

2011

Factors associated with fruit and vegetable consumption among Caribbean immigrants in the United States

Claudia Martin-Ayoade

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Factors Associated with Fruit and Vegetable Consumption Among Caribbean Immigrants in the
United States

by

Claudia Martin-Ayoade

Thesis

Submitted to the School of Health Sciences

Eastern Michigan University

In partial fulfillment of the requirements

for the degree of

MASTER OF SCIENCE

In

Dietetics

Thesis Committee:

Chair: Rubina S. Haque, PhD, RD

Alice Jo Rainville, PhD, RD, CHE, SNS

Mary Anne Drake-Brown, PhD, RD

November 15, 2011

Ypsilanti, Michigan

Acknowledgements

I would like to thank the administrator for the Caribliffe Central website for agreeing to send out the survey to the Caribbean-born members of the site. I would also like to thank the site's members who took the time to fill out the survey.

I will be forever grateful to my thesis advisor, Dr. Rubina Haque, for her guidance and expertise. Thanks for helping me gain the knowledge to help in my future career as a dietitian. I would also like to especially thank my committee members, Dr. Alice Jo Rainville and Dr. Mary Anne Drake-Brown. Dr. Rainville, you have served as not only my advisor but my professor in foodservice management classes and my career coach. I have so much respect for you and your work and hope you can continue to be my mentor as I embark on my new career path in child nutrition and education. Dr. Drake-Brown, thank you seems inadequate for all the assistance you have provided me by allowing me to complete my rotations with your company. You have given me so much of your time and expertise and I will be forever grateful for the education and experiences you have provided me. I would like to thank Inna Sapozhnikova for her help with the statistical analysis. Her expertise was appreciated in every way to make my thesis a success.

Last, but most important, I would like to thank my husband, Fatai Ayoade, and my children, Cameron and Gavin Ayoade. Fatai, thank you for being Mr. Mom while I completed the most demanding portions of my academic program. I love you! I would like to thank my kids for their patience when mom was busy studying and could not take them outside to play. It has been a journey for all of us and I would not have done it without your love, support, and understanding.

Abstract

Background: There are limited data available on the fruit and vegetable consumption of Caribbean immigrants in the United States.

Purpose: To assess changes in intakes of fruits and vegetables in Caribbean immigrants while assessing knowledge of the recommended servings and barriers to intake.

Method: A cross sectional Internet questionnaire was conducted for Caribbean-born members of the social network website Cariblifecentral.com. Data were analyzed using descriptive frequencies, Pearson's chi-square, and the Student's t-test.

Results: Of 113 respondents, 37 reported consuming less vegetables since emigrating ($p < 0.10$) while 29 reported eating more. However, 10.8% of respondents did not know the recommended servings for vegetables. Access to fresh produce was no barrier to consumption.

Conclusions: As this population continues to grow, it becomes necessary to tailor nutrition and disease prevention information and provide education about the benefits of consuming a balanced diet and risks associated with inadequate intake of fruits and vegetables.

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Chapter 1: Introduction

Background

It has been well documented that most Americans do not consume adequate amounts of the daily recommended fruits and vegetables (1, 2). Guenther and colleagues (3) created a primary dataset from a 24-hour recall from each of the 8,070 respondents in the 1999-2000 National Health and Nutrition Examination Survey. They concluded that most Americans eat much less than the recommended amounts of fruits and vegetables, and only 40% of Americans eat an average of five or more servings of fruits and vegetables per day. Inadequate intake of fruits and vegetables increases the risk for certain chronic diseases (4, 5, 6) such as cardiovascular disease, stroke, diabetes, and some cancers. Fruit and vegetable intake is a concern not just for native born Americans but also for immigrant populations.

As the immigrant population continues to grow, it is important to tailor nutrition and disease prevention information to educate particular ethnic groups about the benefits of consuming a balanced diet and the risks associated with inadequate intake. In 2007, the total population of the United States (U.S.) was 301.6 million, and of that, 38.1 million were immigrants (7). In 2003 the U.S. Census Bureau reported that approximately 10% of all foreign-born individuals are from the Caribbean (8, 9), and that trend is projected to increase given the close proximity of the Caribbean to the U.S. Fruit and vegetable consumption in the Caribbean diet varies among islands because they have specific cuisines that are unique to them as a result of blending of a variety of different cultures that are not limited to the French, Spanish, British, Dutch, and African populations (10). It is important to know whether Caribbean immigrants adopt the typical American diet and lifestyle, a process referred to as acculturation. Acculturation has been defined as “the process by which immigrants adopt the attitudes, values,

customs, beliefs, and behaviors of a new culture’’ (11). For the purpose of this study, acculturation is the likelihood of Caribbean immigrants adopting the eating habits of the U.S. population, based on their years of residence in the U.S.

Problem Statement

Fruits and vegetables are an integral part of a majority of diets around the world. Immigrants who move to the U.S. are faced with the choice of adapting to the typical American diet, incorporating American foods in their usual diet, or strictly maintaining their original ethnic diet. While there have been previous studies on fruit and vegetable intake, Caribbean immigrants are usually grouped with African Americans or Hispanics and have rarely been studied as a group of their own (12).

A Population Reference Bureau bulletin issued in December 2007 reported that African and Caribbean foreign-born black people differ from each other and from U.S. - born African Americans in many ways, yet are viewed as part of the large African American population (12). A 2007 American Community Survey Report by the United States Census Bureau concluded that 9.7% of all Hispanics who are foreign-born and living in the U.S. were born in the Caribbean (9). Additionally, the report stated that approximately 4.5% of all foreign-born blacks residing in the U.S. are from the Caribbean (9). These numbers represent a significant group of people whose dietary patterns need more detailed studies. This study investigated the self-reported fruit and vegetable consumption of Caribbean-born nationals as a group and did not separate them by ethnicity or include them as part of the African American demographic.

Purpose of the Study

This purpose of this study was as follows:

1. Determine if there are any changes in fruit and vegetable consumption after immigration and if duration of residency, place of birth, and traditional diet influenced the amounts consumed.
2. Determine if Caribbean immigrants are knowledgeable about the recommended number of servings and benefits of fruits and vegetables.
3. Assess what barriers might restrict fruit and vegetable consumption for Caribbean immigrants.
4. Determine how consumption of fruits and vegetables correlates to the Body Mass Index (BMI) of Caribbean immigrants after immigrating to the United States.

Justification and Significance

The Caribbean immigrant population in the United States continues to grow at a rapid pace and currently accounts for a little more than 1% of the total population (7). Although the Caribbean immigrants are a significant ethnic population, there is limited published data related to their consumption of fruits and vegetables. Authors Waters (13) and Guy (14) chronicled the lack of attention that is paid to the Caribbean Community in their books. Assessing the frequency of fruit and vegetable consumption is vital in determining the nutritional risks and possible health risks in the Caribbean-born population. It is even more important to explore the degree of retention or abandonment of traditional Caribbean dietary habits as well as the adoption of new ones in the U.S. A cross-sectional survey of the Caribbean-born population was conducted. This study is important in the following ways:

- a) The study aims to provide an understanding of fruit and vegetable consumption and behavior(s) of the Caribbean immigrants for healthcare and nutrition professionals.

- b) It will allow for the development of more specific and targeted nutrition education and health improvement programs for this group by policy makers.
- c) It is also aimed to provide information regarding access to fresh fruits and vegetables in this population.
- d) The results of this study provide information for healthcare professionals to further study how fruit and vegetable intake impacts obesity and subsequent chronic diseases in the Caribbean community.

Research Questions

Based on the stated objectives of this study, the following questions were formulated.

1. Do Caribbean immigrants increase or decrease their fruit and vegetable intake when they move to the U.S.?
2. Does the length of residence correlate to the changes in fruit and vegetable intake of Caribbean immigrants?
3. Are Caribbean immigrants aware of the recommended daily fruit and vegetable intake amounts set forth by the Dietary Guidelines for Americans?
4. Are there barriers that prevent adequate fruit and vegetable consumption for Caribbean immigrants?
5. Is there a correlation between fruit and vegetable servings per day and self-reported BMI among Caribbean immigrants?

Chapter 2: Review of Literature

Caribbean Immigrants Identified

The Caribbean is composed of islands in the Caribbean Sea that stretch southward in an arch off the tip of Florida to almost the northeastern coast of South America (10). Its close location to the United States has resulted in the latest estimation of 3.8 million people who were born in the region and currently reside in the United States (9). While this appears to be a significant number of people, Waters (13) stated that black immigrants from the Caribbean who reside in the U.S. remain mostly invisible because Americans tend to see race and ethnicity as interchangeable for black Americans. Guy (14) supported this argument when he concluded that black Caribbean-born immigrants as a community appear to be invisible and forgotten. He further added that the physical appearance of Caribbean immigrants has caused them to be viewed as part of the African American community. These findings point to a need for more research to be conducted on Caribbean immigrants.

In 2005, Read and colleagues (15) reported that research directed at understanding Afro Caribbean health experiences in the U.S. has been sparse until recently (15). More recent studies have found that the stress of assimilation can negatively impact the health of Caribbean immigrants, and some may refuse to assimilate in the American culture because they will be perceived as black Americans, which they believe to be a step down (16, 17). It is further believed that they steadfastly maintain their cultural distinctiveness (17). If they resist assimilation, how is it that they have always been perceived to be African Americans? These findings would lead one to conclude that while Caribbean immigrants are distinct, they are also a heterogeneous group that deserves more focused studies about how their diet and eating patterns

impact the nation's nutrition and healthcare goals, especially as it relates to fruit and vegetable intake.

Dietary Acculturation

Among immigrant subgroups, fruit and vegetable intake varies depending on traditional cuisine that is unique to each subgroup. As immigrants become acculturated in the U.S., do they maintain their traditional eating habits or do they adopt the American diet? The lack of studies on acculturation in the Caribbean community makes it difficult to determine if they fully acculturate or just merely assimilate in the American culture. Livingston and colleagues (16) investigated acculturative stress and Caribbean immigrants' health with regard to depression and mental health. They concluded that there is a positive relationship between personal problems and depression while adapting to life in the United States, which negatively impacts the health of Caribbean immigrants. Miranda and colleagues (18) concluded that there has been very little health-related empirical research on black immigrants and even less on Caribbean immigrants in particular. Given these findings, it is safe to assume that how well Caribbean immigrants adopt American dietary patterns remains largely unknown.

In an effort to understand dietary patterns of immigrants in the USA, researchers have tried to address the changes adopted by immigrants. Most studies have focused on acculturation and overall food intake of Hispanics (19, 20), particularly Mexicans, and some Asian groups (20, 21). Abraidoa-Lanza and colleagues investigated if healthy behaviors declined with greater acculturation (19). Their findings indicated that Hispanic immigrants, who are more acculturated, have adopted the more unhealthy American diet. The study (19) was limited because the focus was restricted to Hispanic subjects only, but it presented characteristics of immigrant behavior that may be applicable to other immigrant groups. This study focused on Caribbean-born

subjects notwithstanding their race and measured dietary acculturation based on length of residence.

Pierce and colleagues (21) measured dietary acculturation in Japanese Americans with the use of confirmatory factor analysis of food-frequency data. These researchers used cross-sectional data from 219 second-generation and 277 third-generation Japanese Americans to study specific characteristics of the typical Japanese as well as the Western U.S. diet. They concluded that the greater the acculturation, the greater the westernization of the diet. This study differs in that it has focused on first-generation immigrants only.

Knowledge

How much do Caribbean immigrants know about the daily recommended servings, the benefits, and the risks of not consuming enough fruits and vegetables? It would be difficult for anyone to adhere to intake recommendations if they are ignorant of what they might be. The Dietary Guidelines for Americans recommend five or more servings of fruits and vegetables per day, depending on the person's total caloric intake (22). Previous research has indicated that immigrants may not be the only ones who may lack awareness. Guenther and colleagues (3) concluded that most Americans were not aware of the recommendations set forth in the Dietary Guidelines for Americans, which supports the proposed argument that knowledge and awareness could be a significant factor in understanding fruit and vegetable intake or lack thereof.

Shaikh and colleagues (23) reviewed the psychosocial predictors of fruit and vegetable consumption in American adults and while strong evidence was found for self-efficacy, social support, and knowledge as predictors of adult fruit and vegetable intake, weaker evidence was found for variables that included barriers, intentions, attitudes/beliefs, stages of change, and autonomous motivation (23).

Barriers

What are the barriers that prevent adequate consumption? Barriers to fruit and vegetable consumption are explored in various studies, and there is evidence to support the argument that there are indeed barriers that affect most individuals. Researchers found that the primary barriers most often encountered were accessibility to well stocked stores, availability of ethnic foods, cost, appeal, taste, preparation knowledge, education level, age, and income level (23, 24, 25). The Health Belief Model (24) indicates that knowledge, perceived benefits and barriers, should be enough to predict fruit and vegetable consumption. Zenk and colleagues (25) studied 266 black women in Detroit and concluded that there were more positive perceptions of the selection and quality, but not affordability, of fresh produce at the retail outlet where they shopped. These perceptions were positively associated with intake, independent of store type and location as well as age, per capita income, and years of education.

According to Wolf and colleagues (26), there is a lack of awareness of the current fruit and vegetable recommendations among urban black men (n= 455) in the greater New York City metropolitan area. They found that the greater the knowledge of fruits and vegetables recommendations, the higher the consumption and the lower the perceived barriers. These findings point to the need for studies to investigate level of knowledge and possible barriers that prevent or reduce consumption of fruits and vegetables as well as determine if increased knowledge increases intake. A U.S. Department of Agriculture Economic Research Service report (27) provided data that detail the average spent on fruits and vegetables by low income households, which is considered to be those households with incomes less than or equal to 130% of the poverty line. They found that half of the low income households had weekly fruits and vegetables purchases of \$2.50 or less per person, whereas half of higher income households had

per person expenditures of \$4.00 or less. This showed that those in the lower income bracket, on average, spent \$1.50 less per person on fruits and vegetables, which is not much less than those who have the means to afford the recommended amounts. In addition, 19% of low-income households compared to 10% of higher income households bought no fruits and vegetables over a two-week survey period in 2000 (27).

Body Mass Index

The length of time that an immigrant has resided in the United States impacts their eating habits and subsequently their body mass index (BMI) (28). BMI is defined as the body weight in kilograms divided by the square of height in meters. Goel and colleagues conducted a cross-sectional study to analyze data from the 2000 National Health Data Survey and showed that after 10 years, BMI of foreign-born individuals appeared to increase significantly (29). This pattern was relatively consistent across sex, race, and ethnicity, except among black immigrants who experienced no change in BMI as it related to years of residence. Data from the National Health Survey documented that BMI distribution of foreign-born immigrants who had lived in the United States for at least 15 years approached that of people who are born in the U.S. How active a person is in his/her daily life can impact his/her BMI, but that factor was not considered for this study (29). As immigrants get acculturated to increased sedentary behavior and poor dietary patterns of the U.S., such changes may be reflected as changes in BMI related to an increase in obesity rates (30, 31).

Gillum and Sempos reported that self-reported height, weight, and BMI in Mexican Americans may not be of sufficient validity for use by public health agencies since it underestimates obesity prevalence in women of all ethnic groups (32). BMI was a secondary variable in this study and while it was useful, it was not the key issue in this study.

There are limited studies of fruit and vegetable consumption by Caribbean immigrants. Akbar and colleagues (33) evaluated the dietary contribution of culturally preferred foods in a population of Black Seventh-Day Adventists from the eastern and southern United States (n=134). Fifty percent of respondents had parents of Caribbean descent while 42% were born in the Caribbean. The primary focus of the study was to determine the dietary patterns of black Seventh-Day Adventists and not Caribbean immigrants in general but rather the dietary cultural diversity of the group (33).

Sharma and colleagues (34) examined nutrient intakes by immigration status (place of birth), age bands, and gender, as assessed by a food frequency questionnaire for adult African-Caribbean residents (n=250) in inner-city Manchester in northwest England. They assessed the relationship between macronutrient intake and reported coronary heart disease (CHD) risk profile and concluded that a Caribbean birthplace has an independent effect on total fat intake and percentage of energy from fat.

The researchers (34) looked at the complete nutrient intake and not just fruits and vegetables, which differs from the intent of this present study to focus solely on fruit and vegetable intake. Furthermore, their study was conducted in the United Kingdom, while the primary goal of this study is to determine if Caribbean immigrants increase or decrease their fruit and vegetable intake upon moving to the U.S., and if length of residence affects their intake.

Questionnaire

According to Kraut and colleagues, there are several advantages to conducting a survey online (35). It is fast, reliable, efficient, easy to standardize and cost effective. Gosling and colleagues suggested that online surveys yield data that are comparable to those obtained through face-to-face interviews (36). However, the disadvantage is that majority of people who

participate in an online survey will not be representative of either a particular group of people or of the overall human population.

According to Leedy and Ormrod, surveys are commonplace features of contemporary life (37). It is the most popular tool used to present facts about the nature and status of a given situation as it exists at the time when the study was conducted (38).

In a quantitative cross-sectional fruit and vegetable consumption study conducted in Sweden, Gillum and Sempos (32) concluded that one-third of respondents chose the web-based survey when paper-based and web-based surveys were offered to all respondents. Disadvantages of online surveys include uncertainty over the validity of the data and sampling issues, and concerns surrounding the design, implementation, and evaluation of an online survey.

Chapter 3: Methodology

Sample Population

The target population was the approximately 2,100 members of the Caribbean social networking website CaribLifeCentral.com. However, not all members were born in the Caribbean, and the administrator for the website estimated that only 50% of the members were born in the Caribbean (n=1050). This social network membership is open only to men and women 18 years or older. An invitation to participate in the study with a link to the survey was posted on the CaribLifeCentral.com website and sent to the member's email account by the administrator. To avoid any potential bias in the analysis, only subjects who reported migrating directly from their Caribbean country of birth to the U.S. were included, and those who were born in the U.S. to Caribbean parents were excluded.

Questionnaire Administration

A cross-sectional questionnaire was developed by the principal investigator and conducted using the SurveyMonkey™ software program. Established in March 2007, CaribLifeCentral.com primarily targets the Caribbean Diaspora residing in the U.S., England, and Canada, and provides people interested in the Caribbean with relevant news, blogs, and events in a social media format.

Carib Life Central LLC is a privately-held company based in Atlanta, Georgia. Permission to conduct a survey of its members was obtained (see Appendix A) and a link to the questionnaire was sent via electronic mail to members of this social network residing in 16 states within the USA (FL, GA, NY, MO, MD, CT, TX, WA, KS, OR, MI, IN, IL, NC, NJ, VA).

The survey link was sent to the administrator of CaribLifeCentral.com who then forwarded the link via email to all listed members with a request specifically for those of

Caribbean birth to respond. A reminder email was sent after ten days. Data collection lasted 15 days. This website was selected because its membership represents Caribbean-born immigrants who are residents of the U.S.

The advantage of conducting an online survey using a social network website was that it offered a direct access to a large population of Caribbean-born individuals across the U.S. Secondly, a program such as Survey Monkey™ allows secure data collection, which can then be exported to Microsoft Excel™ for further analysis.

Participants were asked to click on an electronic informed consent form that stated the purpose of the research and that the information they were providing was for research purposes only and was not intended to compromise their privacy in any way. The consent form was also included in the notification email explaining, in detail, the purpose of the study, the procedure involved, confidentiality of the study data, expected risks and benefits, notice that participation was voluntary, use of research results, and contact information (see Appendix B). The next page of the questionnaire was the Consent to Participate page, which required the participants to acknowledge that they have read the previous page and understood the consent information, they are aware that they can withdraw at anytime, all their questions and concerns have been fully addressed, and that by clicking on the agree button, they are consenting to take the survey (see Appendix C). They were then able to access the questionnaire. The College of Health and Human Services Human Subjects Review Committee at Eastern Michigan University in Ypsilanti, Michigan, approved the study protocol (see Appendix D: CHHS-HSRC Approval Letter).

To protect the confidentiality of the participants, the survey did not contain information that could personally identify the subjects. The study was conducted using the SurveyMonkey™

software program that employs Secure Sockets Layer (SSL) technology that protects user information using both server authentication and data encryption, to ensure that user data is safe, secure, protected, and available only to authorized persons (39).

Email addresses or web URLs were not saved by the researcher. All information collected from all participants was confidential. Finally, the link to the questionnaire with the consent form was sent to participants by the administrator for Carib Life Central's website and not from the primary investigator. At no time did the principal investigator have access to any of the participants' email information per Carib Life Central's policy to not share member information.

Questionnaire

For this exploratory, cross-sectional research, a detailed Internet-administered fruit and vegetable intake questionnaire including demographic information was developed. The types of questions were multiple choice, numeric open ended, and rating scale. Data were collected on fruit and vegetable consumption, Caribbean country of origin, age at time of immigration, length of residence in U.S., height and weight to calculate BMI, and possible barriers to fruit and vegetable consumption.

Participants were sent a three-section questionnaire with a total of 26 questions (see Appendix C). Section One was used to record the participants' demographic and anthropometric measurements. Section Two was used to assess fruit and vegetable consumption, while the third section sought information about fruit and vegetable knowledge and barriers. All instruments were designed by the primary investigator, who is also a Caribbean immigrant, and after extensive review of literature that yielded very little information that was specific to eating habits of Caribbean immigrants.

The topics and wording of the questions were based on previously validated fruits and vegetables questionnaires (15, 31, 38). It was also pre-tested on five Caribbean immigrants, and two questions were eliminated based their suggestions that they were similar to previously answered questions.

Demographic Information: The first 11 questions made up the demographic section. The demographic portion of the questionnaire comprised three sections that included information on country of birth, years of residence in the U.S., age, gender, martial status, income, and education. The last section recorded participants' height and current weight information. This was used to calculate BMI that was expressed in kg/m^2 in order for the researcher to analyze if there was a correlation with BMI and the number of servings of fruits and vegetables respondents consumed.

Consumption, Knowledge, and Barriers Information: This section was divided in two sections: (1) Consumption History and (2) Knowledge and Barriers. In order to detect a pattern of change since residing in the U.S., questions 12-17 were used to gather information regarding consumption before and after immigrating to the U.S.. The remaining questions, numbers 18-26, were used to gather information on the participants' knowledge of recommended fruits and vegetables servings as well as possible barriers they may encounter to prevent adequate consumption, such as cost and access to fresh fruits and vegetables. These sections consisted of close-ended questions including multiple choice and some numeric open-ended questions requiring yes/no answers. The remaining questions were a series of 5-point rating scale questions where each one was rated from 1 = Disagree, 5 = Strongly Agree.

Data Analysis

The Microsoft Excel software program (version 2007) was used to calculate body mass index (BMI) and the Statistical Package for the Social Sciences (SPSS) software (SPSS release 17.0, SPSS Inc, Chicago, IL) (40), was used to perform further data analysis.

Descriptive statistics were obtained to summarize the demographics of the respondents and their responses to the questions. One-way analysis of variance (ANOVA) was used to reveal the factors that influence intake. Students' z-tests (test for significant differences in percentages) and t-tests (test for significant differences in means) were used to compare fruit and vegetable intake across the study variables of knowledge of recommended fruit and vegetable consumption, barriers, BMI, education, age, length of residence in the U.S., and access to Caribbean foods. Intake results were further analyzed using Pearson's chi-square. Correlations were used to reveal dependencies of intake variables with ordinal behavioral factors for questions (25, 26, and 17).

Chapter 4: Results

Data Management and Screening

An estimated 1050 eligible members were invited to participate in the study of which n=113 responses were collected. Data were downloaded to the Microsoft Excel™ program from the SurveyMonkey™ software program and then imported into SPSS 17.0.0 software program for analysis. Question number two had the most respondents (n=95), while question number 26 had the fewest respondents (n=82).

Body Mass Index (BMI)

Height and weight were requested from respondents in order to calculate their BMI. A total of 85 respondents provided height information, while only a total of 82 people provided their weight. Table 1 contains results for BMI calculations of 81 valid responses. The results show that 53% of respondents were overweight or obese while 38% were within the normal BMI range of 18.5 to 24.9.

Table 1. BMI of Respondents Based on Self-Reported Weight and Height in the Study of Factors Associated with Fruit and Vegetable Consumption Among Caribbean Immigrants in the United States (n=81).		
BMI category (kg/m²)	Total (n)	% of Total
Underweight (BMI <18.5)	3	4
Normal weight (BMI 18.5-24.9)	31	38
Overweight (BMI 25-29.9)	29	36
Obese (BMI 30-34.9)	14	17
Morbidly obese (<35.0)	4	5
Total	81	100%

Demographic Characteristics

Demographic characteristics of this sample population are presented in Table 2. Of the 113 participants, 84 respondents provided information regarding their length of stay in the U.S. Their response showed that 15.5% have been residing in the United States for five years or less, 9.5% for between six and ten years, 17.9% for the past 11 to 15 years, 20.2% for 21 to 25 years, and 20.2% for more than 26 years.

A majority of participants (54.1%) were 30-49 years. Most participants (43.4%) were married and/or in a committed relationship while 38.6% of participants were single and never married. Females accounted for 68.2% of the participants and males 31.8%. A majority (89%) attended college. More than half (52.3%) had an income above \$45,001.

Table 2: Demographic Characteristics of Participants in the Study of Factors Associated with Fruit and Vegetable Consumption Among Caribbean Immigrants in the United States (n=86).		
Demographic Characteristics	Total (n)	(%) of Total
Age		
18-29	25	29.3
30-49	46	54.1
>50	14	16.5
Gender		
Male	27	31.8
Female	58	68.2
Education		
Primary or Secondary	9	10.6
Post Secondary	76	89.4
Martial Status		
Married / A member of an unmarried couple	36	43.4
Single /Divorced /Separated /Widowed	47	56.6
Income		
0-15,000	11	12.9
15,001-30,000	5	5.9
30,001-45,000	16	18.8
45,001-70,000	20	23.5
>70,000	33	38.8
Length of Residence		
0-5 years	13	15.5
6-10 years	8	9.5
11-15 years	15	17.9
16-20 years	14	16.7
21-25 years	17	20.2
>26 years	17	20.2

Respondents were asked to provide information identifying their Caribbean island of birth; of the 86 respondents, a majority (66.3%) were immigrants from Jamaica. Almost 6% of respondents belonged to a group titled “Other,” that were islands not named but grouped together for convenience. Haiti and Trinidad and Tobago also had five respondents each. Immigrants from Guyana accounted for 4.7% of overall respondents. The remaining countries listed were The Bahamas, Barbados, Cayman Islands, Cuba, Dominican Republic, Dominica, Grenada,

Puerto Rico, St. Kitts and Nevis, and St. Lucia. Table 3 presents a complete list of the Caribbean country of origin of all respondents.

Table 3: Caribbean Country of Origin of Respondents in the Study of Factors Associated with Fruit and Vegetable Consumption Among Caribbean Immigrants in the United States (n=86).

Country	Total (n)	% of Response
The Bahamas	0	0.0
Barbados	2	2.3
Cayman Islands	1	1.2
Cuba	0	0.0
Dominican Republic	2	2.3
Dominica	0	0.0
Grenada	0	0.0
Guyana	4	4.7
Haiti	5	5.8
Jamaica	57	66.3
Puerto Rico	2	2.3
St. Kitts and Nevis	2	2.3
St. Lucia	1	1.2
Trinidad and Tobago	5	5.8
Other*	5	5.8
Total	86	100
*Other: Islands in the Caribbean that are not listed		

There were respondents from 16 states who participated in the survey as shown in Table 4. The majority of the respondents currently reside in the eastern and southern parts of the U.S.. The state with the most respondents was Florida (n=22), followed by Georgia (n=19) and New York (n=15).

Table 4: State Residence of Respondents in the Study of Factors Associated with Fruit and Vegetable Consumption Among Caribbean Immigrants in the United States (n=85).

State (Abbreviation)	Total Responses (no)
Florida (FL)	22
Georgia (GA)	19
New York (NY)	15
Texas (TX)	7
New Jersey (NJ)	3
Missouri (MO)	3
Maryland (MD)	3
Kansas (KS)	3
Michigan (MI)	2
Illinois (IL)	2
Washington (WA)	1
Virginia (VA)	1
Oregon (OR)	1
North Carolina (NC)	1
Indiana (IN)	1
Connecticut (CT)	1
Total	85

Consumption of Fruits and Vegetables

There were widely varied responses to fruit and vegetable consumption by the respondents. ANOVA and Chi-Square tests were used to evaluate correlations between age, level of education, length of residence, and BMI while t-tests and z-tests were performed to check the significance of differences.

Table 5 and Table 6 show the mean scores of responses by Caribbean immigrants to the questions shown. Scores were determined by assigning points to Likert Scale items as follows: Strongly Disagree = 1, Disagree = 2, Undecided = 3, Agree = 4 and Strongly Agree = 5. ANOVA and Chi-Square tests were used to assess correlation and presents the significance level for fruit and vegetable intake based on age, education, years of residence, and BMI.

The age of respondents was a significant factor ($p < 0.05$) whether they admitted to eating more canned vegetables than fresh ones (Table 5). The results also show that their level of

education was also a significant factor ($p < 0.10$) for their choice to consume traditional fruits and vegetables.

Table 5: Frequency of Intake by Age and Education (Chi-Square Test) of Respondents in the Study of Factors Associated with Fruit and Vegetable Consumption Among Caribbean Immigrants in the United States.

Questions	N	Age		Education	
	(No)	***Mean	P-Value	***Mean	P-Value
I eat more frozen fruit than I do fresh fruit.	84	1.61		1.61	
I eat more canned fruit than I do fresh fruit.	75	2.67		1.96	
I eat more frozen vegetables than I do fresh ones.	76	2.79		2.44**	$p < .10^{**}$
I eat more canned vegetables than I do fresh ones.	76	2.0	$p < .05^*$	2.33	
I eat more fruits since I moved to the United States.	75	2.32		2.32	
I eat more vegetables since I moved to the United States.	79	2.8		2.85	
I eat Less fruit since I moved to the United States.	76	3.11		3.11	
I eat less vegetables since I moved to the United States.	80	2.73**	$p < .10^{**}$	2.73	
Vegetables from my native island remain a vital part of my diet.	81	3.46		3.46	
Fruits from my native island remain a vital part of my diet.	87	3.41		3.41**	$p < .10^{**}$

*Difference significant at 95% level of significance
 **Difference significant at 90%-94% level of significance
 ***Each response was scored on a 1 – 5 scale: 1 = Strongly Disagree, 5 = Strongly Agree. Data presented represents the mean of the Caribbean immigrants' responses to each of the statements.

Table 6 represents respondents who admitted that some amounts of fruits (mean=3.39) and vegetables (mean=3.46) from their native countries still remained a part of their diet.

Furthermore, data showed a significant correlation between diet and BMI of respondents belonging to this group ($p < 0.05$) Additionally, results showed a correlation ($p < 0.10$) between length of residence in the United States and increased fruit intake, while length of residence and

BMI correlated to consumption of more frozen than fresh fruit. Table 6 summarizes the results of intake frequency based on years of residence and BMI.

Table 6: Frequency of Intake by Length of Residence and BMI (Chi-Square Tests) in the Study of Factors Associated with Fruit and Vegetable Consumption Among Caribbean Immigrants in the United States (n=85).					
Questions	n	Years of residence ***Mean	P-Value	BMI ***Mean	P-Value
I eat more frozen fruit than I do fresh fruit.	84	1.62**	p-<.10**	1.61**	p-<.10**
I eat more canned fruit than I do fresh fruit.	75	2.68		2.67	
I eat more frozen vegetables than I do fresh ones.	76	2.46		2.46	
I eat more canned vegetables than I do fresh ones.	76	2.01		2.01	
I eat more fruits since I moved to the United States.	75	3.34**	p-<.10**	2.3	
I eat more vegetables since I moved to the United States.	79	2.77		2.8	
I eat Less fruit since I moved to the United States.	76	3.31		3.14	
I eat less vegetables since I moved to the United States.	80	2.74		2.73	
Vegetables from my native island remains a vital part of my diet.	81	3.45		3.46	p-<.05*
Fruits from my native island remains a vital part of my diet.	87	3.42		3.39	p-<.05*
*Difference significant at 95% level of significance **Difference significant at 90%-94% level of significance ***Each response was scored on a 1 – 5 scale: 1 = Strongly Disagree, 5 = Strongly Agree. Data presented represents the mean of the Caribbean immigrants' responses to each of the statements.					

The results summarized in Table 7 present the servings of fruits and vegetables per day consumption by respondents based on their age. Seventy-nine percent (n=67) of respondents consumed four to six servings of fruit daily. Of this number, 53.7% were in the 30-49 age group, while 28.3% were in the younger 18-29 age group.

Similarly, 82% of respondents reported that they consumed 1-3 servings of vegetables per day, with 58% between the ages of 30-49 years old. Seventy-six percent of respondents who

were in the 18-29 age group consumed at least 1-3 servings of vegetables daily. However, a significantly lower number reported that they ate zero servings of vegetables ($p < 0.05$).

Respondents who were 18-29 years old drank four glasses of fruit juice daily, while an overwhelming 85% of all respondents reported that they consumed zero servings of vegetable juice on a daily basis.

None of the respondents who were 18-29 years old consumed a 100% traditional Caribbean diet ($p < 0.10$); a majority (44%) of respondents belonging to this age group reported that they consumed a 25% traditional Caribbean diet ($p < 0.05$). In the 30-49 age group a majority of respondents (38%) had a 75% traditional diet, and 28% and 22% had a 50% and 25% traditional Caribbean diet, respectively.

Table 7: Intake Variables ANOVA Results Based on the Age of Participants in the Study of Factors Associated with Fruit and Vegetable Consumption Among Caribbean Immigrants in the United States.

Intake Variable		Age			Total
Question	Serving/day	18-29 years old	30-49 years old	50 years and older	
On average, how many servings of fruit do you eat daily?	1-3 servings/day	4	4	0	8
	4-6 servings/day	19	36	12	67
	7-9 servings/day	2	5	2	9
	9 or more servings/day	0	1	0	1
Total		25	46	13	85
How many servings vegetable do you eat daily?	0 servings/day	4*	1	0	5
	1-3 servings/day	19	39	11	69
	4-6 servings/day	2	6	2	10
Total		25	46	13	84
On average, how many glasses of fruit juice do you consume per day?	0 servings/day	2	7	4	13
	1 serving/day	**6	21	6	33
	2 servings/day	7	10	3	20
	3 servings/day	4	3	0	7
	4 servings/day	*4	**1	1	6
	5 or more servings/day	2	3	0	5
Total		25	45	14	84
On average how many glasses of vegetable juice do you consume per day?	0 servings/day	21	39	12	72
	1 serving/day	2	6	2	10
	2 servings/day	2	1	0	3
Total		25	46	14	85
Which of the options below best represents your diet on a weekly basis?	100% Traditional Caribbean	**0	5	1	6
	75% Traditional Caribbean	9	17	4	30
	50% Traditional Caribbean	5	13	5	23
	25% Traditional Caribbean	*11	10	4	25
Total		25	45	14	84

*The indicator is significantly higher within this age group compared to other age groups; p< 95% significance level.

**The indicator is significantly lower within this age group compared to other age groups; p< 90% significance level.

The results shown in Table 8 indicate that 80% of respondents (n=67) ate 4-6 servings of fruit daily. However, 46.3% of these respondents (n=31) did not attend college and resided in the U.S. less than fifteen years. Further, 53.7 percent of the same group who consume 4-6 servings per day (n=36), went to college and resided in the United States for more than fifteen years. A significant number ($p<0.05$) of respondents with college degrees were consuming at least 7-9 servings of fruit daily. In addition, the results showed that respondents without a college degree were consuming at least five or more servings of fruit juice per day ($p< 0.05$).

Fifty-nine percent of those who have resided in the U.S. for more than fifteen years consumed 1-3 servings of vegetables per day compared to 41% of those who have resided in the U.S. less than fifteen years.

The results summarized in Table 8 show that 6% of respondents who have resided in the United States for more than fifteen years still consume a diet that is 100% traditional. However, 8.6% of Caribbean immigrants who have lived in the U.S. for less than fifteen years maintain a traditional Caribbean diet. Thirty-one percent of respondents who have lived in the United States more than fifteen years consume a diet that is 50% traditional Caribbean, while a lesser 23% of those who emigrated from the Caribbean less than fifteen years ago maintain a 50% traditional diet.

Table 8: Intake Variables ANOVA Results of Education and Years of Residence in Study of Factors Associated with Fruit and Vegetable Consumption Among Caribbean Immigrants in the United States.

Intake Variable		Highest level of Education		Total	Years of Residence		Total
Question	Serving/day	Primary or secondary	Higher		Less than 15 years	15+ years	
On average, how many servings of fruit do you eat daily?	1-3 servings/day	4	4	8	4	4	8
	4-6 servings/day	31	36	67	31	36	67
	7-9 servings/day	**1	*8	9	1	7	8
	9 or more servings/day	1	0	1	0	1	1
Total		37	48	85	36	48	84
How many servings vegetable do you eat daily?	0 servings/day	3	2	5	*4	**1	5
	1-3 servings/day	30	39	69	28	40	68
	4-6 servings/day	4	6	10	4	6	10
Total		37	47	84	36	47	83
On average, how many glasses of fruit juice do you consume per day?	0 servings/day	4	9	13	5	8	13
	1 serving/day	13	20	33	12	20	32
	2 servings/day	10	10	20	12	8	20
	3 servings/day	3	4	7	2	5	7
	4 servings/day	3	3	6	2	4	6
	5 or more servings/day	*4	**1	5	2	3	5
Total		37	47	84	35	48	83
On average how many glasses of vegetable juice do you consume per day?	0 servings/day	30	42	72	28	43	71
	1 serving/day	6	4	10	*7	**3	10
	2 servings/day	1	2	3	1	2	3
Total		37	48	85	36	48	84
Which of the options below best represents your diet on a weekly basis?	100% Traditional Caribbean	4	2	6	3	3	6
	75% Traditional Caribbean	14	16	30	14	16	30
	50% Traditional Caribbean	8	15	23	8	15	23
	25% Traditional Caribbean	11	14	25	10	14	24
Total		37	47	84	35	48	83

*The indicator is significantly higher within this age group compared to other age groups; p< 95% significance level.

**The indicator is significantly lower within this age group compared to other age groups; p< 90% significance level.

Knowledge of Fruit and Vegetable Recommendations

Table 9 assesses the relationship between knowledge and frequency of fruit and vegetable consumption. It summarizes the results of a comparison of two groups: Those who reported less than 15 years of residence in U.S. (n=35) and those who reported more than 15 years of residence in U.S. (n=48).

The majority of respondents (71.4%) who consumed 3 servings of fruit per day and have resided in the U.S. for less than fifteen years were significantly ($p<0.05$) more likely to be aware that they should consume at least three servings of fruit per day. Similarly, those who have lived in the U.S. more than fifteen years were significantly ($p<0.05$) more likely to be aware of the recommended five or more servings of fruit per day. However, the results did not reveal any significant correlation between vegetable consumption and awareness of the recommended amounts.

More importantly, there were 10.8% of the total (n=83) respondents who admitted to not knowing the recommended amount of daily vegetable servings, while 7.2% did not know the recommended servings for fruits. Fourteen percent of those who resided in the U.S. less than 15 years did not know the recommended daily servings for vegetables. Further, 8.3% of respondents with more than fifteen years of residency in the U.S. also reported not knowing the recommended daily servings of vegetables.

Those who have resided in the U.S. for more than 15 years tended to give the correct answer about daily recommendations for fruits and vegetables more often than those who have resided less than 15 years.

Table 9: Knowledge of Recommended Fruit and Vegetable Intake in Study of Factors Associated with Fruit and Vegetable Consumption Among Caribbean Immigrants in the United States (N=83).

Knowledge Questions/ Servings		Number of years living in the United States		
		less than 15 years	15+ years	Total
		n=35	n=48	n=83
What is the recommended number of servings of fruit that people should eat daily?	1 servings/day	5.7%	10.4%	8.4%
	3 servings/day	71.4%*	45.8%**	56.6%
	5+servings/day	14.3%**	37.5%*	27.7%
	Don't know	8.6%	6.3%	7.2%
What is the recommended number of servings of vegetables that people should eat daily?	1 servings/day	5.7%	8.3%	7.2%
	3 servings/day	54.3%	52.1%	53.0%
	5+ servings/day	25.7%	31.3%	28.9%
	Don't know	14.3%	8.3%	10.8%
The recommended servings per day are in bold letters.				
*Significantly higher compared to another group (at 95% level of significance); (p<0.05) level of significance				
**Significantly lower compared to another group (at 90% level of significance); (p< .10) level of significance				

Barriers

Table 10 provides a summary of the responses to possible barriers to consumption of fruits and vegetables by the study respondents. A majority (75.3%) of the total respondents (n=85) disagreed that it takes too long to prepare vegetables. While 42.7% of respondents did not believe that fruits and vegetables were too expensive, 43.9% agreed that they were indeed too expensive. The majority of respondents, 89.3%, agreed that fresh fruits and vegetables were readily available in their local grocery stores, and 48.8% thought they ate enough fruit most days.

Taste did not appear to be a major barrier because 68% of respondents admitted that they liked the taste of most vegetables. The majority of respondents (n=63) had a Caribbean grocery store in the area where they reside. However, 16 respondents did not have a Caribbean grocery store in their area of residence and six did not know if they had one. These results indicated that most respondents had access to traditional fruits and vegetables.

Table 10: Perceived Barriers to Fruit and Vegetable Consumption in Study of Factors Associated with Fruit and Vegetable Consumption Among Caribbean Immigrants in the United States.

Perceived Barriers to Consumption	It takes too long to prepare vegetables.		Fruits & vegetables are too expensive.		Fresh fruits and vegetables are readily available in my local grocery stores.		I think that I eat enough fruit most days.		I like the taste of most vegetables.	
	Mean (2.05)		Mean (3.01)		Mean (4.21)		Mean (3.19)		Mean (3.67)	
	Count	%	Count	%	Count	%	Count	%	Count	%
Disagree (total)	64	75.3	35	42.7	7	8.3	35	41.7	21	25.0
Neither agree nor disagree	11	12.9	11	13.4	2	2.4	8	9.5	6	7.1
Agree (total)	10	11.8	36	43.9	75	89.3	41	48.8	57	67.9
Total	85	100.0	82	100.0	84	100.0	84	100.0	84	100.0

The results of Table 11 revealed that 58% of the respondents who consumed 4-6 servings of fruit daily tended to be overweight or obese, while only 43% of those who reported 1-3 servings of vegetables were within normal BMI range of 18.5-24.9. Respondents who consumed one serving of fruit juice per day were significantly ($p < 0.05$) more likely to be overweight or obese (BMI of 25+) than those who drank more or less fruit juice daily. Interestingly, the majority of respondents from all BMI ranges reported consuming only 1-3 servings of vegetables daily. Furthermore, almost 70% of all respondents reported inadequate vegetable consumption.

Fifty seven percent of respondents who consumed a 75% traditional Caribbean diet were significantly ($p < 0.05$) more likely to be within the normal BMI range. However, the results indicated that the respondents who reported a diet that was 50% traditional Caribbean or less were significantly ($p < 0.05$) more likely to be overweight or obese. This indicates that their diets have changed since immigrating to the U.S.

Table 11: BMI Range and Intake of Respondents in a Study of Factors Associated with Fruit and Vegetable Consumption Among Caribbean Immigrants in the United States.

Intake Variable		BMI Range			Total
Question	Serving/day	Up to normal weight	Over weight	Obesity	
One average, how many servings of fruit do you eat daily?	1-3 servings/day	4	2	2	8
	4-6 servings/day	27	25	13	65
	7-9 servings/day	3	3	3	9
	9 or more servings/day	1	0	0	1
Total		35	30	18	83
How many servings vegetable do you eat daily?	0 servings/day	2	2	1	5
	1-3 servings/day	29	23	15	67
	4-6 servings/day	4	4	2	10
Total		35	29	18	82
On average, how many glasses of fruit juice do you consume per day?	0 servings/day	7	2	4	13
	1 serving/day	**8	*16	*8	32
	2 servings/day	9	7	3	19
	3 servings/day	4	2	1	7
	4 servings/day	4	1	1	6
	5 or more servings/day	3	2	0	5
Total		35	30	17	82
On average how many glasses of vegetable juice do you consume per day?	0 servings/day	30	26	15	71
	1 serving/day	4	3	2	9
	2 servings/day	1	1	1	3
Total		35	30	18	83
Which of the options below best represents your diet on a weekly basis?	100% Traditional Caribbean	3	3	0	6
	75% Traditional Caribbean	*16	**7	**5	28
	50% Traditional Caribbean	**6	*10	*7	23
	25% Traditional Caribbean	10	10	5	25
Total		35	30	17	82
*The indicator is significantly higher within this BMI range compared to other BMI range; p< 95% or more significance level.					
**The indicator is significantly lower within this BMI range compared to other BMI range; p> 95% significance level.					

Chapter 5: Discussion

Impact on Body Mass Index (BMI)

The impact of fruit and vegetable consumption on BMI has been well documented to show that the less fruits and vegetables in a person's diet, the more likely they are to be overweight or obese (20, 28, 30). This study found that diet and years of residence of Caribbean immigrants in the United States were indeed correlated to their BMI. Park and colleagues (41) conducted a study in New York City and found evidence to suggest that acculturation is associated with weight gain; however, neighborhood characteristics such as the proportion of foreign-born residents and proportion of linguistically isolated residents living in an individual's home neighborhood were the only variables associated with BMI among Hispanics.

These study results found that acculturation does increase BMI. Data from this study suggest that when Caribbean immigrants consumed at least a 75% traditional diet, they tended to have a normal BMI. However, when diet was only 50% traditional or less, they tended to become overweight and obese (Table 11). Participants who incorporated traditional Caribbean fruits and vegetables in their diet showed significantly ($p < 0.05$) normal BMIs (Table 6). This would most likely be more prevalent in areas where immigrants have access to Caribbean food products. In addition, results show that Caribbean immigrants who lived in the U.S. for more than 15 years tended to eat a less traditional diet (Table 8). These findings are supported by previous studies on acculturation (41, 42, 43).

Bennett and colleagues (42) found similar results in a study of 551 black adult men and women, which suggested that foreign-born blacks, which describes most Caribbean immigrants (12, 14), had a lower obesity risk than all U.S.-born participants. Most immigrants strive to maintain as much of their culture as possible (13, 14), and eating traditional foods is one way of

doing so, as found in this study. This study suggests that there is a causal relationship between increased years of residence and consumption of a more traditional Caribbean diet. Results were that Caribbean immigrants who lived in the U.S. more than fifteen years tended to eat a less traditional diet (Table 8) than those who have lived in the U.S. less than 15 years. It appeared that the majority of respondents who still consume a traditional Caribbean based diet would most likely be consuming a Jamaican diet because 66% of the respondents were of Jamaican origin (Table 3).

One of the implications of this study is that years of residence tended to reduce consumption of a traditional diet by Caribbean immigrants, and as they get acculturated in the American way of life there is an increased likelihood of higher BMIs.

Fruit and vegetable intake since emigrating from the Caribbean

Many of the respondents (n=80) admitted that they consumed fewer vegetables since immigrating to the U.S. ($p<0.10$) (Tables 5 and 6). Consumption of canned vegetables was significantly correlated to the age of the respondents ($p<0.05$) (Table 5). Those who were older were more likely to eat more canned vegetables than respondents who were younger. The age groups that were used in the present study were 18-29 years, 30-49 years, and over 50 years. While most of the study participants (78.8%) admitted to eating 4-6 servings of fruit per day, those who were 30-49 years of age were most likely to do so. They were also more likely to eat 1-3 servings of vegetables than members of the other age groups.

Level of education was significantly correlated to increased consumption of frozen vegetables ($p<0.05$). These findings suggest that Caribbean immigrants eat more canned and frozen vegetables since immigrating to the U.S., and respondents with a higher level of education were more likely to eat frozen than canned forms.

In trying to answer the question of whether there has been increased intake since moving to the U.S., the results not only indicated increased fruit intake, it also showed significant correlation ($p < 0.05$) between increased consumption of frozen fruits and the years of residence in the U.S. (Table 6). Table 8 represents the amount of servings of fruits and vegetables typically consumed by Caribbean immigrants on a daily basis. An overwhelming 85% of respondents did not consume any vegetable juice, regardless of their age, education, or years of residence. The results indicate that some respondents may be differentiating between fresh fruits and vegetables and those that are canned or frozen.

Correlation of length of residence to changes in intake

In a study to examine associations of diet with acculturation among Hispanic immigrants from Mexico to Washington State, Neuhausser and colleagues (43) found that dietary habits changed as Hispanics acculturated to the U.S. Highly acculturated Hispanics ate fewer servings of fruits and vegetables per day than with those not highly acculturated ($p < 0.05$). There is some similarity with their findings and the results of the present study, which indicates that some immigrants eat fewer vegetables the longer they reside in the U.S. (Table 8). However, the Japanese American study that investigated second and third generation immigrants (21) presents an opportunity for a similar future study in the Caribbean community.

Results of this study indicated that there is a relationship between years of residence and fruit and vegetable consumption. Respondents with less than 15 years of residence appeared to eat fewer vegetables than those who resided in the United States for more than 15 years. However, the results presented in Table 8 indicate that those who resided more than fifteen years ate more frozen and canned fruits and vegetables compared to those with fewer years of residence in the U.S. It appears that length of residence correlates to a significant reduction in

vegetable intake overall but show an increase in frozen and canned vegetables consumption. There was not a significant correlation between length of residence and changes in fruit consumption.

Awareness of recommended fruits and vegetables servings

There has been limited research published in the area of Caribbean immigrants and food consumption. Some studies have shown that there are indeed differences in dietary practices not only as a group but differences by country of origin (10, 31, 32). There appears to be a need to increase awareness in the Caribbean community regarding the recommended servings per day for fruits and vegetables set forth by the USDA Dietary Guidelines for Americans (22).

The results presented in Table 10 reveal that when asked about their knowledge of daily recommended amounts, 56.6% of respondents believed that three servings per day was the recommendation for fruit intake, while 53% believed that three servings per day was the correct recommendation for vegetable intake. Interestingly, 7.2% did not know the recommendations for fruit and 10.8% did not know the recommendations for vegetables.

In addition, 8.4% believed that the recommendation for fruit was one serving per day, while 7.2% believed the same for vegetables (Table 9). These results are similar to those that have been previously reported from studies of different populations (3, 4, 26). While the results show that a majority of respondents were consuming some fruits and vegetables on a daily basis, they are underestimating the recommended amounts of five or more servings per day set forth by the Dietary Guidelines for Americans (3, 4, 22).

Barriers to fruit and vegetable consumption

The results of this study reveal that there is no barrier for access to fresh fruits and vegetables, including some from the participant's native country. A majority of respondents in

this study admitted to having access to fresh fruits and vegetables as well as Caribbean stores in their neighborhood (Table 10). Unlike some programs that promote initial consumption for getting people to start eating fruits and vegetables (44, 45), there is a need for educational programs regarding the recommended amounts per day for maximum health benefits. The goal is to not just increase intake but to increase it to the recommended amounts.

When asked whether fruits and vegetables were too expensive, 42.9% of respondents agreed they were too expensive while 42.7% did not agree. Imported ethnic fruits and vegetables are oftentimes more expensive due to market factors such as fluctuations in currency, high cost of oil, plus import fees that are added (46). For respondents who desire a more traditional Caribbean diet, it could be cost prohibitive.

While 48.9% of respondents believed that they ate enough fruits each day, 41% did not agree that they consumed enough fruits everyday. This could be partly due to the lack of knowledge of the daily recommended amounts, and it is entirely possible that if immigrants are educated about the amounts that they should consume, there will be a noticeable increase in consumption.

Pomerleau and colleagues (44) found that designing an effective intervention such as tailoring dietary messages to ethnic identity as well as using computer-tailored nutrition education may improve intervention and can be effective to increase fruit and vegetable consumption. In this case, the intervention would be nutrition education regarding the amount of fruits and vegetables that must be eaten daily to achieve maximum benefit including consumption of vegetable juice.

Respondents were asked about time of preparation, which did not appear to be a barrier because 75% of respondents did not believe that it took too long to prepare vegetables. Taste did

not appear to be a barrier to consumption because only 25% of respondents responded that they did not like the taste of vegetables.

Given the fact that the majority of respondents (n=75) had access to fresh fruits and vegetables in their local grocery stores, it did not appear that access was a barrier to consumption. There will be increased access to ethnic fruits and vegetables according to a study published by the Agricultural Marketing Resource Center (47). They predicted that sales of U.S. ethnic foods, including fresh produce, are estimated to reach \$2.71 billion in 2015. This should lead to positive gains in fruit and vegetable access and consumption in the near future.

Chapter 6: Conclusion

Previous research of fruit and vegetable consumption by Caribbean immigrants was very limited and found to have been conducted in Britain (34) rather than the U.S., or they focused on Hispanic people from the Caribbean (31). This study gathered and analyzed data related to fruit and vegetable consumption by Caribbean immigrants residing in the U.S. regardless of their racial or cultural background. Caribbean immigrants who maintained a 75% to 100% Caribbean diet tended to have a lower BMI than those who adopted a less traditional Caribbean diet.

Duration of stay contributed to increased consumption of fruits and vegetables especially in people 30-49 years old. However, there appeared to be more fruit consumption overall than vegetables consumption and an increased amount of both in frozen and canned forms. This is likely due to necessary diet changes by Caribbean immigrants due to decreased availability of fresh fruits and vegetables throughout the year. It appears that Caribbean immigrants substitute frozen and canned fruits and vegetables for fresh ones, which is a major departure from their native diet because frozen and canned fruits and vegetables are not popular in the Caribbean due to availability of fresh fruits and vegetables all year round.

There were distinct differences between fruits and vegetables in the study participants' barriers, knowledge, and consumption of those foods. The results suggest that for Caribbean immigrants, increased knowledge of the recommended servings of fruits and vegetables leads to increased intake. Vegetable juices such as carrot juice and beet juice are a popular dietary choice in the Caribbean. Educating Caribbean immigrants on the benefits of adding vegetable juice could significantly increase their vegetable intake.

As the Caribbean immigrant population continues to grow, it will be necessary to tailor nutrition and disease prevention information to provide education about recommended amounts

of fruits and vegetables to be consumed each day, the benefits of consuming a balanced diet and the risks associated with inadequate intake.

Limitations of the Study

There were several limitations to this study. It is possible that errors inherent in self-reported fruit and vegetable consumption habits and weight may have resulted in bias due to under-reporting or over-reporting of actual consumption and actual weight. The question that required self-reported weight had the lowest response rate. It is entirely possible that some respondents did not know how much they currently weigh or did not want to share weight. The data were derived from a cross-sectional survey, and it is possible that those who were interested in living healthy were the ones who were more likely to respond, which could result in a bias. Also, the survey design was flawed because demographic and anthropometric questions should be placed at the end of surveys after the respondents have answered other questions.

Short questions were used to obtain information on fruit and vegetable consumption as opposed to a more detailed tool such as a food frequency questionnaire or requiring a 24-hour dietary recall. It has been documented that short questions do not usually provide an accurate estimate of total intake, and any interpretation of data must take this into account (35, 48).

Furthermore, web-based surveys are limited to computer users, and it is likely that immigrants who are not computer literate were not able to participate in the study. The study could have benefited from making the survey available for more than 15 days in order to give more people a chance to participate which would have increased the sample size of the study. Additionally, the relatively small sample size may have limited the statistical significance of study results.

Future Studies

Future studies should examine the fruit and vegetable consumption of the second generation Caribbean immigrants. It would be worthwhile to explore geographical areas that have a predominant Caribbean immigrant population to determine if increased access to foods from their home country increases their fruit and vegetable intake. Studying the food purchases of Caribbean households would provide important information regarding dietary practices of Caribbean immigrants.

Studies should be done in cities and states with smaller Caribbean populations and compared to areas with larger populations. Using focus groups, face-to-face interviews, and more detailed questionnaires with open-ended questions could provide more significant information regarding the dietary and health practices of Caribbean immigrants.

It may be worthwhile to study trends in obesity among Caribbean immigrants to determine if acculturation factors in the U.S. such as the increased availability of calorically dense foods, increased sedentary behavior, and poor dietary patterns are contributing factors to changes in BMI. These proposed studies could be important for understanding the contribution of Caribbean immigrants' health and risk factors for disease while providing information to develop strategic nutrition and physical activity intervention programs for improving health.

Definition of Terms

Assimilation: The process of social and cultural adaptation and absorption of a minority group into the dominant culture. Forms of assimilation include acculturation, identification, civic, and marital.

BMI: Body Mass Index (kg/m^2) or $((\text{lbs}/\text{inches}^2) \times 703)$

Caribbean: The Caribbean has many islands located in the Caribbean Sea. Cuba, Jamaica, Haiti, Dominican Republic, Puerto Rico and the Bahamas are a few of the islands found in the Caribbean.

Caribbean born: A person who was born in the any country that is located in the Caribbean.

Ethnic group: A group of people who share cultural, racial, linguistic, and social heritage

Foreign Born: The foreign born are those who were not U.S. citizens at birth.

Hispanic: Persons of Mexican, Puerto Rican, Cuban, Central or South American, Caribbean or other Spanish culture or origin, regardless of race.

Immigrant: A person who leaves one country to settle permanently in another.

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APPENDICES

APPENDIX A. PERMISSION LETTER FROM CARIB LIFE CENTRAL



Date 7/19/10

Eastern Michigan University
CHHS Human Subjects Review Committee
306 Marshall Building
Ypsilanti, MI 48197

Dear Committee Members:

Claudia Martin-Ayoade has permission to conduct the research project entitled Fruit and Vegetable Intake of Caribbean Immigrants in the United States at Carib Life Central's Website. I have reviewed the project and am aware that the activity involved with project comprises of a survey administered by Survey Monkey that is to be sent to our Caribbean born members to determine their fruit and vegetable consumption history. Claudia will provide the link to the survey and I will send that link to the survey to members of Carib Life Central.

Signed,

A handwritten signature in black ink that reads "Jason Walker".

Jason Walker
WRFG Radio 89.3FM
Administrator - Carib Life Central
www.cariblifecentral.com
Phone: 678-768-3779

APPENDIX B: INFORMED CONSENT

1. Informed Consent

Informed Consent Form

Title of Study:

Fruit and Vegetable Intake of Caribbean Immigrants in the United States

Study Investigators:

Principal investigator: Claudia Martin-Ayoade, Masters of Nutrition Student. Eastern Michigan University, Ypsilanti, MI
Committee Chair and Faculty Advisor: Rubina S. Haque PhD, RD. Eastern Michigan University, Ypsilanti, MI

Purpose of the Study:

The purpose of this research is to study Fruit and vegetable intake of Caribbean immigrants residing in the United States and what changes in consumption, if any, occurs after immigrating to the United States. You are invited to participate in this research project because you have migrated to the United States from the Caribbean. This study will help to determine if the Caribbean born population consume the recommended servings of fruit and vegetable and how to develop future programs to increase consumption if necessary.

Procedure:

Participation in this study will involve completion of a 26 question multiple choice and rating scale question survey of demographic information, fruit and vegetable consumption, knowledge of benefits as well as barriers to fruit and vegetable consumption since you immigrated to the United States. The survey will be administered with SurveyMonkey™ software. This survey will be accessible via the internet using the web link provided. The approximate total time to complete the questionnaire should be about 10 minutes or less.

Confidentiality:

Responses to the survey questions will remain anonymous. Only a unique computer-generated code number will identify your questionnaire responses. At no time will your name or your email address be associated with your responses to the questionnaire. The results of this survey will only be used in aggregate form and individual responses will not be reported. The researcher will not know who you are.

Expected Risks: Participation in the survey does not place you as the participant at any foreseeable immediate nor future physical, psychological, or emotional risk.

Expected Benefits: Participation in the survey will assist healthcare professionals, government agencies and educators to understand the Caribbean community's fruit and vegetable consumption and be better able to design appropriate education materials for nutrition and disease prevention programs.

Voluntary Participation: Participation in this study is voluntary and uncompensated, monetarily or otherwise. You may choose not to participate. If you do decide to participate, you may change your mind at any time and withdraw from the study without negative consequences.

Use of Research Results: Results will be presented in aggregate form only. No names or individually identifying information will be revealed. Results may be presented at research meetings and conferences, and in scientific publications.

Future Questions: If you have any questions concerning your participation in this study now or in the future or if you would like a copy of the study results, you may contact: Dr. Rubina S. Haque, RD at (734) 487-8538 or via email at rhaque@emich.edu.

This research protocol and informed consent document has been reviewed and approved by the Eastern Michigan University College of Health and Human Services Human Subjects Review Committee for use from _____ to _____. If you have questions about the approval process, please contact Dr. George Liepa, Chair of CHHS HSRC, at (734)487-0077 or via email at chhs_human_subjects@emich.edu.

Please proceed to participate in the survey if you are over the age of 18 years and was born in the Caribbean.

APPENDIX C: QUESTIONNAIRE

2. Consent Page

*** 1. Consent to Participate:**

I have read all of the information about this research study, including the research procedures and possible risks and benefits to me, as provided in the notification email. The content and meaning of this information has been explained, and I understand. All my questions, at this time, have been answered. By clicking on the "agree" button below, entering the survey and answering the questions, I hereby consent and do voluntarily offer to follow the study requirements and take part in the study. I can withdraw from the survey at any time. I can click on the "disagree" button below to decline participation in this study.

Agree

Disagree

3. Demographics

Please answer each of the following multiple choice questions as accurately as possible by selecting the answer that best represents you.

2. What is your Caribbean Country of birth?

- The Bahamas
- Barbados
- Cayman Island
- Cuba
- Dominica
- Dominican Republic
- Grenada
- Guyana
- Haiti
- Jamaica
- Puerto Rico
- St. Kitts and Nevis
- St. Lucia
- Trinidad and Tobago
- Other

3. Number of years living in the United States.

- 0-5 years
- 6-10 years
- 11-15 years
- 16-20 years
- 21-25 years
- 26 years and above

4. What is your age?

- 18-29 years old
- 30-49 years old
- 50-64 years old
- 65 years and older

5. What is your marital status?

- Married
- Divorced
- Separated
- Widowed
- Single/Never married
- A member of an unmarried couple

6. What is your annual household income?

- 0-\$15,000
- \$15,001-\$30,000
- \$30,001-\$45,000
- \$45,001-\$70,000
- \$70,001-\$100,000
- \$100,001 and over

7. Highest level of education?

- Some high school
- Completed high school
- Technical/Vocational school
- Some college
- College graduate
- Post graduate work

8. Which state do you reside?

State:

9. How tall are you?

Feet
Inches

10. Gender

- Male
- Female

11. How much do you weigh?

4. Fruit and Vegetable Consumption History

Based on your present knowledge, please select the best answer to each of the following multiple choice questions.

12. One average, how many servings of fruit do you eat daily? (a serving is usually 1 cup fresh fruit or half a cup of dried fruit or 1 medium apple)

- 0 servings/day
- 1-3 servings/day
- 4-6 servings/day
- 7-8 servings/day
- 9 or more servings/day

13. How many servings vegetable do you eat daily? (A serving is 1 cup cooked or raw vegetables or 2 cups leafy greens.)

- 0 serving/day
- 1-3 serving/day
- 4-6 servings/day
- 7-8 servings/day
- 9 or more servings/day

14. On average, how many glasses of fruit juice do you consume per day?

- 0 servings/day
- 1 serving/day
- 2 servings/day
- 3 servings/day
- 4 servings/day
- 5 or more servings/day

15. On average how many glasses of vegetable juice do you consume per day?

- 0 servings/day
- 1 serving/day
- 2 servings/day
- 3 servings/day
- 4 servings/day
- 5 or more servings/day

16. Which of the options below best represents your diet on a weekly basis?

- 100% Traditional Caribbean
- 75% Traditional Caribbean
- 50% Traditional Caribbean
- 25% Traditional Caribbean

17. For each of the statement below, please indicate the extent of your agreement or disagreement.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I eat more frozen fruit than I do fresh fruit.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I eat more canned fruit than I do fresh fruit.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I eat more frozen vegetables than I do fresh ones.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I eat more canned vegetables than I do fresh ones.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I eat more fruits since I moved to the United States.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I eat more vegetables since I moved to the United States.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I eat Less fruit since I moved to the United States.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I eat less vegetables since I moved to the United States.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vegetables from my native island remains a vital part of my diet.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fruits from my native island remains a vital part of my diet.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

5. Knowledge and Barriers

Based on your present knowledge, please select the best answer to each of the following multiple choice questions.

18. What is the recommended number of servings of fruit that people should eat daily?

- 1 serving/day
- 3 servings/day
- 5 servings/day
- Don't know

19. What is the recommended number of servings of vegetables that people should eat daily?

- 1 serving/day
- 3 servings/day
- 5 servings/day
- Don't know

20. How often do you typically eat dinner at a restaurant? (Please include sit down, take out and fast food restaurants).

- 1 time per week
- 2-3 times per week
- 4-5 times per week
- 6 or more times per week
- I always eat at home

21. How many times per week do you eat a home cooked meal?

- 1 time per week
- 2-3 times per week
- 4-5 times per week
- 6 or more times per week
- I never eat home cooked meals

22. How many times per week do you eat a home cooked Caribbean meal?

- 1 time per week
- 2-3 times per week
- 4-5 times per week
- 6 or more times per week
- I do not eat any home cooked Caribbean meals.

23. Who is responsible for the grocery shopping in your household?

- Myself
- Spouse
- Family member/ friend
- Other

24. Are there any Caribbean grocery stores available in your area?

- Yes
- No
- Don't know of any

25. The statements below relates to your knowledge of the benefits of eating fruits and vegetables. Please indicate the extent of your agreement or disagreement.

	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
Fruit and vegetables are a good source of fiber.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Not eating enough fruits and vegetables can increase the risk for heart disease, cancer and diabetes.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fruits and vegetables are a great source of energy.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

26. The statements below relates to barriers that may prevent adequate intake of fruits and vegetables. Please indicate the extent of your agreement or disagreement.

	Strongly agree	Agree	Neither agree nor disagree	disagree	Strongly disagree
It takes too long to prepare vegetables.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fruits & vegetables are too expensive.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fresh fruit and vegetable are readily available in my local grocery stores.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think that I eat enough fruit most days.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I like the taste of most vegetables.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

7. Thank you for participating in this study. Your contribution is greatly app...

APPENDIX D: PERMISSION LETTER FROM CHHS- HSRC

October 18, 2010

Claudia Martin-Ayoade
c/o Rubina Haque
Eastern Michigan University
School of Health Sciences
Ypsilanti, Michigan 48197

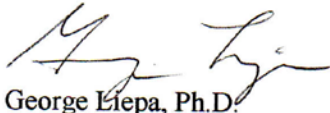
Dear Claudia Martin-Ayoade,

The CHHS Human Subjects Review Committee has reviewed the revisions to your proposal entitled: "Fruit and Vegetable Intake of Caribbean Immigrants in the United States" (CHHS 11-001).

The committee reviewed your proposal and its revisions and concluded that the risk to participants is minimal. Your study is approved by the committee.

Good luck in your research endeavors.

Sincerely,



George Elepa, Ph.D.
Chair, CHHS Human Subjects Review Committee

