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Examining Rural and Urban Differences in Fruit and Vegetable Intake Among Obese and Overweight Adults in Georgia (BRFSS 2015)

Kadija Hamki

ABSTRACT

EXAMINING RURAL AND URBAN DIFFERENCES IN FRUIT AND VEGETABLE INTAKE AMONG OBESE AND OVERWEIGHT ADULTS IN GEORGIA (BRFSS 2015)

By

KADIJA HAMKI

11/30/2018

INTRODUCTION: The prevalence of obesity and overweight is continuously on the rise in the United States. According to Organization for Economic Co-operation and Development projections, obesity levels are expected to rise to 47% in 2030. Being obese or overweight increases the risk of chronic diseases, cancer, and type 2 diabetes. Fruit and vegetable intake are known to be beneficial in reducing risks for cardiovascular disease and cancer. There is extensive research showing a health disparity between urban and rural areas, where BMI levels are much higher in rural areas compared to urban. However, little is known regarding fruit and vegetable intake in rural and urban resident obese individuals. Hence, this study is designed to examine the fruit and vegetable intake differences among the obese and overweight populations in rural and urban Georgia.

METHODS: Data were taken from the Behavioral Risk Factor Surveillance System 2015 dataset, for Georgia. A total of 1,233 eligible rural (29.7%) and urban (70.3%) obese/overweight participants responses were recorded and analyzed. Univariate and multivariate techniques were used to analyze specific variables that could potentially contribute to low fruit and vegetable intake.

RESULTS: *Fruit intake:* The multivariate analysis showed that lower education level and medical cost issues were statistically significant variables that are associated with low fruit intake in rural areas. Sex, physical activity in past month, and smoking status were the statistically significant variables that are associated with low fruit intake in urban areas. *Vegetable intake:* The multivariate regression analysis of vegetable intake showed that, low vegetable consumption was significantly associated with an income of less than $15,000, and medical cost in rural areas. For urban areas, education, smoking status, and heavy drinker status were significantly associated with low vegetable intake.

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Author's Statement Page

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INTRODUCTION

Obesity is a very important public health issue not only in the United States but also worldwide. As the prevalence of obesity increases, so do the rates of chronic diseases, cancer, and other health complications such as stroke and hypertension. According to OECD projections, obesity levels are expected to be high in the United States, where approximately 47% of the population are projected to be obese in 2030 (OECD, 2017). The Behavioral Risk Factor Surveillance System (BRFSS) dataset of 2017 showed that adult obesity rates are now exceeding 35% in seven states and 30% in 29 states (“Adult Obesity in the United States, n.d.”). The highest rate of obesity is found in West Virginia (38.1%) and the lowest in Colorado (22.6%). Worldwide, obesity has nearly tripled between 1976 and 2016 (“Obesity and Overweight”, n.d.).

There are many environmental, behavioral, biological, and social factors that contribute to becoming obese or overweight. Some behavioral factors can include fruit and vegetable intake, physical activity, and smoking habits. For the purpose of this study, the focus will be on fruit and vegetable intake among obese and overweight individuals. Lack of fruit and vegetable intake is major contributing factor of obesity. Lack of proper fruit and vegetable consumption is also known to lead to negative health consequences and an increased risk of chronic diseases (“Vegetables and Fruit”, 2018). Around 5.2 million deaths worldwide were identified as being related to inadequate fruit and vegetable intake (“Increasing fruit and vegetable”, 2018). Fruits and vegetables are a good source of vitamins, minerals, dietary fiber, and other non-nutrient substances that may counteract the effects of carcinogens and other harmful substances (“Increasing fruit and vegetable”, 2018). Hence it is crucial to examine fruit and vegetable intake in the obese and overweight population in order to determine how far behind this population is on their daily dietary intakes and also to improve and develop strategies to help incorporate more fruit and vegetables in their diets.

There are notable differences of food environments between rural and urban residential areas that shape an individual's lifestyle. A study using the National Health and Nutrition Examination Survey from 2005 to 2008 found that obesity is significantly higher in rural versus urban (Befort, Nazir, & Perri, 2012). As a consequences of this high obesity prevalence, there is a higher rate of chronic disease in rural areas compared to urban areas ("Chronic Disease in Rural America", 2017). Research has shown that rural areas tend to be more limited in terms of healthy food availability and transportation access. Healthy food affordability is another factor that influences obesity; healthier foods tend to be more expensive, a barrier to their purchase (Treuhaft & Karpyn, 2010).

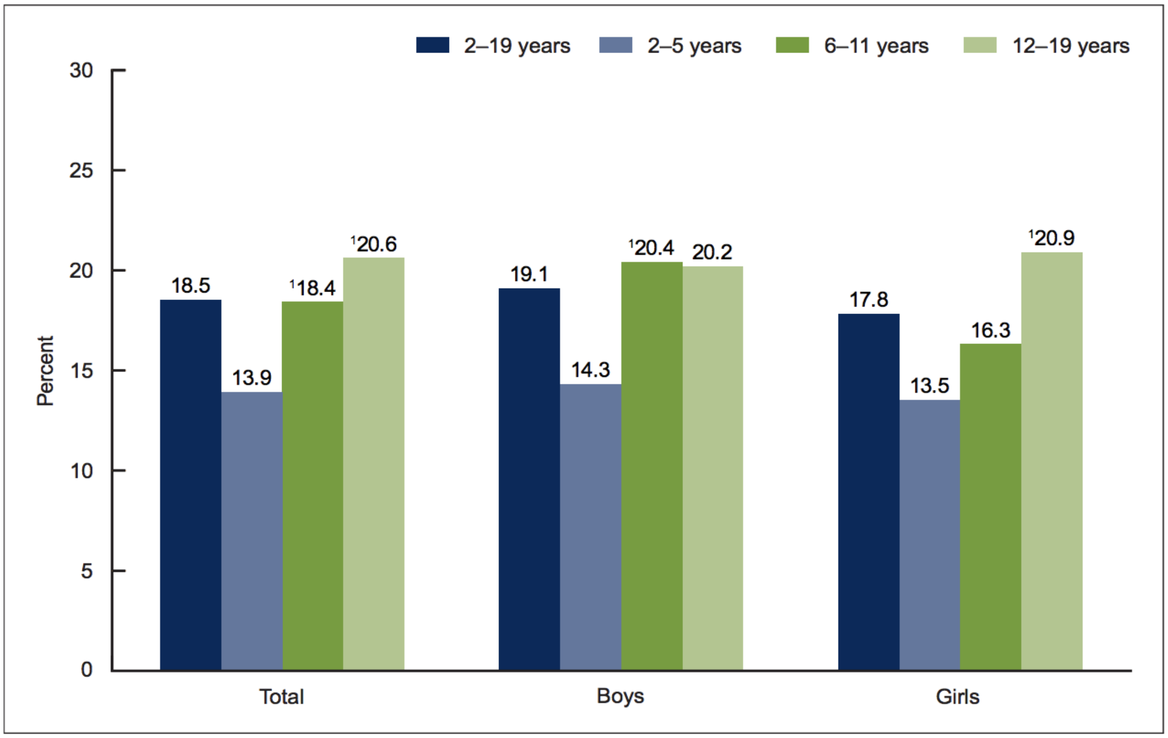
To date, there has been very limited research that has compared fruit and vegetable intake among the obese and overweight population in rural and urban areas. Majority of research has focused on urban and rural differences in terms of fruit and vegetable intake among the overall population and also on the differences of obesity prevalence.

REVIEW OF LITERATURE

Obesity Rates

Obesity rates in the United States have increased in all race, gender, and age groups (“National Obesity Rates & Trends”). Obesity is measured by body mass index (BMI, weight(kg)/height(m^2). A BMI between 25.0 kg/m^2 and 30 kg/m^2 is classified as overweight, and a BMI of 30 kg/m2 or higher is classified as obese. The classification of BMI is different for children from what it is for adults owning to their continuous biological development. Furthermore, child BMI measures also differ between girls and boys, owing to their sexual development and maturation (Hruby & Hu, 2015). The prevalence of childhood obesity in the U.S. is illustrated in Figure 1 using the 2015-2016 NHANES. As shown, the prevalence of obesity increases by age from 13.9% in children between 2-5 years of age, 18.4% in children ages 6-11, and 20.6% in children ages 12 to 19 years old (“Childhood Obesity Trends”, n.d.). Boys were shown to have a higher likelihood of being obese than girls, with their prevalence at 19.1% whereas girls are at 17.8%. The obesity prevalence of boys has been increasing at a faster rate when compared to that of girls; their obesity rate went up by 11% between 2013-2016 while girls only experienced a 4% increase. The consequences of obesity in children includes harm to their brain, heart, lungs, kidneys, muscles, and bones (Ebbeling, Pawlak, & Ludwig, 2002). Early exposure to obesity is associated with obesity in adulthood and increase likelihood of experiencing health complications and an unpleasant lifestyle (Hruby & Hue, 2015).

Figure 1. Prevalence of obesity among youth aged 2-19 years, by sex and age: United States, 2015-2016

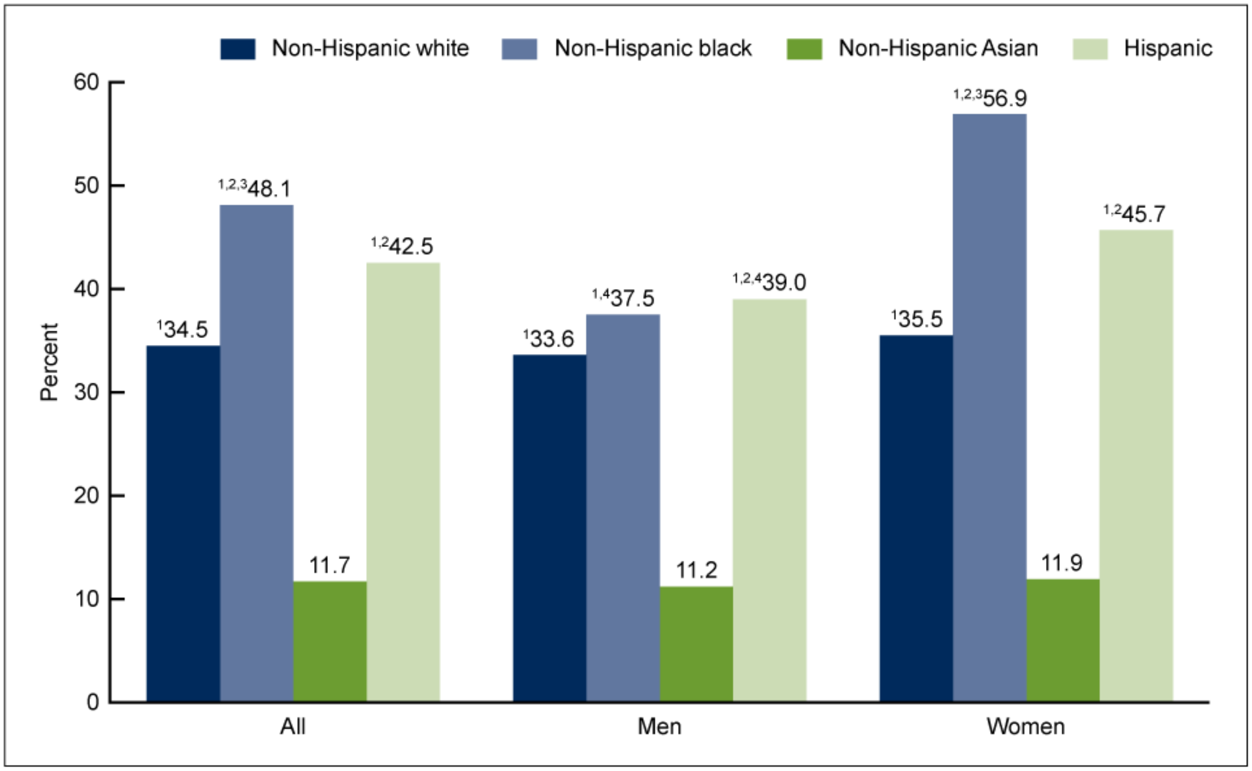


[1]Significantly different from those aged 2–5 years.
NOTE: Access data table for Figure 3 at: https://www.cdc.gov/nchs/data/databriefs/db288_table.pdf#3.
SOURCE: NCHS, National Health and Nutrition Examination Survey, 2015–2016.

A study assessing low self-esteem in a group of overweight children found conclusive evidence for the claims of poor mental health (National Center for Health Statistics, 2017). In the study (National Center for Health Statistics, 2017) 545 overweight participants were ages 10 to 13 . The parents completed questionnaires that measured the self-esteem, eating habits, and bullying of their child. Children's mental health status were assessed using the Self-Perception Profile for Children (SPPC) scale and the Eating Disturbance Scale (EDS-5). The subscales of SPPC included "Scholastic Competence," "Social Acceptance," "Athletic Competence," and "Physical Appearance." Example questions from of the EDS-5 are: 'Are you satisfied with your eating habits?', 'Have you felt guilty about eating?' and 'Have you felt that you are too fat?'. Results from the completed analysis showed statistically significant differences between the normal weight group and overweight/obese group in terms of self-esteem and disturbed eating (Danielsen et al., 2012). Obese and overweight children displayed more problematic scores on SPPC and EDS-5. When breaking down SPPC into the subscales, low scores in Scholastic Competence, Social Acceptance, and Athletic Competence were associated with being bullied and high scores on the EDS-5 (high EDS-5 score signifies disordered eating patterns). Low scores on Physical Appearance were significantly associated with females, high EDS-5 score, being bullied, and higher BMI (Danielsen et al., 2012).

As previously mentioned, obesity rates have shown an increase overtime regardless of gender, race, and age group. To assess the association between obesity, race/ethnicity, and socioeconomic status, investigators used data from the National Survey of American Life. The sample included 3,570 African Americans, 1,621 Caribbean Blacks, and 891 non-Hispanic Whites that were recruited between February 2001 and June 2003. Results of Univariate analysis showed that African Americans are more likely to be obese than Caribbean Blacks and non-Hispanic Whites (Lincoln, Abdou & Lloyd, 2014). The age group with the highest likelihood of being obese is 35-64 years of age. People with lower incomes are more likely to be either normal weight or obese compared to those with higher incomes. The National Health Interview Survey, 2011-2014, showed similar trends in obesity. As shown in Figure 2, non-Hispanic blacks are shown to exceed non-Hispanic whites in obesity prevalence.

Figure 2. Prevalence of obesity among adults aged 20 and over, by sex and race and Hispanic origin: United States, 2011–2014



[1]Significantly different from non-Hispanic Asian persons.
[2]Significantly different from non-Hispanic white persons.
[3]Significantly different from Hispanic persons.
[4]Significantly different from women of the same race and Hispanic origin.
NOTE: All estimates are age-adjusted by the direct method to the 2000 U.S. census population using the age groups 20–39, 40–59, and 60 and over.
SOURCE: CDC/NCHS, National Health and Nutrition Examination Survey, 2011–2014.

Childhood obesity is also a major problem in Georgia. The state of Georgia is ranked the 24th when it comes to obesity rates in the nation and 18th for obesity rates for ages 10-17. It has shown around a 20% increase in the year 2017 compared to the year 1990 ("The State of Obesity in Georgia", n.d.).

Benefits of Good Fruit and Vegetable Consumption

It is known that fruit and vegetable intake have positive effects on the body and can help prevent the occurrence of certain chronic diseases (“Vegetables and Fruits”, 2018). Eating at least five servings of fruits and vegetables is suggested to reduce risks of cardiovascular disease and cancer (“Vegetables and Fruits”, 2018). There are certain phytochemicals and other anticarcinogenic compounds that are found in fruits and vegetables. For example, lutein, which is found in green leafy vegetables such as spinach and kale, has been used to prevent colon cancer, breast cancer, type 2 diabetes, and heart disease (“Lutein”, n.d.). Vitamin C that is found in citrus fruits contains antioxidants that reduces nitrite which results in fewer formations of nitrosamines (Duyn & Pivonka, 2000). Nitrosamines are chemical compounds that have been found to be carcinogenic through various epidemiological studies. Cruciferous vegetables, such as broccoli and cabbage, contain high amounts of sulfuric compounds (isothiocyanates and dithiolthiones) that assist in increasing enzyme activity that is involved in detoxifying carcinogens and other harmful substances (Duyn & Pivonka, 2000). Flavonoids, which are phytochemicals, are found in almost all vegetables and fruits and play an important role in human health. They carry many antioxidant, anti-inflammatory, and anti-tumor qualities that help prevent and fight cancer (Lawenda, 2016).

As evidence for how these chemical components influence the reduction of diseases and cancers, a study done in 2004 assessed the association between fruit and vegetable intake and risk of major chronic diseases in two large cohorts of men and women. This Health Professionals’ Follow-up Study included 37,725 males between the ages of 40 and 75 as well as 71,910 females ages 30 to 55. At baseline the participants completed a questionnaire on lifestyle practices and medical history. Additional questionnaires were sent out every two years to update individual characteristics, behaviors, and disease outcomes. In terms of fruit and vegetable intakes, assessments were done the average daily fruit and vegetable intake and on specific food groups such as: citrus fruits, green leafy vegetables, cruciferous vegetables, legumes, and potatoes. Analysis results showed that the median intake of total fruits and vegetables was 5.3 servings per day for men and 5.2 servings for women. Participants in the higher quartiles of fruit and vegetable intake experienced a slightly lower risk of major chronic diseases (Hsin-Chia et al., 2004). Of all the specific food categories, only green leafy vegetables showed a statistically significant association with lower risk of major chronic diseases among participants in the highest quartile compared to the lowest quartile (Hsin-Chia et al., 2004). High consumption of fruits and vegetables were associated with lower risk of cardiovascular disease.

The connection between fruit and vegetable intake and reduced risk of cancer is a fairly new and ongoing topic of interest. A study evaluated this relationship among 182,145 breast cancer patients characterized by menopausal status, hormone receptor status, and molecular subtypes. It was concluded that greater intakes of fruits and vegetables, specifically cruciferous, yellow, and orange vegetables, were associated with significantly lower breast cancer risk (Farvid et al., 2018). As mentioned previously, cruciferous vegetables contain chemical compounds that help with detoxifying carcinogens. They also are rich sources of indoles that are known to block tumor production in animal studies (Duyn & Pivonka, 2000). Yellow and orange vegetables, such as carrots, are rich in beta carotene which is an antioxidant that protects cell membranes and DNA from oxidative damage (Duyn & Pivonka, 2000). With cardiovascular disease and cancer being the leading causes of death in the United States, this research plays a vital role in constructing prevention and intervention programs that heavily incorporates fruits and vegetables.

Fruit and Vegetable Intake Effect on BMI

One of the main factors that can be attributed to an increase in obesity is the high consumption of energy-dense foods (Hall et al, 2011). A way to combat this is to include more fruits and vegetables in your diet, which is something many obesity prevention programs emphasize. Death from inadequate fruit and vegetable consumption is due to the change in diet (incorporating more energy-dense foods) and lack of physical activity. Research has shown that women commonly have higher fruit and vegetable consumption rates than men. Given that women and men exhibit different eating habits, it is important to assess fruit and vegetable consumption between the two sexes. Women also have higher levels of morbidity and lower cardiovascular risk and premature mortality ("Surveillance of Fruit", n.d.). Thus, an assessment of health outcomes across the different genders should also be a subject of evaluation.

An intervention trial study evaluated the effect of incorporating fruits or oats in the diets of women on energy consumption and body weight. The sample included 49 women, ages 30 to 50 years old, with BMI greater than 25 kg/m^2 and had low alcohol consumption and physical activity. Women that were diagnosed with diabetes or took medication that could alter their metabolism and weight were excluded. Their diets were designed to include 55% energy from carbohydrates, 15% from protein, and 30% from fat, which is a standardized hypocaloric diet. Their diets were adjusted every two weeks depending on body weight in the three treatment groups (apples, pears, or oat cookies). The oats treatment serves as a comparison group because it contains high energy density. The participants consumed around 2401 +/- 389 kcal/day, 2459 +/- 464 kcal/day or 2383 +/- 31 kcal/day. Energy intake was assessed using an energy density table selected from the USDA Nutrient Database for Standard Reference. Each treatment group contained 16 participants that committed to their assigned diet for ten weeks (Oliveira, Sichieri, & Mozzer, 2008).

Results of the analysis determined that energy density affects energy intake when fruits are incorporated to diet, which in turn modifies body weight. After adjusting for age, BMI across the different fruit groups showed significant differences; the oats group showed an increase in BMI although it was not a statistically significant finding. After treatment, BMI for the apple group decreased by 1.32 kg, the pear group decreased by 2.17 kg, and the oat group by 0.73kg. These findings were found to be statistically significant when comparing fruits with oats (Oliveira, Sichieri, & Mozzer, 2008).

The Australian population ranks fifth highest in the prevalence of obesity among OECD countries. Rates in Australia have been increasing by more than 2%-3% every year. The Global Burden of Disease Study estimated 16,140 deaths per year in Australia due to inadequate fruit and vegetable consumption. One study assessed the association of fruit and vegetable intake and BMI in Australian men and women aged 45 years and up. Participants were randomly sampled from Medicare Australia, which is a universal health insurance scheme that provides near complete coverage of the population. The fruit and vegetable intake variables were derived from questions such as “About how many serves of vegetables do you usually eat each day?” and “About how many serves of fruit or glasses of fruit do you usually have each day?”.

Indicators of low fruit intake were defined as lower than 2 servings per day and less than 5 servings per day for low vegetable intake (Charlton et al, 2014).

The results of the logistic regression ran to assess the relationship between fruit and vegetable intake and BMI concluded that men were consuming less fruit (mean 1.6 servings/day) and vegetables per day (mean 2.9 servings/day) than women (mean 1.9 servings of fruit and 3.7 servings of vegetables per day) ($p < 0.0001$ for both comparisons). Women were found to be twice as likely to satisfy the fruit and vegetable recommendations. In relation to BMI, men had a higher chance of being overweight or obese (69.0%) compared to women (57.1%). With normal weight as the referent category, underweight women were least likely to be in the highest observed vegetable intake category (OR 0.84; 95% CI 0.73–0.97) while obese and overweight women were significantly more likely (OR 1.09; 95% CI 1.04–1.14). The opposite was seen when assessing fruit intake; obese and overweight women were less likely to be seen in the highest observed fruit intake category. For men, when comparing to the normal weight category, overweight men were less likely to be in the highest vegetable intake quartile (OR 0.94; 95% CI 0.90-0.98) (Charlton et al, 2014).

Rural and Urban Differences

Differences in urban and rural areas can influence the lifestyle of an individual, whether it be access to healthy foods, street connectivity, or recreation density. Studies have been done to dissect these factors and see how they can lead an individual to become obese or overweight. In terms of access to healthy foods, a study was done in Maryland that looked at the dynamic of food environments in rural counties, specifically what types of retail food stores are more common, what are their characteristics, and whether healthy food availability varies between these store types. This study included 7 rural counties with a combined number of 244 stores that were classified as licensed retail food outlets by the county health departments. The Nutrition Environment Measures Survey (NEMS-S) was used to examine the availability of healthy foods. In addition to this, a health food availability index (HFAI) was calculated for every store. Analysis results showed that supermarkets had the highest mean HFAI (24.8) and gas stations had the lowest (8.7) (Campbell, 2017). In terms of healthy beverages, supermarkets, convenience stores, and gas stations had the highest availability. The most common food source type found were convenience stores, which accounted for 26.1% of high healthy food availability.

A cross-sectional study looked at fruit and vegetable intake in rural and non-rural areas to see if they were consuming the daily recommendation of at least five servings of fruits and vegetables per day. Using the BRFSS of 2009, a Univariate analysis and multivariate logistic regression was performed. The dependent variable was rural adults consuming at least five daily servings of fruits and vegetables. A total of 219,479,823 adults were analyzed, and 52,259,789 were classified as consuming at least five daily servings of fruits and vegetables. Of those who were consuming at least five daily servings, 8,983,840 were identified as rural residents. The Univariate analysis showed that rural residents were less likely to be consuming five daily servings of fruits and vegetables compared to their non-rural counterparts (OR 1.161, 95% CI 1.160-1.162). The covariates measured in this study were: sex, children in household, marital status, income, health status, having health insurance, medical deferment, physical activity, and routine check-up. All the covariates showed a statistically significant association with the dependent variable. Results from the logistic regression analysis demonstrated that of those rural residents that were consuming five daily servings of fruits and vegetables were more likely to be female, married or living with a partner, living without children, and engaging in moderate physical activity. In terms of race, African Americans, Hispanics, or multiracial were also more likely than Caucasians to be consuming five daily servings (Lutfiyya, Change, & Lipsky, 2012).

Apart from food environment, built environment also influences the lifestyle of an individual, and can be a critical factor in the amount of physical activity they are engaging in, in turn affecting their BMI. A study done by Frank et al. examined whether built environment effects the amount of physical activity, thus becoming a contributing factor to obesity. Data were pulled from the Neighborhood Quality of Life Study, focusing on the geographical area of Kings County in Washington. “Walkability Index” was used to characterize built environment within 1-kilometer network buffer of each respondents geocoded place of residence (Frank et al, 2006). Self-reported height and weight of each individual were converted into meters and kilograms to calculate BMI. Transportation-related physical activity was assessed using the International Physical Activity Questionnaire (IPAQ). A linear regression was done to assess the relationship between BMI and minutes spent to active transportation (walking or biking). Results revealed that there is a strong association between walkability index and active transportation (Frank et al, 2006). This means that the friendlier an area is for walking the more likely it is for people to ride their bikes or walk to their destination. Along with this association, it was found that walkability index was negatively associated with BMI. This gives supporting evidence of why residents living in urban areas are more likely to engage in physical activity. Another study that focused on perceptions of walkability between rural and urban areas found that urban areas are perceived to be more walkable in terms of access to local destinations and the quality of routes to these destinations (Berry et al, 2017).

METHODS

Data Collection

This study used data from the 2015 Behavioral Risk Factor Surveillance System (BRFSS) to examine fruit and vegetable intake among obese and overweight individuals in the state of Georgia. BRFSS is a national system of health-related telephone surveys that collects data on health-related risk behaviors, chronic health conditions, and use of prevalence services (CDC, 2018) .

Measures

The BRFSS questionnaire included a broad range of items that measured health behaviors and conditions, including self-reported fruit and vegetable intake, meeting physical activity recommendations, general health status, and demographic characteristics. Although there are more recent BRFSS datasets available, fruit and vegetable intake are only assessed in the odd years. The 2017 dataset was only recently made available.

Defining Rural and Urban Areas

BRFSS classifies Metropolitan Status Code into four different categories: (1) In the center of an MSA, (2) Outside the center city of an MSA but inside the county containing the center city, (3) Inside a suburban county of the MSA, and (4) Not an MSA. Rural residents were defined as individuals who are not living in an MSA. Urban residents were defined as individuals living in the center of an MSA, outside the center city of an MSA but inside the county containing the center city, and inside a suburban county of the MSA (BRFSS, 2015).

Fruit and Vegetable Intake

In BRFSS, fruit and vegetable intake were measured by categorizing individuals who consume fruits one or more times per day and those who consume fruit less than one time per day. Vegetable intake is measured in the same manner. The responses were calculated from individual questions such as “how many times per day did you eat dark green vegetables?”, “how many times per day did you eat orange-colored vegetables?”, “how many times per day did you eat cooked or canned beans?” and “not counting what you just told me about, during the past month, about how many times per day did you eat OTHER vegetables?”. For fruit intake the questions asked were “fruit juice intake in times per day” and “fruit intake in times per day”. Those who reported consuming fruits and vegetables less than one time daily were used as indicators to highlight very low levels of intakes across Georgia (“Surveillance of Fruit and Vegetable”, n.d.). Using the guidelines noted in the Surveillance of Fruit and Vegetable Intake Using Behavioral Risk Factor Surveillance System by the CDC, low fruit intake was coded as receiving less than one intake daily, and good was coded as more than one intake daily.

Behavioral variables

As shown in Table 1.2, the behavioral factors that were measured include smoking status, heavy drinkers and physical activity along with the fruit and vegetable intakes mentioned previously. Smoking status was derived from a four-level calculated variable (current smoker- now smokes every day, current smoker-now smokes some days, former smoker, and never smoked) and then recoded into two categories: smoker and non-smoker. Heavy alcohol consumption was considered more than 14 drinks per week for adult men and more than 7 drinks per week for women. Physical activity was assessed by having participants report if they had any physical activity or exercise in the past month other than their regular job. The participants were also assessed to see if they met aerobic recommendations based on the *2008 Physical Activity Guidelines for Americans;* participants who met the guidelines reported at least 150 minutes of moderate intensity activity per week or at least 75 minutes per week of vigorous-intensity activity per week.

Clinical variables

Obesity can result from health issues that limit an individual's movement or energy to partake in obesity-combatting activities or habits. That being said, the clinical factors that were measured in this study included the diagnosis of high blood pressure, high cholesterol, coronary heart disease or myocardial infraction, asthma, and arthritis. Table 1.3 presents the frequency distribution of the clinical characteristics of obese and overweight participants in rural and urban areas.

Health and health care status variables

Variables related to health include general health status, health care coverage, and whether medical cost was an issue in the past year (could not see a doctor because of cost). General health status was originally a five-level variable (excellent, very good, good, fair, and poor) that was broken down into two-levels: good and poor.

Study Population

The population in this study was composed of 1,255 obese and overweight respondents of the BRFSS 2015 that reside in the state of Georgia. The mean age observed in the rural population was 61.887 +/- 12.337 and 61.229 +/- 13.047 in the urban population. As shown in Table 1.1, 35.92% of the rural population is male and 64.08% are female. In the rural population

40.14% are male and 59.86% are female. Obese and overweight participants, who are the main focus of this study, constitute 73.65% of the rural population and 70.53% in the urban population.

Statistical Analysis

A multivariate logistic regression analysis was run on all demographic, behavioral, clinical, and health/health care variables in the same model, with fruit and vegetable intake as the dependent variables to assess whether there is an association between fruit and vegetable intake and residential area. As shown in Tables 2.1 - 3.4, a Univariate analysis was done on the demographic, behavioral, clinical, and health/health care variables to determine the association between the individual factors and lack of fruit or vegetable intake. A second multivariate regression analysis was run on the association between demographic, behavioral, clinical, and health/health care variables and fruit and vegetable intake in rural and urban areas. Statistical analyses were performed using SAS 9.4 Software.

RESULTS

Descriptive

The sample used in this data consisted of 1255 obese/overweight individuals that reside in rural or urban areas. The mean age of participants in rural areas was 61.887 +/- 12.337 and 61.229 +/- 13.047 in urban areas. Females outnumbered males in both areas, with 68.12% in rural areas and 63.80% in urban areas (table 1).

Association between residential areas (rural/urban) and fruit intake

The univariate analysis revealed that for residents residing in rural and urban areas, education was significantly associated with lower fruit intake. As shown in Table 2.1, rural and urban residents who did not graduate from college have a higher odd of experiencing low fruit intake compared to those who graduated from college (rural: OR = 1.593; urban: OR = 1.363). Similarly, among behavioral factors, those who did not engage in physical activity in the past month were found more likely to experience low fruit intake in both residential areas (rural: OR = 1.539; urban: OR = 1.780). In terms of health and health care status (Table 2.4), both urban and rural areas revealed that those who did not see a doctor because of medical costs were more likely to experience low fruit intake than those who did (rural: OR = 2.121; urban: OR = 1.068). In urban areas, females were less likely to experience low fruit intake (OR = 0.747; 95% Cl: 0.568 – 0.982). Urban residents also experienced a higher likelihood of low fruit intake when they did not meet aerobic recommendations (OR= 1.620) compared to those who did and were active smokers (OR = 1.898) compared to those who did not smoke. In terms of clinical factors, urban residents who had high blood pressure were more likely to have low fruit intake those who did now have high blood pressure (OR = 1.426; 95% CI: 1.078-1.886). These results were shown to be statistically significant at p-value <0.05.

As shown in Table 4.1, the multivariate analysis for fruit intake showed that education and medical cost were statistically significant variables that are associated with low fruit intake in rural areas. Sex, physical activity in past month, and smoking status were statistically significant variables that are associated with low fruit intake in urban areas.

Association between residential area (rural/urban) and vegetable intake

The univariate analysis for vegetable intake revealed that, in terms of demographic factors, those who did not graduate college were more likely to experience low vegetable intake than those who did (rural: OR = 2.559; urban: OR = 2.128). In rural areas, those who were not married/not living with a partner also experienced low vegetable intake compared to those who were married/living with a partner. For behavioral factors, the significant findings were shown in urban areas; those who did not have physical activity, did not meet the aerobic recommendations, and are smokers were more likely to have a low vegetable intake (shown in table 3.2). For clinical factors, those in rural areas were more likely to have low vegetable intake if they have coronary heart disease or myocardial infraction. In urban areas, those who had high blood pressure were more likely to have low vegetable intake compared to those who did not have high blood pressure (OR = 1.402, 95% Cl= 1.006 – 1.954). As shown in Table 3.4, those who are in rural areas and experience poor health are more likely to have low vegetable intake than those who are in good health (OR = 2.100, 95% Cl= 1.063 – 4.148). These results were shown to be statistically significant at p-value <0.05.

The result of multivariate logistic regression analysis for vegetable intake showed that, low vegetable consumption was significantly associated with an income of less than $15,000, and have medical cost issues in rural areas. For urban areas, education, smoking status, and heavy drinker status were significantly associated with low vegetable intake.

Stepwise analysis

The result of the stepwise regression analysis of fruit intake in rural areas revealed that the number of children in the household, medical cost issues, physical activity in the past month, and asthma are the most significant determining factors in low fruit intake. For urban areas, physical activity, smoking status, and sex were found to be significant factors resulting in low fruit intake. Pertaining to vegetable intake, income, race, medical cost issues, and sex were significant characteristics that’s were associated with low vegetable intake in rural areas. In urban areas, characteristics that were significantly associated with low vegetable intake were education level, physical activity index, smoking status, and heavy drinker status.

DISCUSSION AND CONCLUSION

Obesity has accounted for nearly 300,000 deaths per year in the United States. Obesity increases the risk for chronic disease, cancer, and other health complications such as stroke and hypertension. Adequate fruit and vegetable intake are key factors that contributes to maintaining a healthy weight and decreasing the odds of being stricken with the diseases and complications previously listed. In this study it was interesting to see different factors that contributed to low fruit and vegetable intake among obese/overweight participants in rural and urban areas. This study examined fruit and vegetable intake separately. In terms of low fruit intake, the main factors that had a significant contribution in urban areas were sex, physical activity, and smoking status. In rural areas the significant factors were education level and medical costs. For low vegetable intake in urban areas, the main contributing factors were education level, smoking status, and heavy drinker status. In rural areas it was income.

Fortunately, from the analysis done in this study, majority of the populations both in urban and rural areas were receiving good fruit and vegetable intake. In urban areas, 40.1% had low fruit intake and 22.8% had low vegetable intake. In rural areas, 46.11% had low fruit intake and 26.0% had low vegetable intake. These results revealed that rural areas exhibited more people who had low fruit and vegetable consumption, in support with most studies, which found that rural areas have lower fruit and vegetable consumption because of poor access, affordability, and transportation. Urban areas are more associated with easier access to stores and better transportation. In this study, urban areas were shown to have physical activity and smoking status as a common factor between low fruit intake and low vegetable intake. Those who had not engaged in physical activity in the past month and were current smokers displayed low intake of both fruits and vegetables. Previous research has supported these findings, where low physical activity was associated with inadequate fruit and vegetable consumption (Silva & Silva, 2015). Furthermore, in terms of smoking status, studies have also demonstrated that smokers have poorer diets compared to nonsmokers. Smokers consumed more energy, fat, alcohol, and caffeine than nonsmokers (McPhillips et al, 1994).

Results in this study indicate that a higher proportion of residents in rural areas that earn less than $15,000 had low vegetable intake. One possible reason for this to be a significant finding in rural areas but not urban may be related to food costs. Food tends to be less expensive in larger supermarkets than smaller markets or convenience stores. Higher priced food outlets may be the only local and convenient food source in some rural areas. Rural populations are on average to be more likely to be uninsured or underinsured. According to the U.S. Census Bureau 2011-2015, around 13.3% of people in rural areas lived with incomes below the poverty threshold and income inequality was lower for rural households than urban households (Bishaw & Posey, 2016). Taking this information into consideration, we can deduce that medical cost would more likely be an issue in rural areas rather than urban. Those who were heavy drinkers in urban areas showed that they were at lesser odds of having low vegetable intake, which contradicts a lot of the current literature that suggests that those who consume high amounts of alcohol often are lacking in healthy foods.

A point to consider in this study, and other studies of this nature, is the impact of household size and the availability of food preparation and storage equipment. A study that assessed the homes of a rural, urban, and suburban counties in Oklahoma found that less than 1% lacked refrigerators in the rural region; meaning that there did not appear to be a lack of proper food storage. Lack of proper food storage can lead residents to not buy fruits and vegetables because they do not have the equipment to store it for long periods of time (Landers & Shults, 2008). The urban and suburban counties were found to be more lacking in the proper food storage equipment, for example, 44% of rural residents had stand-alone freezers whereas only 24% and 28% of urban and suburban residents did (Landers & Shults, 2008). In terms of household size, the bigger the household the more fruits and vegetables are purchased, which is an expected finding (Miller et al., 2016).

Several limitations to this study should be noted. First, the fruit and vegetable variable used in this study was a categorical variable. Participants responded with either consuming 2 or more fruits per day or less than 2 fruits per day, as such was done for the vegetable variable. Because this variable was not continuous, the exact number of fruit and vegetables consumed could not be calculated which may have yielded different results. Recall bias is also another limitation in this study. Some participants may find it difficult to accurately recall the amount of fruits and vegetables they consumed and physical activity among other things. This study uses a small sample size, which increases the likelihood of type II error. One final limitation is how urban and rural areas were defined in this study. BRFSS does not provide a concrete classification of urban and rural areas, therefore MSA was the only possible definition for rural, and the remaining were listed as urban.

The results revealed from this study can help shape intervention programs to cater to obese and overweight residents in both urban and rural areas. These obesity intervention strategies should highlight the importance of fruit and vegetable intake and how, specifically in urban areas, smoking and not engaging in physical activity can affect the consumption level of healthy foods. In rural areas specifically, the interventions should be targeted to those who do not have access to healthy foods and are of low-income households.

Majority of the population studied has good fruit and vegetable intake; however, the rural population appears to be at a greater risk of having low fruit and vegetable intake. Factors of food environment, such as food availability, plays a major role in having making sure this population is receiving a good amount of healthy foods in their daily diets. Findings from this suggest the need to pay attention to rural populations in terms of food quality and availability. By looking at the different types of factors individually (demographic, behavioral, clinical, health/healthcare status), it may be possible to isolate specific contributions of good fruit and vegetable intake that can help to lessen the disparity between rural and urban resident adults.

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APPENDICES

Table 1. Frequency table of demographic, behavioral, clinical, and health/health care characteristics, classified into urban and rural residential areas

	Rural 505 (28.89%)	Urban 1243 (71.11%)
Age		
Mean +/- STD DEV	61.887 +/- 12.337	61.229 +/- 13.047
Sex		
Male	161 (31.88%)	450 (36.20%)
Female	344 (68.12%)	793 (63.80%)
Marital status		
Married/Living with partner	272 (53.86%)	710 (57.12%)
Not married/Not living with partner	233 (46.14%)	533 (42.88%)
Employment		
Employed	183 (36.24%)	501 (43.44%)
Unemployed	322 (63.76%)	742 (59.69%)
Education		
College graduate	150 (29.70%)	540 (43.44%)
Not college graduate	355 (70.30%)	703 (56.56%)
Income		
<$15,000	87 (17.23%)	112 (9.01%)
$15,000-$35,000	186 (36.83%)	337 (27.11%)
$35,000-$50,000	59 (11.68%)	173 (13.92%)
$50,000 or more	173 (34.26%)	621 (49.96%)
Number of children in HH		
No children	412 (81.58%)	967 (77.80%)
1 or more children	93 (18.42%)	276 (22.20%)
Race		
Caucasian	377 (74.65%)	868 (69.83%)
African American	107 (21.19%)	315 (25.34%)
Other	21 (4.16%)	60 (4.83%)
Obese/overweight status		
Normal	132 (26.35 %)	361 (29.47%)
Obese/overweight	369 (73.65%)	864 (70.53%)
Physical activity in past month		
Had physical activity	336 (66.53%)	888 (71.44%)
Did not have physical activity	169 (33.47%)	355 (28.56%)
Physical activity index		
Meets aerobic recommendations	169 (45.31%)	657 (52.86%)
Does not meet recommendations	204 (54.69%)	586 (47.14%)
Smoking status		
Smoker	80 (15.84%)	149 (11.99%)
Non-smoker	425 (84.16%)	1094 (88.01%)
Heavy drinker status		
Not a heavy drinker	489 (96.83%)	1189 (95.66%)
Heavy drinker	16 (3.17%)	54 (4.34%)

Fruit intake		
Good	274 (54.26%)	767 (61.71%)
Low	231 (45.74%)	476 (38.29%)
Vegetable intake		
Good	378 (74.85%)	990 (79.65%)
Low	127 (25.15%)	253 (20.35%)
High blood pressure		
Does not have HBP	311 (61.58%)	684 (55.03%)
Does have HBP	194 (38.42%)	559 (44.97%)
High cholesterol		
Does have high cholesterol	250 (49.50%)	613 (49.32%)
Does not have high cholesterol	255 (50.50%)	630 (50.68%)
CHD or MI		
Does have CHD or MI	54 (10.69%)	140 (11.26%)
Does not have CHD or MI	451 (89.31%)	1103 (88.74%)
Asthma		
Has asthma	426 (84.36%)	1077 (86.65%)
Does not have Asthma	79 (15.64%)	166 (13.35%)
Arthritis		
Has arthritis	264 (52.28%)	510 (41.03 %)
Does not have arthritis	241 (47.72%)	733 (58.97%)
General health		
Good health	454 (90.08%)	1173 (94.37%)
Poor health	50 (9.92%)	70 (5.63%)

Table 2.1 Univariate analysis of the association between demographic factors and lack of fruit intake in rural and urban areas.

	Rural OR | 95% CL	Urban OR | 95% CL
Age		
Mean +/- STD DEV	0.981 | 0.965 0.998	0.997 | 0.986 1.008
Sex		
Male	1.00 – Reference	1.00 – Reference
Female	0.748 | 0.489 1.143	*0.747 | 0.568 0.982
Marital status		
Married/Living with partner	1.00 – Reference	1.00 – Reference
Not married/Not living with partner	0.976 | 0.648 1.471	1.017 | 0.775 1.334
Employment		
Employed	1.00 – Reference	1.00 – Reference
Unemployed	0.711 | 0.466 1.085	0.940 | 0.714 1.238
Education		
College graduate	1.00 – Reference	1.00 – Reference
Not college graduate	*1.593 | 1.002 2.534	*1.363 | 1.033 1.797
Income		
<$15,000	0.993 | 0.551 1.789	1.194 | 0.756 1.885
$15,000-$35,000	0.890 | 0.546 1.453	1.133 | 0.825 1.555
$35,000-$50,000	0.762 | 0.385 1.511	0.890 | 0.583 1.359
$50,000 or more	1.00 - Reference	1.00 - Reference
Number of children in HH		
No children	1.00 – Reference	1.00 - Reference
1 or more children	2.060 | 1.215 3.491	0.885 | 0.634 1.235
Race		
Caucasian	0.991 | 0.349 2.811	1.298 | 0.677 2.491
African American	0.937 | 0.313 2.802	1.035 | 0.523 2.051
Other	1.00 - Reference	1.00 – Reference

**significant with p<0.05*

Table 2.2 Univariate analysis of the association between behavioral factors and lack of fruit intake in rural and urban areas.

	Rural OR | 95% CL	Urban OR | 95% CL
Physical activity in past month		
Had physical activity	1.00 – Reference	1.00 – Reference
Did not have physical activity*	*1.539 | 1.004 2.358	*1.780 | 1.333 2.378
Physical activity index		
Meets aerobic recommendations	1.00 – Reference	1.00 – Reference
Does not meet recommendations*	1.414 | 0.938 2.133	*1.620 | 1.234 2.125
Smoking status		
Smoker	1.789 | 0.992 3.225	*1.898 | 1.234 2.920
Non-smoker	1.00 - Reference	1.00 – Reference
Heavy drinker status		
Not a heavy drinker	1.00 – Reference	1.00 – Reference
Heavy drinker	0.774 | 0.215 2.788	1.423 | 0.709 2.855

**significant with p<0.05*

Table 2.3 Univariate analysis of the association between clinical factors and lack of fruit intake in rural and urban areas.

	Rural OR | 95% CL	Urban OR | 95% CL
High blood pressure		
Does have HBP	0.964 | 0.625 1.488	*1.426 | 1.078 1.886
Does not have HBP	1.00 - Reference	1.00 – Reference
High cholesterol		
Does have high cholesterol	0.955 | 0.635 1.435	1.172 | 0.895 1.535
Does not have high cholesterol	1.00 - Reference	1.00 - Reference
CHD or MI		
Does have CHD or MI	0.920 | 0.501 1.688	1.079 | 0.711 1.637
Does not have CHD or MI	1.00 - Reference	1.00 - Reference
Asthma		
Has asthma	1.532 | 0.881 2.664	0.917 | 0.624 1.348
Does not have Asthma	1.00 - Reference	1.00 - Reference
Arthritis		
Has arthritis	0.722 | 0.479 1.088	1.162 | 0.886 1.523
Does not have arthritis	1.00 - Reference	1.00 - Reference

**significant with p<0.05*

Table 2.4 Univariate analysis of the association between health care factors and lack of fruit intake in rural and urban areas

	Rural OR | 95% CL	Urban OR | 95% CL
General health		
Good health	1.00 – Reference	1.00 – Reference
Poor health	0.957 | 0.495 1.851	1.178 | 0.685 2.024
Healthcare coverage		
Has health care coverage	1.00 – Reference	1.00 – Reference
Does not have coverage	0.830 | 0.359 1.919	0.994 | 0.520 1.899
Medical cost		
Medical cost an issue	*2.121 | 1.204 3.737	*1.608 | 1.041 2.485
Medical cost not an issue	1.00 – Reference	1.00 - Reference

significant with p<0.05

Table 3.1 Univariate analysis of the association between demographic factors and lack of vegetable intake in rural and urban areas

	Rural	Urban
	OR | 95% CL	**OR | 95% CL**
Age	1.048 | 0.658 1.668	1.002 | 0.989 1.014
Mean +/- STD DEV		
Sex		
Male	1.00 – Reference	1.00 – Reference
Female	0.828 | 0.514 1.334	1.046 | 0.758 1.443
Marital status		
Married/Living with partner	1.00 – Reference	1.00 – Reference
Not married/Not living with partner	*1.642 | 1.031 2.615	1.349 | 0.984 1.849
Employment		
Employed	1.00 – Reference	1.00 – Reference
Unemployed	1.348 | 0.825 2.202	1.000 | 0.725 1.379
Education		
College graduate	1.00 – Reference	1.00 – Reference
Not college graduate	*2.559 | 1.396 4.690	*2.128 | 1.507 3.004
Income		
<$15,000	3.411 | 1.769 6.578	2.022 | 1.214 3.368
$15,000-$35,000	1.840 | 1.023 3.308	1.988 | 1.378 2.869
$35,000-$50,000	0.541 | 0.193 1.519	1.059 | 0.625 1.794
$50,000 or more	1.00 - Reference	1.00 - Reference
Number of children in HH		
No children	1.00 – Reference	1.00 - Reference
1 or more children	1.043 | 0.576 1.887	0.847 | 0.569 1.260
Race		
Caucasian	0.649 | 0.199 2.122	1.279 | 0.555 2.949
African American	2.357 | 0.698 7.955	2.130 | 0.904 5.019
Other	1.00 - Reference	1.00 - Reference

**significant with p<0.05*

Table 3.2 Univariate analysis of the association between behavioral factors and lack of vegetable intake in rural and urban areas.

	Rural OR | 95% CL	Urban OR | 95% CL
Physical activity in past month		
Had physical activity	1.00 – Reference	1.00 - Reference
Did not have physical activity	1.175 | 0.728 1.897	*1.976 | 1.426 2.737
Physical activity index		
Meets aerobic recommendations	1.00 – Reference	1.00 – Reference
Does not meet recommendations	1.055 | 0.662 1.680	*2.013 | 1.455 2.785
Smoking status		
Smoker	1.146 | 0.599 2.191	*1.890 | 1.194 2.992
Non-smoker	1.00 – Reference	1.00 - Reference
Heavy drinker status		
Not a heavy drinker	1.00 – Reference	1.00 - Reference
Heavy drinker	1.226 | 0.311 4.840	0.329 | 0.099 1.089

**significant with p<0.05*

Table 3.3 Univariate analysis of the association between clinical factors and lack of vegetable intake in rural and urban areas.

	Rural OR | 95% CL	Urban OR | 95% CL
High blood pressure		
Does have HBP	1.674 | 0.992 2.824	*1.402 | 1.006 1.954
Does not have HBP	1.00 - Reference	1.00 – Reference
High cholesterol		
Does have high cholesterol	1.077 | 0.678 1.711	0.883 | 0.644 1.209
Does not have high cholesterol	1.00 – Reference	1.00 – Reference
CHD or MI		
Does have CHD or MI	*2.075 | 1.103 3.903	1.235 | 0.772 1.977
Does not have CHD or MI	1.00 – Reference	1.00 – Reference
Asthma		
Has asthma	1.180 | 0.628 2.218	0.785 | 0.509 1.211
Does not have Asthma	1.00 – Reference	1.00 – Reference
Arthritis		
Has arthritis	0.954 | 0.599 1.519	0.890 | 0.714 1.345
Does not have arthritis	1.00 – Reference	1.00 – Reference

**significant with p<0.05*

Table 3.4 Univariate analysis of the association between health care factors and lack of vegetable intake in rural and urban areas.

	Rural	Urban
General health		
Good health	1.00 – Reference	1.00 – Reference
Poor health	*2.100 | 1.063 4.148	1.620 | 0.905 2.899
Healthcare coverage		
Has health care coverage	1.00 - Reference	1.00 – Reference
Does not have coverage	0.956 | 0.368 2.483	0.709 | 0.309 1.627
Medical cost		
Medical cost an issue	0.671 | 0.340 1.324	1.406 | 0.866 2.283
Medical cost not an issue	1.00 – Reference	1.00 – Reference

**significant with* $p<0.05$

Table 4.1 Multivariate analysis of the association between demographic, behavioral, clinical, and health/health care status factors of fruit intake in rural and urban areas

	Rural OR | 95% CL	Urban OR | 95% CL
Age	0.998 | 0.972 1.025	0.989 | 0.974 1.005
Mean +/- STD DEV		
Sex		
Male	1.00 – Reference	1.00 – Reference
Female	0.786 | 0.472 1.312	*0.697 | 0.513 0.947
Marital status		
Married/Living with partner	1.00 – Reference	1.00 – Reference
Not married/Not living with partner	1.140 | 0.668 1.947	1.032 | 0.743 1.434
Employment		
Employed	1.00 – Reference	1.00 – Reference
Unemployed	1.033 | 0.581 1.837	0.890 | 0.622 1.271
Education		
College graduate	1.00 – Reference	1.00 – Reference
Not college graduate	*1.831 | 1.042 3.217	1.189 | 0.855 1.652
Income		
<$15,000	0.730 | 0.308 1.730	1.013 | 0.560 1.829
$15,000-$35,000	0.622 | 0.312 1.239	1.050 | 0.701 1.571
$35,000-$50,000	0.708 | 0.335 1.495	0.773 | 0.489 1.222
$50,000 or more	1.00 - Reference	1.00 - Reference
Number of children in HH		
No children	1.00 – Reference	1.00 – Reference
1 or more children	0.534 | 0.270 1.057	1.197 | 0.796 1.799
Race		
Caucasian	1.124 | 0.358 3.524	1.290 | 0.647 2.571
African American	0.945 | 0.283 3.157	0.992 | 0.484 2.036
Other	1.00 - Reference	1.00 - Reference
Physical activity in past month		
Had physical activity	1.00 – Reference	1.00 – Reference
Did not have physical activity	1.671 | 0.878 3.181	* 1.583 | 1.050 2.387
Physical activity index		
Meets aerobic recommendations	1.00 – Reference	1.00 – Reference
Does not meet recommendations	1.158 | 0.633 2.120	1.204 | 0.819 1.769
Smoking status		
Smoker	1.186 | 0.936 3.525	*1.708 | 1.077 2.709
Non-smoker	1.00 – Reference	1.00 – Reference
Heavy drinker status		
Not a heavy drinker	1.00 – Reference	1.00 – Reference
Heavy drinker	0.515 | 0.131 2.033	1.121 | 0.539 2.332
High blood pressure		
Does have HBP	1.081 | 0.636 1.836	1.359 | 0.982 1.883
Does not have HBP	1.00 - Reference	1.00 - Reference
High cholesterol		
Does have high cholesterol	0.994 | 0.625 1.580	1.089 | 0.811 1.462
Does not have high cholesterol	1.00 – Reference	1.00 – Reference

CHD or MI		
Does have CHD or MI	1.373 | 0.682 2.760	0.809 | 0.510 1.281
Does not have CHD or MI	1.00 – Reference	1.00 – Reference
Asthma		
Has asthma	1.843 | 0.977 3.476	1.092 | 0.722 1.651
Does not have Asthma	1.00 – Reference	1.00 – Reference
Arthritis		
Has arthritis	0.768 | 0.461 1.279	1.036 | 0.758 1.415
Does not have arthritis	1.00 – Reference	1.00 – Reference
General health		
Good health	1.00 – Reference	1.00 – Reference
Poor health	0.769 | 0.351 1.685	0.888 | 0.487 1.619
Healthcare coverage		
Has health care coverage	1.00 - Reference	1.00 - Reference
Does not have coverage	0.385 | 0.142 1.044	0.551 | 0.259 1.171
Medical cost		
Medical cost an issue	*2.357 | 1.219 4.557	1.561 | 0.955 2.552
Medical cost not an issue	1.00 – Reference	1.00 – Reference

**significant with p<0.05*

Table 4.2 Multivariate analysis of the association between demographic, behavioral, clinical, and health/health care status factors of vegetable intake in rural and urban areas

	Rural OR | 95% CL	Urban OR | 95% CL
Age	1.001 | 0.971 1.032	1.003 | 0.985 1.023
Mean +/- STD DEV		
Sex		
Male	1.00 – Reference	1.00 – Reference
Female	0.563 | 0.305 1.039	0.772 | 0.535 1.114
Marital status		
Married/Living with partner	1.00 – Reference	1.00 – Reference
Not married/Not living with partner	0.984 | 0.528 1.834	1.006 | 0.681 1.485
Employment		
Employed	1.00 – Reference	1.00 – Reference
Unemployed	1.079 | 0.538 2.161	0.696 | 0.453 1.069
Education		
College graduate	1.00 – Reference	1.00 – Reference
Not college graduate	1.625 | 0.791 3.341	*1.696 | 1.136 2.532
Income		
<$15,000	*2.952 | 1.109 7.861	1.381 | 0.708 2.692
$15,000-$35,000	1.609 | 0.722 3.587	1.520 | 0.956 2.416
$35,000-$50,000	0.533 | 0.176 1.612	0.874 | 0.498 1.534
$50,000 or more	1.00 - Reference	1.00 - Reference
Number of children in HH		
No children	1.00 – Reference	1.00 – Reference
1 or more children	0.958 | 0.429 2.140	1.175 | 0.720 1.917
Race		
Caucasian	0.991 | 0.257 3.823	1.421 | 0.592 3.412
African American	2.728 | 0.672 11.082	2.230 | 0.911 5.456
Other	1.00 - Reference	1.00 - Reference
Physical activity in past month		
Had physical activity	1.00 – Reference	1.00 – Reference
Did not have physical activity	0.954 | 0.444 2.051	1.436 | 0.901 2.287
Physical activity index		
Meets aerobic recommendations	1.00 – Reference	1.00 – Reference
Does not meet recommendations	1.034 | 0.498 2.146	1.439 | 0.908 2.269
Smoking status		
Smoker	1.132 | 0.535 2.395	*1.876 | 1.134 3.105
Non-smoker	1.00 – Reference	1.00 – Reference
Heavy drinker status		
Not a heavy drinker	1.00 – Reference	1.00 – Reference
Heavy drinker	0.648 | 0.137 3.055	*0.257 | 0.074 0.896
High blood pressure		
Does have HBP	0.834 | 0.435 1.599	1.156 | 0.789 1.712
Does not have HBP	1.00 - Reference	1.00 - Reference

High cholesterol		
Does have high cholesterol	1.015 | 0.587 1.754	0.854 | 0.602 1.210
Does not have high cholesterol	1.00 – Reference	1.00 – Reference
CHD or MI		
Does have CHD or MI	0.622 | 0.294 1.315	0.989 | 0.582 1.683
Does not have CHD or MI	1.00 – Reference	1.00 – Reference
Asthma		
Has asthma	1.551 | 0.734 3.279	0.860 | 0.535 1.383
Does not have Asthma	1.00 – Reference	1.00 – Reference
Arthritis		
Has arthritis	1.369 | 0.746 2.513	0.772 | 0.532 1.120
Does not have arthritis	1.00 – Reference	1.00 – Reference
General health		
Good health	1.00 – Reference	1.00 – Reference
Poor health	1.845 | 0.809 4.211	1.360 | 0.706 2.620
Healthcare coverage		
Has health care coverage	1.00 - Reference	1.00 - Reference
Does not have coverage	1.125 | 0.354 3.569	0.549 | 0.220 1.368
Medical cost		
Medical cost an issue	0.438 | 0.192 1.000	1.235 | 0.713 2.138
Medical cost not an issue	1.00 – Reference	1.00 – Reference

**significant with p<0.05*