations in Atlanta to announce the study had to be canceled due to COVID-19. This study may be limited by recall bias of participants, which may impact the quality of responses. This study did not evaluate nutrient content or adequately consider the portion size of commonly consumed Nigerian foods; neither did it consider other socioeconomic and environmental factors that influence food consumption to reach a more definitive conclusion. These limitation notwithstanding, this is the only known study among Nigerian women in Atlanta that describes their dietary practices (i.e., frequency of consuming common Nigerian foods and usage of salt and bouillon) may be related to their length of stay and health statuses.

Implications for Public Health Practice

It is imperative that health literacy and education programs be designed for this population in the hope of reducing their combined use of salt & bouillon in meal preparation. Furthermore, this population should be targeted for culturally appropriate interventions on diet and dietary practices for the management of and prevention against diabetes, hypertention and other non-communicable diseases.

Suggestions for Future Research

Future studies could consider a larger sample size to examine the dietary practices of this study population. Future research could be conducted to compare the dietary practices of Nigerians

in Nigeria and Nigerians in the U.S., such as this study population, and examine the frequency of consumption of American foods vs. Nigerian foods among the study population. It is hoped that further studies with larger sample size will help further expand on the results of this study to reach a more comprehensive conclusion.

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Figure 1: Egusi (Melon Seed) Soup with Semo (Wheat) Bolus [*Source: DreamAfrica (2018). Top 10 Yoruba Foods to try. https://www.thedreamafrica.com/top-10-yoruba-food-you-have-to-try/)*

Figure 2: Seafood Okra Soup with Eba (Cassava) Bolus [*Source: Funke Koleosho's Food Blog. https://funke-koleosho.blogspot.com/2017/09/swallow-truth.html*]

Figure 3: Edikaikong (Fresh Pumpkin and Water Leaves) Soup with Fufu (Cassava) Bolus [*Source: SisiYemmieTV – YouTube. How To Cook THE BEST EDIKANGIKONG SOUP + MARKET RUNS. https://www.youtube.com/watch?app=desktop&v=F5xB6fPSkdo]*

Figure 4: Nigerian Jollof Rice with Stewed Chicken [Source: DreamAFrica. 10 African Food Facts That May Surprise You. https://www.demandafrica.com/food/10-african-food-facts-that-may-surprise-you/]

Figure 5: White Rice with Beef Stew [Source: KQED Blog (2020). Mom's Nigerian Stew Is Three Generations of Comfort. https://www.kqed.org/bayareabites/138836/flavors-at-home-moms-nigerian-stew-is-three-generations-of-comfort]

Figure 6: Nigerian Fried Rice with Fried Chicken [Source: All Nigerian Recipes Blog. Nigerian Rice and Spaghetti Recipes. https://www.allnigerianrecipes.com/rice/]

Figure 7: Yam Porridge [Source: Chef Lola's Kitchen (2015). Yam pottage/Yam Porridge (Asaro) Recipe. https://cheflolaskitchen.com/yam-porridge-pottage/]

Figure 8: Ogbono Soup [Source: Nigerian Food Recipes From Ernest (2018). Recipe on How to Make Ogbono Soup. https://nigerianmeal.com/ogbono-soup-recipe/]

Figure 9: Nigerian Yam and Fried Eggs [Source: Steemit (2018). Yam and Fried Egg: Eating The Nigerian Way. https://steemit.com/food/@holuwa-seun/yam-and-fried-egg-eating-the-nigerian-way]

Figure 10: Wraps of Amala Lafun [Source: Instagram - @RuthAffairs (2020). White Amala. https://www.instagram.com/p/CHlR40bJUAD/]

Figure 11: Pap and Moi Moi [Source: My Active Kitchen (2016). Moimoi Elewe. https://www.myactivekitchen.com/moimoi-elewe-moinmoin/]

Figure 12: Tuwon Shinkafa [Source: Nneka Ngwu – The Guardian (2019). Tuwon Shinkafa (Rice Meal) And Miyan Taushe (Pumpkin Soup). https://guardian.ng/life/food/tuwo-shinkafa-rice-meal-and-miyan-taushe-pumpkin-soup/]