Food Availability and Behavior of Youth EFNEP Participants in Virginia

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GENERAL and SCHOLARLY ABSTRACT

Low-income and minority youth are disproportionately affected by low food access, low dietary quality, and high levels of obesity. The Expanded Food and Nutrition Education Program (EFNEP) is designed specifically to assist limited resource youth and adult audiences to "acquire the knowledge, skills, attitudes, and changed behavior necessary for nutritionally sound diets, and to contribute to their personal development and improvement of the overall family diet and nutritional well-being" by using a peer-education model (USDA, 2012). To date, little published research exists on dietary patterns and food access among youth who participated in EFNEP. The specific research goals of this study were to: 1) explore baseline dietary and physical activity self-efficacy and behaviors of youth EFNEP participants, 2) examine differences in self-efficacy and behaviors based on socio-demographic factors and food availability, and 3) determine the association between food availability and dietary behavior. This study consisted of conducting surveys with 1,864 low-income youth, ages 7 to 14 years old, across Virginia prior to participation in an obesity-prevention program. The survey consisted of a 55-item written pre, post-test instrument that had been previously tested for validity and reliability. Self-efficacy is individual's confidence about a certain targeted behavior. In this study participants were asked how often they think healthy foods are consumed during the day. Confidence was an indicator of their motivation towards choosing nutritious foods. Youth perception or confidence towards consuming food items in this study was higher than actual dietary intake. Most participants reported availability across all food groups, with the exception of meat and

beans (41.4%) and dessert (48.3%). Significantly less than half of participants reported not meeting dietary behavior thresholds for the following food groups: grains (27.0%); whole grain (19.7%); low-fat milk (31.5%); vegetables (18.2%); colored vegetables (15.3%); and baked foods (31.7%). Availability of meats and beans and fruits were higher among Latinos than non-Latinos. Younger participants reported a higher consumption of sugar-sweetened beverages and screen time; however, the children had participated in physical activity. Participants who reported a higher availability of fruits and vegetables at home also participated in physical activities at least once a day. This study provided insight into the availability of food, as well as food consumption among low-income audiences across Virginia, based on youth EFNEP reporting. The results highlighted the importance of strategic interventions to improve the availability of nutritious foods and obesity prevention strategies to enhance self-efficacy and intake of nutritious foods among low-income youth.

DEDICATION

I have been blessed with wonderful parents. I would like to express my deepest gratitude for my father, Sami Almohanna, and my mother, Batool Almohanna who have been loving and a source of inspiration, guidance, and encouragement throughout the years of my life. Their presence in my life has truly been a blessing from God.

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ATTRIBUTION

This PhD manuscript was written by the PhD candidate. The project was conceptualized by Dr. Elena L. Serrano, Dr. George Davis, Dr. Mary M. McFerren, and Dr. Kathryn W. Hosig. They are included as authors because they are members of the doctor's candidacy committee. They have contributed by providing input, insight, and guidance to achieve research goals, and implement the research proposal and data analysis. Statistical data analysis was consulted with Dr. Stephen Werre.

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Introduction

Overweight and obesity rates have tripled among children and adolescents in the United States. Obesity is a disease in which there is an accumulation of excess body fat. According to the Centers for Disease Control and Prevention (CDC, 2010), the obesity rate was reported to be 17% among American children and adolescents aged 2-19 (Ogden, Carroll, Kit, & Flegal, 2012a). The obesity rate is continuously rising in the US, and has reached an epidemic rate within the last twenty years (Coleman-Jensen, Nord, Andrews, & Carlson, 2012; Ogden, Carroll, Curtin, Lamb, & Flegal, 2010; Ogden, Carroll, Kit, & Flegal, 2012b). According to the National Institutes of Health(NIH) more than two out of three adults were either overweight or obese and one in twenty adults was considered to be extremely obese (National Institute of Health, 2012).

Obesity is a major public health concern in the United States and needs to be addressed immediately. If children continue, to increase in weight at the same rate, it is anticipated that children will suffer from chronic disease (National Cancer Institute, 2012; Polednak, 2008). Low-income and minority youth are disproportionately affected by obesity (Ogden et al., 2010). African American and Hispanic children have a higher obesity prevalence rate which is approximately 41.0% (Ogden et al., 2012a). Unhealthy dietary habits among adolescents not only have direct negative physical and psychological effects, but also could present possible life threatening diseases. This obesity epidemic degrades the quality of life and the longevity of children (Bray & Bouchard, 2004). The surrounding environment contributes largely to the

rapidly growing prevalence of obesity as it may encourage high energy intake and minimum energy expenditure. Consuming a poor diet filled with “empty calories” and having low levels of physical activity, can lead to an energy imbalance, further increasing childhood obesity in the United State (US). Given that the US is considered an ‘’obesogenic’’ country, there is an urgent need to tackle obesity among youth in the US (Boone-Heinonen & Gordon-Larsen, 2012).

The highest obesity rates were reported among groups with high poverty rates and low education (Drewnowski & Specter, 2004). A strong emphasis on promoting healthy lifestyle among low-income youth is necessary in order to prevent incidence of chronic conditions later on in life, especially obesity, cardiovascular disease, type 2 diabetes, and certain types of cancer (Freedman, Mei, Srinivasan, Berenson, & Dietz, 2007; Li, Ford, Zhao, & Mokdad, 2009; Walker, Gurka, Oliver, Johns, & DeBoer, 2012).

On a daily basis, the American diet consists of high energy-dense processed products that are made of saturated fats and simple carbohydrates, along with low intake of complex carbohydrates and fiber found abundantly in fruits, vegetables, and whole grains (Deshmukh-Taskar, Nicklas, Yang, & Berenson, 2007). It is crucial to evaluate and improve the current understanding of nutrition and physical activity among youth. Nutrition education can play an important role in promoting a healthy lifestyle that incorporates adequate diet and sufficient physical activity (Prelip, Kinsler, Thai, Erausquin, & Slusser, 2012). This can be achieved by implementing programs that address a healthy affordable lifestyle among low-income individuals. To this effect, there are programs which focus on providing nutrition lessons to young children, as well as their parents and families, in order to reduce the prevalence of diet-related diseases.

Obesity in the United States

Prevalence of obesity among children and adults in the US is a leading nutritional health problem. Obesity has continuously increased since the 1970s. In the beginning of the 1970s, the prevalence of obesity was 5% for children ages 2-5 years, 4.0% for children ages 6-11 years, and 6.0% for adolescent's ages 12 -19 years. It reached 12.1% for children ages 2-5 years, 18.0% for children ages 6-11 years, and 18.4% for adolescent's ages 12-19 years between the years 2009–2010 (Ogden et al., 2010; Ogden et al., 2012b; Wang, 2011). In the late 1970s, 15.1% of adults were obese, whereas in 2009-10, 35.7% of adults were obese (Ogden et al., 2012b). When looking at the early 1990s, none of the states had an adult obesity prevalence rate of more than 25%.

In 2000, no state had obesity rates more than 30%, whereas in 2010, 37 states had obesity prevalence rates of 25% or more (CDC, 2010). According to the National Health and Nutrition Examination Survey approximately 66.3% of adults (≥20 years) were overweight or obese, 32.42% were obese, and 4.8% were extremely obese in 2003-2004 (Wang & Beydoun, 2007). Approximately two-thirds, 68.8%, of men were found to be overweight or obese as compared to 61.6% of women in 2001-2002 (Hedley et al., 2004). More recently, it was discovered that 37.5% of adults and 17.0% of youth/children were obese. The prevalence of obesity was higher in boys (18.6%) than girls (15.0%) (Ogden et al., 2012b). The percentage of children aged 6–11 years in the US who were obese increased from 7.0% in 1980 to nearly 20.0% in 2008 (Ogden et al., 2010). Infants and toddlers were found to be 9.7% above the 95th percentile of the weight-for-recumbent-length growth charts and 16.9% of children and adolescents from 2-19 years of age were obese in year 2009-10 (Ogden et al., 2012a).

Preschool children aged two to five who are described as obese have a much higher chance of becoming obese adults, as their likelihood increases four times when compared to normal weight children (Freedman, Khan, Dietz, Srinivasan, & Berenson, 2005). If the parents were obese, it is twice as likely that the children aged <10 years old will develop obesity in adulthood (Whitaker, Wright, Pepe, Seidel, & Dietz, 1997). Collective evidence stated that prevention is the best key to eliminate obesity related illnesses among children and adolescents. A continuous effort is needed to improve weight status and to reduce adiposity consumption in order to achieve a decline in blood pressure and to improve blood lipids (for example, total cholesterol (TC), high density lipoprotein (HDL-C), and triglycerides, insulin resistance, and inflammatory markers (Hayman et al., 2007).

Obesity among Low-Income and Minorities

Generally, rates of childhood obesity in the US are alarmingly high, yet there is a higher risk found among ethnic minority and low-income children. There is a huge gap represented in disparities between non-Hispanic White and Hispanics and non-Hispanic Black individuals in terms of healthy eating and physical activity (Kumanyika & Grier, 2006). Twenty nine percent of Mexican American male boys and 26.8% of non-Hispanic black girls have a higher likelihood of being obese as compared to 14.5% non-Hispanic white youth (Ogden & Carroll, 2010). Obesity levels are higher among children of low socioeconomic status (130% of poverty level); (boys, 21.1%; girls, 19.3%) compared with high (350% of poverty level); (boys, 11.9%; girls, 12%) (Ogden & Carroll, 2010).

In a study that associated food security and chronic disease, it was found that families from food insecure homes tend to alter their food choices according to a certain monthly food

budget as a coping mechanism (Seligman, Laraia, & Kushel, 2010). Low-income families adjust to their situation by reducing their food intake and changing food types. They choose to replace fruits, vegetables, and dairy, which are relatively expensive, with fast foods rich in empty calories and less expensive. Since food availability can pose a challenge, families are obligated to adopt a diet dense in calories and low in nutrition value, which makes them more prone to diet related chronic diseases.

Controlling calories to manage body weight is an essential principle, but following the recommended nutrition guidelines for calorie consumption is even more important. To achieve optimal results, nutrient-dense foods high in vitamins and minerals, and relatively few calories should be consumed. Nutrient-dense foods are lean, low in solid fats and sodium, with a minimum to no added sugars or refined starches. These qualities make the foods low in empty calories and high on essential nutrients. These foods contain naturally occurring components such as dietary fiber, which is included in vegetables, fruits, whole grains, fat-free or low-fat milk and milk products, seafood, lean meats and poultry, eggs, beans and peas (legumes), and nuts and seeds. These foods mentioned are nutrient-dense, especially if prepared without added solid fats, sugars, starches, and sodium (USDA, 2010).

Socio-Economic Status

Low-income status and poor food security are strongly associated with lower food expenditures, low fruit and vegetable consumption, and lower-quality diets. Low-income groups tend to consume high fat and high carbohydrate energy-dense diets. These foods are low in lean meats, fish, fruits and vegetables and this population is less likely to use up their disposable income on food. There is a strong link between poverty and obesity based on food

affordability. The economic framework provides a logical explanation between socioeconomic variables and obesity when taste, dietary energy density, and diet costs are used as intervening variables (Drewnowski & Specter, 2004).

Obesity rates are elevated among minority groups particularly Mexican-American and African-American children. In 1988 to 1994 15.4% of Mexican-American and 14.0% of African-American children were overweight or obese. Reported in 2009/2010 it was noted between the ages of 6-17 that 23.4% of Mexican-American and 25.7% of African-American were overweight or obese due to poor eating habits and lack of physical activity (Federal Interagency Forum on Child and Family Statistics, 2015).It was reported that Latino families endure poverty, experience food insecurity, and are more likely to experience higher rates of obesity as compared to White non-Hispanic households (USDA, 2012). In 2009, the Commodity Supplemental Food Program under the supervision of USDA stated that 12.9% Hispanic participants were part of the program (USDA, 2012).

There are key determinants for normal biological growth and maturation among children, which along with genetics and hormones include consuming an adequate diet (Malina, Bouchard, & Bar-Or, 2004; Tanner, 1962). Recent studies reported that food insecurity and being overweight exist among low-income populations. The prevalence of being overweight continues to be relatively high among food insecure children even though it was not found to be statistically significant (Eisenmann, Gundersen, Lohman, Garasky, & Stewart, 2011). In the United States, children are struggling with several nutrition related disorders leading to increasing obesity and food insecurity issues. In fact, 21.3% of the US children suffer from living in food insecure homes indicating that children are living in distressing financial conditions

without enough means to obtain healthy food choices nor enough food to sustain them (Nord, 2009). Quite a few studies indicate that, food insecurity is related to many negative outcomes, including poor general health and health limitations; increased hospitalization and psychological problems; clinical levels of psychosocial dysfunction; anxiety and depression; and academic performance (Alaimo, Olson, Frongillo, & Briefel, 2001; Carmichael, Yang, Herring, Abrams, & Shaw, 2007; Cook et al., 2004; Olson, 1999).

The relationship between food insecurity and obesity is a controversial topic nationally. NHANES has examined this topic for children (total n = 6995) among several age groups (3-5 years old, 6 -8 years old, 9-11 years old and 12-17 years old) and by gender and race/ethnicity (White, Black, and Hispanic). The incidence of combined overweight and obesity was at 28.8% among children in food-secure households. On the other hand, it was discovered that the prevalence of obesity was higher among children in food-insecure households at 38.8% ($p<0.01$). When considering controlling for age, gender, race, and poverty, the study reported an increase (32%) in the likelihood of being overweight/obese for children with food insecure households (Casey et al., 2006).

Studies investigating the effect of the Welfare Reform Act (1996) on the well-being of low-income children and families were completed with over 2400 low-income children ages 10 to 15 year olds and their mothers in low-income neighborhoods in Boston, Chicago and San Antonio. In these studies, there was no significant association between prevalence of overweight and obesity between food-secure and food-insecure children. It was reported that mothers of food insecure households to be stressed. These stressors included maternal employment status, self-esteem, and psychological distress. These stressors contributed to an

increased likelihood of being overweight or obese among adolescents (Gundersen, Lohman, Eisenmann, Garasky, & Stewart, 2008; Lohman, Stewart, Gundersen, Garasky, & Eisenmann, 2009).

A cross-sectional study performed at Hartford, on 212 children ages 2-12 years old found that the prevalence of overweight or obesity in food-secure children was 43%. Fifty-seven percent of food-insecure children were overweight or obese. The results were not statistically significant yet they indicate high rates of overweight and obesity among adolescents living in food-insecure homes (Martin & Ferris, 2007). Another study by Feinberg et al., confirmed a pattern of the increasing prevalence of overweight amongst food-secure (58%) and food-insecure (60%) black children. The researchers believe that their sample was not a perfect demonstration of the research site demographics at that area, as they were an urban population which was equally divided with half being Haitian children and the other half African–American children (Feinberg, Kavanagh, Young, & Prudent, 2008).

Food Insecurity

According to the United States Department of Agriculture food insecurity could be identified as limited or uncertain availability of nutritionally adequate and safe foods, or limited or an uncertain ability to acquire acceptable food in a socially acceptable way (Bickel, Nord, Price, Hamilton, & Cook, 2000; USDA, 2012). The United States government utilizes the Core Food Security Module (CFSM), a supplement to the Current Population Survey in order to assess food security. In 2006, The Economic Research Service (ERS) changed the term 'food insecurity' with 'hunger' to "very low food security" because of the extreme low food insecure status among the low-income population (USDA, 2012). Hunger is defined as a painful

continuous sensation in the stomach caused by lack of food or repeated involuntary lack of food access. The USDA identifies individuals as food insecure if they respond positively to one or more questions in the module. Severity of food insecurity depends on a number of positive responses to the questions.

Food insecurity in the United States remains a national concern (Nord, Andrews, & Carlson, 2008). Approximately, 14% of the US population was food insecure at some point during 2011. Almost eight million households in the US have children living in food insecure homes and nearly half of these homes (~3.9 million) were food insecure sometimes during the year. Moreover, 0.8 million children are living in households that are extremely food insecure (Coleman-Jensen et al., 2012).

Welfare, Children, and Families

The US government funded welfare programs in the 1930's during and after the Great Depression. These programs have been operating for almost sixty-one years as answers to the alarming rates of citizens who were living on little or no income. The eligibility of welfare programs relies on certain factors determined by each state independently. The main factors that are considered for eligibility are gross and net income, size of the family, and any crisis situation such as medical emergencies, pregnancy, homelessness, or unemployment. Each state is provided with a grant known as Temporary Assistance for Needy Families (TANF). The type and amount of aid varies between states. Most states offer fundamental aid such as health care, food stamps, child care assistance, unemployment, cash aid, and housing assistance (Moffitt, 2008).

In the United States twenty million households with children participate in the Supplemental Nutrition Assistance Program (SNAP), formerly known as the Food Stamp Program. Two other food and nutrition programs are the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), and the National School Lunch Program (Nord et al., 2008). A study conducted by Jones et al., confirmed that participating in federally funded food assistance programs could improve the health status, particularly weight status among food insecure children. This study had a sample of five to twelve year olds living at 185% of poverty. The prevalence of being overweight in childhood varies by household food security status and could be influenced by involvement with food assistance programs within low-income households. Results of logistic regression showed that food-insecure girls, but not boys, who partook in food assistance programs had a considerable reduction in the chance (OR 0.32; 0.12–0.77 95% confidence interval) of being overweight when compared with food-insecure girls who were not part of any assistance programs (Eisenmann et al., 2011).

Obesity and the Food Environment

Studies examining the relationship between the food environment and weight status, have found that communities with a larger number of fast food or quick-service restaurants tend to have higher BMIs (Stewart, Blisard, & Jolliffe, 2006). Since the 1970s, the number of fast food restaurants has more than doubled. Further, the proportion of daily caloric intake from foods eaten away from home has increased (Stewart et al., 2006). When children, adolescents, and adults eat out, particularly at fast food restaurants, they are at an increased risk of gaining weight, being overweight and obese. The strongest association between fast food consumption and obesity occur when one or more fast food meals are consumed per week. As a result of the

changing food environment, individuals need to deliberately make healthy food choices, both at home and away from home. Those food choices need to consist of nutrient dense, low in calories, and should be appropriate in portion size (USDA, 2010).

Childhood and adolescent obesity rates could increase due to various environmental factors including: adapting to parent's poor dietary habits; increasing consumption of processed foods; having children and adolescents being in-charge of their own meals without adult supervision; and eating in front of a distraction like a TV or computer. Parents have a very important role in determining their child's well-being. Parenting styles could influence a child's risk for obesity. Children's contexts, such as the home and school environments, could promote unhealthy eating and limited exercise habits that could contribute to obesity. The home environment has a lasting effect on children's weight patterns and health habits. Within the home environment the most appropriate age for behavior change intervention is during adolescence. Children during adolescence are willing to accept changes easily and maintain those habits, which is a possible solution to eradicating obesity (Rosenkranz & Dzewaltowski, 2009).

Consequences of Obesity

Being obese or overweight increases risks for a set of illnesses and chronic diseases, including factors leading to cardiovascular disease, such as high cholesterol or high blood pressure (USDA, 2010). In a population-based sample of 5- 17 year olds, 70% of obese youth had at least one risk factor for cardiovascular disease (Freedman et al., 2007). Obese children have a higher risk of acquiring pre-diabetes, a condition in which blood glucose levels are elevated, indicating a high risk for the development of diabetes. There is also a greater likelihood of

overweight and obesity extending into adulthood with added consequences (CDC, 2011; Li et al., 2009).

Many of the associated complications and diseases may require medication and hospitalization which may impact the finances at the family level, as well as at the national level. Studies have shown that obesity related healthcare costs amount to $147-$210 billion per annum (Cawley & Meyerhoefer, 2012; Finkelstein, Trogdon, Cohen, & Dietz, 2009).

Lifestyle and genetics are strong contributors in increasing the risk for any chronic disease. It has been established that conditions like cardiovascular disease, diabetes, and hypertension are important health considerations as they are more prevalent among low-income obese populations. Early cross-sectional studies have confirmed that dietary habits varied due to different factors such as socioeconomic, demographic, behavioral, lifestyle, and physical activity levels (Deshmukh-Taskar et al., 2007).

Cardiovascular Disease

Cardiovascular diseases (CVD) particularly atherosclerosis is the number one cause of death in the US. The disease is prevalent across different populations such as older audiences, gender (particularly males) who have a family history, and individuals who have hypertension, dyslipidemia, diabetes, cigarette smoking, and/or obesity are at higher risk. Genetics and lifestyle are two main contributors. Family history is the primary contributor and non-modifiable. Lifestyle domains can be altered to improve the outcomes that include diet, physical activity, and smoking (Daniels, Pratt, & Hayman, 2011). Passive smoking may be one of the main factors that deteriorates cardiovascular status and vascular function in children by increasing unfavorable high-density lipoprotein levels (Metsios, Flouris, Angioi, & Koutedakis,

2011). Globally, 700 million children are exposed to environmental tobacco smoke, even though different measures are adopted by countries to eradicate indoor smoking (Rushton, 2004).

Studying atherosclerosis from childhood to adulthood is complex. One study reported that autopsies of young adults who died from accidental causes had atherosclerosis. They found that the adults had relatively advanced levels of atherosclerosis, including fibrous plaques (Berenson et al., 1998; McGill, McMahan, Malcom, Oalmann, & Strong, 1997; McGill et al., 2001). Focusing on preventive medicine is a fundamental step to eliminate pre-existing conditions for diseases among children and any direct association with CVD risk factors that could advance toward adulthood. It is crucial to emphasize strategies to prevent cardiovascular diseases and their risk among low-income children and their families so they can enjoy a better quality of life in the future.

Diabetes

Diabetes mellitus (DM) is a disease in which the blood glucose levels are elevated because of a defect in insulin production or action. Insulin is a hormone that the body needs to absorb and use blood glucose (sugar) to generate energy for the body to function. Insulin has its own functional signaling system that cannot be interrupted because it controls blood glucose levels that should not be elevated. Any elevation in blood glucose level leads to a series of metabolic abnormalities causing further complications and premature death. Diabetes can be controlled and its complications avoided through diet and insulin management (CDC, 2011). The most common types of diabetes are: Type 1 diabetes, Type 2 diabetes, Gestational diabetes.

Formerly known as insulin-dependent diabetes mellitus (IDDM) or juvenile-onset diabetes. Type 1 diabetes occurs as a result of the body's lack of ability to generate insulin. The disease function develops as the body's immune system destroys pancreatic beta cells, which are the only known cells in the body that produce insulin. The only known mechanism to control type 1 diabetes is to inject or pump insulin into the body. This particular type of diabetes is prominent among children and young adults; however; the chances for type 1 diabetes to occur among adults are much lower, approximately 5% of all diagnosed cases of diabetes. The causes of type 1 diabetes are autoimmune, genetic, or environmental (American Diabetes Association, 2016).

Previously known as non–insulin-dependent diabetes mellitus (NIDDM) or adult-onset diabetes. Type 2 diabetes occurs because of the body's resistance to the action of insulin and insufficient insulin production. It is most prevalent among adults with 90% to 95% of all diagnosed cases. Insulin loses its functional role when the body resists or does not use insulin properly. The body loses its ability to produce insulin because of the rising demand needed. Type 2 diabetes is more prevalent with older age, obesity, family history of diabetes, history of gestational diabetes, impaired glucose metabolism, physical inactivity, and race/ethnicity. It was established that ethnicity is strongly associated with increasing prevalence of type 2 diabetes, as it was found that minority groups are at a higher risk of type 2 diabetes and its complications (American Diabetes Association, 2016). These groups include African Americans, Hispanic/Latino Americans, American Indians, and some Asian Americans and Native Hawaiians or other Pacific Islanders. The chances of developing type 2 diabetes among children and adolescents are low; however, it is diagnosed at higher rates among American Indians, African

Americans, Hispanic/Latino Americans, and Asians/Pacific Islanders. Minority populations are more frequently affected by type 2 diabetes and they constitute 25 percent of all adult patients with diabetes in the United States and represent the majority of children and adolescents with type 2 diabetes. Diabetes prevalence rates among American Indians are two to five times those of whites. On average, African American adults are 1.7 times as likely to be affected by type 2 diabetes and Mexican Americans and Puerto Ricans are twice as likely to have the disease as non-Hispanic whites of similar age (ODPHP, 2012).

The third type of diabetes is gestational diabetes, which is a form of glucose intolerance during pregnancy. It can result in prenatal complications in mother and child leading to a higher chance of a cesarean section. This temporary elevation in blood glucose level may turn into chronic type 2 diabetes post-partum. It has been found that African Americans, Hispanic/Latino Americans, and American Indians have a higher likelihood to be diagnosed with gestational diabetes along with obese women and women with a family history of diabetes. In the case of a pregnant woman being diagnosed with gestational diabetes an immediate course of treatment would be to adjust maternal blood glucose levels to reduce the risk of complications in the infant (American Diabetes Association, 2016).

There are other types of diabetes that are caused due to unusual genetic conditions such as maturity-onset diabetes of youth, surgery, medications, infections, pancreatic disease, and other illnesses. These represent 1% to 5% of all diagnosed cases (CDC, 2011). National statistics reported that approximately 25% of Americans with DM are undiagnosed, and another 57 million Americans have blood glucose levels that increase the risk of developing DM

in the future (CDC, 2008). See Table 1 for further information regarding diabetes rates by age based on data from 2010.

Table 1: American Diabetes Rates by Age

Years	Age	US Residents with Type 1 & 2 Diabetes
2010	≥20 years old	1.9 million (newly diagnosed)
2010	<20 years old	215,000 people
2010	>65 years old	10.9 million

Source: CDC, 2011

DM affects an estimated 23.6 million people in the United States and is the 7th leading cause of death as it lowers life expectancy by up to 15 years (CDC, 2011). DM can increase the risk of heart disease by two to four times. DM is the leading cause of kidney failure, lower limb amputations, and adult-onset blindness (CDC, 2008; Portuese & Orchard, 1995). In addition, the estimated total financial cost of DM in the United States in 2007 was $174 billion, which includes the costs of medical care, disability, and premature death (CDC, 2011).

Blood Pressure

Another chronic disease that is known to accompany obesity is elevated blood pressure. Rates that exceed 140/90mmHg (over 95 percentile) on three separate occasions were not within the expected rates (American Academy of Pediatrics, 1996). When measuring elevated blood pressure, health care individuals compare and associate blood pressure levels with normal individuals and consideration is given to age, sex, and height. According to a report from the NHLBI, elevated blood pressure levels among children are alarming and action is needed to target children to improve their health status. For an individual to be considered pre-

hypertensive, his/her blood pressure should be between the 90th and 95th percentiles based on age, sex, and height (American Academy of Pediatrics, 2004; Falkner, 2010).

Hypertension is identified by systolic or diastolic elevated blood pressure above the 95th percentile on a regular basis. Stage 1 hypertension is present when blood pressure is above the 95th percentile but below the 99th percentile plus 5 mm Hg (~12mm Hg above the 95th percentile). Stage 2 hypertension is present when blood pressure is above the 99th percentile plus 5 mm Hg (American Academy of Pediatrics, 2004). Clinically, pre-hypertensive patients would be recommended to change their lifestyle in order to improve their health condition. Changes include reducing BMI if needed, limit or lower dietary sodium, improve diet, and enhance physical activity time in order to improve their blood pressure rates. Collective evidence supports that hypertension is one of the leading diseases that is associated with obesity. Much effort is needed to eliminate hypertension among youth in order to improve the quality of life (American Academy of Pediatrics, 2004).

Factors Contributing to Obesity

Dietary Pattern and Quality of Food Consumed

There are certain factors that affect the number of calories a person should consume each day based on age, gender, height, weight, and level of physical activity. The average daily caloric range for an adult woman is between 1,600 to 2,400 calories per day, whereas for adult men the range per day is between 2,000 to 3,000 calories. An active lifestyle should be promoted and encouraged. It has been estimated that young children need 1,000 to 2,000 calories per day and older children need 1,400 to 3,200 calories per day, with boys generally needing more calories than girls (USDA, 2010).

Identifying caloric needs based on age and gender is a suitable method to assess how much a person needs to consume each day. Some appropriate ways to maintain caloric consumption among adults are:

- Responding to internal cues of hunger and satiety,
- Watching body weight, and
- Adopting a sufficient amount of caloric intake based on changes in weight status and level of physical activity.

Similarly, in children, the treatment for obesity or overweight should include:

- Implementing healthy eating habits,
- Motivating families to participate in physical activity,
- Establishing proper clinics/offices to monitor and care for these children, and
- Utilizing a case based approach that does not impact their appropriate growth.

Dietary macronutrients, such as dietary fat, carbohydrates, and micronutrients, such as sodium and calcium, could contribute to the increasing risk of cardiovascular disease (CVD) (USDA, 2010) .

Low-income status and poor food security are strongly associated with lower food expenditures, low fruit and vegetable consumption, and lower-quality diets (Blaylock, Smallwood, Kassel, Variyam, & Aldrich, 1999; Kaufman, MacDonald, Lutz, & Smallwood, 1997). Individuals with lower incomes tend to consume high fat, high carbohydrate energy-dense diets, and lower lean meats, fish, fruits, and fresh vegetables. Although controversial, some researchers suggest an inverse relation between energy density (MJ/kg) and energy cost ($/MJ), such that energy-dense foods are more affordable for low-income families. These

energy dense foods are sources of empty calories and high energy intakes. These foods attribute to a link between poverty and obesity based on their affordability (Drewnowski & Specter, 2004).

Fruits and Vegetables

The recommended consumption for Americans based on food intake patterns is a minimum of two to four servings/day of fruits and three to five servings/day of vegetables. This recommendation promotes the slogan "5-9-A-DAY" (USDA, 2010). For children, the daily recommendation is 1-2 cups of fruit and 1-2 ½ cups of vegetables, depending on age, gender, and physical activity level. It was reported that few Americans meet these recommendations on their daily dietary patterns (USDA, 2010). Availability and accessibility are consistently shown to be important correlating factors to improve fruit and vegetable intake among families. Parental practices that promotes consumption of fruits and vegetables is also related with increasing consumption of fruits and vegetables (Dave, Evans, Pfeiffer, Watkins, & Saunders, 2010).

Fruit and vegetable intake is linked with decreased risk of many chronic diseases. Adequate intake of fruits and vegetables, a minimum of 2.5 cups per day, is believed to reduce the risk of cardiovascular diseases, such as heart attacks and stroke, and could improve the body's immunity for some types of cancer (USDA, 2010). Consuming fruits and vegetables without added fats or sugars might increase the likelihood of maintaining a healthy body weight for adults and children (USDA, 2010).

A study investigated the association between fruit and vegetable consumption and being overweight. In one national representative study, the study discovered a link between lower intake of fruit and being overweight in both boys and girls. The relationship between

lower intake of vegetables and being overweight was only found with boys (Lin & Morrison, 2002). Research confirmed that children do not consume adequate amounts of vegetable compared to the other food groups (Baranowski et al., 1997).

Fruit Juice

Ideally, fruit intake should comprise whole fruits including fresh, canned, frozen, and dried forms. It is preferable to drink 100% juice rather than fruit drinks with added sugars. Relying on 100% fruit juice as a source of needed nutrients in the diet is not the ideal approach to consuming fruits because juice lacks dietary fiber. Fruit juice needs to be consumed in moderation since it could lead to excess calories (USDA, 2010). When extracting juice from fruit the main aim is to provide the highest possible nutrients and benefits. In the market there is a wide range of choices when it comes to beverages. The package labeling should state the existing percentage of juice in a beverage. Some of those beverages state that it contains 25% juice or a 100% juice or that it could provide a 100% of a certain nutrient on a daily basis. A beverage would only be considered a 100% juice if the food label states this; otherwise it will be considered to be a sweetened juice drink with minimum juice content. It is advised to consume fruit canned in 100% juice rather than in syrup (USDA, 2010).

By the recommendation of the American Academy of Pediatrics, fruit juice consumption should be limited to an intake of 4 to 5 oz. per day for children 1-6 years of age, and from 8-12 oz. per day for children 7-18 years of age (American Academy of Pediatrics, 2001). In a longitudinal study among children aged 9-14 years of age, it was found that there is an association between consuming sweetened beverages including fruit drinks and an increased BMI (Berkey, Rockett, Field, Gillman, & Colditz, 2004). The choice of reducing or eliminating

intake of sweetened sugared beverages might be the least difficult and most-effective method to reduce ingested energy levels and prevent obesity (Striegel-Moore et al., 2006).

Grains

There are two types of carbohydrates: simple and complex. The difference in classification is determined from the chemical structure and the speed that sugar needs to be digested and absorbed in the body. The chemical composition of simple carbohydrates is one or two sugars. Simple sugars are added to foods, soda, and candy. These sugars also include table sugar which quickly dissolves in the mouth and into the body. These sugars are considered a high source of ''empty calories''. There are other simple carbohydrates that are natural and beneficial in terms of vitamins, minerals and fibers, such as fructose (fruit) and lactose (milk). Complex carbohydrates, also referred to as "starches", are made of three or more connected sugars. They are digested more slowly, and found in grains such as bread, pasta, oatmeal, and rice. Vegetables are rich in complex carbohydrates, such as broccoli, corn, and legumes (kidney beans, lima beans, and chick peas) (USDA, 2010).

Americans consume sufficient amounts of grains but most of them are refined grains instead of whole grains. Refined grains, in most cases, are a high source of solid fats and added sugars, whereas whole grains are a rich source of nutrients such as iron, magnesium, selenium, B vitamins, and dietary fiber, depending on the type of whole grain. Studies reported that consuming whole grains could reduce the risk of cardiovascular disease and overweight (Ye, Chacko, Chou, Kugizaki, & Liu, 2012).

Current recommendations suggest that at least half of all grains consumed should come from whole grains to optimally achieve needed nutrients. Less than 5% of Americans consume

the daily recommended amount of whole grains (3 ounce portion). The average American population was consuming less than a one ounce-portion of whole grains per day (USDA, 2010).

Children who are five years old should consume at least 10 g of fiber per day until they are 15 years old. They should gradually increase their intake to that of an adult levels (20–25 g per day). Research reports that the actual consumption of dietary fiber throughout childhood and adolescence is about12 g per day or 5 g/1000 kcal (4200 kJ)(USDA, 2010). Epidemiological studies emphasize the importance of fiber intake as it is crucial for body weight regulation among free-living individuals consuming self-selected diets (Pereira & Ludwig, 2001). Consuming a fiber rich diet that includes non-starchy vegetables, fruits, whole grains, legumes, and nuts might have a positive effect on eliminating childhood obesity and reduce the probability of cardiovascular disease and type 2 diabetes (Bazzano, He, Ogden, Loria, & Whelton, 2003; Eshak et al., 2010; Liu et al., 2002).

Beans and Peas

Legumes appear to be wholesome foods. They contain an excellent source of protein along with many other beneficial nutrients similar to animal proteins, such as iron and zinc. Beans and peas are a good source of potassium and folate that are present in vegetables.

Green beans and green peas are not grouped with legumes since they have a higher starch content. They have characteristics similar to certain vegetables such as onions, lettuce, celery, and cabbage. The US Dietary Guidelines For Americans 2010 recommends ½ cup to 1 ½ cups per week of beans and peas for children with calorie requirements of 1000-2000 per day (USDA, 2010). The National Health and Nutrition Examination Survey for adults aged $\geq$19 reported that on a given day, only 7.9% of adults consume dry beans and peas. It was found

that Hispanics tend to consume beans and peas at a higher rate compared to other racial groups (Mitchell, Lawrence, Hartman, & Curran, 2009).

Milk and Dairy Products

Milk and dairy products contain protein and are a dietary source of many crucial nutrients including calcium, vitamin D, and potassium. Several studies reported that consuming milk and dairy products are associated with optimal bone health for adults, adolescents, and children. It has been shown that milk consumption is linked to reducing the risk of cardiovascular disease, type 2 diabetes, and high blood pressure among adults (USDA, 2010).

The intake of milk and fortified soy beverages is less than the recommended amount among adults, children, and adolescents from 4-18 years, and children between 2-3 years old(USDA, 2010). The recommended amount of milk and dairy products are 2 cups per day for young children two to three years old. For children aged 4-8 years it is recommended to consume 2.5 cups per day, and three cups per day of fat-free or low-fat milk for adults, children, and adolescents ages 9-18 years. It was reported that milk consumption is less among females as compared to males. Milk consumption declines with age (USDA, 2010).

The most consumed milk in the US is reduced fat (2%) or whole (full-fat) milk. Fat free (skim) or low-fat (1%) milk are less consumed (USDA, 2010). Half of milk and dairy products are in the form of whole fat cheese. Consuming fat-free milk, low-fat milk, and low-fat cheeses offer the same amount of nutrients with less solid fats, which can lead to lower caloric intake sand improve weight status (USDA, 2010).

The habit of drinking milk should be promoted among young children to promote lifelong dietary patterns and promote bone health. Populations with lactose-intolerance are

recommended to find alternative sources to milk in the form of low-lactose and lactose-free milk products in order to meet their recommended needs of protein, calcium, potassium, magnesium, vitamin D, and vitamin A. These alternative sources include soy beverages that are fortified with calcium, vitamin A and D. They can be used for food preparation as well (USDA, 2010).

Protein

Protein provides amino acids that assist in building and preserving body muscle and tissues. The main sources of proteins are animal and plant foods. Animal-based protein foods are seafood, meat, poultry, eggs, milk, and other dairy products. Plant sources of protein include beans and peas, nuts, seeds, and soy products. The current recommendations for all forms of protein for youth is between 2-5 ½ ounces per day, depending on age, gender, and activity level (USDA, 2010). Based on data from the National Health & Nutrition Examination Survey protein intake averages around 14g/day in young children and increases to around 91 (± 22) gram per day for adults ages 19-30. The amount decreases for seniors to (66± 17) gram per day. The intake of protein accounts for 13.4% of calories for children aged 4-8 years and 16.0% for adult men aged 51-70 years (Mitchell et al., 2009).

Fat content and its consumption is an important issue when consuming meat, poultry and eggs as they are considered a source of solid fats. Seafood, nuts and seeds contain oil, offer healthy fats, and are considered healthier choices when compared to solid fats. It was reported that some individuals are exceeding their needed total intake of protein food, whereas others are consuming much less than they are required. Meat, poultry, and eggs are the most frequently consumed proteins. Seafood, beans and peas, soy products, nuts, and seeds are not

consumed as much or as often. A wide range of proteins could provide a wholesome diet leading to improved intake of nutrients and health outcomes if consumed along with other nutrients within calorie goals. The consumption of peanuts, walnuts, almonds ,and pistachios has been linked with improved reduction of cardiovascular disease risk factors when consumed as part of the daily diet (USDA, 2010). One issue to consider when consuming nuts and seeds is their high oil content, which contributes to high calories. Therefore, they should be consumed in moderation (USDA, 2010).

Seafood

Seafood consumption in the United States is currently 3.5 ounces per week, which is lower than the recommended intake. The importance of seafood is derived from its ability to provide certain unique nutrients, such as omega-3 fatty acids, especially acid (EPA) and docosahexaenoic acid (DHA). Some studies showed that consuming 8 ounces of seafood per week provides an average of 250 mg per day of EPA and DHA, which are linked to reducing cardiac deaths among individuals who are either with or without pre-existing cardiovascular disease (USDA, 2010). The consumption of seafood should be increased to achieve optimal benefits. The amount of EPA and DHA vary depending on the type of seafood. It is preferable that higher consumption should be from types that are rich in EPA and DHA. Children should be encouraged to consume them in small amounts. When consuming seafood, methyl mercury represents a concern, however, the benefits of eating appropriate seafood within the recommended amounts compensates for the risks associated with it (USDA, 2010).

Seafood consumption provides many benefits for the population in general and particularly during fetal growth and development. Consuming seafood within the

recommended amount is beneficial for pregnant or breastfeeding women as it is strongly linked with improved infant health, such as visual and cognitive development. Women who are pregnant or breastfeeding are recommended to consume on a weekly basis from 8-12 ounces of seafood that is lower in methyl mercury (USDA, 2010).

Sodium

Sodium is an essential nutrient that the body requires only in small quantities. Collective evidence links the consumption of sodium with individuals' blood pressure level (USDA, 2010). Studies indicate that a reduction in sodium intake positively decreases blood pressure in select adults and children. Maintaining a sound blood pressure range will inhibit many diseases such as cardiovascular disease, congestive heart failure, and kidney disease. As a result, it is highly recommended to minimize the intake of sodium (USDA, 2010).

The vast majority of Americans consume sodium in higher quantities compared to what they need. Americans aged ≥2 years consume around 3,400 mg of sodium per day. Salt could be consumed directly as in table salt or could be hidden within other ingredients while cooking or processing food, curing meat, baking, masking flavors, retaining moisture, and enhancing flavors (USDA, 2010). The upper limit for sodium consumption is 2300 mg per day for children younger ≤14 years old and 1500 mg per day for ≥9 years or older (USDA, 2010).

Fats and Oils

Fats can be found in either plants or animal foods. They are a source of some essential fatty acids. These essential fatty acids are essential for the body as they help with absorption of the fat-soluble vitamins A, D, E, and K. Acceptable intake ranges of fat consumption have been established by the Institute of Medicine (IOM) (USDA, 2010) See Table 2.

Table 2: Daily Recommendations for Fat and Oils

Fat and Oils by Age	Percent of Daily Calories From Fat and Oil
1-3 years	30 to 40%
2-18 years	25 to 35%
19 years and older	20 to 35%

Source: USDA, 2010

There are different types of fats including saturated, unsaturated (monounsaturated, and polyunsaturated) and transfatty acids. Some fats are considered healthy for the body and others harmful. Healthy fats are monounsaturated and polyunsaturated fats whereas unhealthy ones are saturated and Trans fat. Fat can be found either naturally in some foods or added with food preparation. Consumption of fat is a concern for most Americans as they consume it in un-balanced ratios. There is a higher consumption of saturated and trans fatty acids when compared to unsaturated fatty acids (USDA, 2010).

Solid Fats and Added Sugars

In the US Dietary Guidelines for Americans 2010, a new term was developed, solid fats and added sugars (SoFaS), to describe an excessive consumption of sugars and solid fats as an increasing issue in the U.S. Currently, Americans consume 35% or nearly 800 calories of SoFaS per day. The most popular example includes fruit-flavored drinks, fruit juice drinks, and fruit punch. According to the USDA Food Patterns, between 5% and ≤15% of calories from solid fats and added sugars can reasonably be consumed by a majority of people in order to meet nutrient needs within caloric limits (USDA, 2010).

Physical Activity among Americans

Individuals who are physically active at a young age have an increased likelihood to continue to be physically active into adulthood. Data have shown a strong association between the benefits of physical activity and maintaining a healthy lifestyle (Strong et al., 2005). Other studies indicate that being physically active has regularly many advantages: (Strong et al., 2005; Trost & Loprinzi, 2008).

- Improved cardiovascular fitness,
- Increased bone mass,
- Improved psychological well-being,
- Decreased risk of obesity, and
- Reduced elevated blood pressure

Several observational studies support the claim that among children and adolescents (4–18 years of age) and young adults (19–21 years of age) there is a positive correlation between sedentary behavior and having adverse lipid profiles, increased levels of obesity, and related cardiovascular risk factors, including hypertension and insulin resistance (Janz, Dawson, & Mahoney, 2003; Raitakari et al., 1997). Many longitudinal studies performed among young Finns support the evidence that having a physically active lifestyle would indicate an optimal cardiovascular profile (Janz et al., 2003; Raitakari et al., 1997).

Being physically active poses many challenges, including imbalanced caloric expenditure. Many Americans, due to their work, are confined to being sedentary. Their physical environment may not make it feasible for them to be physically active. For example, a lack of sidewalks or even safe public parks may inhibit exercise. One third of American adults

participates in leisure-time physical activity on a regular basis, whereas about one-third are considered inactive and these rates decline by age. A national survey that monitors physical activity among children found that 42% of children ages 6-11 years were involved in 60 minutes of physical activity each day, whereas only 8% of adolescents achieved this goal. Adults were less active, 5%of them took part in 30 minutes of physical activity each day and met the recommended weekly goal of at least 150 minutes (Troiano et al., 2008).

In order to maintain a healthy balanced lifestyle, the major contributors that support a calorie balance with food intake are weight management and physical activity. The U.S. Department of Health and Human Services in 2008 issued recommendations of brief physical activity for Americans aged 6 years and older. The main highlights for the 2008 Physical Activity Guidelines for Americans included weight management and health consequences including premature death, diseases such as coronary heart disease, type 2 diabetes, and osteoporosis (ODPHP, 2008).

Engaging in physical activity has several benefits. It can help a person maintain a healthy weight or achieve weight loss, if needed, when combined with low caloric consumption. Research in adult populations reported any decrease in sedentary activity such as television viewing and engaging in some type of physical activity is associated with improved weight maintenance among children, adolescents and adults (USDA, 2010). It is recommended for adults to perform an equivalent of 150 minutes of moderate-intensity aerobic activity each week to achieve a healthy body weight. By gradually reaching the targeted amount of physical activity time, along with reducing caloric intake, a balanced weight can be achieved. Some adults require a higher level of physical activity due to a higher caloric intake when compared to

others. These other adults might require more than the equivalent of 300 minutes per week of moderate-intensity activity (USDA, 2010).

Recommendations for Maintaining a Healthy Lifestyle

The most important issue in maintaining a healthy lifestyle is to monitor dietary intake and to substitute high density caloric foods with nutrient-dense foods and beverages relatively low in calories. The United States has a broad collection of nutritious foods available. Presently, the consumption of vegetables, fruits, whole grains, milk and milk products, and oils are lower than recommended amounts. The lack of sufficient amounts of nutrients particularly potassium, dietary fiber, calcium, and vitamin D in the diet of American adults and children is a major public health concern. Folic acid is low in consumption and a source of concern for the health of pregnant women (USDA, 2010).

USDA recommends these guidelines to control caloric intake and maintain body weight (2010):

- Individuals should increase the consumption of whole grains, vegetables, and fruits. Studies reported that those adults who have a higher intake of whole grains would lower body weight compared to adults who eat fewer whole grains.
- The intake of sugar-sweetened beverages should be reduced; there is a strong indication that people who consume more sugar-sweetened beverages have higher body weight in comparison to those who drink less. Sugar-sweetened beverages are high in empty calories and contain very few essential nutrients to the diet.
- The consumption of 100% fruit juice should be monitored for overweight or obese children and adolescents. Evidence states that increased consumption of 100% fruit juice is associated with increased body weight for obese or overweight children.
- Reading nutrition fact labels on food packaging allows individuals to be aware of the caloric content of foods and beverages they are about to consume.
- While dining out individuals who are trying to watch their caloric intake should choose smaller portions or lower-calorie options. Sharing a meal or taking home part of the meal are good choices. It is advisable to review the calorie content of foods and beverages. Sometimes the caloric value is on the menu, food wrappers, or online. It is always preferable to cook and eat more meals at home as individuals have control over ingredients.

- Individuals should serve and consume smaller portions of foods and beverages particularly if they are high in calories as it is associated with weight loss and maintenance over time.
- Consuming a nutrient-dense breakfast regularly was linked to weight loss and weight loss maintenance, along with enhanced nutrient intake. Skipping breakfast is related to excess body weight, especially among children and adolescents.
- Screen time should be limited for all ages as it encourages over eating resulting in increased rates of overweight and obesity. Therefore screen time (watching TV, playing electronic games, or using the computer) should be limited to not more than 1-2 hours each day, and should not be combined with eating at the same time.

Socio-Ecological Model

Socio-Economic and Environmental Influences

The US has become an obesogenic environment fostering unhealthy eating and low physical activity levels. Individuals are not meeting dietary or physical activity recommendations and contributing to the creation of unhealthy social, cultural, and physical environments in society. A collaborative effort is needed to change the current health status. In addition to cultural and social norms around food and activity, a coordination should occur between different sectors of the community to improve food access and availability. Collaborative efforts are needed within a community, which includes individuals and families, educators, organizations, health professionals, small and large businesses, and policymakers. Individuals in a society can contribute to changing and improving the American health landscape.

The Social-Ecological Model is a framework to help understand how different layers and factors influence a behavior as a prevention tool. This model assesses and considers all segments of the community and how to build active relationships between individuals and families, environmental settings, and numerous sectors of influence along with the effect of social and cultural norms and values. Generally there are four-levels of the social-ecological

model to achieve better understanding of an issue and the possible influence of the suggested prevention approaches (Dahlberg & Krug, 2002). The socio- ecological model builds upon Bronfenbrenner's model that the development of a child is embedded in multiple influences ranging between a child's experience such as the family to more distal influences like policies in place of federal and state laws (Birch & Anzman, 2010; Neumark-Sztainer, 2005).

Individual factors

A combination of individual factors including age, gender, income, race/ethnicity, genetics, and the presence of a disability can shape and determine an individual's food intake and physical activity pattern (Birch & Anzman, 2010; Neumark-Sztainer, 2005).

*E*nvironmental Settings

Individuals make multiple food and physical activity decisions each day in different community settings such as schools, workplaces, faith-based organizations, many recreational facilities, foodservice, and food retail establishments. The food and activity opportunities there can influence a person's choices (Birch & Anzman, 2010; Neumark-Sztainer, 2005).

Sectors of Influence

The community usually influences several divisions of the government, public health, health care systems, agriculture, industry, and media. Each of those divisions has its own unique way of determining the extent to which a community has access to healthy opportunities for individuals and families within their own communities.

Social and Cultural Norms and Values

Social norms are laws that regulate society's thoughts, beliefs, and behaviors. These regulations are assumed to be acceptable behaviors, values that are shared and recognized

among a community and are being practiced in all levels of society from law administration to personal encounters. In terms of healthy eating and physical activity, cultural norms influence attitudes and attitudes towards health, food, and exercise. Each culture has its own unique understanding of what a person's body shape should look like, appropriate body weight, how much he/she should consume and how much time they are to spend on physical activity respectively. This may vary greatly from location to location and can also drive changes to the environment. Trying to commit to healthy choices could be challenging among certain societies particularly if those societies were not supportive of such healthy values (USDA, 2010).

Six C's Model

The dynamics of food consumption to socialization practices and media influences along with contextual factors like poverty and culture among children have been illustrated by using both the ecological framework (Bronfenbrenner, 1979) and the specific concept of the Six-C's model (Harrison et al., 2011). Both collaborations investigated factors that contribute to a child's eating patterns, being overweight, and obese.

The Six-C's model focused on influences that feed certain practices by parents such as eating practices, meal times, and influences of media in a household. Parents, particularly mothers, have a strong influence on their child's development. Consuming a healthy diet can influence the health status of a community (Kunkel, McKinley, & Wright, 2009; Sandstead, 2003).

Maintaining a healthy diet could also have serious consequences on the socio-emotional development, self-regulation processes, and brain development of a child. These factors are all inter-related in the home environment and the social interactions that involve food. The

practices used to consume food and the socialization practices in households will be discussed in detail and will be based on the ecological framework and the Six-C's model (Barbara, Fiese, & Jones, 2012).

Cell

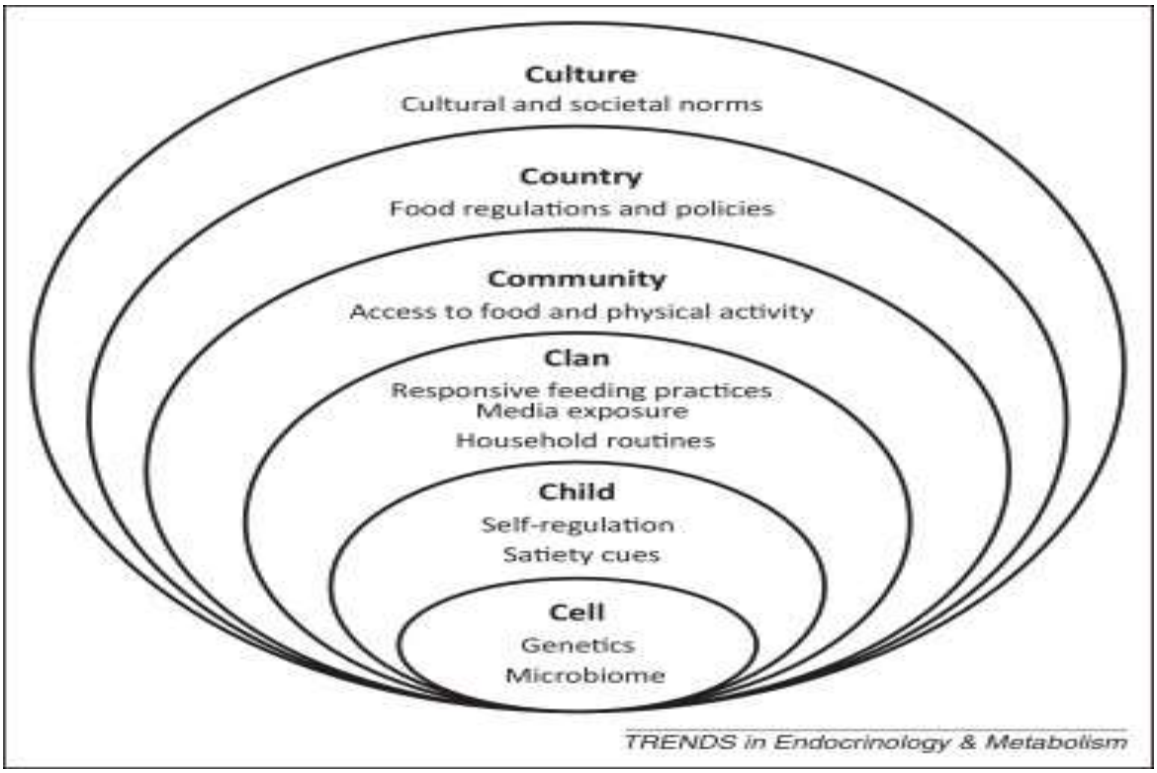
The cell level represents the role of genetics and biological predisposition. There is little known about how genetic variation accounts for specific weight variation. Research suggests that only one to two percent of the variance of weight is explained by polygenes such as fat mass and obesity-associated protein (FTO) and melanocortin receptor 4 (MCR4) that controls fat consumption (Hinney, Vogel, & Hebebrand, 2010). It was discovered that an obvious direct association between eating behaviors among four year old children with a higher risk of FTO genes consumed more food than low FTO gene children (Wardle, 2009). Studies reported that genetic variation could possibly contribute to the signals of fullness and satiety (Harvey & Ashford, 2003) .

Child

Child level represents the behavioral characteristics typically under the child's control. Children develop their food preferences and proclivities based on the genetic vulnerabilities or protective features from an early age. Children's food preference reasons may differ; some of them are related to different individual sensory makeup or have an association with self-regulatory processes such as inhibitory control. Also, young children particularly preschoolers may develop the habit of 'picky' eating. For example, children may restrict types, textures, and colors of foods that they may or may not consume. A study with parents of infants and toddlers who were surveyed on a national scale reported that half of the parents stated that their

children were consistently unwilling to try new foods or have restricted food choices (Carruth, Ziegler, Gordon, & Barr, 2004).

Figure 1: Six-C's Model of Food and Family (adapted from Harrison et al., 2011)



Another longitudinal study (18 months) stated that picky eating could be episodic whereas only 5% of the children maintained a picky eating habit throughout three time measurement periods (Dubois, Farmer, Girard, Peterson, & Tatone-Tokuda, 2007). It was discovered that the incidence of picky eating decreases to between 13% - 22% after the preschool age (Mascola, Bryson, & Agras, 2010). Another theory behind restrictive eating would be having over reactiveness to touch or tactile defensiveness which might restrict the range of food that may be eaten and show less likeliness to eat at other people's home (Smith, Roux, Naidoo, &

Venter, 2005). Childhood fussiness around food is found to be associated with parent's pressure toward eating or having an extremely restrictive-over-controlling feeding style (Webber, Cooke, Hill, & Wardle, 2010).

Clan

Clan level represents family dynamics and parenting practices. This level investigates the influence of family as a whole on feeding practices. It is important to consider the subsystems of the family including parent-child relationship, marital relationship, sibling relationship, along with family daily activities, rules, and traditions to be able to understand the roots of eating practices (Schermerhorn & Cummings, 2008). Parent-child relationships may regulate food consumption based on feeding practices and distinctive parenting style that have the ability to either promote or derail a child's ability to self-regulate in an early age. A meal routine among a family may also affect food consumption based on the emotional bond created during family rituals. Parenting style and family meal time can definitely play a role on determining the eating patterns for a child in a household (Barbara et al., 2012).

Parenting Style

Parenting style may play a role in influencing children's food consumption. Different parenting styles including authoritarian and authoritative and indulgent or uninvolved, have a role on a child's eating behavior. It was discovered that parenting styles are a combination of behavior and attitudes that occur on a multiple context of social interaction, which are meant to socialize children (Fisher & Birch, 1999; Hughes, Power, Fisher, Mueller, & Nicklas, 2005). Multiple studies by Ventura and Birch suggested that parenting practices were reported to be related to children's eating behaviors, whereas they discovered that pressure to eat was most likely

associated with picky eating. Having restrictive feeding practices by parents is found to lead to an increased intake of palatable foods and eating on absence of hunger (Faith et al., 2004).

Family Mealtimes

The importance of family mealtime is driven from an attempt to understand family life. This could be achieved by observing how a family arranges and prepares food and what rules they may have at the space where they eat. Family mealtimes have been known to have four important developmental functions that are: cultural socialization, literacy, and academic outcomes, risk behavior and socio–emotional development, and nutrition (Larson, Branscomb, & Wiley, 2006). Family mealtime is crucial for socio-emotional development, which is associated with nutritional practices. A recent meta-analysis of seventeen studies that included more than 180,000 children and adolescents indicated a strong association with frequency of shared mealtimes with the family and having multiple positive nutritional outcomes (Hammons & Fiese, 2011).

Recent evidence suggests that at the very least shared family meals need to occur three times a week to achieve health promoting effects on child development. It was reported that children and adolescents who shared three meals or more per week reduced the odds of being overweight by 12%, eating unhealthy foods by 20%, and having increased the chances of eating healthy foods by 24%. It was stated that children who consumed meals with their families on a regular basis consumed vegetables, fruits, and calcium rich foods at higher rates (Neumark-Sztainer, Wall, Perry, & Story, 2003). Another study reported that children from limited resource families who consumed breakfast at home had a higher intake of fruits, 100% fruit juice, and milk (Koszewski, Behrends, Megan, Sehi, & Jones, 2011).

Television Viewing and Food Marketing

The home environment could give a child exposure to media and advertising based on family preference and habit around media. Literature has shown that watching television while eating and having a TV in the area where the family eats is associated with reduced intakes of fruits and vegetables (Fitzpatrick, Edmunds, & Dennison, 2007). Having a TV in the dining area also reduced family attention to satiety cues (Brunstrom & Mitchell, 2006). Along with television viewing and playing computer games during a mealtime has shown to increase consumption of food by 40-100% and it was reported that people felt less full (Oldham-Cooper, Hardman, Nicoll, Rogers, & Brunstrom, 2011). The presence of television in the dining area is distracting and may influence a person's attention span, leading to overeating and hindering communication among family members (Christakis et al., 2009). Another interesting concern regarding television presence in the dining area is losing visual engagement among family members, which might influence children's satiety cues and end up giving them more food or less than they need (Salvy, Vartanian, Coelho, Jarrin, & Pliner, 2008).

Targeted food advertisements may also play a role in promoting unhealthy eating habits for children, since children tend to consume more calories while watching food ads during meals (Halford, Boyland, Hughes, Oliveira, & Dovey, 2007). Continuous exposure to fast food, and sweetened beverages advertisements is linked to higher consumption of these food items among elementary school age children (Andreyeva, Kelly, & Harris, 2011). It has been observed that children are being exposed to advertisements of unhealthy, energy dense food items more than exposure to fruits and vegetables. This exposure can trigger requests and preference for these foods (Powell, Szczypka, & Chaloupka, 2010). Collective efforts to inhibit marketing and

advertising of fast-foods, energy drinks, and energy dense foods should be a priority to eliminate the harmful effects on children's health (Hearst et al., 2013).

Community

The community level represents the influences outside the home. These include schools, peers, and other community factors such as access to food. The family environment plays an important role in access to healthy foods. Neighborhoods vary in terms of what type of food they offer to their residents. Some are densely packed with fast food outlets and convenience stores that sell pre-packaged energy dense foods. Food Swamps is the term used for these neighborhoods. Other communities offer more balanced food outlets such as large grocery stores that are rich with fruit and vegetable vendors. Studies reported that living close to a super market that offers fresh produce increases the consumption of fruits and vegetables. Distance from these convenience stores reduced the purchase of fresh produce and families ate less fruits and vegetables. Studies discovered that the family home location and surroundings affects their available food access as well as their socioeconomic resources (Rose & Richards, 2004; Zenk et al., 2005).

Country

The country level represents the state and national policies as well as institutional policies that act as barriers or supporters for food consumption, such as food marketing, subsidies for agriculture, and dietary guidance. In 2011 there were no federal policies issued against targeted food advertising for children. Increasing the advertising for 'healthy for you' or 'go foods' was not as successful (Kunkel et al., 2009). Food assistance programs have been serving the American people for fifty years, ever since an active rebellion took place against

poverty and hunger, and the Food Stamp Act was issued to secure a safety net for low-income populations and their children. The fight against hunger is a continuous battle and much effort is needed to improve the overall diet and health for the low-income population (Cook & Frank, 2008).

Culture

The culture level is considered an outer sphere that represents culture specific norms and expectations. There is an impact that a culture has on the types of food that individuals and families consume, communicate with each other and the role that they expect the food to have in their life and health. Much research has focused on studying migrating Latino families and how shifting to another culture might influence mealtime routines, eating habits, and communication methods. Studies confirm that families that migrated from Mexico have had relatively healthy diets upon arriving to the US; however, after ten years these families have adopted a different diet that is dense with fat, salt, sugar, fried foods, and low in fruits, and vegetables (Winkleby et al., 2006).

A crucial understanding of cultural factors that mediate changes in dietary habits among Latino children needs to occur as they are at a significant risk of developing obesity (Flegal, Carroll, Ogden, & Curtin, 2010). A study conducted with over 1600 Latino adults who migrated from Mexico to Washington State investigated the acculturation level of these families. It was observed that the level of acculturation was associated with dietary habits (Neuhouser, Thompson, Coronado, & Solomon, 2004); the more the person was acculturated, the less the adult would consume fruits and vegetables. This was accompanied by an increased

trend of consuming fat at the table for adults and a modest increase of soda and chips among children (Andaya, Arredondo, Alcaraz, Lindsay, & Elder, 2011).

Many environmental factors, have played an important role in determining Latino families' dietary behaviors, which was a focus on the impact of working parents on family mealtime. After migrating from the United States, many Latino families needed to acquire multiple jobs or have long working hours (Yoshikawa, 2011). This resulted in creating a challenge for families to share mealtimes together. It was reported that Latino families tend to have much healthier eating habits with children who consumed breakfast with their families at least four times a week and who consumed more fruits and vegetables (Andaya et al., 2011). Reports confirmed that children who ate in front of the television consumed more highly dense foods such as chips and soda (Koszewski et al., 2011).

Another major factor that influences Latino families' eating patterns is income. This factor increases the risk of food insecurity among Latinos in the United States who are the fastest growing ethnicity (Kersey, Geppert, & Cutts, 2007). A national survey in 2006 reported that Latino men earned $15,000 less on full time work and female workers earned about $8,000 per year, compared to their counterparts (United States Census Bureau, 2011). In 2010, 16.2 million children were living in households that were classified as food insecure (Coleman-Jensen, Nord, & Andrews, 2011). Food insecurity excessively influenced low-income minority families who are non-White Hispanic with the highest rate being 26.2% of food insecurity in comparison with 25.1% for Black non-Hispanic and 10.8%. White-non-Hispanic. Hispanics are more likely to be clients for food pantries as they made up 20% of the food clients' pantries in 2005 (Mabli, Cohen, Potter, & Zhao, 2010). Overall children who grow up without enough or

adequate sources of healthy food have a higher risk of developing poor health, behavioral problems at school, and an increased risk for maternal depression (Bronte-Tinkew, Zaslow, Capps, Horowitz, & McNamara, 2007). All of these problems accompanied with adapting to a new culture might increase the risk of obesity among Hispanic food insecure populations (Mazur, Marquis, & Jensen, 2003).

US Nutrition Assistance Programs and EFNEP

The US government's commitment for improving the nutritional health of its citizens is reflected in federal funding. There are multiple Federal programs devoted to nutrition education. The Expanded Food and Nutrition Education Program (EFNEP) and Supplemental Nutrition Assistance Program – Education (SNAP-Ed) are designed specifically to provide nutrition education (GAO, 2004). USDA spends millions of dollars every year on these programs. In 2002 USDA spent $472 million on nutrition education programs such as EFNEP, Women, Infants and Children Program (WIC), and SNAP-ED (GAO, 2004). EFNEP is being conducted in the US and its territories (Halberstadt, Parke, Stifter, Cassidy, & Fox, 1995).

The goal of EFNEP is to assist limited resource audiences to "acquire the knowledge, skills, attitudes, and changed behavior necessary for nutritionally sound diets, and to contribute to their personal development and improvement of the overall family diet and nutritional well-being" by using a peer-education or paraprofessional model. These federal programs help families to make more sound nutritional decisions, yielding a better health status and hopefully reducing medical expenses. Every year, EFNEP serves more than a half million people. In the Fiscal Year 2011, EFNEP served 506,156 youth and 134,446 adults. Youth EFNEP is designed for

enrichment in school and after-school programs through 4-H EFNEP clubs, camps, and home gardening workshops (USDA, 2012a).

EFNEP

Since its development in 1964, the EFNEP was assessed to have attracted as many as 4,121,849 youth and 150,995 adults, while indirectly reaching an additional 556,784 family members (Wells, Montgomery, & Blake, 2008). Those participants who were enrolled in the program have been able to gain skills in food preparation, food storage, food safety, and food shopping, food planning, sanitation skills, and food preparation (Wells et al., 2008). The program has had a significant impact on the community as 78% of the families enrolled in the EFNEP program later joined federal food assistance programs that could further enhance the knowledge of proper diet and food nutrition (Wells et al., 2008). The government has designated a certain amount of its annual budget for EFNEP programs. In fact, the National Institute of Food and Agriculture (NIFA) provided 67.9 million for 75 universities to fund EFNEP (USDA, 2016).

A 2003 survey revealed that over 150,000 beneficiaries of the program reported having experienced positive improvement on their health due to the impacts of the education program. Data from the survey reported that consumption of cereals and breads increased by 80% due to the program. Fruit consumption increased by 70% (Wells et al., 2008). Consumption of vegetables increased by 80%, and meat and dairy products increased by 30% and 50% respectively. With regards to race, it was discovered that Whites, Blacks, Hispanics, American Indians, and Asians/Pacific Islanders had statistically significant ($p<0.001$) improvements in all major food groups. Out of the 106,062 graduates of the EFNEP program 83% were reported

with improvement in food management practices and improvement in better meal budgeting, as well as an increase in food consumption. Eighty seven percent of graduates improved in their nutritional practices concerning the way they make food choices (Wen et al., 2011).

In another study, dietary behavior and self-efficacy in adolescents (n=188; 7th to 8th grade) in northern California was evaluated. Upon completion of a nine-lesson dietary and physical activity intervention, it was reported that there was a significant difference in physical activity behavior and physical activity self-efficacy before and after the lessons. However, analysis of dietary behavior and self-efficacy were not significantly changed (Shilts, Smith, Ontai, & Townsend, 2008).

EFNEP educators were able to reach more than 340,000 families specifically, 377,702 children. EFNEP operates in more than 800 counties in the US. The program influenced youth as 85% of participants in 2015 increased their knowledge and were able to choose healthy foods. EFNEP graduates (84%) adult improved food resource management practices and 24, 914 youths extended their knowledge into preparing low cost nutritious foods. Physical activity increased among both youth and adults. Recent reports by the NIFA stated that EFNEP graduates had diets that were close to MyPlate recommendations; however, there is still a need for continuous nutrition education to achieve more optimal results among the low-income population (USDA, 2016).

Cost-Benefit and Cost-Effectiveness EFNEP

The United States spends billions of dollars annually to improve nutrition welfare among the at risk population through public and private food assistance programs. Funds are determined by how well those programs achieve their expected goals in relation to their initial

cost. Policy makers continuously collaborate with public program assistance leaders to develop cost effectiveness techniques to examine their programs (Wells et al., 2008).

The EFNEP Evaluation/Reporting System (ERS) started in 1993 and was implemented nationwide. The purpose was to evaluate the program's impact by comparing participants' food intakes with the Food Guide Pyramid and the Recommended Dietary Allowances for key nutrients, and by assessing behavioral alterations in relation to food resource management, food safety, and improved nutrition practices. The goal of this evaluation was to point out strengths of the program and address weaknesses in order to make any necessary adjustments in training of staff, curricula, and activities for clients, and allocation of resources (Burney & Haughton, 2002).

The analysis of the cost benefit of adult programs is well known. The national average cost of EFNEP participating in the US was $594 and the lowest maximum average cost/participant was $156 in Texas. The highest was $2,286 in Mississippi. In a study conducted among youth EFNEP low income participants in Virginia by Baral et al., it was reported that the cost effectiveness of improving dietary behavior was $75 for behavior improvement among youth. Obesity, low quality diet, and minimum physical activity are major significant health concerns among the low income population. Therefore, education focused programs could be a great resource to improve the overall health among these limited income populations (Baral, Davisa, Blakec, & Serrano, 2013).

In New York, cost effectiveness of EFNEP was estimated and its possible effect on health care costs was evaluated from 5730 low-income participants. Upon completion of a series of six or more food and nutrition lessons, the cost effectiveness was estimated from behavior change

and quality adjusted life years (QALY) weights. Overall, it was established that the lessons mediated improvement in food and nutrition behavior and will potentially improve participants future health and reduce the health care costs (Dollahite, Kenkel, & Thompson, 2008).

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Chapter 2: Materials and Methods

Rationale

Few studies have been conducted on youth EFNEP audiences. This research was a part of a larger project designed to assess the cost-effectiveness of youth EFNEP in Virginia. This novel study aimed to provide a large-scale, observational assessment of baseline food availability, self-efficacy, and dietary behavior among low-income youth in Virginia, prior to participating in youth EFNEP. The results from this study can be used to identify gaps and weaknesses in availability, self-efficacy, and behavior among low-income youth and assist with informing content and directions of youth EFNEP programming.

Research Goals

The specific research goals and anticipated findings of this study were to:

1) Explore baseline food availability, as well as dietary and physical activity self-efficacy and behavior of youth EFNEP participants, with the expectation that youth would report low food availability, self-efficacy, and behaviors, across several indicators.

2) Compare food availability, self-efficacy and behaviors across socio-demographic factors. It was anticipated that differences would be noted based on gender, age, family living arrangement, ethnicity, and race.

3) Examine the association between food availability at home and actual dietary behaviors, expecting that higher food availability would be associated with higher reported intakes.

Measures

A questionnaire was developed specifically for this project and for EFNEP, ages seven to 14 years old. The questionnaire consisted of the following domains: socio-demographic information; food availability; nutrition and physical activity self-efficacy; and nutrition and physical activity behavior. Socio-demographic questions included age, gender, living arrangement, race, ethnicity, and academic performance. Questions for food availability, self-efficacy, and behavior were based on the different food groups and foods to emphasize or limit, based on the *US Dietary Guidelines for Americans* (initially 2005, then 2010), such as breads and cereals, whole grains, fruit, vegetables, low-fat dairy, and lean meats, as well as sugar-sweetened beverages and fried foods. Physical activity questions were based on recommended levels of physical activity according to the *Physical Activity Guidelines for Americans* (USDA, 2010)

The questions on self-efficacy and behavior were identified, designed, and validated by the cost-effectiveness analysis project advisory board that consisted of nationally recognized faculty with expertise in nutrition, EFNEP, economics, item response theory, and program evaluation. First, a list of 'indicators' were established in alignment with the *US Dietary Guidelines for Americans* (originally 2005 then 2010) and content of national youth EFNEP curricula. Second, an extensive literature review was conducted to identify valid, reliable, and sensitive instruments focusing on diet and physical activity for limited resource youth (Hernandez-Garbanzo, Brosh, Serrano, Cason, & Bhattarai, 2013). Then, a wide range of potential questions were created and presented to the advisory group (see Appendix B). The advisory board reviewed the content to confirm validity of the proposed instrument. Then,

feedback on the appropriateness of the proposed indicators and response categories was collected from four highly effective EFNEP program assistants (PAs) from Virginia. Measurement methodology was recommended by all four PAs to be based on frequency rather than the quantity of food (i.e. cup, ounces) as a way to ensure that the target audience (children aged 7-14 years) was able to understand the measurement method. The preliminary instrument of 93 items was then pilot-tested to create a shorter instrument with only 33 items, using item analysis and exploratory factor analysis (Baral, 2013). Participants' responses were measured on a 4 point Likert-type scale (0, 1, 2, and 3) with the exception of items 12 to 19, which were a 9-point Likert-type scale.

Participants

All youth EFNEP PAs were provided training on the research protocol. The Program Assistants (PAs) in Virginia (n=19) administered the written questionnaire within their localities to youth between the ages of seven and 14 (3rd to 7th grade), between August 2011 and May 2012. Classrooms and schools were targeted that contained at least 50% of their student population eligible for free or reduced school lunch (USDA, 2014). PAs determined which schools had at least 50% students' who were eligible for free or reduced school lunch. The PAs administered the questionnaires to all youth participants, prior to participation in any nutrition education programs through Virginia EFNEP. Upon completion, PAs mailed all questionnaires to the research team in pre-paid, postage boxes.

Each box contained: a cover sheet indicating the PA's name, contact information, school name, date of pre/post-tests, questions about previous nutrition classes' exposure, and comments/notes; a group enrollment form with the PA's name, group ID, address of schools,

phone numbers, program start and end date, and number of meetings/lessons; and pre- and post-tests. Voluntary, human subject research approval was obtained by the Institutional Review Board at Virginia Tech with informed consent provided by all PAs and implied consent from all participating youth. See Appendix A.

Data Analysis

Data Management: All boxes were reviewed to confirm receipt of the cover page, group enrollment form, and pre-/post-tests. PAs were contacted immediately if any of these components were missing. A label denoting PA, group, grade, and date of pre-test administration was placed on each pre-test. A unique number (common for both pre-and post-surveys) was assigned to each instrument.

Data Entry: All data were initially entered into Microsoft Access 2010. For data entry, the textual categories were converted to numerical codes as shown in Table 3.

Table 3: Key of Codes of Socio-Demographic Factors

Predictor	Category	Codes
Gender	Boy	0
	Girl	1
Age	11-14	0
	7-10	1
Living Arrangement *	Both Parents	0
	Others	1
Ethnicity*	African American	0
	White	1
Race	Non-Hispanic	0
	Hispanic	1

*Other sub-groups of categories were not included in the analyses given their small sample sizes

For availability numerical codes represented frequency (number of days in week) that a particular food group was featured in the home. For self-efficacy and behavior the numerical codes 0, 1, 2, 3 represented the number of times in a day a participant though they could eat (self-efficacy) - or actually ate (behavior) the specific food category in question.

After data entry, data were converted to Excel and SAS version 9.4 (Cary, NC, USA) for data analyses. The questions from the survey were divided into these three major domains food availability, self-efficacy, and dietary behaviors. Physical activity opportunities, food availability; self-efficacy towards physical activity and food, and physical activity and dietary behaviors were also assessed. The dietary behaviors included consumption of whole grains, milk, low-fat milk, whole milk, fruits, fresh fruit, vegetables, colored vegetable, water, meat, beans, sugar-sweetened beverages, dessert, planning meals based on MyPlate, and physical activity.

Reformatting of Data using SAS: Raw data for analytical purposes were comprised of numerical codes instead of textual categories. Data analysis was performed using sas proc format and the sas data step for gender, ethnicity, race, and living arrangement. See Table 3.

Numerical codes for availability were divided into different categories on the basis of frequency (number of days) that a particular food group was offered at home. Higher frequency denotes that the participant reported availability of that specific food for 4-7 days; lower frequency 1-3 days. None denotes that the participant reported no availability at all during the survey period. The same thresholds were used for physical activity. See Table 4.

Table 4: Threshold Values of Food Availability among Youth EFNEP Participants

Exposure or Predictor	Threshold of Number of Days per Week
Food and Physical Activity Availability	Higher Frequency (4-7)
	Lower Frequency (1-3)
	None (0)

Numerical codes for measures of self-efficacy and actual behavior for each of the foods under consideration were reformatted into a "YES" or "NO" category depending on whether or not a threshold for that specific food or physical activity was met. See Table 4. The thresholds were between ≥3 and ≤ 1. See Table 5 for threshold values. They were determined by experts in nutrition, based on current dietary recommendations and the assumptions that a child would consume three meals a day, in addition to snacks. Taking whole grain as an example, participants who thought that they could eat whole grains three or times per day were coded as "YES" for the SAS variable, whereas those who reported two or less were coded as "NO." They were then converted to numerical codes: "YES" as 1 and "NO" as 0. Reformatting for this part of the analysis was carried out in a SAS data step using "if – then" statements.

Statistical Analysis: A variety of statistics tests were performed to test each of the research goals (See following).

Table 5: Threshold of Self-Efficacy and Actual Behavior among Youth EFNEP Participants

Food Item or Physical Activity	Threshold of Number of Times per Day
Grain	(≥3/day to <3/day)
Whole Grain	
Vegetable	
Colored Vegetable	
Water	
Milk	(≥2/day to <2/day)
Low Fat Milk	
Whole Milk	
Fruit	
Fresh Fruit	
Beans	(≥1/day to<1/day)
Sugar-Sweetened Beverages	≤1/day vs. >1/day
Physical Activity participation	Yes or No
Number hours Physical Activity	(≥1 hours/day or <1 hours/day)

<u>Research Goal 1</u>: Explore baseline food availability, as well as dietary and physical activity self-efficacy and behavior of youth EFNEP participants (Tables 7, 8, and 9; Figures 2, 3, and 4).

<u>Hypothesis for Food Availability</u>

- Null hypothesis: The proportion of participants within the ''High'' frequency group (3 to 4 days a week) = the proportion of participants within the ''Low'' frequency group (1 to 3 days a week) = the proportion of participants within ''none'' availability group.
- Alternative Hypothesis: At least two of the proportions above are significantly different.

Statistical Analysis: One-way contingency tables were generated for all participants to provide an overall summary of food availability (Table 7). P-values denote statistical significance between proportions of responses for each category threshold. Statistical significance was set at $p \leq 0.05$.

Hypothesis for Self-Efficacy:

- Null hypothesis: The proportion of participants who thought that they could consume the threshold values of specific foods or attain optimal physical activity in a day = the proportion of participants who did not think they could consume the threshold values of specific foods or attain physical levels in a day.
- Alternative Hypothesis: The two proportions above are not equal.

Statistical Analysis: One-way contingency tables were generated for all participants to provide an overall summary of self-efficacy (Table 8 and Figure 2). P-values denote statistical significance between proportions of responses for each category threshold. Statistical significance was set at $p \leq 0.05$.

Hypothesis for Behavior:

- Null hypothesis: The proportion of participants who consume threshold values or attain optimal physical activity levels = these foods or attain optimal physical activity = the proportion of participants who do not consume threshold values or attain optimal physical activity levels within a day
- Alternative Hypothesis: The two proportions above are not equal.

Statistical Analysis: One-way contingency tables were generated for all participants to provide an overall summary of actual dietary behavior intake (Table 9, Figure 3, and 4). P-values denote

statistical significance between proportions of responses for each category threshold. Statistical significance was set at p≤0.05.

Proportion of food availability, self-efficacy and dietary behavior intake categories for each food group were compared using chi-square. Analysis chi-square test was chosen because the data were categorical data and the categories had sufficient counts (as a guide, each category had way over 5 counts). Statistical significance was set at p≤0.05.

<u>Research Goal 2:</u> Compare food availability, self-efficacy and behaviors across socio-demographic factors* (*Table 10; Figures 5 and 6)* (*Appendices C, D, E, F, G, and H).

- Null Hypothesis: There is no difference in the proportion of youth that reported the optimal threshold or higher for food availability, self-efficacy and actual dietary behaviors (designated as outcomes) based on socio-demographic factors (designated as predictors).
- Alternative Hypothesis: There are differences in the proportion of youth that reported the optimal threshold or higher for food availability, self-efficacy and actual dietary behaviors based on socio-demographic factors.

<u>Statistical Analysis:</u> Fisher's exact test (or Fisher's exact test with Monte-Carlo simulation where necessary) was used to test for associations between socio-demographic factors (age, gender, ethnicity, race, and living arrangement) (designated as predictors) and the proportion of individuals who achieved threshold levels for food availability, self-efficacy and actual dietary behaviors. (For detailed analyses, see Appendices C, E, F, G, and H.) Fisher's exact test was selected because data were sparse, with many cells having counts of 0 to 4 for some of the two-

way contingency tables. Statistical significance was set at p≤0.05. Figures 5 and 6 illustrate self-reported self-efficacy and dietary behavior for whole grains and vegetables based on socio-demographic factors, as examples.

***Research Goal 3*: Examine the association between food availability at home and actual dietary behaviors, expecting that higher food availability would be associated with higher reported intakes (Table 11).**

Hypothesis for Association:

- Null Hypothesis: The proportion of respondents who report achieving threshold values of behaviors with a "high" frequency of food availability = The proportion of respondents who report achieving threshold values of behaviors with a "low" frequency" of food availability = The proportion of respondents who report achieving threshold values of behaviors with "none" availability.

Statistical Analysis: Two-way contingency tables were generated when assessing associations See Table 11. Fisher's exact test was also used to test for associations between food availability (designated as a predictor) and actual dietary behaviors (designated as predictor) in order to determine if higher availability resulted in higher consumption. The p-value denotes the significance of the difference between proportions of participants who met the behavior thresholds among categories of food availability. Additionally, these proportions were compared between "low" and "none." Wherever there were three or more comparisons applicable, p-values were adjusted for multiple comparisons using Bonferroni's procedure. Statistical significance was set at p≤0.05.

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Chapter 3: Results

Research Goals

Research Goal 1: Explore baseline food availability, as well as dietary and physical activity self-efficacy and behavior of youth EFNEP participants

Research Goal 2: Compare food availability, self-efficacy and behaviors across socio-demographic factors

Research Goal 3: Examine the association between food availability at home and actual dietary behaviors, expecting that higher food availability would be associated with higher reported intakes

Socio-Demographic Characteristics of Youth Participants

Table 6 shows socio-demographic characteristics of youth. A total of 1,864 youth completed written questionnaires, including 955 females (51.3%) and 908 males (48.7%). A larger proportion of the students who participated in the study were younger between 7 and 10 years old (79.3%). Most participants reported themselves as white (44.1%), overall they represented a diverse set of racial and ethnic backgrounds with 29.9% African Americans, 8.5% American Indian, 1.1% Asian, and 16.2% "other." One in ten were considered Hispanic (10.8%). Participants lived primarily with both parents (61.9%), followed by mothers only (25.3%), grandparents (5.4%), fathers (3.9%), and "other."

Table 6: Socio-Demographic Characteristics of Youth EFNEP Participants

Socio-Demographic Characteristics	Category	N=1864(%)[1]
Gender	Male	908 (48.7)
	Female	955 (51.3)
Age	Younger (7-10)	1474 (79.3)
	Older (11-14)	386 (20.8)
Race	Hispanic	198 (10.8)
	Non-Hispanic	1640 (89.2)
Ethnicity	American Indian	147(8.5)
	Asian	19 (1.1)
	Pacific Islander	6 (0.4)
	African American	517 (29.9)
	White	764 (44.1)
	Other	280 (16.2)
Living Arrangement	Mother	459 (25.3)
	Father	70 (3.9)
	Both parents	1122 (61.9)
	Grandparents	97 (5.4)
	Other	65 (3.6)

[1] Data were generated by dividing the total sample population at baseline based on different social demographic information. Total sample population for each of the social-demographic do not correspond to N=1864 due to missing information for some of the participants.

Participants' Self-Reported Food and Physical Activity Availability at Home

Table 7 represents percentages of participants within each category of frequency of food availability. Availability was divided into different categories on the basis of frequency (number of days) that a particular food group was featured in the home. Higher frequency means that food was available for 4-7 days. Lower frequency represents 1-3 days. The response ''none'' means that food was not available at home during the survey period. With the exception of meat and beans and dessert, over half of participants reported relatively high availability of all food, beverages and, physical activity measured. The highest proportion of participants reported high availability of milk (75.2%), fruit (69.7%), and physical activity (73.5%). Meat and beans was by far the food category with the lowest level of reporting, with 41.4% of respondents of high frequency availability. Milk was the lowest among ''none'' frequency availability with (4.0%). Differences across frequency of availability were statistically significant for each food and physical activity category (see Table 7.)

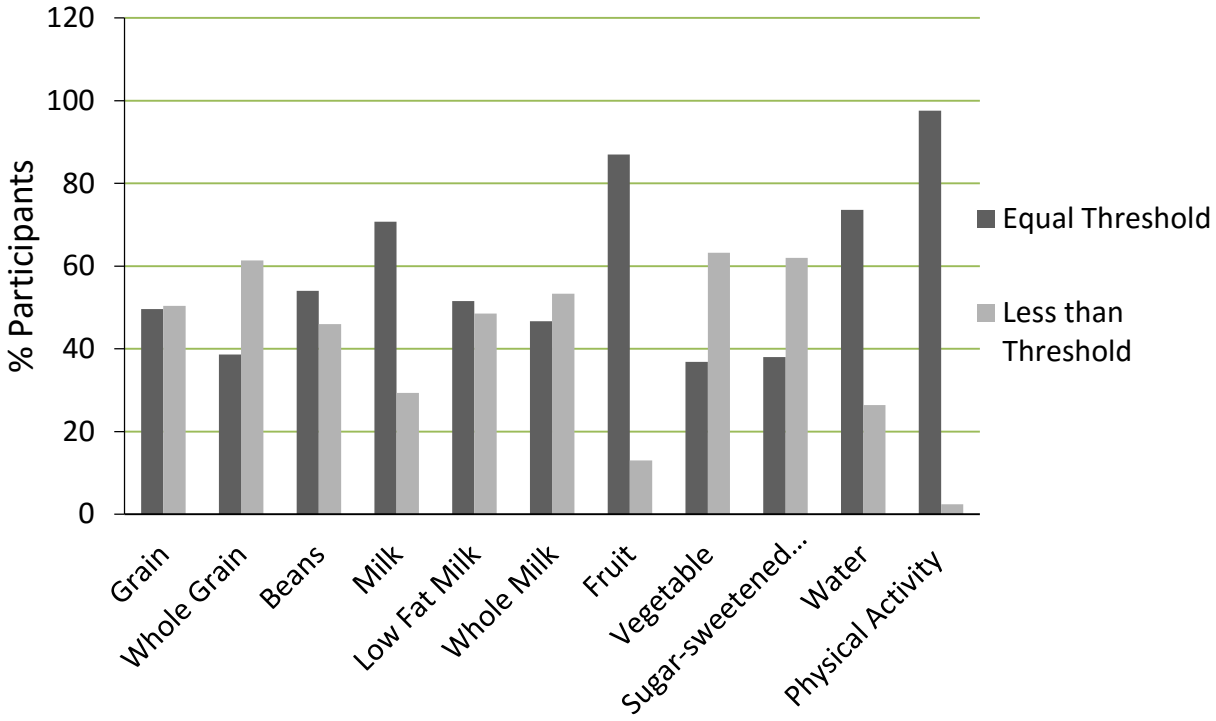
There were several noted statistical differences in reported availability by age, race, ethnicity, gender, and living arrangement. For example, younger and white individuals had significantly higher availability of whole grains (Appendix C), sugar-sweetened beverages at home (Appendix E). Hispanic participants reported higher significance availability of meat and beans (Appendix C), fruits, and colored vegetables (Appendix D). Boys reported lower levels of availability for fruit and colorful vegetables than girls (Appendix D), but higher physical activity (Appendix F).

Table 7: Self-Reported Overall Food and Physical Activity Availability Among Youth EFNEP Participants

Food and Physical Activity Availability	Number of Days per Week	N (%) (N=1864)	P-value
Whole Grains	Higher Frequency (4-7)	815 (61.8)	0.001
	Lower Frequency (1-3)	421 (31.9)	
	None	82 (6.2)	
Meat and Beans	Higher Frequency (4-7)	597 (41.4)	0.001
	Lower Frequency (1-3)	546 (37.8)	
	None	300 (20.8)	
Milk	Higher Frequency (4-7)	1225 (75.2)	0.001
	Lower Frequency (1-3)	339 (20.8)	
	None	66 (4.0)	
Fruit	Higher Frequency (4-7)	1108 (69.7)	0.001
	Lower Frequency (1-3)	383 (24.1)	
	None	99 (6.2)	
Vegetable	Higher Frequency (4-7)	1003 (63.5)	0.001
	Lower Frequency (1-3)	445 (28.2)	
	None	131 (8.3)	
Sugar-Sweetened Beverages	Higher Frequency (4-7)	1061 (63.6)	0.001
	Lower Frequency (1-3)	444 (26.6)	
	None	163 (9.8)	
Dessert	Higher Frequency (4-7)	811 (48.3)	0.001
	Lower Frequency (1-3)	677 (40.3)	
	None	190 (11.3)	
Physical Activity	Higher Frequency (4-7)	1232 (73.5)	0.001
	Lower Frequency (1-3)	351 (20.9)	
	None	94 (5.6)	

[1]Percentages were computed based on sample size for each specific question and do not include missing data. P-values denote statistical significance between proportions of responses for each category threshold. Higher frequency denotes that the participant reported availability of that specific food for 4-7 days. Lower frequency represents 1-3 days. None denotes that the participant reported no availability at all during the survey period.

Figure 2: Self-Reported Self-Efficacy toward Food and Physical Activity Behaviors among Youth EFNEP Participants based on Established Thresholds



Participants' Self- Efficacy toward Food and Physical Activity Behaviors

Table 8 reported participant self-efficacy toward food groups based on threshold frequency for number of times participants think that they can consume a food item in the day. Over half of participants reported significant high threshold values of self-efficacy towards consuming milk, fruit, water, and physical activity. Significant differences were detected for individuals who reported meeting desired threshold levels of self-efficacy with low proportion for whole grains, whole milk, vegetables, and sugar-sweetened beverages (see Table 8 and Figure 2.)

Differences were noted based on age, gender, ethnicity, and race. Younger participants were more likely to report confidence in consuming within threshold levels for low-fat milk and older participants more likely to plan meals and snacks based on MyPlate. Females and African Americans reported higher self-efficacy toward consuming adequate or acceptable levels of fresh fruit. The proportion of Hispanics who indicated self-efficacy toward consuming beans at least once a day was significantly higher than other ethnicities. Non-Hispanic participants were more likely to report self-efficacy toward choosing baked instead of fried foods at least twice a day. Non-Hispanics significantly had higher proportion in meeting threshold for feeling confident about replacing fried foods with baked foods. Females had more self-efficacy toward consuming sugar-sweetened Beverages (Appendix H).

Table 8: Self-Reported Self-Efficacy toward Food and Physical Activity Behaviors among Youth EFNEP Participants

Food Group or Physical Activity	Thresholds	N (%) (N=1864)	P-Value[1]
Grain	≥3/day	912 (49.6)	0.744
	<3/day	926 (50.4)	
Whole Grain	≥3/day	709(38.6)	0.001
	<3/day	1126 (61.4)	
Beans	≥1/day	994 (54.0)	0.0007
	<1/day	848 (46.0)	
Milk	≥2/day	1301(70.7)	0.001
	<2/day	538 (29.3)	
Low Fat Milk	≥2/day	945(51.5)	0.2076
	<2/day	891(48.5)	
Whole Milk	≥2/day	862(46.7)	0.0045
	<2/day	984 (53.3)	

Table 9: Self-Reported Self-Efficacy toward Food and Physical Activity Behaviors among Youth EFNEP Participants, continued

Food Group or Physical Activity	Thresholds	N (%) (N=1864)	P-Value[1]
Fruit	≥2/day	1606(87.0)	0.001
	<2/day	239 (13.0)	
Fresh Fruit	≥2/day	1569 (84.9)	0.001
	<2day	279 (15.1)	
Vegetable	<3/day	675 (36.8)	0.001
	≥3/day	1157 (63.2)	
Colored Vegetable	<3/day	650 (35.7)	0.001
	≥3/day	1171(64.3)	
Baked Food	≥2/day	1157 (62.9)	0.001
	<2/day	683(37.1)	
Sugar-Sweetened Beverages	≥1/day	702(38.0)	0.001
	<1/day	1143(62.0)	
Water	<3/day	1359 (73.6)	0.001
	≥3/day	488 (26.4)	
Physical Activity	≥1 hours/day	1798 (97.6)	0.001
	<1 hours/day	44 (2.4)	

[1]P-values denote statistical significance between proportions of responses for each category threshold. Percentages computed based on sample size for specific question and do not include missing data.

Participants' Self-Reported Food and Physical Activity Behaviors

Over half of participants reported intakes that achieved optimal threshold values for whole milk, fruits, meat, sugar-sweetened beverages, water, and physical activity (see figures 3 and 4). Participants reported low intakes of grains, whole grains, low-fat milk, baked foods, and vegetables, based on threshold values (see Table 9).

Figure 3: Self-Reported Food Behaviors among Youth EFNEP Participants based on Established Thresholds

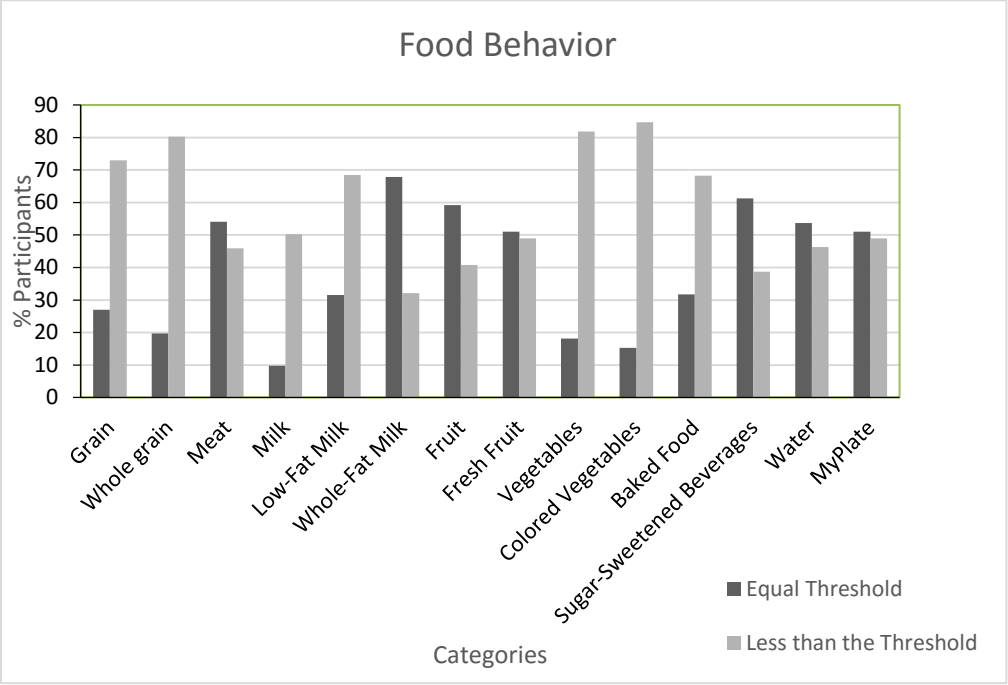


Figure 4: Self-Reported Physical Activity Behaviors among Youth EFNEP Participants based on Established Thresholds

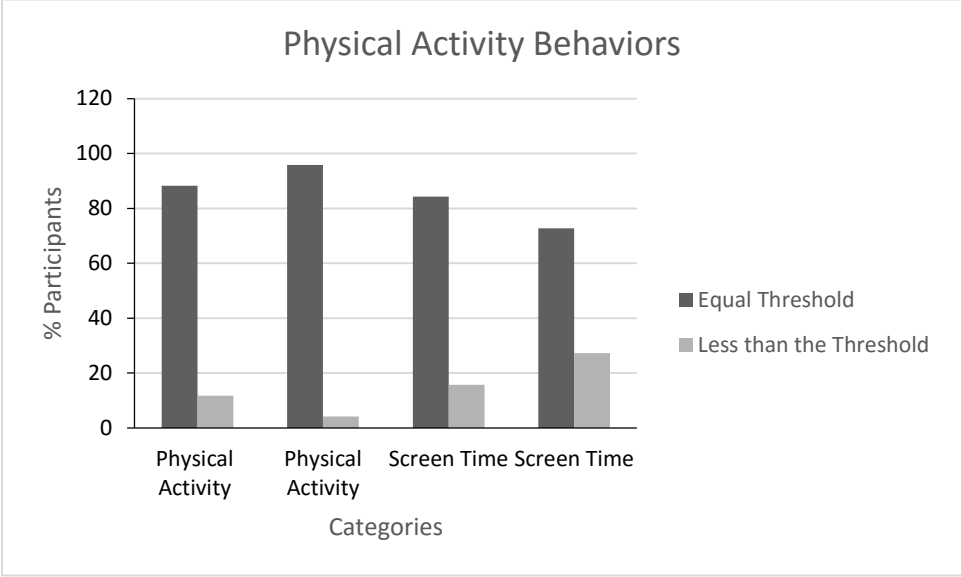


Table 10: Self-Reported Food and Physical Activity Behaviors among Youth EFNEP Participants

Food-and Physical Activity-Related Behavior*	Threshold (Times per day)	N (%) (n=1864)	P-Value [1]
Grains	≥3/day	490 (27.0)	0.001
	<3/day	1322 (73.0)	
Whole grains	≥3/day	357 (19.7)	0.001
	<3/day	1452 (80.3)	
Meat	≥2/day	978 (54.1)	0.0005
	<2/day	831 (45.9)	
Milk	≥2/day	873 (49.8)	0.8485
	<2/day	881 (50.2)	
Low-Fat Milk	≥2/day	569 (31.5)	0.001
	<2/day	1238 (68.5)	
Whole-Fat Milk	≥2/day	1229 (67.9)	0.001
	<2/day	580 (32.1)	
Fruit	≥2/day	1075 (59.2)	0.00
	<2/day	740 (40.8)	
Fresh Fruit	≥2/day	925 (51.0)	0.372
	<2/day	887 (49.0)	
Vegetables	≥3/day	323 (18.2)	0.001
	<3/day	1447 (81.8)	
Colored Vegetables	≥3/day	275 (15.3)	0.001
	<3/day	1518 (84.7)	
Baked Food	≥2/day	569 (31.7)	0.001
	<2/day	1226 (68.3)	
Sugar-Sweetened Beverages	≥1/day	1109 (61.3)	0.001
	<1/day	700 (38.7)	
Water	<3/day	966 (53.7)	0.0019
	≥3/day	834 (46.3)	

Food-and Physical Activity-Related Behavior*	Threshold (Times per day)	N (%) (n=1864)	P-Value [1]
Physical Activity	Physically Active	1584 (88.2)	0.001
	Not Physically Active	211 (11.8)	
Physical Activity	≥1 hours/day	1693 (95.8)	0.001
	<1 hours/day	75 (4.2)	
Screen Time	Had screen time	1507 (84.3)	0.001
	No screen time	281 (15.7)	
Screen Time	≥2 hours/day	1288 (72.7)	0.001
	<2 hours/day	483 (27.3)	

[1]P-values denote statistical significance between proportions of responses for each category threshold. Percentages computed based on sample size for specific question (taking into consideration missing data).
*Example: Yesterday, I drank fat-free or low fat milk… 0, 1, 2, or 3 or more times per day. Clarifications were provided, when possible, such as: "Consider any flavor, smoothies, coffee drinks, and other beverages. Low-fat milk is 1% and fat-free is skim milk or 0% milk, and they usually have green tops."

Participants' Self-Reported Food and Physical Activity Behaviors by Socio-Demographic Characteristics

There were several noted statistical differences in reported dietary behaviors based on age, gender, race ethnicity, and living arrangement. (For all analyses and data, see Appendix G). For example, intake of fruit was statistically higher among older youth than younger, based on optimal thresholds. In addition, youth who reported they were African American reported higher fruit intake than those that reported they were white. Older youth reported choosing baked foods more frequently, were less likely to limit sugar-sweetened beverages, and reported more screen time than younger participants.

The most substantial differences across socio-demographic characteristics were noted for low-fat milk (Table 10). Differences in proportions were noted for youth who reported achieving the

threshold values for gender, age, and ethnicity. Boys, younger participants, and African American participants were more likely to meet the threshold values ($p<0.05$). For example, the proportions of boys who reported achieving the threshold value for low-fat milk are significantly different than the proportions for girls ($p=0.007$), however there are no significant differences depending on living arrangement ($p=0.711$).

Table 11: Self-Reported Low-Fat Milk Intake among Youth EFNEP Participants by Socio-Demographic Factors

Predictor	Category	N (%) (n=1864)	Threshold (≥2 Times per Day) N (%)	P-Value[1]
Gender	Boy	875 (48.4)	302 (34.5)	0.007
	Girl	931 (51.6)	266 (28.6)	
Age	11-14	378 (21.0)	101 (26.7)	0.025
	7-10	1426 (79.0)	468 (32.8)	
Living Arrangement	Both mother and father	1090 (61.9)	338 (31.0)	0.711
	Others	670 (38.1)	214 (31.9)	
Ethnicity	African American	508 (30.2)	178 (35.0)	0.001
	White	742 (59.4)	195 (26.3)	
Race	Hispanic	192 (10.8)	63 (32.8)	0.681
	Non-Hispanic	1590 (89.2)	496 (31.2)	

[1]P-values denote statistical significance between proportions of respondents that achieved the optimal threshold by socio-demographic characteristic. In other words, the comparisons are made by rows. For example, boys were more likely to report meeting the threshold for low-fat milk than girls (p=.007), however there are no significant differences depending on living arrangement (p=.711).

Participants' Self-Reported Food Behaviors and Self- Efficacy

In general, self-efficacy was higher than actual food intake or physical activity behavior across all socio-demographic characteristics. For example, it was observed that for whole grains, the high threshold self-efficacy was higher across different socio-demographic categories as compared to the actual high threshold dietary behavior (Figure 5). There was no significant difference in whole grains self-efficacy based on different socio-demographic categories (Appendix H & Figure 5). However, consumption of whole grains three times or more per day was low over all based on different socio-demographic. There was a statistical significant difference between the intake of whole grains and ethnic groups who reported consuming whole grains three times or more per day. Whites (15.9%) were lower in whole grain consumption as compared to African Americans (24.0%) (Appendix G & Figure 5). Similar trends were also observed for vegetable self-efficacy and intake (Figure 6). There was no statistical significant difference in self-efficacy of vegetable consumption three times or more a day based on socio-demographic information. Consumption of vegetables three times or more per day was low over all based on socio-demographic information (see Appendix H.) Gender wise, significantly less boys (15.7%) consumed vegetables three times or more when compared with girls (20.7%), $p<0.01$. There was a significant difference in vegetable consumption based on ethnicity. African Americans (21.9%), consumed more vegetables three times or more a day when compared with Whites (16.2%) (Appendix G & Figure 6).

Figure 5: Self-Efficacy and Intake of Whole Grain of Youth EFNEP Participants

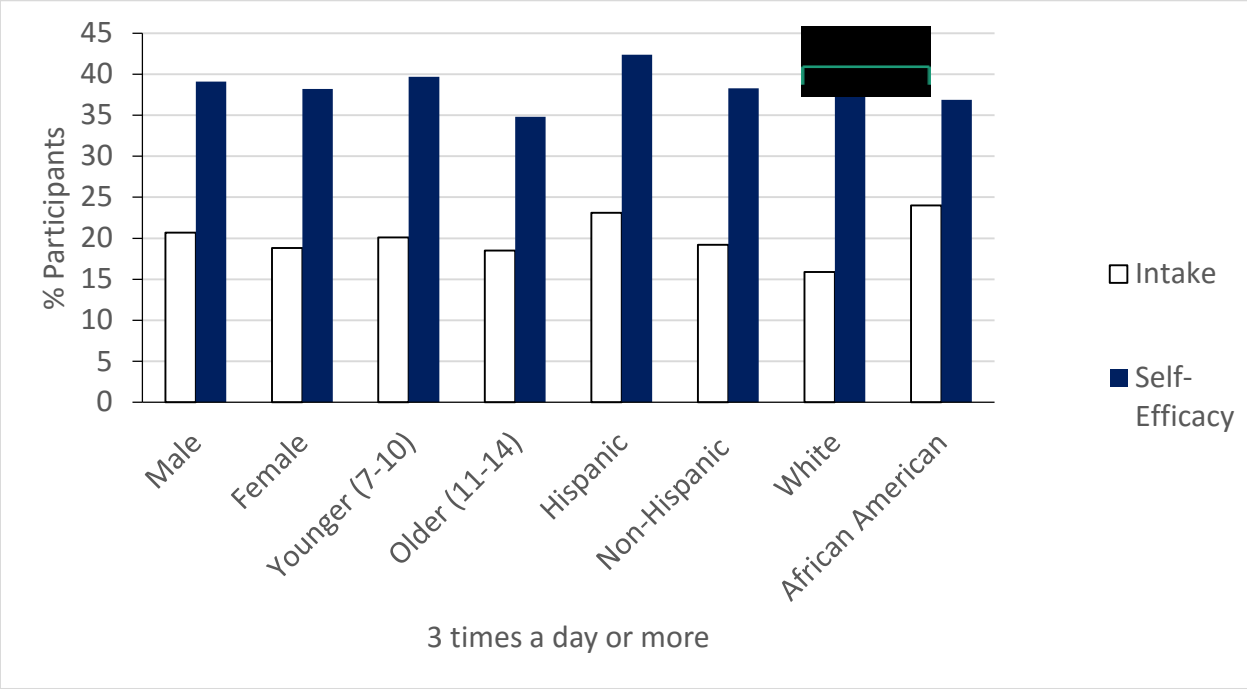
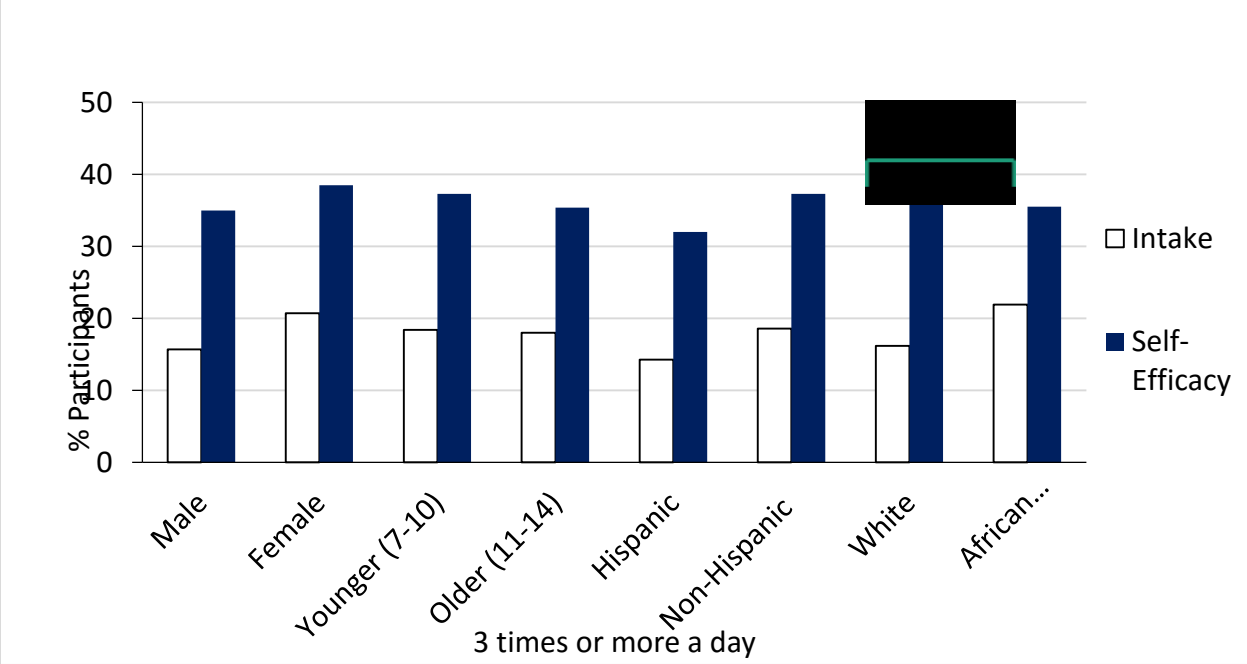


Figure 6: Self-Efficacy and Intake of Vegetables of Youth EFNEP Participants



Food and Physical Activity Availability and Related Behaviors

Table 11 outlines the association between food or physical activity availability in relation to actual dietary intake or physical activity. The first column corresponds to behavioral dietary intake for a set of select food items and food availability along with threshold for each food item. The second column is the food availability threshold. The third column is number of participants and percentages corresponding for food availability threshold. The fourth column is the number and percentages of participants corresponding to dietary behaviors intake meeting threshold. The superscripts in column four indicates the differences existing across all levels of frequency of food availability. The proportions are not equal within each food group and physical activity. The fifth column represents the number and percentages of participants' dietary behaviors that did not meet the desired threshold.

Overall most of the association between food availability and actual intake were statistically significant between thresholds. Most of the participants reported higher availability threshold; however, actual consumption threshold proportions were much lower and statistically significant from each other. This was indicated by the superscripts addition. Across all associations between food item availability and their actual intake among youth participants, it was discovered that most of the foods are statistically significant across all thresholds or at least between two of them yielding to accept the alternate hypothesis. For example, whole grain (61.8%) availability was highly available for most participants; however, only 23.7% consumed whole grains. Similar patterns were detected across different thresholds. Within the "none" group the availability of whole grains was 6.1% but 10.1% of the 6.1% actually wanted to consume whole grain three times or more each day. This supports the positive influence of increasing healthy food availability at home to improve the overall intake of healthy foods.

Table 11: Association between Food and Physical Activity Availability and Behavior among Youth EFNEP Participants

Baseline Behavioral Intake	Availability Threshold	N	Behavior equal to or greater than the threshold	Behavior lower than the threshold
Whole Grain Availability and Whole Grain Intake (3 times a day)	Higher Frequency (4-7)	796 (61.8)	189 (23.7)[a]	607 (76.3)
	Lower Frequency (1-3)	414 (32.1)	80 (19.3)[ab]	334 (80.7)
	None	79 (6.1)	8 (10.1)[b]	71 (89.9)
Meat and Bean Availability and Meat Intake (2 times a day)	Higher Frequency (4-7)	591 (41.9)	355 (60.1)[a]	236 (39.9)
	Lower Frequency (1-3)	524 (37.2)	272 (51.9)[b]	252 (48.1)
	None	295 (20.9)	155 (52.5)[ab]	140 (47.5)
Milk Availability and Meat Intake (2 times a day)	Higher Frequency (4-7)	1159 (75.1)	645 (55.7)[a]	514 (44.3)
	Lower Frequency (1-3)	322 (20.9)	135 (41.9)[b]	187 (58.1)
	None	62 (4.0)	21 (33.9)[b]	41 (66.1)
Fruit Availability and Fruit Intake (2 times a day)	Higher Frequency (4-7)	1086 (69.9)	753 (69.3)[a]	333 (30.7)
	Lower Frequency (1-3)	372 (23.9)	201 (54.0)[b]	171 (46.0)
	None	96 (6.2)	22 (22.9)[c]	74 (77.1)
Vegetable Availability and Intake (3 times a day)	Higher Frequency (4-7)	963 (63.8)	231 (24.0)[a]	732 (76.0)
	Lower Frequency (1-3)	423 (28.0)	55 (13.0)[b]	368 (87.0)
	None	123 (8.2)	9 (7.3)[b]	114 (92.7)
Fruit Availability and Fresh Fruit intake (2 times a day)	Higher Frequency (4-7)	1084 (69.9)	662 (61.1)[a]	422 (38.9)
	Lower Frequency (1-3)	372 (24.0)	165 (44.4)[b]	207 (55.6)
	None	95 (6.1)	17 (17.9)[c]	78 (82.1)
Sugar-Sweetened Beverages Availability and Intake (1 time a day)	Higher Frequency (4-7)	1036 (63.8)	561 (54.2)[a]	475 (45.8)
	Lower Frequency (1-3)	430 (26.5)	296 (68.8)[b]	134 (31.2)
	None	159 (9.8)	129 (81.1)[c]	30 (18.9)
Physical Activity Availability and Physical Activity (1 time a day)	Higher Frequency (4-7)	1196 (73.8)	1125 (94.1)[a]	71 (5.9)
	Lower Frequency (1-3)	335 (20.7)	263 (78.5)[b]	72 (21.5)
	None	89 (5.5)	54 (60.7)[c]	35 (39.3)

[abc] Within each block representing dietary behavior and physical activity, rows with different superscripts are significantly different from each other.

*This table was designed to report the participant responses for food item availability in relation to food consumption.

Chapter 4: Discussion

In recent years there has been no increase in obesity prevalence among low-income children from different racial and ethnic groups. The obesity rate is still high in the US (Ogden, Carroll, Kit, & Flegal, 2014; Pan, McGuire, Blanck, May-Murriel, & Grummer-Strawn, 2015). Although lower than 2011, the percentage of food insecure US households have not changed from 2013 to 2014 (Table 11). In 2014, 6.9 million households had very low food security (Coleman-Jensen, Rabbitt, Gregory, & Singh, 2015).

Table 12: Rate of Food Insecurity is US Households

Year	Food Insecurity Levels	Percentage of People
2011	Low	14.9%
2013-2014	Low	14.3%
2014	Very Low	5.6%

Source: Coleman-Jensen, Rabbitt, Gregory, & Singh, 2015

Interestingly in Virginia, the average prevalence of food secure households (10.1%) and very low food insecure households (4.3%) was significantly lower than the national average (Coleman-Jensen et al., 2015). Schools eligible for the program have implemented new approaches including school gardening classes; salad bars, and fresh produce from local Farmer's Markets; and in-school, free fruit and vegetable distribution programs (Adams, Bruening, & Ohri-Vachaspati, 2015). Even with a number of nutrition assistance programs, there is still a huge dietary disparity and obesity problem among youth in the USA (Flegal, Carroll, Ogden, & Curtin, 2010).

This study was conducted within the Virginia EFNEP program, which involves strong collaborations with schools that provides free-or reduced meals to children from low-income families to improve their dietary habits and increase nutritional awareness. The main aim of this observational study was to explore food availability, self-efficacy and dietary behaviors among low-income youth enrolled in EFNEP.

***Research Goal 1*:** Explore baseline food availability, dietary and physical activity, self-efficacy and behavior of youth EFNEP participants.

The first research goal was to collect baseline data for EFNEP from 7 to 14 years old participants at schools with at least 50% of students in free-or reduced-meal programs and compare these finding with national trends and recommendations from the Dietary Guidelines of America, 2015-2020.

Whole Grains: In this study, 61.8% of the participants reported they had high frequency of whole grains availability in their homes, only 6.2% had no availability. Yet, it was found that the self-efficacy towards consumption was much lower. Additionally, most respondents reported lower consumption levels, mirroring national estimates. According to the *US Dietary Guidelines for Americans 2015-2020*, the recommended total grain intake met the requirements for children ages 7-14 years; however, there was very low whole grain intake and higher refined and processed grain intake than the recommended average levels (USDA, 2015). A recent report has shown that whole grain consumption decreased body fat mass, whereas refined wheat intake increased total cholesterol and LDL suggesting a cardio protective role of whole grains (Kristensen et al., 2012). Other studies have reported that whole grain and cereal fiber intake strongly correlate with lower weight status, total percent body fat, and lower abdominal

("trunk fat") mass in older adults (Harland & Garton, 2008; McKeown et al., 2009; Rose, Hosig, Davy, Serrano, & Davis, 2007)

Meat and Beans: It was discovered that there was an overall low availability of meats and beans at home with approximately 37.8% and 20.8% of the participants with 1-3 times/week and not available, respectively. This study discovered that 54.1% consumed meat at least two times a day, however, suggesting that they are meeting if not exceeding the national recommendations, even though they don't report as much at home. The average protein food intake in the US for age 8-14 years for both genders is within the recommended protein intake. It is possible that consumption of foods rich in proteins were outside their homes such as school provided meals, dining out, and fast foods.

Milk: In this study approximately one-third of participants were consuming whole fat milk two or more times a day and approximately 4% of participants did not have milk in their home. According to the *US Dietary Guidelines of America 2015-2020*, the average dairy product intake is well below the recommended intake levels for both boys and girls. It is essential to consume milk in the diet during growing years for proper bone mass, bone density, and reduced risk of osteoporotic fracture (Black, Williams, Jones, & Goulding, 2002; Kalkwarf, Khoury, & Lanphear, 2003). This gap between actual and recommended daily intake increases with age (USDA, 2015). The dairy food group is comprised of fluid milk (51%), cheese (45%), yogurt (2.6%), and fortified soy beverage (1.5%) (USDA, 2015). Calcium and vitamin D intake through milk and milk products is essential to avoid weight gain and obesity (Heaney, 2003; Teegarden, 2003). Major differences between milk availability, self-efficacy, and actual consumption were noticed. This could be attributed to the variation in the questions asked in availability. There was an

inconsistency in the questionnaire concerning all dairy products including milk, yogurt, and cheese. Only milk was mentioned in self-efficacy and actual consumption.

Fruit and Vegetables: Participants reported a high frequency of fruit availability. There was also a high overall percentage of participants who felt confident and actually consumed at least two servings of fruit per day. The same trend was observed for fresh fruits. These findings are not consistent to the *US Dietary Guidelines of Americans 2015-2020,* which shows a low intake of fruits among 9 to 14 years old boys and girls (USDA, 2015). This study discovered that the majority of participants reported consuming vegetables, as well as colorful vegetables, fewer than three times a day, that is consistent with national trends. The intake of fruits and vegetable is linked with other factors, such as exposure to taste during infancy (Birch, Gunder, Grimm-Thomas, & Laing, 1998), consumption by parents (Gibson, Wardle, & Watts, 1998), and socio-economic status and availability at home (Rasmussen et al., 2006).

Sugar-Sweetened Beverages*:* Overall, the availability of sugar-sweetened beverages (SSB) was reported to be higher (63.6%), indicating frequent availability for these beverages on a daily basis. Similar results were reported for self-efficacy of SSB consumption. Sugar-sweetened beverages including soft drinks, fruit drinks, and flavored waters are a main source of added sugars for almost 39% of Americans in 2009-2010. These beverages must be substituted with drinks without added sugars, such as water, low-fat or fat-free milk or 100% fruit or vegetable juice (USDA, 2015). In a recent study, severe obesity in young children was highly linked with intake of SSBs or juice (Ford et al., 2016).

Desserts*:* The availability of desserts at participants' homes was not relatively high, which was a positive result. There was a noticeable difference in the percentage of available desserts

between the participants who had dessert on a daily basis and participants who did not have dessert at all. According to the *Dietary Guidelines of America 2015-2020*, the beverage (47%) and snacks and dessert (31%) are the main contributors of added sugars in population two years and older (USDA, 2015). Approximately 13% or 270 calories per day are derived from added sugars in the US (Mathias, Ng, & Popkin, 2015).

Summary:

From this goal it was discovered that there was insufficient food availability, low self-efficacy, and low actual consumption in the different food groups. Around 4% of all participants reported non-availability of milk at home. The SSBs availability was overall high (63.6%; 4-7 days/week). There was an overall low self-efficacy of whole grains (61.4%), milk (29.3%), whole milk (46.7%), vegetables (63.2%), and colorful vegetable (64.3%) consumption. There was high self-efficacy toward consuming fruit (87.9%), limiting SSBs (62.0%), and drinking water (73.6%), as well as toward physical activity (97.6%). Overall, only 27.0% met the threshold values for bread and cereal, 19.7% for whole grain, 31.5% for low-fat milk, 59.2% for fruits, 18.2% for vegetables, and 15.3% for colorful vegetables. The majority of participants reported high whole milk (67.9%) and SSBs (61.3%) consumption.

Improving self-efficacy and basic nutrition knowledge is essential to changing the nutrition behavior of children (O'Dea, 2016). The study findings highlight the need for nutrition education to focus on:

- Consuming whole grains, along with reducing the consumption of refined and processed grains.
- Increasing the availability of whole grains meat, milk, water, vegetables and fruits, and decreasing SSBs at home.
- Increasing daily intake, especially of low-fat milk and milk products in place of cheese that contains more sodium and saturated fats, and less potassium, vitamin A, and vitamin D compared to milk or yogurt.

- Deep-orange, cruciferous, and dark-green vegetable consumption

Research Goal 2: Analyze and compare food availability, as well as dietary self-efficacy and behavior, based on socio-demographic factors.

Whole grains: This study discovered that participants that reported lower or no availability of whole grains were more likely to report being African American. In this study, younger participants also had high frequency whole grain availability. Data from the NHANES 1999-2004 reported that the mean whole grain serving consumed was 0.59 and 0.63 for children and adolescents between the ages of 6-12 and 13-18 years old, respectively (O'Neil, Nicklas, Zanovec, & Cho, 2010), that supports our findings.

Meat and Beans: The consumption of meat, including processed meat, increased with age suggesting that with age participants developed the preference towards consuming meat. Even though these participants may have low or no meat and beans available at home. It has been reported that there is high meat, poultry, and egg consumption in teen boys and adult men. There is overall low seafood consumption across all age/sex groups suggesting the need to shift to more vegetables and alternate protein rich foods (USDA, 2015).

Milk: Males consumed more milk than females. However, the reported self-efficacy of consuming low fat milk more than twice/day was higher (51.5%) indicating the gap in actual consumption and self-efficacy. Younger participants were consuming and more confident of drinking low fat milk as compared to older participants. It is possible that with age they start developing preference towards different food items yielding a reduction in overall milk consumption. A study has reported dairy and calcium intakes are inadequate in 4-18-year olds (Kranz, Lin, & Wagstaff, 2007). White participants reported highest actual whole milk

consumption. Based on previous research, white girls had the most positive response to the taste of milk while Hispanics had the least taste preference (Auld et al., 2002).

Fruits: Overall there were no differences in availability of fruits based on age and ethnicity. This might indicate awareness or personal preference among participants. Females were more confident of consuming fresh fruit as compared to males. Older participants reported higher fruit consumption as compared to younger participants. White participants reported less availability of fruit at home. Interestingly, Hispanics reported higher fruit availability and consumption of fruit and fresh fruit as compared to non-Hispanics. A study has shown that ethnically Hispanics spent more on fresh fruits compared to Whites and Blacks (Ryabov, 2016). A cross-sectional analyses has shown that dairy, grains, and total fruits and vegetable intakes are inversely proportional to obesity among adolescents (Bradlee, Singer, Qureshi, & Moore, 2010).

Vegetables: Demographically, females, older participants, and Hispanics reported higher availability of vegetables. *The US Dietary Guidelines for Americans 2015-2020* indicate that overall vegetable consumption, gender, and age are lower than the recommended intake. The vegetable intake relative to recommendation is lowest for 9-14 year old males and 14-18 year old females (USDA, 2015). A study has shown that ethnically, African-Americans and Hispanics spend less on vegetables than non-Hispanic Whites (Ryabov, 2016). Higher vegetable consumption could be attributed to traditional cooking methods, tasting preference, or affordability.

Sugar-Sweetened Beverages: Younger participants had a higher frequency availability of these beverages at home. In addition, among different ethnicities, participants who reported they were white had the highest availability of SSBs. Positively, the majority of participants reported

consumption of SSBs one time or less a day. Younger participants had higher actual consumption of sugary drinks as compared to older participants.

Desserts: Females had relatively more availability to desserts at a higher frequency as compared to males. The recommended daily maximum intake of added sugars of 10 grams is exceeded by all age/gender groups and is highest for 9-18 year olds. Grain based ready-to-eat desserts such as cakes, cookies, and pies constitute 7.2% of calories and around 10.8% of solid fats in the US diet. In 2009-2010, stores (33%), schools (32%) and fast food restaurants (35%) contributed to empty calorie intake of children (Poti, Slining, & Popkin, 2014).

Physical Activity*:* The majority of participants had a high frequency of physical activity at home. Males had more high frequency active days as compared to females. It has been reported that physical activity for female adolescents is positively associated with friends and peer physical activity, suggesting inclusion of peer effect in intervention work (Sirard et al., 2013).

Summary:

Race: Hispanics had significantly high availability of meats and beans, and fruits as compared to non-Hispanics. The proportion of non-availability of meats and beans was higher among non-Hispanics. Non-Hispanics had lower self-efficacy for bean consumption as compared with Hispanics. Hispanics reported significantly higher fruit, and fresh fruit consumption compared to non-Hispanics.

Age: Older participants had significantly high availability of vegetables compared with the younger group. Younger participants reported higher self-efficacy of low-fat milk consumption but had lower confidence about MyPlate, planning meals, and snacks according to MyPlate. Older participants had significantly higher meat, processed meat, and fruit consumption

compared to younger participants. However, the SSBs consumption, screen time, and strenuous physical activity for 30 minutes was higher for younger participants.

Gender: Boys had significantly lower fruit, and colorful vegetable availability when compared with girls. Boys had high frequency availability of physical activity. In addition, girls had higher self-efficacy of SSBs consumption. Boys had significantly higher processed meat and low-fat milk consumption compared with girls. In addition, boys reported significantly higher strenuous physical activity than girls.

Research Goal 3: Examine the association between food availability at home and actual dietary behaviors.

Food available at home is the source of 70% of food eaten by Americans. Food availability in the home is a predictor to 75% of overall food consumed (Raynor, Polley, Wing, & Jeffery, 2004; Story, Kaphingst, Robinson-O'Brien, & Glanz, 2008). Availability of healthy foods is an important environmental determinant for improving children's dietary behavior (Olstad, Goonewardene, McCargar, & Raine, 2015). Studies have shown that food choices of children from low-income families are often unhealthy due to the availability of unhealthful food items at homes, restricted eating habits, and late night meals (Dammann & Smith, 2010; Gray et al., 2007). As a result, as expected, there was a significant correlation between "high" availability of almost all studied food items and actual food consumption, such as whole grains, meat consumption, fruit (including fresh fruit), vegetable, and milk, and consumption at threshold levels. The findings highlight the need for interventions to improve overall food availability and access at home, as well as the quality of products created by food manufacturers (Mathias et al., 2015).

Limitations

There are several limitations to this study. First, the study utilized a written questionnaire designed for children, relying on self-report and appropriate cognitive skills to recall what foods were available in their home and what they ate, not objective data. The questionnaire was administered prior to any nutrition education. As a result, they may not have been able to differentiate between "whole" grains and other types of grains, as well as "low-fat" milk and regular, full-fat milk. The method of choice in response to the questionnaire was based on frequency during the day and not on servings or a 24-hour recall that would provide a profile of a child's overall diet for a day, not just patterns of food intake. Additionally, different food items were combined into one category, such as meat and beans, which could have influenced responses. Ideally, parents or childcare providers would have provided insight into food availability and dietary behaviors of participating youth – however, recruitment of parents through school-based programs in research studies is extremely challenging. Additionally, in this study, we simply looked at baseline self-efficacy, behavior, and availability, not factors that may influence these, including food insecurity, parenting approaches and school-based programs. Future studies should consider a mixed methods approach. Incorporating focus group discussions from families could have improved understanding of potential contributors to food purchases, availability, and dietary behavior.

Conclusions and Future Direction

This study acts as a cornerstone for future research by identifying attributes of food availability, self-efficacy, and behavior reported by low-income youth participating in the EFNEP program. Youth reported relatively lower consumption of vegetables, milk, grains, and whole-grains, relative to other food groups and types, similar to national trends. The following

percentage of youth EFNEP participants in our study reported no availability of these foods: whole grains (6.2%); meat (20.8%); milk (4.0%); fruits (6.2%); vegetables (8.3%); and physical activity (5.6%). On the whole, participant self-efficacy towards consuming food groups were relatively high with the exception of whole grains, vegetables, and consuming sugar-sweetened beverages less than once a day. Participants reported high actual availability of whole grains and vegetables, although relatively low self-efficacy towards consuming these foods. Overall, there was low reported consumption of grains, whole grains, low-fat milk, vegetables, colored vegetables, and baked foods, suggesting that participants may not be meeting ideal recommendations and thresholds.

This observational study of EFNEP low-income youth confirmed a need for an urgent intervention focused on nutrition guidance efforts on improving the overall attitude, subjective norm, and perceived behavioral control for the intake of whole grains, protein, low-fat dairy products at homes and schools along with reducing screen time. The overall improvement and shift towards healthier dietary choices during younger age will have a positive and long lasting impact which can be tracked into adulthood.

The next phase of the project will analyze differences in responses from before to after participation in the youth EFNEP nutrition education program. The outcomes will enable researchers and administrators to understand program strengths and weaknesses. The differences in dietary self-efficacy and behavior as a result of the program can determine the role that youth EFNEP can play in addressing dietary quality among this vulnerable population.

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Appendixes

Appendix A: IRB Approval Letter

Office of Research Compliance
Institutional Review Board
2000 Kraft Drive, Suite 2000 (0497)
Blacksburg, Virginia 24060
540/231-4606 Fax 540/231-0959
e-mail irb@vt.edu
Website: www.irb.vt.edu

MEMORANDUM

DATE: September 16, 2011

TO: Elena L. Serrano, George Davis, Jandelle Fournillier, Mary McFerren

FROM: Virginia Tech Institutional Review Board (FWA00000572, expires May 31, 2014)

PROTOCOL TITLE: Examination of the Cost Effectiveness of Youth EFNEP

IRB NUMBER: 11-771

Effective September 16, 2011, the Virginia Tech IRB Chair, Dr. David M. Moore, approved the new protocol for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB-approved protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the IRB as an amendment request and approved by the IRB prior to the implementation of any changes, regardless of how minor, except where necessary to eliminate apparent immediate hazards to the subjects. Report promptly to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at http://www.irb.vt.edu/pages/responsibilities.htm (please review before the commencement of your research).

PROTOCOL INFORMATION:
Approved as: **Expedited, under 45 CFR 46.110 category(ies) 7**
Protocol Approval Date: **9/16/2011**
Protocol Expiration Date: **9/15/2012**
Continuing Review Due Date*: **9/1/2012**
*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

FEDERALLY FUNDED RESEARCH REQUIREMENTS:
Per federally regulations, 45 CFR 46.103(f), the IRB is required to compare all federally funded grant proposals / work statements to the IRB protocol(s) which cover the human research activities included in the proposal / work statement before funds are released. Note that this requirement does not apply to Exempt and Interim IRB protocols, or grants for which VT is not the primary awardee.

The table on the following page indicates whether grant proposals are related to this IRB protocol, and which of the listed proposals, if any, have been compared to this IRB protocol, if required.

Date*	OSP Number	Sponsor	Grant Comparison Conducted?
9/15/2011	08253506	USDA CSREES	yes on 9/15/2011

*Date this proposal number was compared, assessed as not requiring comparison, or comparison information was revised.

If this IRB protocol is to cover any other grant proposals, please contact the IRB office (irbadmin@vt.edu) immediately.

cc: File

Appendix B: Instrument for EPNEP Survey

Instrument: Instruments for youth EFNEP effects survey

HEALTHY WEIGHTS FOR HEALTHY KIDS EVALUATION

Before ☐ **After** ☐

Instruction: Please write in your answer to the following questions. When you respond, please print your answer.

Section 1: Tell us about yourself.

1. What is the **first letter** of your:

FIRST name _____ MIDDLE name _____ LAST name _____

2. Are you a: Boy ☐ Girl ☐ **[Please check one.]**

3. What **month** were you born? **[Please circle one.]**

January	February	March	April
May	June	July	August
September	October	November	December

4. What is your **favorite food**?

_____

5. What is your **favorite superhero**?

_____

6. How **old** are you? **[Please circle one.]**

7 8 9 10 11 12 13 14

Please circle your answer to the following questions:

7	**How do you describe yourself?**	American Indian/ Alaskan Native	Asian	Pacific Islander	African American	White	Other
8	**Are you Hispanic or Latino?**	Yes			No		
9	**What language do you use with your parents most of the time?**	English	Spanish	Vietnamese		Chinese	Other
10	**Who do you live with?**	Mother	Father	Both mother and father		Grand parents	Other
11	**What grades do you usually get in school?**	Mostly A's	Mostly B's	Mostly C's	Mostly D's	Mostly F's or E's	

Section 2: What foods and drinks can you find at home?

Below are some questions about foods and drinks you had in your home last week.
This is *not* a question about eating, but just about *if* they were in your home. Please circle how many days last week the food or drink was in your home. **Circle just one.**

12	Last week, we had **food made with whole grains** like whole wheat breads, cereals, brown rice, in our home _____ days a week	0 days	1 day	2 days	3 days	4 days	5 days	6 days	7 days	I don't know
13	Last week, we had **meat or kidney beans, or black beans, or brown beans, or red beans,** in our home_____ days a week	0 days	1 day	2 days	3 days	4 days	5 days	6 days	7 days	I don't know
14	Last week, we had **milk and milk products** like yogurt, cheese, in our home_____ days a week	0 days	1 day	2 days	3 days	4 days	5 days	6 days	7 days	I don't know
15	Last week, we had **fruit** like apple, oranges, cantaloupe, grapes, pears, in our home_____ days a week	0 days	1 day	2 days	3 days	4 days	5 days	6 days	7 days	I don't know

16	Last week, we had **vegetables** like broccoli, green beans, spinach, corn, tomatoes, carrots, in our home_____ days a week	0 days	1 day	2 days	3 days	4 days	5 days	6 days	7 days	I don't know
17	Last week, we had **beverages** like Coke,™ Gatorade,™ fruit drinks, Snapple,™ in our home_____ days a week	0 days	1 day	2 days	3 days	4 days	5 days	6 days	7 days	I don't know
18	Last week, we had **desserts** like cookies, cake, candy or pies, in our home_____ days a week	0 days	1 day	2 days	3 days	4 days	5 days	6 days	7 days	I don't know
19	Last week, I had the chance to be **physically active at home** _____ days a week	0 days	1 day	2 days	3 days	4 days	5 days	6 days	7 days	I don't know

SELF-EFFICACY

Section 3: What do you THINK you can eat?

We want to ask you some questions about your *confidence* in eating different foods or drinking different beverages each day. We are *not* asking what you *actuall*y eat or drink or what you *should* eat or drink. This is not a test. There are no right or wrong answers. So, please be as honest as possible. Please read the 2 examples below:

A.	**Each day, I think I can** eat a banana… I think I can eat a banana at breakfast, one for an afternoon snack, and one after dinner. So, that is a total of three times. I circle 3 or more.	0	1	2	3 or more
B.	**Each day, I think I can** eat carrots… I do not think I can eat any carrots. I circle 0.	0	1	2	3 or more

Please respond just like the examples above, by circling ONE number for each question.

20	**Each day, I think I can** eat breads, grains and cereals….	0	1	2	3 or more
21	**Each day, I think I can** eat whole grains… Whole grains include whole wheat breads, oatmeal, cornmeal (cornbread), brown rice, and popcorn.	0	1	2	3 or more

22	**Each day, I think I can** eat kidney beans, or black beans, or brown beans, or red beans… Do not include green beans.	0	1	2	3 or more
23	**Each day, I think I can** drink milk… Include milk substitutes like soy milk, almond milk, and rice milk.	0	1	2	3 or more
24	**Each day, I think I can** drink fat-free or low fat milk… Include milk substitutes. Consider any flavor, smoothies, coffee drinks, and other beverages. Low fat milk is 1% and fat-free is skim milk or 0% milk, and they usually have green tops.	0	1	2	3 or more
25	**Each day, I think I can** drinkwhole milk… Include milk substitutes. Consider any flavor, smoothies, coffee drinks, and other beverages. Reduced fat is 2%, and usually has blue tops. Whole milk usually has red tops.	0	1	2	3 or more

26	**Each day, I think I can** eat fruit… Fruit includes pieces of fresh fruit, dried fruit, or 100% fruit juice.	0	1	2	3 or more

27	**Each day, I think I can** eat *fresh* fruit…	0	1	2	3 or more
28	**Each day, I think I can** eat vegetables…	0	1	2	3 or more
29	**Each day, I think I can** eat vegetables that were orange, red, yellow, or green…	0	1	2	3 or more
30	**Each day, I think I can** eat baked foods instead of fried foods… Baked foods include chicken without skin and pretzels.	0	1	2	3 or more

31	**Each day, I think I can** drink regular soda… Regular soda includes Coca Cola, ™ Pepsi, ™ and Mountain Dew. ™	0	1	2	3 or more
32	**Each day, I think I can** drink water…	0	1	2	3 or more

		Yes or No?			
33	I know what to eat for **MyPlate**...	Yes			No
		How much do you agree with this statement?			
34	**Each day, I think I can** eat meals and snacks according to **MyPlate**	Strongly Disagree	Disagree	Agree	Strongly Agree

Section 4: How physically active do you THINK you can be?

Below are statements about how active you think you can be. Please circle ONE category for each question. Be sure to read the question and response closely.

	Question	Hours Per Day				
35	**Each day, I think I can** be physically active for _____ hours. Physically active includes running, jumping, and dancing.	0	½	1	1 ½	2 or more
	Question	Days Per Week				
36	**Each week, how many days do you think you can** breathe hard for 30 minutes or more while physically active?	0	1	2	3	4 or more

BEHAVIOR

Section 5: What did YOU Eat or Drink Yesterday?

In this section, we want to ask you some questions about what you **actually** eat and drink – *NOT* what you *should* eat or drink or *think* you can eat or drink. There are no right or wrong answers. Please be as honest as possible.

C.	Yesterday, I ate a banana… Yesterday, I ate a banana at breakfast, at lunch, for an afternoon snack, and at dinner. So, that is a total of four times. I circle 3 or more.	0	1	2	3 or more
D.	Yesterday, I ate carrots… Yesterday, I did not eat any carrots. I circle 0.	0	1	2	3 or more

Please respond just like the examples above, by circling ONE number for each question.

37	Yesterday, I ate **breads, grains and cereals….**	0	1	2	3 or more
38	Yesterday, I ate **whole grains…** Whole grains include whole wheat breads, oatmeal, cornmeal (cornbread), brown rice, and popcorn.	0	1	2	3 or more

39	Yesterday, I ate **meat…**	0	1	2	3 or more
40	Yesterday, I ate **hamburger meat, hot dogs, sausage (chorizo), steak, bacon, bologna, or ribs…**	0	1	2	3 or more
41	Yesterday, I drank **milk**… Include milk substitutes like soy milk, almond milk, and rice milk.	0	1	2	3 or more
42	Yesterday, I drank **fat-free or low fat milk…** Include milk substitutes. Consider any flavor, smoothies, coffee drinks, and other beverages. Low fat milk is 1% and fat-free is skim milk or 0% milk, and they usually have green tops.	0	1	2	3 or more
43	Yesterday, I drank **whole milk…** Include milk substitutes. Consider any flavor, smoothies, coffee drinks, and other beverages. Reduced fat is 2%, and usually has blue tops. Whole milk usually has red tops.	0	1	2	3 or more
44	Yesterday, I ate **fruit…** Fruit includes pieces of fresh fruit, dried fruit, or 100% fruit juice.	0	1	2	3 or more

45	Yesterday, I ate ***fresh*** **fruit…**	0	1	2	3 or more
46	Yesterday, I ate ***canned*** **fruit in syrup…**	0	1	2	3 or more
47	Yesterday, I ate **vegetables…**	0	1	2	3 or more
48	Yesterday, I ate **vegetables that were orange, red, yellow, or green…**	0	1	2	3 or more
49	Yesterday, I ate **baked foods instead of fried foods…** Baked foods include chicken without skin and pretzels.	0	1	2	3 or more
50	Yesterday, I drank **regular soda…** Regular soda includes Coca Cola, ™ Pepsi, ™ and Mountain Dew. ™	0	1	2	3 or more
51	Yesterday, I drank **water…**	0	1	2	3 or more

How much do you agree with this statement?					
52	Yesterday**, I ate** meals and snacks according to **MyPlate**	Strongly Disagree	Disagree	Agree	Strongly Agree

Section 6: How physically active are YOU?

Below are statements about how active you are. Please circle ONE category for each question. Be sure to read the question and response closely.

	Question	Hours Per Day			
53.1	Yesterday, were you **physically active?**	Yes		No	
If yes, *please answer question 53.2.* ***If No****, go to question 54.1.*					
53.2	Yesterday, I was **physically active for _____ hours.** Physically active includes running, jumping, and dancing.	½	1	1 ½	2 or more
54.1	Yesterday, did you **watch TV, play video games, or use the computer?**	Yes		No	
If yes, *please answer question 54.2.* ***If No****, go to question 55.*					

54.2	Yesterday, I **watched TV, played video games, or used the computer** for _____ hours.		1	2		3 or more
	Question		Days Per Week			
55	Last week, how many days did you **breathe hard for 30 minutes or more** while physically active?	0	1	2	3	4 or more

THANK YOU!

Appendix C: Availability of Whole Grains, Meat and Beans, and Milk at Home

Social Demo-graphic factor	Category	Whole Grains N (%)				Meat and Beans N (%)				Fat-free or low-fat milk N (%)			
		N	None	Lower Freq (1-3 days)	Higher Freq (4-7 days)	N	None	Lower Freq (1-3 days)	Higher Freq (4-7 days)	N	None	Lower Freq (1-3 days)	Higher Freq (4-7 days)
Gender	Male	613 (46.6)	40 (6.5)	187 (30.5)	386 (62.9)	746 (51.7)	133 (19.1)	267 (38.4)	296 (42.5)	777 (47.7)	37 (4.8)	162 (20.8)	578 (74.3)
	Female	704 (53.5)	42 (5.9)	234 (33.2)	428 (60.8)	696 (48.2)	167 (22.4)	279 (37.4)	300 (40.2)	852 (52.3)	29 (3.4)	176 (20.6)	647 (75.9)
	Total	1317				1442				1629			
	P-value	0.5598				0.3055				0.3658			
Age	Younger (7-10)	1015 (77.0)	64 (6.3)	304 (29.9)	647 (63.7)	1113 (77.1)	244 (21.9)	396 (35.6)	473 (42.50)	1279 (78.5)	55 (4.3)	264 (20.6)	960 (75.1)
	Older (11-14)	303 (22.9)	18 (5.9)	117 (38.6)	168 (55.5)	330 (22.9)	56 (16.9)	150 (45.5)	124 (37.6)	351 (21.5)	11 (3.1)	75 (21.4)	265 (75.5)
	Total	*1318*				1443				1630			
	P-value	***0.0202***				***<u>0.0044</u>***				0.6276			
Race	Hispanic	128 (9.8)	7 (5.5)	35 (27.3)	86 (67.2)	1269 (89.1)	20 (12.8)	55 (35.3)	81 (51.9)	1438 (89.4)	4 (2.4)	31 (18.2)	135 (79.4)
	Non-Hispanic	1173 (90.2)	75 (6.3)	374 (31.7)	724 (61.7)	156 (10.9)	278 (21.9)	482 (37.9)	509 (40.1)	170 (10.6)	61 (4.2)	297 (20.7)	1080 (75.1)
	Total	1301				1425				1608			
	P-value	0.5180				**<u>0.0043</u>**				0.3912			

Ethnicity	African American	404 (32.9)	27 (6.7)	167 (41.3)	210 (51.9)	432 (43.4)	103 (23.8)	177 (40.9)	152 (35.2)	459 (40.9)	25 (5.5)	128 (27.9)	306 (66.7)
	White	515 (42.0)	27 (5.2)	131 (25.4)	357 (69.3)	564 (56.6)	113 (20.1)	204 (36.2)	247 (43.8)	662 (59.1)	26 (3.9)	97 (14.7)	539 (81.4)
	Total	1225				1340				1520			
	P-value	**<.0001**				**0.0204**				**0.0001**			
Living Arrange-ment	Both parents	783 (61.2)	51 (6.5)	233 (29.8)	499 (63.7)	848 (60.6)	169 (19.9)	299 (35.3)	380 (44.8)	978 (61.6)	36 (3.7)	180 (18.4)	762 (77.9)
	Other	495 (38.7)	29 (5.9)	176 (35.6)	290 (58.6)	551 (39.4)	122 (22.2)	235 (42.7)	194 (35.2)	609 (38.4)	28 (4.6)	151 (24.7)	430 (70.6)
	Total	1278				1399				1587			
	P-value	**0.0999**				**0.0021**				**0.0285**			

* Percentages were computed as numbers of participants within each level of availability divided by the number of participants in each of the social demographic categories

Appendix D: Availability of Fruits and Vegetables at Home

Category		Fruit N (%)				Colorful Vegetables N (%)			
		N	None	Lower Freq (1-3)	Higher Freq (4-7)	N	None	Lower Freq (1-3)	Higher Freq (4-7)
Gender	Male	770 (48.5)	61 (7.9)	191 (24.8)	518 (67.2)	755 (47.9)	83 (10.9)	225 (29.8)	447 (59.2)
	Female	819 (51.5)	38 (4.6)	191 (23.3)	590 (72.0)	823 (52.2)	48 (5.8)	220 (26.7)	555 (67.4)
	Total	1589				1578			
	P-value	**0.0129**				**2.000E-04**			
Age	Younger (7-10)	1239 (77.9)	83 (6.7)	300 (24.2)	856 (69.1)	1231 (78.0)	118 (9.6)	334 (27.1)	779 (63.3)
	Older (11-14)	351 (22.1)	16 (4.6)	83 (23.7)	252 (71.8)	347 (21.9)	13 (3.8)	110 (31.7)	224 (64.6)
	Total	1590				1578			
	P-value	0.3211				**0.0011**			
Race	Hispanic	171 (10.9)	7 (4.1)	27 (15.8)	137 (80.1)	160 (10.3)	19 (11.9)	32 (20.0)	109 (68.1)
	Non-Hispanic	1399 (89.1)	89 (6.4)	349 (24.9)	961 (68.7)	1397 (89.7)	110 (7.9)	405 (28.9)	882 (63.1)
	Total	1570				1557			
	P-value	**0.0069**				**0.0221**			
Ethnicity	African American	449 (41.5)	25 (5.6)	122 (27.2)	302 (67.3)	449 (40.8)	21 (4.7)	150 (33.4)	278 (61.9)
	White	634 (58.5)	54 (8.5)	150 (23.7)	430 (67.8)	651 (59.2)	66 (10.1)	161 (24.7)	424 (65.1)
	Total	1479				1471			
	P-value	0.1040				<.0001			
Living Arrange-ment	Both parents	950 (61.5)	64 (6.7)	208 (21.9)	678 (71.4)	933 (60.9)	78 (8.4)	260 (27.9)	595 (63.8)
	Others	596 (38.5)	33 (5.5)	167 (28.0)	396 (66.4)	600 (39.1)	53 (8.8)	174 (29.0)	373 (62.2)
	Total	1546				1533			
	P-value	0.0212				0.8761			

***** Percentages were computed as numbers of participants within each level of availability divided by the number of participants in each of the social demographic categories

Appendix E: Availability of Sugar-sweetened Beverages and Desserts at Home

Category		Sugar-Sweetened Beverages N (%)				Desserts N (%)			
		N	None	Lower Freq (1-3)%	Higher Freq (4-7)%	N	None	Lower Freq (1-3)%	Higher Freq (4-7)%
Gender	Male	799 (47.9)	89 (11.1)	220 (27.5)	490 (61.3)	818 (48.9)	109 (13.3)	333 (40.7)	376 (45.9)
	Female	868 52.1)	74 (8.5)	223 (25.7)	571 (65.9)	859 (51.2)	81 (9.4)	344 (40.1)	434 (50.5)
	Total	1667				1677			
	P-value	0.0944				**0.0232**			
Age	Younger (7-10)	1317 (79.1)	135 (10.3)	328 (24.9)	854 (64.8)	1320 (78.8)	151 (11.4)	539 (40.8)	630 (47.7)
	Older (11-14)	349 (20.9)	28 (8.0)	116 (33.2)	205 (58.7)	356 (21.2)	39 (10.9)	138 (38.8)	179 (50.3)
	Total	1667				1676			
	P-value	**0.0072**				0.6989			
Race	Hispanic	173 (10.5)	15 (8.7)	51 (29.5)	107 (61.9)	179 (10.8)	22 (12.3)	78 (43.6)	79 (44.1)
	Non-Hispanic	1477 (89.5)	146 (9.9)	386 (26.1)	945 (63.9)	1478 (89.2)	166 (11.2)	589 (39.9)	723 (48.9)
	Total	1650				1657			
	P-value	0.6231				0.4687			
	African American	463 (40.19)	46 (9.9)	149 (32.1)	268 (57.9)	470 (40.5)	48 (10.2)	199 (42.3)	223 (47.5)
	White	689 (59.8)	60 (8.7)	146 (21.2)	483 (70.1)	689 (59.5)	80 (11.6)	262 (38.0)	347 (50.4)
	Total	1551				1561			
	P-value	**0.0001**				0.3295			
	Both parents	1005 (61.9)	109 (10.9)	258 (25.7)	638 (63.5)	1012	113 (11.2)	404 (39.9)	495 (48.9)

Living Arrangement						(62.1)			
	Others	618 (38.1)	48 (7.7)	177 (28.6)	393 (63.6)	617 (37.8)	72 (11.7)	256 (41.5)	289 (49.8)
	Total	1623				1629			
	P-value	**0.0768**				0.7223			

* Percentages were computed as numbers of participants within each level of availability divided by the number of participants in each of the social demographic categories

Appendix F: Availability of Physical Activity Opportunities at Home

Category		Physical Activity N (%)			
		N%	**None**	**Lower Freq (1-3)%**	**Higher Freq(4-7)%**
Gender	Male	824 (49.1)	51 (6.2)	151 (18.3)	622 (75.5)
	Female	852 (50.8)	43 (5.1)	199 (23.4)	610 (71.6)
	Total	1676			
	P-value	**0.0306**			
Age	Younger (7-10)	1322 (78.9)	72 5.45	275 20.80	975 73.75
	Older (11-14)	353 (21.1)	22 (6.2)	75 (21.3)	256 (72.5)
	Total	1675			
	P-value	0.7948			
Race	Hispanic	174 (10.5)	12 (6.9)	39 (22.4)	123 (70.7)
	Non-Hispanic	1482 (89.5)	80 (5.4)	308 (20.8)	1094 (73.8)
	Total	1656			
	P-value	0.5428			
Ethnicity	African American	451 (38.3)	32 (7.1)	117 (25.9)	302 (66.9)
	White	696 (60.7)	30 (4.3)	114 (16.4)	552 (79.3)
	Total	1556			
	P-value	**<.0001**			
Living Arrangement	Both parents	1012 (62.1)	50 (4.9)	198 (19.6)	764 (75.5)
	Others	617 (37.8)	41 (6.7)	145 (23.5)	431 (69.9)
	Total	1629			
	P-value	**0.0388**			

* Percentages were computed as numbers of participants within each level of availability divided by the number of participants in each of the social demographic categories

Appendix G: Food Intake at Home by Socio-Demographic Factor

*The tables were designed to report the participant responses for each food items separately in relation to socio-demographic information.

Behavioral intake measurement at baseline	Predictor	Category	N%	Threshold (≥3Times per Day) N (%)	P_Value
Whole Grain	Gender	Boy	880 (48.7)	182 (20.7)	0.315
		Girl	928 (51.3)	174 (18.8)	
	Age	11-14	378 (20.9)	70 (18.5)	0.514
		7-10	1428 (79.1)	287 (20.1)	
	Living Arrangement	Both mother and father	1088 (61.8)	199 (18.3)	0.074
		Others	673 (38.2)	147 (21.8)	
	Ethnicity	African American	505 (40.5)	121 (24.0)	0.000
		White	742 (59.5)	118 (15.9)	
	Race	Hispanic	195 (10.9)	45 (23.1)	0.214
		Non-Hispanic	1589 (89.1)	305 (19.2)	

Behavioral intake measurement at baseline	Predictor	Category	N%	Threshold (≥2Times per Day) N (%)	P_Value
Meat	Gender	Boy	875 (48.4)	487 (55.7)	0.186
		Girl	933 (51.6)	490 (52.5)	
	Age	11-14	375 (20.8)	224 (59.7)	0.015
		7-10	1431 (79.2)	753 (52.6)	
	Living Arrangement	Both mother and father	1090 (61.9)	569 (52.2)	0.076
		Others	671 (38.1)	380 (56.6)	
	Ethnicity	African American	506 (40.5)	316 (62.5)	0.001
		White	743 (59.5)	363 (48.9)	
	Race	Hispanic	194 (10.9)	100 (51.5)	0.446
		Non-Hispanic	1590 (89.1)	866 (54.5)	

Behavioral intake measurement at baseline	Predictor	Category	N%	Threshold (≥2Times per Day) N (%)	P_Value
Processed Meat	Gender	Boy	870 (48.5)	374 (43.0)	0.038
		Girl	924 (51.5)	352 (38.1)	
	Age	11-14	373 (20.8)	176 (47.2)	0.004
		7-10	1419 (79.2)	550 (38.8)	
	Living Arrangement	Both mother and father	1089 (62.3)	402 (36.9)	0.001
		Others	658 (37.7)	303 (46.0)	
	Ethnicity	African American	503 (40.6)	252 (50.1)	0.001
		White	735 (59.4)	231 (31.4)	
	Race	Hispanic	194 (11.0)	72 (37.1)	0.28
		Non-Hispanic	1577 (89.0)	650 (41.2)	

Behavioral intake measurement at baseline	Predictor	Category	N%	Threshold (≥2Times per Day) N (%)	P_Value
Milk	Gender	Boy	854 (48.7)	450 (52.7)	0.017
		Girl	899 (51.3)	422 (46.9)	
	Age	11-14	369 (21.1)	190 (51.5)	0.482
		7-10	1382 (78.9)	682 (49.3)	
	Living Arrangement	Both mother and father	1055 (61.7)	525 (49.8)	0.842
		Others	655 (38.3)	322 (49.2)	
	Ethnicity	African American	495 (40.7)	227 (45.9)	0.161
		White	721 (59.3)	361 (50.1)	
	Race	Hispanic	190 (11.0)	98 (51.6)	0.591
		Non-Hispanic	1539 (89.0)	760 (49.4)	

Behavioral intake measurement at baseline	Predictor	Category	N%	Threshold (≥2Times per Day) N (%)	P_Value
Low fat milk	Gender	Boy	875 (48.4)	302 (34.5)	0.007
		Girl	931 (51.6)	266 (28.6)	
	Age	11-14	378 (21.0)	101 (26.7)	0.025
		7-10	1426 (79.0)	468 (32.8)	
	Living Arrangement	Both mother and father	1090 (61.9)	338 (31.0)	0.7110
		Others	670 (38.1)	214 (31.9)	
	Ethnicity	African American	508 (30.2)	178 (35.0)	0.001
		White	742 (59.4)	195 (26.3)	
	Race	Hispanic	192 (10.8)	63 (32.8)	0.681
		Non-Hispanic	1590 (89.2)	496 (31.2)	

Behavioral intake measurement at baseline	Predictor	Category	N%	Threshold (≥2Times per Day) N (%)	P_Value
Whole milk	Gender	Boy	878 (48.6)	590 (67.2)	0.512
		Girl	930 (51.4)	639 (68.7)	
	Age	11-14	377 (20.9)	247 (65.5)	0.292
		7-10	1429 (79.1)	979 (68.5)	
	Living Arrangement	Both mother and father	1090 (61.9)	758 (69.5)	0.041
		Others	671 (38.1)	435 (64.8)	
	Ethnicity	African American	509 (40.6)	328 (64.4)	0.003
		White	746 (59.4)	540 (72.4)	
	Race	Hispanic	193 (10.8)	128 (66.3)	0.625
		Non-Hispanic	1592 (89.2)	1083 (68.0)	

Behavioral intake measurement at baseline	Predictor	Category	N%	Threshold (≥2Times per Day) N (%)	P_Value
Fruit	Gender	Boy	881 (48.6)	506 (57.4)	0.139
		Girl	933 (51.4)	568 (60.9)	
	Age	11-14	377 (20.8)	241 (63.9)	0.045
		7-10	1435 (79.2)	834 (58.1)	
	Living Arrangement	Both mother and father	1095 (61.9)	632 (57.7)	0.149
		Others	673 (38.1)	412 (61.2)	
	Ethnicity	African American	509 (40.6)	340 (66.8)	0.001
		White	746 (59.4)	379 (50.8)	
	Race	Hispanic	194 (10.8)	132 (68.0)	0.009
		Non-Hispanic	1597 (89.2)	930 (58.2)	

Behavioral intake measurement at baseline	Predictor	Category	N%	Threshold (≥2Times per Day) N (%)	P_Value
Fresh Fruit	Gender	Boy	882 (48.7)	433 (49.1)	0.11
		Girl	929 (51.3)	491 (52.9)	
	Age	11-14	378 (20.9)	207 (54.8)	0.118
		7-10	1431 (79.1)	718 (50.2)	
	Living Arrangement	Both mother and father	1094 (62.1)	545 (49.8)	0.239
		Others	669 (37.9)	353 (52.8)	
	Ethnicity	African American	506 (40.4)	313 (61.9)	0.001
		White	746 (59.6)	304 (40.8)	
	Race	Hispanic	195 (10.9)	122 (62.6)	0.001
		Non-Hispanic	1593 (89.1)	791 (49.7)	

Behavioral intake measurement at baseline	Predictor	Category	N%	Threshold (≥3Times per Day) N (%)	P_Value
Vegetable	Gender	Boy	860 (48.6)	135 (15.7)	0.008
		Girl	910 (51.4)	188 (20.7)	
	Age	11-14	372 (21.1)	67 (18.0)	0.94
		7-10	1395 (78.9)	256 (18.4)	
	Living Arrangement	Both mother and father	1067 (61.9)	195 (18.3)	0.651
		Others	656 (38.1)	114 (17.4)	
	Ethnicity	African American	494 (40.0)	108 (21.9)	0.014
		White	740 (60.0)	120 (16.2)	
	Race	Hispanic	189 (10.8)	27 (14.3)	0.162
		Non-Hispanic	1557 (89.2)	290 (18.6)	

Behavioral intake measurement at baseline	Predictor	Category	N%	Threshold (≥3Times per Day) N (%)	P_Value
Colored Vegetable a day	Gender	Boy	872 (48.7)	120 (13.8)	0.077
		Girl	920 (51.3)	155 (16.8)	
	Age	11-14	375 (20.9)	58 (15.5)	0.936
		7-10	1415 (79.1)	217 (15.3)	
	Living Arrangement	Both mother and father	1084 (62.2)	165 (15.2)	1
		Others	660 (37.8)	101 (15.3)	
	Ethnicity	African American	498 (40.1)	93 (18.7)	0.033
		White	743 (59.9)	105 (14.1)	
	Race	Hispanic	193 (10.9)	24 (12.4)	0.289
		Non-Hispanic	1577 (89.1)	246 (15.6)	

Behavioral intake measurement at baseline	Predictor	Category	N%	Threshold (≥2Times per Day) N (%)	P_Value
Baked food instead of fried food	Gender	Boy	876 (48.8)	279 (31.8)	0.879
		Girl	918 (51.2)	289 (31.5)	
	Age	11-14	375 (20.9)	136 (36.3)	0.039
		7-10	1418 (79.1)	433 (30.5)	
	Living Arrangement	Both mother and father	1085 (62.1)	345 (31.8)	1
		Others	663 (37.9)	211 (31.8)	
	Ethnicity	African American	502 (40.4)	193 (38.4)	0.001
		White	741 (59.6)	192 (25.9)	
	Race	Hispanic	194 (10.9)	63 (32.5)	0.744
		Non-Hispanic	1578 (89.1)	495 (31.4)	

Behavioral intake measurement at baseline	Predictor	Category	N%	Threshold (≥1Times per Day) N (%)	P_Value
Sugar-sweetened Beverages	Gender	Boy	882 (48.8)	531 (60.2)	0.335
		Girl	926 (51.2)	578 (62.4)	
	Age	11-14	377 (20.9)	207 (54.9)	0.004
		7-10	1429 (79.1)	901 (63.1)	
	Living Arrangement	Both mother and father	1096 (62.3)	694 (63.3)	0.023
		Others	664 (37.7)	384 (57.8)	
	Ethnicity	African American	501 (40.2)	293 (58.5)	0.139
		White	746 (59.8)	468 (62.7)	
	Race	Hispanic	195 (10.9)	128 (65.6)	0.186
		Non-Hispanic	1590 (89.1)	964 (60.6)	

Behavioral intake measurement at baseline	Predictor	Category	N%	Threshold (≥3Times per Day) N (%)	P_Value
Water	Gender	Boy	879 (48.9)	453 (51.5)	0.08
		Girl	920 (51.1)	513 (55.8)	
	Age	11-14	375 (20.9)	194 (51.7)	0.383
		7-10	1422 (79.1)	772 (54.3)	
	Living Arrangement	Both mother and father	1091 (62.3)	600 (55.0)	0.103
		Others	661 (37.7)	337 (51.0)	
	Ethnicity	African American	502 (40.4)	291 (58.0)	0.001
		White	742 (59.6)	354 (47.7)	
	Race	Hispanic	194 (10.9)	120 (61.9)	0.018
		Non-Hispanic	1582 (89.1)	834 (52.7)	

Behavioral intake measurement at baseline	Predictor	Category	N%	Yes N%	P_Value
Knowledgeable of MyPlate	Gender	Boy	826 (48.4)	417 (50.5)	0.699
		Girl	882 (51.6)	454 (51.5)	
	Age	11-14	362 (21.2)	225 (62.2)	0.001
		7-10	1345 (78.8)	646 (48.0)	
	Living Arrangement	Both mother and father	1032 (62.1)	536 (51.9)	0.266
		Others	630 (37.9)	309 (49.0)	
	Ethnicity	African American	478 (40.5)	311 (65.1)	0.001
		White	703 (59.5)	291 (41.4)	
	Race	Hispanic	187 (11.1)	104 (55.6)	0.188
		Non-Hispanic	1502 (88.9)	757 (50.4)	

Behavioral intake measurement at baseline	Predictor	Category	N%	Yes N%	P_Value
Physical Activity	Gender	Boy	872 (48.6)	778 (89.2)	0.241
		Girl	922 (51.4)	806 (87.4)	
	Age	11-14	371 (20.7)	322 (86.8)	0.319
		7-10	1421 (79.3)	1260 (88.7)	
	Living Arrangement	Both mother and father	1085 (62.1)	964 (88.8)	1
		Others	662 (37.9)	575 (86.9)	
	Ethnicity	African American	499 (40.3)	443 (88.9)	0.409
		White	740 (59.7)	658 (88.9)	
	Race	Hispanic	192 (10.8)	165 (85.9)	0.288
		Non-Hispanic	1579 (89.2)	1397 (88.5)	

Behavioral intake measurement at baseline	Predictor	Category	N%	Threshold (≥1/hr per Day) N (%)	P_Value
Physical Activity Hours	Gender	Boy	852 (48.2)	815 (95.7)	0.906
		Girl	915 (51.8)	877 (95.8)	
	Age	11-14	368 (20.8)	354 (96.2)	0.771
		7-10	1397 (79.2)	1337 (95.7)	
	Living Arrangement	Both mother and father	1066 (61.9)	1022 (95.9)	0.714
		Others	656 (38.1)	626 (95.4)	
	Ethnicity	African American	493 (40.0)	478 (97.0)	0.111
		White	728 (59.6)	691 (94.9)	
	Race	Hispanic	189 (10.8)	181 (95.8)	1
		Non-Hispanic	1555 (89.2)	1489 (95.8)	

Behavioral intake measurement at baseline	Predictor	Category	N%	Yes N%	P_Value
Screen Time	Gender	Boy	869 (48.6)	744 (85.6)	0.135
		Girl	918 (51.4)	762 (83.0)	
	Age	11-14	367 (20.6)	331 (90.2)	0.001
		7-10	1418 (79.4)	1173 (82.7)	
	Living Arrangement	Both mother and father	1079 (62.0)	898 (83.2)	0.313
		Others	661 (38.0)	563 (85.2)	
	Ethnicity	African American	499 (40.4)	442 (88.6)	0.002
		White	737 (59.9)	606 (82.2)	
	Race	Hispanic	192 (10.9)	154 (80.2)	0.114
		Non-Hispanic	1573 (89.1)	1335 (84.9)	

Behavioral intake measurement at baseline	Predictor	Category	N%	Threshold (≥2/hr per Day) N (%)	P_Value
Screen Time Hours	Gender	Boy	864 (48.8)	620 (71.8)	0.393
		Girl	906 (51.2)	667 (73.6)	
	Age	11-14	365 (20.6)	247 (67.7)	0.015
		7-10	1403 (79.4)	1040 (74.1)	
	Living Arrangement	Both mother and father	1072 (62.1)	812 (75.7)	0.001
		Others	653 (37.9)	446 (68.3)	
	Ethnicity	African American	493 (40.3)	325 (65.9)	0.001
		White	730 (59.7)	557 (76.3)	
	Race	Hispanic	187 (10.7)	143 (76.5)	0.225
		Non-Hispanic	1561 (89.3)	1127 (72.2)	

Appendix H: Self- Efficacy at Baseline by Socio-Demographic Factor

* The tables were designed to report the participant responses for each food items separately in relation to socio-demographic information.

Dietary Behavior by Food Group	**Predictor**	**Category**	**N%**	**Threshold (≥3Times per Day) N (%)**	**P_Value**
Whole Grain	Gender	Boy	894 (48.7)	350 (39.1)	0.701
		Girl	940 (51.3)	359 (38.2)	
	Age	11-14	382 (20.9)	133 (34.8)	0.087
		7-10	1450 (79.1)	576 (39.7)	
	Living Arrangement	Both mother and father	1106 (61.9)	434 (39.2)	0.617
		Others	680 (38.1)	258 (37.9)	
	Ethnicity	African American	509 (40.3)	188 (36.9)	0.264
		White	755 (59.7)	303 (40.1)	
	Race	Hispanic	198 (10.9)	84 (42.4)	0.279
		Non-Hispanic	1612 (89.1)	617 (38.3)	

Dietary Behavior by Food Group	Predictor	Category	N%	Threshold (≥1Times per Day) N (%)	P_Value
Beans	Gender	Boy	898 (48.8)	478 (53.2)	0.575
		Girl	943 (51.2)	515 (54.6)	
	Age	11-14	381 (20.7)	209 (54.9)	0.729
		7-10	1458 (79.3)	784 (53.8)	
	Living Arrangement	Both mother and father	1111 (62.0)	610 (54.9)	0.242
		Others	682 (38.0)	355 (52.1)	
	Ethnicity	African American	510 (40.2)	270 (52.9)	0.647
		White	758 (59.8)	391 (51.6)	
	Race	Hispanic	196 (10.8)	131 (66.8)	0.001
		Non-Hispanic	1621 (89.2)	846 (52.2)	

Dietary Behavior by Food Group	Predictor	Category	N%	Threshold (≥1Time per Day) N (%)	P_Value
Milk	Gender	Boy	899 (48.9)	645 (71.7)	0.356
		Girl	939 (51.1)	655 (69.8)	
	Age	11-14	382 (20.8)	267 (69.9)	0.659
		7-10	1454 (79.2)	1033 (71.0)	
	Living Arrangement	Both mother and father	1109 (62.0)	801 (72.2)	0.087
		Others	680 (38.0)	465 (68.4)	
	Ethnicity	African American	510 (40.4)	319 (62.5)	0.001
		White	753 (59.6)	571 (75.8)	
	Race	Hispanic	196 (10.8)	139 (70.9)	1
		Non-Hispanic	1618 (89.2)	1142 (70.6)	

Dietary Behavior by Food Group	Predictor	Category	N%	Threshold (≥2Times per Day) N (%)	P_Value
Low Fat Milk	Gender	Boy	897 (48.9)	480 (53.5)	0.084
		Girl	938 (51.1)	464 (49.5)	

	Age	11-14	384 (20.9)	164 (42.7)	0.001
		7-10	1449 (79.1)	781 (53.9)	
	Living Arrangement	Both mother and father	1104 (61.8)	583 (52.8)	0.205
		Others	683 (38.2)	339 (49.6)	
	Ethnicity	African American	509 (40.2)	255 (50.1)	0.864
		White	756 (59.8)	383 (50.7)	
	Race	Hispanic	197 (10.9)	111 (56.3)	0.152
		Non-Hispanic	1614 (89.1)	820 (50.8)	

Dietary Behavior by Food Group	**Predictor**	**Category**	**N%**	**Threshold (≥2Times per Day) N (%)**	**P_Value**
Whole Milk	Gender	Boy	900 (48.8)	423 (47.0)	0.816
		Girl	945 (51.2)	439 (46.5)	
	Age	11-14	384 (20.8)	172 (44.8)	0.421
		7-10	1459 (79.2)	688 (47.2)	
	Living Arrangement	Both mother and father	1113 (62.0)	527 (47.3)	0.465
		Others	683 (38.0)	311 (45.5)	

	Ethnicity	African American	510 (40.2)	240 (47.1)	1
		White	760 (59.8)	358 (47.1)	
	Race	Hispanic	197 (10.8)	96 (48.7)	0.597
		Non-Hispanic	1624 (89.2)	755 (46.5)	

Dietary Behavior by Food Group	**Predictor**	**Category**	**N%**	**Threshold (≥2Times per Day) N (%)**	**P_Value**
Fruit	Gender	Boy	899 (48.8)	770 (85.7)	0.096
		Girl	945 (51.2)	835 (88.4)	
	Age	11-14	385 (20.9)	344 (89.4)	0.171
		7-10	1457 (79.1)	1261 (86.5)	
	Living Arrangement	Both mother and father	1114 (62.1)	969 (87.0)	0.942
		Others	681 (37.9)	594 (87.2)	
	Ethnicity	African American	511 (40.2)	460 (90.0)	0.03
		White	760 (59.8)	652 (85.8)	
	Race	Hispanic	196 (10.8)	176 (89.8)	0.261
		Non-Hispanic	1624 (89.2)	1407 (86.6)	

Dietary Behavior by Food Group	Predictor	Category	N%	Threshold (≥2Times per Day) N (%)	P_Value
Fresh Fruit	Gender	Boy	901 (48.8)	744 (82.6)	0.008
		Girl	946 (51.2)	824 (87.1)	
	Age	11-14	382 (20.7)	329 (86.1)	0.52
		7-10	1463 (79.3)	1239 (84.7)	
	Living Arrangement	Both mother and father	1114 (61.9)	948 (85.1)	1
		Others	685 (38.1)	583 (85.1)	
	Ethnicity	African American	509 (40.1)	447 (87.8)	0.009
		White	761 (59.9)	627 (82.4)	
	Race	Hispanic	198 (10.9)	173 (87.4)	0.398
		Non-Hispanic	1625 (89.1)	1377 (84.7)	

Dietary Behavior by Food Group	Predictor	Category	N%	Threshold (≥3Times per Day) N (%)	P_Value
Vegetable	Gender	Boy	894 (48.8)	313 (35.0)	0.121
		Girl	937 (51.2)	361 (38.5)	

	Age	11-14	376 (20.6)	133 (35.4)	0.51
		7-10	1453 (79.4)	542 (37.3)	
	Living Arrangement	Both mother and father	1107 (62.0)	407 (36.8)	0.84
		Others	678 (38.0)	253 (37.3)	
	Ethnicity	African American	504 (39.9)	179 (35.5)	0.173
		White	759 (60.1)	299 (39.4)	
	Race	Hispanic	197 (10.9)	63 (32.0)	0.159
		Non-Hispanic	1610 (89.1)	601 (37.3)	

Dietary Behavior by Food Group	**Predictor**	**Category**	**N%**	**Threshold (≥3Times per Day) N (%)**	**P_Value**
Colored Vegetable	Gender	Boy	883 (48.5)	310 (35.1)	0.625
		Girl	937 (51.5)	340 (36.3)	
	Age	11-14	374 (20.6)	120 (32.1)	0.102
		7-10	1444 (79.4)	530 (36.7)	
	Living Arrangement	Both mother and father	1100 (62.0)	396 (36.0)	0.759
		Others	673 (38.0)	237 (35.2)	

	Ethnicity	African American	503 (39.9)	186 (37.0)	0.811
		White	758 (60.1)	275 (36.3)	
	Race	Hispanic	193 (10.7)	62 (32.1)	0.302
		Non-Hispanic	1603 (89.3)	577 (36.0)	

Dietary Behavior by Food Group	**Predictor**	**Category**	**N%**	**Threshold (≥2Times per Day) N (%)**	**P_Value**
Baked Food instead of fried food	Gender	Boy	897 (48.8)	546 (60.9)	0.091
		Girl	942 (51.2)	610 (64.8)	
	Age	11-14	379 (20.6)	248 (65.4)	0.283
		7-10	1458 (79.4)	908 (62.3)	
	Living Arrangement	Both mother and father	1112 (62.1)	714 (64.2)	0.158
		Others	679 (37.9)	413 (60.8)	
	Ethnicity	African American	508 (40.2)	327 (64.4)	0.905
		White	756 (59.8)	484 (64.0)	
	Race	Hispanic	197 (10.9)	109 (55.3)	0.024
		Non-Hispanic	1618 (89.1)	1031 (63.7)	

Dietary Behavior by Food Group	Predictor	Category	N%	Threshold (≥3Times per Day) N (%)	P_Value
Water	Gender	Boy	900 (48.8)	660 (73.3)	0.792
		Girl	946 (51.2)	699 (73.9)	
	Age	11-14	381 (20.7)	272 (71.4)	0.267
		7-10	1463 (79.3)	1086 (74.2)	
	Living Arrangement	Both mother and father	1114 (62.0)	846 (75.9)	0.002
		Others	684 (38.0)	473 (69.2)	
	Ethnicity	African American	509 (40.1)	384 (75.4)	0.174
		White	761 (59.9)	547 (71.9)	
	Race	Hispanic	198 (10.9)	150 (75.8)	0.549
		Non-Hispanic	1624 (89.1)	1194 (73.5)	

Dietary Behavior by Food Group	Predictor	Category	N (%)	Yes N (%)	P_Value
Knowledge of MyPlate	Gender	Boy	885 (48.9)	497 (56.2)	0.776
		Girl	925 (51.1)	526 (56.9)	
	Age	11-14	380 (21.0)	263 (69.2)	0.001

		7-10	1428 (79.0)	758 (53.1)	
	Living Arrangement	Both mother and father	1095 (62.2)	605 (55.3)	0.198
		Others	666 (37.8)	389 (58.4)	
	Ethnicity	African American	504 (40.5)	369 (73.2)	0.001
		White	739 (59.5)	314 (42.5)	
	Race	Hispanic	192 (10.8)	110 (57.3)	0.817
		Non-Hispanic	1594 (89.2)	896 (56.2)	

Dietary Behavior by Food Group	**Predictor**	**Category**	**N (%)**	**Yes**	**P_Value**
Choosing to Plan Meals and Snacks from MyPlate	Gender	Boy	879 (49.0)	517 (58.8)	0.078
		Girl	915 (51.0)	500 (54.6)	
	Age	11-14	372 (20.7)	260 (69.9)	0.001
		7-10	1421 (79.3)	757 (53.3)	
	Living Arrangement	Both mother and father	1083 (62.0)	624 (57.6)	0.297
		Others	663 (38.0)	365 (55.1)	
	Ethnicity	African American	497 (40.3)	349 (70.2)	0.001
		White	736 (59.7)	334 (45.4)	
	Race	Hispanic	194 (11.0)	116 (59.8)	0.398

		Non-Hispanic	1577 (89.0)	888 (56.3)	

Dietary Behavior by Food Group	Predictor	Category	N%	Threshold (≥1Time per Day) N (%)	P_Value
Sugar-Sweetened Beverages	Gender	Boy	901 (48.9)	322 (35.7)	0.044
		Girl	943 (51.1)	380 (40.3)	
	Age	11-14	382 (20.7)	134 (35.1)	0.193
		7-10	1460 (79.3)	567 (38.8)	
	Living Arrangement	Both mother and father	1113 (62.0)	433 (38.9)	0.25
		Others	683 (38.0)	247 (36.2)	
	Ethnicity	African American	510 (40.2)	185 (36.3)	0.408
		White	760 (59.8)	294 (38.7)	
	Race	Hispanic	198 (10.9)	75 (37.9)	1
		Non-Hispanic	1622 (89.1)	615 (37.9)	

Dietary Behavior by Food Group	Predictor	Category	N%	Threshold (≥1Time per Day) N (%)	P_Value
Engagement in Physical Activity	Gender	Boy	899 (48.8)	878 (97.7)	1
		Girl	942 (51.2)	919 (97.6)	
	Age	11-14	383 (20.8)	379 (99.0)	0.059
		7-10	1456 (79.2)	1416 (97.3)	
	Living Arrangement	Both mother and father	1110 (61.9)	1083 (97.6)	1
		Others	682 (38.1)	665 (97.5)	
	Ethnicity	African American	511 (40.3)	501 (98.0)	0.571
		White	757 (59.7)	738 (97.5)	
	Race	Hispanic	198 (10.9)	190 (96.0)	0.136
		Non-Hispanic	1619 (89.1)	1583 (97.8)	