

**Dietary Intake Variables as Predictors of Weight Status and the Prevalence  
of At-Risk for Overweight and Overweight African American  
Preadolescents: An 18 Month Study**

by

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## Abstract

This exploratory quantitative, repeated measures research design investigated whether the dietary intake variables of preadolescents' and their caregivers could be used to predict the weight status of African American preadolescents over the span of 18 months. The study also investigated whether there was a change in the prevalence of at risk and overweight preadolescents across time. Participants were a subsample ( $n=83$ ) of a larger sample of ( $N=292$ ) preadolescents whose ages ranged from 8-12 years. Anthropometric measures were collected to determine the preadolescents' BMI. Age and gender were used to determine weight status. Results from the regression analyses revealed that neither the preadolescents' nor their caregivers' dietary intake variables predicted participants' weight status. Data revealed the prevalence of at risk and overweight preadolescents in the larger sample of 292 increased from Time 1 to Time 3. However, the z-test of proportions showed the change was not statistically significant. Findings indicate a statistically significant decline in the prevalence of at risk and overweight preadolescents in the smaller subsample ( $n = 83$ ). A z-test of proportions revealed a statistically significant difference in the change in prevalence from Time 1 to Time 3 ( $z = 3.15$ , 95% CI [.11, .39],  $p = .0004$ ) and from Time 2 to Time 3 ( $z = 2.96$ , 95% CI [.07, .35],  $p = .003$ ). Results further showed a statistically significant difference between prevalence rates of the larger sample and smaller subsample at T3 ( $z=3.53$ , 95% CI [.07, .35],  $p = .0004$ ). This finding was not anticipated and there was no means to attribute the

cause of decline. Additional research is needed to gain insight on why this group experienced a decline in weight status. Usually African American children when compared to others perform worse. There may be cultural, familial or peer influences on the group that could be investigated. Future studies should minimize and monitor closely the amount of self-reported data in this group to improve accuracy of dietary intake. For instance, meals could be prepared and measured in the research setting. The researcher could also keep track of preadolescents' actual food consumption through other nutritional assessment procedures.

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## List of Abbreviations

AND	Academy of Nutrition and Dietetics
CDC	Centers for Disease Control
HHHQ	Health Habits and History Questionnaire
KFQ	Kid's Food Questionnaire
IOM	Institute of Medicine
NLSAH	National Longitudinal Study of Adolescent Health
NHANES	National Health and Human Nutrition Examination
NCHS	National Center for Health Statistics
NHLBI	National Heart Blood Lung Institute
PedNSS	Pediatric Nutrition Surveillance System
rANOVA	Repeated Measures Analysis of Variance
TFAH	Trust for America's Health
USDA	United States Department of Agriculture

## Chapter I

### Introduction to the Study

Obesity is one of the leading lifestyle-related causes of disease and death in the United States (Centers for Disease Control and Prevention [CDC], 2010)).

Obesity affects individuals across numerous demographic variables such as age, sex, race, ethnicity, culture, socioeconomic status, and nationality (Troiano et al., 1998). The CDC (2010) defines obesity as the condition where a person has a body mass index (BMI) equal to or greater than 30 in adults. The condition of obesity was termed as a disease during the administration of former Surgeon General David Satcher, from 1998-2002 (U.S. Department of Health and Human Services. *Healthy People 2010*, 2000). Amongst children and adolescents the same age and sex, overweight is defined as BMI (for age and sex) at or above the 85th percentile and lower than the 95th percentile. Obesity in this same group is defined as a BMI at or above the 95th percentile (Barlow, 2007). Merriam Webster's dictionary (2007) defines obesity as an abnormal bodily condition that impairs functioning and can be recognized by signs and symptoms. Obesity is a condition that may result in cardiovascular disease (high blood pressure, high cholesterol), cancer, diabetes (Type II or prediabetes) , bone and joint problems, and social and psychological problems (Freedman, Mei, Srinivasan, Berenson, & Dietz, 2007).

During recent decades the number of overweight and obese children and

adolescents age 6-17 years of age in the United States has tripled. Results from the 1999-2000 National Health and Nutrition Examination Survey (CDC, 2009) revealed the number of preadolescents considered overweight or obese increased from 4% in 1960 to over 15% in 1999 (CDC, 2004).



Obesity in preadolescents carries a heavy economic, societal, and personal burden. Research shows that annual healthcare costs associated with treating children and preadolescents for obesity ranges between \$3 to \$11 billion (CDC, 2010; Marder & Chang, 2006). Preadolescents who are diagnosed as overweight or at risk for being overweight are also at a greater risk for health problems than their peers, and the likelihood increases if they remain obese in adulthood. For example, obese preadolescents are more likely to have risk factors associated with cardiovascular disease such as high blood pressure, high cholesterol, and Type 2 diabetes (Freedman, Mei, Srinivasan, Berenson, & Dietz, 2007). A diagnosis of overweight or at risk for being overweight increases the likelihood of hospitalization by as much as two to three times (Marder & Chang). Preadolescents who are diagnosed as being overweight also have a higher chance of being diagnosed with mental health disorders or bone and joint disorders than non-overweight preadolescents (CDC; Marder & Chang).

Children and preadolescents who are overweight are also likely to be overweight or obese adults (Guo & Chumlea, 1999; Freedman et al., 2007). One study showed that preadolescents who were overweight as early as age two were more likely to be obese as adults (Freedman et al., 2007). Another study revealed that approximately 80% of preadolescents who were overweight between the ages of 10 to 15 years were obese adults at age 25 (Whitaker et al., 1997). Other research found that 25% of obese adults were overweight as preadolescents (Freedman et al., 2001). The latter study also found that if a child

was diagnosed as being overweight before 8 years of age, obesity in adulthood was likely to be more severe.

### **Statement of the Problem**

Childhood obesity continues to be a leading public health concern that disproportionately affects low-income and minority preadolescents (Caprio, et al., 2008; Wang & Beydou, 2007). The medical field is beginning to see in children and adolescents medical complications related to obesity that used to be seen only in adults (Caprio, et al., 2008). Therefore obesity prevention programs include medical screening for youth to ensure that they receive appropriate treatment to mitigate the impact of being overweight (Jasik et al., 2008).

Childhood obesity presents unique challenges to the Southern rural, regions of the United States. The Census Bureau (2000) indicated that the term “rural” consists of all territory, populations, and housing units located outside of urbanized areas and urbanized clusters. Alabama is the rural region that was of interest for this study. The prevalence of overweight and at risk for overweight preadolescents in Alabama has continued to rise since 2003. According to data published by Trust for America’s Health ([TFAH], 2010), in 2005 Alabama ranked first in the nation for child obesity rates, which stood at 16.7%. Recent statistics indicate that approximately 30% of preadolescents in Alabama are overweight or at risk for being weight (TFAH, 2011). This number places Alabama as currently being 15th in the nation for the overall prevalence of preadolescents who are overweight or at risk for being overweight.

There is ample research that investigates the prevalence of obesity in children and adolescents. However, few if any interventional studies examine prospectively the impact of a behavior on weight or BMI (Barlow, 2007). A recent report indicated that preadolescents and adolescents are frequently overlooked when it comes to medical screening for obesity related conditions (Jasik, Adams, Erwin, & Ozer, 2011). There are even fewer studies that specifically examine the relationship between daily food intake and the weight status of African American preadolescents living in the Black Belt Regions of the United States. There are also few studies which investigate the change in prevalence of weight status among the population of preadolescents.

### **Purpose of the Study**

The goal of this study was to bridge a gap in the literature regarding the relationship between daily food intake and the weight status of African American preadolescents living in the Black Belt Regions of the United States. This study also addressed a gap in the literature regarding the change in prevalence of weight status among this population of preadolescents across time. The purpose of this study was guided by three objectives. The first objective was to assess whether the dietary intake of preadolescents' predicted their weight status across the span of 18 months. The second objective was to assess whether the dietary intake of caregivers predicted the weight status of preadolescents' across the span of 18 months. The final objective was to determine the change in prevalence of overweight and at risk for overweight preadolescents across the span of 18 months.

## **Nature of Study**

### **Research Design**

This exploratory study employed a quantitative, non-experimental, repeated measures design to examine the variables of interest. Leedy and Omrod (2001) assert that quantitative research is applied in order to explain, authenticate, or validate relationships. The quantitative approach was appropriate for this study because the researcher was interested in exploring the relationship between dietary intake and preadolescent weight status. The research was non-experimental because it was not possible to implement the major requirement of random assignment of participants that is needed in a true experimental design. A quasi-experimental design could not be used because it was not possible to manipulate the independent variables (total dietary intake of calories, protein, carbohydrates, calcium, monounsaturated fat, polyunsaturated fat, fiber, servings of vegetables) in this study (Trochim & Donnelly, 2007). The repeated-measures design enables researchers to collect data on a given variable or set of variables for the same group of participants on several different occasions (Leedy & Omrod, 2001; Stephens, 2009). The use of the repeated measures design allowed the researcher to evaluate changes in the preadolescents' body mass index and weight status across time.

A purposive sampling scheme was used to recruit participants for the study. This sampling procedure is used when a researcher has a specific purpose and is interested in specific groups (Trochim & Donnelly, 2007). The researcher was specifically interested in examining the relationship between the

participants' dietary intake, their weight status, and their parents' dietary intake. Therefore the use purposive sampling was appropriate for this research.

### **Research Questions/Hypotheses**

This research was guided by three research questions. For the purpose of statistical analysis, the hypotheses were presented in the null form. The null hypothesis states that all means are equal. If statistical computations provide values that are significantly different, then the null form of the hypothesis is rejected and its alternative form is accepted (Black, 1999; Howell, 2004). The following questions were addressed with the data collected for this study:

*Research Question 1.* How well does preadolescents' self-reported daily dietary intake predict their body mass index (BMI) across time?

*Null Hypothesis 1 (H<sub>0</sub>):* Preadolescent dietary intake variables, as measured by the KFQ (total calories, carbohydrates, monounsaturated fat, polyunsaturated fat, protein, fiber, servings of vegetables), are not statistically significant predictors of their BMI, as determined by their height and weight, over a span of 18 months.

*Alternate Hypothesis 1 (H<sub>A</sub>):* Preadolescents' dietary intake variables, as measured by the KFQ (total calories, carbohydrates, monounsaturated fat, polyunsaturated fat, protein, fiber, servings of vegetables), are not statistically significant predictors of their BMI, as determined by their height and weight, over a span of 18 months.

*Research Question 2:* To what degree does caregiver self-reported dietary intake variables predict preadolescents' weight status as determined by their BMI?

*Null Hypothesis 2 (H<sub>0</sub>):* Caregiver self-reported dietary intake variables (total calories, carbohydrates, monounsaturated fat, polyunsaturated fat, protein, fiber, servings of vegetables), as measured by the HHHQ, are not statistically significant predictors of preadolescents' weight status as determined by their BMI.

*Alternate Hypothesis 2 ( $H_A$ ):* Caregiver self-reported dietary intake (total calories, carbohydrates, monounsaturated fat, polyunsaturated fat, protein, fiber, servings of vegetables), as measured by the HHHQ, are not statistically significant predictors of preadolescent's weight status as determined by their BMI.

*Research Question 3.* What is the change in the prevalence of overweight and at risk for overweight preadolescents across time?

*Null Hypothesis 3 ( $H_0$ ):* There is not a statistically significant change in the prevalence of overweight and at risk for overweight preadolescents, as determined by their weight status, over a span of 18 months.

*Alternate Hypothesis 3 ( $H_A$ ):* There is a statistically significant change in the prevalence of overweight and at risk for overweight preadolescents over a span of 18 months.

### **Data Collection and Analysis**

Data for this study were collected using several procedures. Information about the preadolescents' dietary intake was collected using the The Kid's Food Questionnaire (KFQ). Information about the caregivers's dietary intake was captured by the Health Habits and History Questionnaire (HHHQ). Each questionnaire provides a list of foods and asks individuals to report the amount of each food that has been consumed in a specified period of time. Both questionnaires were initially intended for research related to investigating the role of diet in health and disease (Block, et al., 1986). Over time the questionnaires have been revised, improved, and used in a variety of settings. Details regarding both questionnaires are presented in Chapter 3. Anthropometric measures were taken of the preadolescents' height and weight. The measures were used to determine the preadolescents' BMI. Details of the anthropometric assessment are presented in Chapter 3.

Statistical analyses were conducted using the Statistical Package for the Social Sciences (SPSS) version 17 software. Tables are used to display results from the data analyses. Chapter 3 of this dissertation provides additional details and information on the research methodology. The data were analyzed using descriptive and inferential statistics. First, descriptive statistics were used to summarize demographic data such as total number of participants, number of participants per school, as well as the age and gender of the participants. Descriptive statistics were also used to determine the average values for the independent variables. Inferential statistics were used to test the null hypotheses for the research questions. Multiple regression analysis was used to address Research Questions 1 and 2. An a priori sample size determination revealed that a minimum sample of  $n = 103$  was needed for adequate statistical power for Research Question 1 and 2. The repeated measures ANOVA (rANOVA) was used to address Research Question 3. An a priori sample size determination revealed that a minimum sample of  $n = 54$  was needed for adequate statistical power for Research Question 3. Guidelines for determining the sample size were taken from two sources (Mertler & Vanatta, 2005; Stevens, 2009). Details regarding the statistical analyses are presented in Chapters 3 and 4.

## **Theoretical Foundation**

### **Sociocultural Theory**

Sociocultural theory serves as one major theoretical base for this study. Sociocultural theory is based mostly on the work of Vygotsky's 1956 work which posited that parents, caregivers, peers and the culture at large were responsible

for the development of higher order functions (Kublin, Wetherby, Crais, & Prizant, 1989). The most important point of this theory is that children's development is shaped by the social and cultural environment of the child. Kublin et al. (1989) summarized the most important part of sociocultural theory in that according to them, "Vygotsky (1934/1986) described learning as being embedded within social events and occurring as a child interacts with people, objects, and events in the environment" (p. 287).

The sociocultural theory emphasizes the role of cultural and social interactions in children's development. "Culture plays a large role in shaping health-related values, beliefs, and behavior" (Bettancourt, p. 953, 2004). Consequently, any effort which seeks to understand or address obesity must take into consideration the social and cultural beliefs of the population to be served. "Beliefs about what is an attractive weight or a healthy weight, what foods are desirable or appropriate for parents to provide children, how families should share meals...are influenced by cultural values and beliefs" (Ogden et al., 2006).

### **Operational Definitions**

Research on obesity in children and preadolescents uses some terms that are often used interchangeably. There are also some terms that are unique to the study of obesity. The terms that are used in the context of this study are presented and defined as follows:

**Adiposity.** This term refers to the amount of fat in the body, and it is expressed either as total fat mass (in kilograms) or the fraction (percentage) of



total body fat. Adiposity varies with age and gender during childhood and adolescence (Institute of Medicine [IOM], 2010).

**Anthropometry.** The study of the physical measurement of the human body in terms of the dimensions of bone, muscle, and adipose (fat) tissue is called anthropometry. It also takes into account a person's size, form and functional capacities (CDC, 2010).

**At risk for overweight.** Children and preadolescents are at risk for being overweight when their weight status reaches between the 85<sup>th</sup> and 95<sup>th</sup> percentile on the growth charts (Ogden, Carroll, & Flegal, 2003).

**Body mass index (BMI).** This concept is a physical measurement that is determined by an individual's weight and height. A person's BMI is calculated as weight divided by the squared measure in height (Ogden, et al, 2010). BMI is an index of adiposity and it is recommended for use with children and preadolescents. BMI is age and gender specific because adiposity varies with age and gender during childhood and adolescence (IOM, 2010).

**BMI- for-age percentile.** This measure is used to categorize BMI into weight categories. The classification allows a persons' BMI to be compared against values for others in a given reference group (CDC, 200).

**Chronic disease.** This term refers to diseases that are of long duration and generally slow in progression (CDC, 2010).

**Energy dense foods.** Foods which are high in calories and can be either nutrient-rich, such as nuts and nut butters, or nutrient-poor, such as processed snack foods and candy. Fat is the most energy-dense nutrient; examples include

oil, butter, lard and margarine (Caprio, et al., 2008).

**Epidemic.** This term has traditionally been used to describe large scale outbreaks of infectious diseases. The term is now being used by medical professionals to describe the prevalence and rapid rise of obesity in the United States (CDC, 2010).

**Growth charts.** These charts are typically used to assess the developmental growth patterns in children and adolescents. The charts consist of a series of percentile curves that illustrate the distribution of selected body measurements in children and preadolescents (CDC, 2000). This study used the growth charts provided by the CDC to determine growth percentiles for participants included in the study.

**Health.** The World Health Organization (WHO) defines health as “the state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity” (World Health Organization, 2002).

**Height.** This physical measurement refers to the vertical distance from the bottom to the top of something when it is standing upright (Merriam Webster). For this study height refers to distance from the bottom of the preadolescents’ feet to the top of their heads when they were standing upright. The Detecto 439 medical scale was used to measure the height of participants in the study.

**Preadolescent.** This is the period of time in childhood that occurs just before the onset of puberty. In girls the time is between the ages of 10 and 12 in girls and 11 and 13 in boys (Merriam Webster).

**Rural.** The term rural is one that relates to the country, country people or life, or agriculture, (Merriam Webster). For this purpose only the following rural areas of Alabama were considered: Bullock, Choctaw, Dallas, Greene, Hale, Lowndes, Macon, Marengo, Perry, Pickens, Sumter and Wilcox counties (Auburn University Outreach, 2004).

**Weight.** The physical measurement that refers to the quantity or thing weighing a fixed and usually specified amount is called weight (Merriam Webster). For this study weight is defined as the adolescents total body weight expressed in kilograms. The Detecto 439 medical scale was used to measure the weight of participants in the study.

**Obesogenic environment.** The term obesogenic environment refers to “the sum of influences that the surroundings, opportunities, or conditions of life have on promoting obesity in individuals or populations” (Swinburn, Egger & Raza, 1999, p. 564).

**Overweight.** This term is a label that indicates a range of weights that are greater than what is generally considered healthy for a given height. The terms also identify ranges of weight that have been shown to increase the likelihood of certain diseases and other health problems (CDC, 2010). Children and preadolescents are identified as being overweight when they have a body mass index (weight status) at or above the 95<sup>th</sup> percentile of the sex-specific weight status-for-age growth charts (Ogden et al., 2010).

**rANOVA.** The repeated measures analysis of variance (rANOVA) procedure is used to assess how independent variables influence continuous

dependent variables (Howell, 2004). For the sake of brevity the acronym rANOVA will be used throughout this document to designate this procedure.

**Weight status.** A simple, inexpensive, and noninvasive measure of a person's total body weight. The term is often used interchangeably with the terms BMI. In contrast to other methods, with access to the proper equipment, individuals can have their weight status routinely measured and calculated with reasonable accuracy (CDC, 2010).

### **Delimitations**

A number of factors can serve as delimitations in any research. Delimitations are factors that set the parameters of a given study (Parajes, 2007), and they are typically factors over which the researcher has control. The following items are the delimiting factors for this study:

- Data were collected from only one area of Alabama's Black Belt regions, county, which was Macon County. Participants from this region may not be representative of other Black Belt regions or other regions of Alabama.
- Data were only collected from following six schools in Macon County: Catholic, D. C. Wolfe, Notasulga, South Macon, Tuskegee Public, and Washington Public.
- Data were collected from participants who were in the 5<sup>th</sup> grade during the initial data collection in Fall 2002, Spring 2003, and Fall 2004. Additional details regarding the procedures used to collect data from the preadolescents' are presented in Chapter 3.

- Data were collected from caregivers in during the initial data collection in Fall 2002. Details regarding the procedures used to collect data from the caregivers are presented in Chapter 3.
- The preadolescents' BMI was determined using anthropometric assessment. Although there are other ways of determining BMI, weight and height measurements were used in this study.
- All personnel involved in the data collection were nutrition students who had been trained to conduct anthropometric assessments.

### **Limitations**

At the outset of the study the researcher recognized several limitations of the study. Those limitations were the limited geographic area from which the data were collected, questions regarding the reliability and validity of food questionnaires, and the impact of genetics on weight status. In addition, the level of physical activity of the preadolescents were not taken into consideration. Physical activity is related to energy expenditure, which is related to weight status. Details regarding each of those limitations are presented in Chapter 5. In addition, several factors emerged as limitations during the data collection and analysis phases. Details regarding those factors are presented in Chapter 5.

### **Assumptions**

There were a number of assumptions that were associated with this study. The first assumption was that the preadolescents would deliver the information packets to their caregivers. The researcher further assumed that caregivers would understand instructions for completing the questionnaires, and that

caregivers would understand the consent form. It was assumed that caregivers would respond honestly to items on the survey. The researcher also assumed that caregivers would complete and return the food questionnaire and caregiver consent form.

There were several assumptions associated with the preadolescents' completion of survey. The first assumption was that preadolescents would return all paperwork required for them to participate in the study. The second assumption was that preadolescents would understand the instructions for completing the survey. It was also assumed that preadolescents would understand the content and instructions for completing and returning the assent form. It was assumed that the preadolescents would respond honestly to items on the survey. The researcher assumed that participants who began the research study would complete all three phases of the study.

The researcher made several assumptions about the accuracy of the data collection process. One assumption was that there would be a standardized procedure for data collection. It was also assumed that the instruments used to collect the anthropometric measurements were accurate and calibrated correctly.

The researcher made several assumptions regarding the technicians and the data collection process. The first assumption posited that the research technicians would attend the training session for the data collection process. The second assumption was that the technicians would follow the data collections procedures. The third assumption was that the technicians would accurately

record the weight and height measurements for each adolescent across each of the three time periods.

The researcher assumed that measuring height and weight was an accurate and reliable technique for determining BMI. An additional assumption was that using BMI and age were reliable methods for determining the BMI-for-age percentile rank for the preadolescents. The final assumption was that using weight status was an accurate method of identifying preadolescents who are overweight or at risk for being overweight.

### **Significance of Study**

The anticipated outcomes from this study may provide a better understanding of how a youth's dietary intake affects the prevalence of obesity over time. In order to clearly understand the factors that contribute to the prevalence of preadolescents who are overweight or at risk for being overweight, health care professionals need a better understanding of the relationship between preadolescent's dietary intake, their caregiver's dietary intake, and the preadolescents' weight status. From this, measures could be developed to address intervention and prevention of this condition.

### **Summary**

Over the past several decades the prevalence of preadolescents in the United States who are classified as being overweight or at risk for being overweight continues to rise (Caprio, 2008; CDC, 2008; Ogden et al, 2008). Research has revealed that the prevalence rate tripled from 1960 – 2008 (NCHS, 1999; CDC, 2003; Ogden et al., 2010). The prevalence rate of overweight and at

risk for overweight African American preadolescents in Alabama is 30% (TFAH, 2011).

The cost associated with the care of preadolescents who overweight or at risk for being overweight carries a heavy economic, societal, and personal burden. The Annual healthcare costs associated with treating children and preadolescents who overweight or at risk for being overweight continues to increase (CDC, 2010; Marder & Chang, 2006). Excessive weight in preadolescents increases the likelihood of hospitalization by as much as two to three times (Marder & Chang). Excess weight in preadolescents also predisposes them to a higher chance of being diagnosed with mental health disorders or bone and joint disorders (CDC; Marder & Chang). Children and preadolescents who are overweight or at risk for overweight are also likely to be overweight or obese adults (Guo & Chumlea, 1999; Freedman et al., 2007).

This chapter presented a brief summary of literature related to the prevalence of overweight and at risk for overweight status among preadolescents. The chapter outlined the problem statement, purpose statement, and research design. The operational definitions, limitations, assumptions, and delimitations were also presented.

Chapter 2 will present and expanded review of literature related to the variables of interest in the study. Chapter 3 will provide a detailed explanation of the research methods that were used. Chapter 4 presents a summary of the statistical analyses and results. Chapter 5 ends with a discussion of the findings,



additional limitations encountered as the research was conducted, implications for social change, and suggestions for future research.

## **Chapter 2**

This chapter presents a summary of the literature on the variables of interest in the study. The chapter first presents a general overview of factors that are related to weight status. Statistics are then presented regarding weight status of residents in the Black Belt region of Alabama. The chapter then presents a summary of literature which addresses the sociocultural variables that are related to weight status in preadolescents. The chapter ends with an overview of anthropometrics as it relates to this study.

### **Literature Review**

Obesity is a condition that affects individuals regardless of their sex, races, ethnicity, culture, socioeconomic status, nationality, or country origin (Troiano et al., 1998). The CDC (2010) defined obesity as a condition in which a person's body mass index (weight status) is greater than or equal to 30. Obesity is second only to smoking as the leading lifestyle-related cause of disease and death in the United States (CDC).

During his administration as Surgeon General from 1998-2002 David Satcher declared the condition of obesity as a disease (Healthy People, 2010). With an increasing number of people experiencing symptoms of and complications from lifestyle and diet-induced obesity, there is an *epidemic* public health crisis. The term epidemic has typically been used by the CDC for

outbreaks of infectious disease, but now the term is being used to describe the prevalence and rapid rise of obesity in the United States (CDC, 2010).

Over the past decade, programs and policies to prevent obesity have increased significantly, along with the funding and support of federal nutrition programs (FRAC, 2010). However, the prevalence of preadolescents who are overweight or at risk for being overweight continues to increase (CDC, 2008; Ogden et al, 2008). Therefore, a thorough understanding of factors which contribute to the obesity epidemic are needed by the government, the medical community, families and individuals. Professionals must first develop a better understanding of the factors related to obesity before they can develop and implement effective intervention and treatment programs.

### **Factors Related to Obesity**

There is not a single prevailing cause of obesity, rather there is a complex set of interactions among factors such as economics, race/ethnicity, social, and cultural factors that contribute to obesity (Caprio et al., 2008). Frequently these factors interact to present a complex set of dynamics that contribute to a growing national and international problem. When attempting to understand the etiology of obesity, one must have a full understanding of the factors related to obesity. The following paragraphs summarize the impact of economics, race/ethnicity, and geographic location on obesity in Alabama

**Socioeconomic Status.** Past studies have shown that socioeconomic factors such as annual income is inversely related to the prevalence of obesity (James, Nelson, Ralph & Leather, 1997; Caprio, et al, 2008). According to one

study, “More than 33 percent of adults who earn less than \$15,000 per year are obese, compared with 24.6 percent of those who earn at least \$50,000 per year” (TFAH, 2011). Research has shown that families of low socioeconomic status and families who live in poverty have the highest risk for being overweight (Danielzick, Czerwinski-Mast, Langnäse, Dilba B., & Müller; 2004).

Poverty may be defined as lack of resources and limited economic potential (US Census, 2010). The association between poverty and obesity may be mediated, in part, by the low cost of energy-dense foods and may be further reinforced by the high palatability of sugar and fat (Drewnowski & Specter, 2004, p. 6). Drewnowski and Darmon (2005) hypothesized that the link between obesity and poverty may be through economic issues related to the cost of a healthy diet. Healthy foods are more expensive to buy; fast food tends to be more available and more affordable than healthy food at full service restaurants; and healthier foods are less accessible for those who are on a fixed income. From sociocultural perspective it would seem that the economics of healthy eating may force individuals of limited income to purchase and consume the less expensive, but unhealthy, food choices.

**Race/Ethnicity.** A number of studies have shown that race or ethnicity is a factor that is related to obesity (Caprio, 2008; TFAH, 2011). Several studies have shown that African Americans have higher rates of overweight and obesity than other segments of the population (Caprio et al.; Ogden et al., 2006; Ogden et al. 2010; TFAH; Wang & Beydoun, 2007). Obesity rates for African American

adults are greater than or equal to 30% of the population in 44 states. In nine states, 40% of African American adults are overweight or obese (TFAH, 2010).

### **Race/Ethnicity, Poverty, and Obesity in Alabama**

Approximately, 26 percent of all Alabamians describe themselves as being Black (US Census, 2009). This is the sixth highest percentage of a Black population among all 50 states. Poverty places individuals at a greater risk for becoming obese (James, et al., 1997; TFAH, 2011). In 2003, more than 33% of Alabama's counties had 20% or more of their population living below the poverty line. Alabama has 4,708,708 residents, of which 24.2% are children and preadolescents. In 2006 over 707,051 individuals in Alabama lived below the poverty level (FRAC, 2006). Almost 35% of those individuals were children and adolescents aged birth to 18 years.

One of the rural regions of Alabama being studied in various ways both nationally and locally is the Black Belt, which is a vast stretch of fertile farmland (dark soil), that extends from Georgia through Alabama and Mississippi. While the soil color gave the area its name, historically African Americans have predominantly populated the counties of the Black Belt. The Black Belt is primarily an agricultural landscape that is characterized by high rates of poverty, unemployment, and crime; poor access to medical care; and limited housing choices for its residents (Auburn University Outreach, 2004). Definitions about the specific counties that make up this region vary, but for this purpose of this study the following rural areas of Alabama were considered for participating in the

study: Bullock, Choctaw, Dallas, Greene, Hale, Lowndes, Macon, Marengo, Perry, Pickens, Sumter and Wilcox counties.

Areas of the Black Belt includes some of the poorest counties in the United States (Falk, Bruce, & Rankin, 1992). Recent statistics indicate that the Black Belt region has the highest poverty rate for children under 18. Table 1 shows the poverty rates for children under 18 in the United States. The table also shows that for the years 1979 – 2005 the Black Belt region had and continues to have the highest percentage of children living in poverty. The tables shows that in 2005 over 27% of children and preadolescents in Alabama lived in poverty, compared to 19% for the national average of United States (US Census, 2009).

Table 1

*Regional Percentages of Persons Under Age 18 Living in Poverty in the US*

Region	<u>Year</u>			
	1979	1989	1999	2005
U.S. total	16.0	17.9	16.2	18.5
South	20.2	21.7	18.7	21.9
Black Belt	27.0	28.4	24.3	27.4
Other areas of the south	17.3	19.2	16.9	20.2
Non-South	14.4	16.4	15.1	17.0

**Over Weight Status in Preadolescents**

Preadolescents comprise a significant proportion of the world's population; some estimates put the number of youth at over 30 percent of the world

population (Caprio, et al., 2008). Over the past three decades the number of overweight and obese preadolescents and adolescents (6-17 years of age) in the United States has tripled. In 1960 approximately 4% of preadolescents were considered overweight or obese. Results from the 1999-2000 National Health and Nutrition Examination Survey showed that the number of overweight and obese preadolescent increased to 15% (NCHS, CDC, 2003).

Other research has shown that the time frame at which children and preadolescents become overweight or obese varies by race (Saha, Eckert, Pratt & Shankar, 2005). A study by Saha and colleagues revealed that 25% of African American preadolescents were at risk for being overweight or were overweight at or before the age of 7; however that percentage was not reached among white males until age 10 and among white females until age 11. These researchers stress the importance of prevention efforts beginning early and being tailored to the needs of specific populations. The findings also indicate the need for race-specific timing of interventions.

The prevalence of overweight and at risk for overweight preadolescents in Alabama has risen since 2003. According to data published by Trust for America's Health (2010), in 2005 Alabama ranked first in the nation for child obesity rates, which stood at 16.7%. The same study revealed that from 2004 – 2007 Alabama ranked first in the nation for the percentage of children who were living in poverty. Recent statistics from (TFAH, 2011) indicated that Alabama ranks 15<sup>th</sup> in the nation for the overall prevalence of preadolescents who are obese and overweight, with approximately 30% of preadolescents in the state

being considered either overweight or obese. These statistics should be cause for concern because Alabama's overall ranking in terms of child well-being is 47<sup>th</sup> (Voices for Alabama Kids, 2010; Kids Count, 2010).

### **Factors Related to Obesity in Preadolescents**

Past research has revealed a number of variables which affects the weight status of preadolescents. Several studies have revealed a link between preadolescents' dietary patterns and their parents' level of education (Kranz & Siega-Riz, 2002; Xie, Gillard, Li & Rockett, 2003). Other studies have indicated a connection between preadolescents' dietary patterns and their and parental income level (James, Nelson, Ralph & Leather, 1997; Caprio, et al.). Other researchers had suggested that although parents determine what foods are available through their choices in purchasing and serving foods, preadolescents' individual food preferences are also important determinants of what they actually eat (Birch, 1999). This section of the dissertation will cover previous research which has linked obesity to the caregivers' level of education, caregiver influence, impact of family meals, food preferences, fast food consumption, and food insecurity to obesity in preadolescents.

**Caregivers' Education.** Past research has indicated a connection between parents' level of education and preadolescents' dietary habits. Preadolescent's health consciousness and more nutritious dietary patterns have been associated with higher levels of parents' education (Kranz & Siega-Riz, 2002; Xie, Gilliland, Li, & Rockett, 2003). Healthier food choices are noted to be



higher for preadolescents with better educated parents (National Longitudinal Study of Preadolescent Health [NLSAH], 2005).

**Caregiver Influence.** Preadolescents who live in an obesogenic environment are at the greatest risk for becoming obese. An obesogenic environment is defined as “the sum of influences that the surroundings, opportunities, or conditions of life have on promoting obesity in individuals or populations” (Swinburn, Egger & Raza, 1999, p. 564). Parental obesity is a stronger predictor of adult obesity than a child’s weight status before age 3. A child with one obese parent is three times more likely to be obese as an adult than a child who has no obese parent, and a child with two obese parents is 13 times more likely to be obese as an adult (Whitaker et al., 1997). Maternal obesity is also predictive of obesity during middle childhood (Strauss & Knight, 1999). However, other studies which have examined the potential genetic effects of maternal weight status on preadolescent from birth through preschool age have been inconclusive. One study suggested that genetic influences on preadolescent’s weight may be independent of those factors that influence weight status in adults (Stunkard, Berkowitz, Stallings & Cater, 1999).

**Modeling and Family Meals.** Parents are key role models for their preadolescents. Parents can encourage preadolescents to eat healthy foods by modeling behavior associated with healthy eating (Fisher & Birch, 1999). Preadolescents are more likely to try a new food if they have observed an adult, particularly their mother, eating it (Harper & Sanders, 1975). Tibbs et al. (2001) suggest that parental modeling may be particularly significant in African

American families because it builds on the strength of the family and kinship networks. Parents who have a laissez-faire approach to child feeding or are not concerned about particular dietary habits may be less likely to set dietary rules for preadolescents or model healthy dietary behaviors (Tibbs et al.).

In one study the frequency of family meals was positively correlated with the intake of recommended nutrients for proper growth and was negatively correlated with soft drink consumption (Neumark-Sztainer, Hannan, Story, Croll & Perry, 2003). Results from one study (NLSAH, 2005) revealed that shared family meals was positively associated with preadolescents' higher consumption of fruits, vegetables, and dairy products. The presence of at least one parent during the evening meal was the most significant parent behavior related to preadolescent eating habits. The study included more than 18,000 preadolescents and the data revealed that food consumption patterns differed significantly by ethnic group. Given the large effect found in this analysis and the fact "that one of every three preadolescents reported eating three or fewer meals with their parent(s), lack of family meals constitutes a prevalent risk factor for poor food intake" (Videon & Manning, 2003, p. 370). Family meals also play a significant role in preventing unhealthy weight control practices among preadolescents (Neumark-Sztainer, Wall, Story & Fulkerson, 2004). The researchers suggest that caregivers make a concerted effort to increase the frequency of family meals and make them pleasant experiences for the preadolescent.

**Food preferences.** Although parents determine what foods are available through their choices in purchasing and serving foods, preadolescents' preferences are important determinants of what they actually eat (Birch, 1999). "Preferences for sweet taste, probably for salty taste, and the rejection of sour and bitter tastes are innate and unlearned" (Birch, 1998, citing Beauchamp et al., 1994). The preference for sweetness is positively related to consumption of sweet foods by preadolescents (Olson & Gemmill, 1981). Preadolescent's eating preferences develop in the context of palatable food, social setting, emotional states, attitudes, knowledge and beliefs about nutrition, food and eating (Birch, 1998; Birch, Zimmerman & Hind, 1980). "By the time children are 3 or 4 years old, eating is no longer deprivation-driven but is influenced by their responsiveness to environmental cues about food intake" (Patrick & Nicklas, 2005, p. 83). Research has shown that by age 13, preadolescents consume more carbonated soda than milk, 100% fruit juice, or fruit drinks (Rampersaud, Bailey & Kauwell, 2003). Another study showed that "Preadolescents who had greater restriction on sugar intake demonstrated a greater preference for sweetness in drinks than preadolescents who had less restriction, the opposite outcome desired by parents (Liem, Mars & DeGraaf, 2004).

Other food preferences are learned from early experience and are associated with social contexts of eating and with physiological consequences (Birch, 1998). Children may develop a preference for energy dense foods when those foods are associated with positive physiological effects like satiety (Birch, 1998). Preadolescents also tend to prefer the foods that are served in the home

(Birch & Marlin, 1982). Children and preadolescents demonstrate a preference for healthier foods when such foods are readily available at home (Baranowski, Cullen & Baranowski, 1999; Story, Neumark-Sztainer & French, 2002).

**Fast food consumption.** A study by French, Story, Neumark-Sztainer, Fulkerson and Hannan (2001) revealed that fast food consumption was positively related to the availability of unhealthy foods at home. The study indicated that fast food consumption was inversely related to the students, their mother's, and their peer's concerns about healthy eating. Data from the Continuing Survey of Food Intake by Individuals [(CSFII), 1994-1996) revealed that of 6,212 preadolescent and preadolescents who took the survey, 30% consumed fast food on a typical day. Their rate of consumption was statistically significant across gender, racial/ethnic groups, and regions of the country. When socioeconomic status and demographic variables were controlled, "increased fast-food consumption was independently associated with gender, age, higher household income, non-Hispanic black race/ethnicity, and residing in the South" (Bowman et al., 2004, p. 112). In contrast, a study by French et al. (2001) did not find an association between frequent consumption of fast food and obesity. In this survey of 7-12 graders in 31 schools, boys who ate fast foods three or more times per week had lower weight status than boys who ate fast food fewer than three times per week. There were also no differences in the weight status for females related to the frequency of fast food.

**Food insecurity.** Hunger and food security were major concerns for a large number of Americans. Almost 3.4% of Alabama resident are classified as

having low food security and 12.3% are at the low or very low food security level. Alabama ranked 16<sup>th</sup> in the nation along with Kansas and Maine for the number of residents with hunger and food security issues

([http://www.frac.org/html/hunger\\_in\\_the\\_us/hunger\\_index.html](http://www.frac.org/html/hunger_in_the_us/hunger_index.html), April 30, 2007).

Several national studies indicate a strong association between food insecurity and obesity (Adams et al., 2003; Hampton, 2007; Townsend et al., 2001; Wilde & Peterman, 2006). In one study, Olson (1999) found a significantly positive association between weight status and food insecurity for women of childbearing age. This study controlled for income and other important confounders. The positive association between food insecurity and OB among women may be the result of socio-economic deprivation and lack of access to resources (Dietz, 1995; Kaiser et al., 2002; Olson, 1999; Tarasuk, 2001).

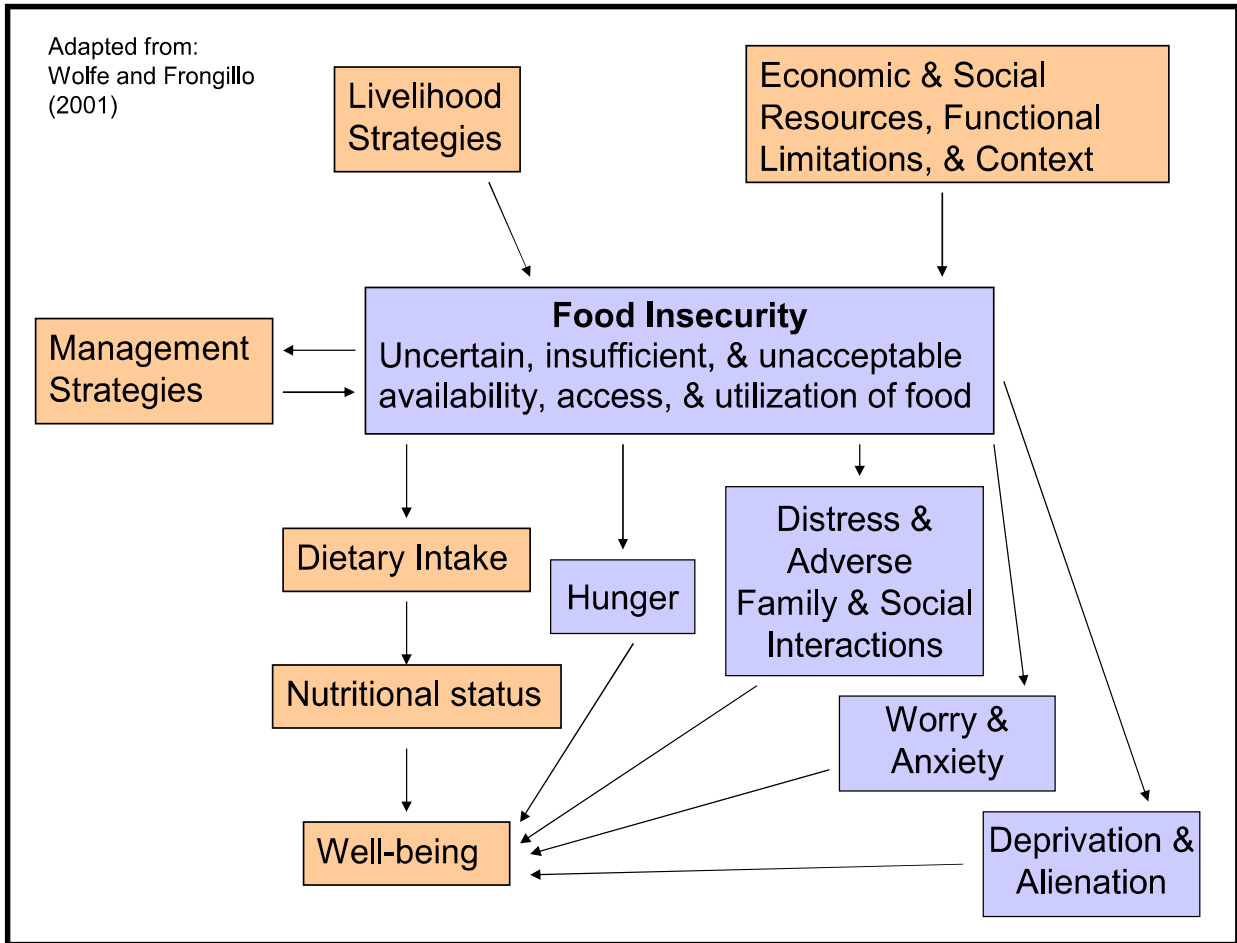
In a national survey of 16-year old students, several researchers (Gulliford et al., 2005; Gulliford et al., 2006a) found that food insecurity was associated with issues concerning weight. In this study the students who were trying to gain weight had the strongest food insecurities. Due to uncertain access to adequate food, individuals who are food insecure may over-consume when food is available (Cook et al., 2004; Gulliford & others, 2006a; Polivy, 1996; Townsend, 2001). Several studies have shown that intermediate levels of food insecurity are positively related to obesity (Adams et al., 2003; Dietz, 1995).

Other studies have shown that people with food insecurities tend to have a preference for low-cost energy-dense foods (Drewnowski & Specter, 2004; Gulliford et al., 2003; Tarasuk, 2001) such as high-fat and high-sugar processed

foods. Research has shown that the energy dense foods often taste better and are cheaper than fresh fruits, vegetables and low-fat dairy products (Hampton, 2007; Drewnowski & Specter, 2004). Preference for low-cost energy-dense foods (Drewnowski & Specter; Gulliford et al., 2003; Kaiser and others, 2002) may be reinforced by the pleasing taste of sugar and fat.

Past research on food insecurities underscore the sociocultural dynamics of food insecurity. Past research has linked food insecurities to a number of social, emotional, physical, and psychological outcomes (USDA, 2006). Figure 1 graphically depicts factors that contribute to food insecurities and some of the resulting outcomes. The top part of the graphic shows some social and cultural factors that contribute to food insecurity. The lower half shows some of the physical, psychological, and medical consequences of food insecurity. The graph clearly indicates that poor body weight status is one of the possible outcomes.

**Food access and affordability.** There has been some research which indicates that food access and affordability is related to obesity. According the Food Research and Action Center (FRAC, 2010) a number of households in the United States report challenges in the accessibility and affordability of fresh fruits and vegetables. Those households are in different areas of the country, they consist of homes from different income and racial and ethnic groups, and the residents in those homes are of varying health status. The report showed that at least one in ten of those households contained children. Hispanics and Blacks in the report had more difficulty in accessing fresh fruits and vegetables than Whites or Asians.



*Figure 1.* A Schematic of social and cultural determinants and consequences of food insecurity

**Energy balance.** Excessive weight gain occurs when energy intake exceeds energy output, but the relative importance of energy intake versus energy output remains controversial (Jeffery & Utter, 2003). The energy intake and expenditure equation is not as simple for preadolescents because they need about 2% greater energy intake than output to support proper growth and

development (Parsons, Power, Logan & Summerbell, 1999). Therefore, research regarding obesity prevention in preadolescents is complicated by the difficulty in measuring small imbalances in energy intake and energy expenditure in this age group (Leibel, Rosenbaum & Hirsch, 1995; Wells, 1998).

### **Effects of Overweight Status on Preadolescents**

Results regarding the effects of overweight and obesity on youth health and well-being are contradictory. Results from the 1996 NLSA reported that overall “preadolescents with above normal body mass did not report poorer emotional, school, or social functioning” (Swallen, Reither, Haas & Meier, 2005, p. 340). However, among younger preadolescents, the 12- to 14-year olds, there was a deleterious effect of obesity on self-esteem, depression, and school/social functioning. For all preadolescents, there was a significant negative association between weight status and physical health.

Some of the immediate health effects of obesity in preadolescents are that it places preadolescents at greater risk for cardiovascular disease, which results in high cholesterol and high blood pressure (Freedman, et al., 2007); prediabetes, a condition in which blood glucose levels indicate a high risk for development of diabetes (American Diabetes Association, 2011) as well as a host of other problems such as bone and joint problems, sleep apnea, and social and psychological problems such as stigmatization and poor self-esteem (Daniels, 2005; Dietz, 2004; Office of the Surgeon General, 2010).

There are also a number of long-term health consequences for children and preadolescents who are obese. They are likely to be obese as adults



(Freedman et al, 2001; Freeman et al., 2005, Freedman, et al., 2009; Guo, 1999). They are more at risk for adult health problems such as heart disease, type 2 diabetes, stroke, several types of cancer, and osteoarthritis (Office of the Surgeon General, 2010). One study showed that preadolescents who became obese as early as age 2 were more likely to be obese as adults (Freedman, et al., 2005). Preadolescents who are overweight and obese face an increased risk for many types of cancer, including cancer of the breast, colon, endometrium, esophagus, kidney, pancreas, gall bladder, thyroid, ovary, cervix, and prostate, as well as multiple myeloma and Hodgkin's lymphoma (Kushi, Byers, Doyle, Bandera, McCullough, & Gansler, 2006).

There are also socioemotional consequences for preadolescents who are overweight or at risk for overweight. Obesity during adolescence is associated with lower levels of educational and career attainment. There is also an increased likelihood of depressive symptoms (Merten et al., 2009). This is a concern because it puts individuals at risk for a life-long struggle with mental health. Guo and colleagues (2001) found that female preadolescents were more vulnerable to psychosocial distresses as a societal pressure as young adults, than their male counterparts. This vulnerability could contribute to a continuous incline in the prevalence of overweight and obesity as these individuals begin to have families of their own.

### **Anthropometric Measures of Weight Status**

**Weight.** Weight status in children is determined by guidelines set by governmental agencies such as the CDC (2011). The guidelines use a series of

anthropometric or body measures to first determine the preadolescents' BMI. The body mass index is then used to as a classification scheme to determine overall weight status. Body mass index is determined through comparing a preadolescents' height and weight against the pediatric growth charts.

**Height.** Height, or length for age, is an indicator of a child's linear growth relative to the child's age (Leonberg, 2008). Height is calculated by measuring the distance from the bottom of the feet to the top of the head in a human body when a person is standing erect. Frequently a preadolescents' height is compared to others of the same age and gender.

Weight -for-age is an indicator of the health and nutritional status of individual. Weight is the first anthropometric measurement to reflect disruptions of either health or nutritional status. When plotted on the appropriate CDC growth chart, weight it is an indicator of an individual's weight compared with others of the same age and sex (CDC, 2011).

**Growth charts.** Growth charts set important parameters for evaluating the nutritional and weight status of child or preadolescents' growth. The charts are gender and age specific (CDC, 2011; Leonberg, 2008). The growth charts consist of a series of percentile curves that represent the distribution of measurements of the population evaluated. CDC Growth Charts are used to determine the corresponding weight status-for-age and sex percentile. A percentile is used to indicate what proportion of the population the child's measurement meets or exceeds. Pediatric growth charts have been used by pediatricians, nurses, and parents to track the growth of infants, preadolescent,

and preadolescents in the United States since 1977. Growth charts are not intended to be used as a sole diagnostic instrument. Instead, growth charts are tools that contribute to forming an overall clinical impression of the child being measure (CDC, 2011).

**BMI-for-age.** The BMI-for-age is a screening tool that is used to identify individuals who are obese, overweight and/or underweight, when compared to someone others who are considered to be at a healthy or normal weight. BMI is an indirect measure of body fatness that has been shown to be related to adult adiposity and health risks. Body mass index is recommended as the standard measure of fatness in preadolescents and children 2 years of age and older (American Academy of Pediatrics, 2003; Cole, Bellizzi, Flegal & Dietz, 2000; de Onis, 2004).

While the use of the BMI to determine weight status promotes early identification of preadolescents who may be at risk for obesity (Pietrobelli et al., 1998), BMI is not a perfect approximation of excess adiposity because weight status varies by race and gender (Daniels, Khoury, & Morrison, 1997). Using more than one measurement technique may be needed for an accurate assessment of weight status, particularly in preadolescents of non-Caucasian descent (Chai et al., 2003). Other measures are skin fold thickness and waist, hip and thigh circumferences. Body composition can also be measured by bioimpedance analysis (BIA) and dual energy X-ray absorptiometry (DXA) (Pietrobelli, 2004).

Weight status determines the relative position of a preadolescents' weight relative to preadolescents of the same sex and age (CDC, 2011). Weight status for preadolescents is calculated differently for girls and boys. When examining weight status in preadolescents practitioners must use different growth charts for males and females because a) the amount of body fat changes with age and b) the amount of adiposity differs between girls and boys. Because of these factors, the interpretation of weight status is both age- and sex-specific for preadolescents and teens. The CDC body mass index-for-age percentiles charts take into account these differences and allow translation of a weight status number into a percentile for a preadolescent's sex and age (CDC, 2000). There are separate charts for boys and girls. An example of a chart for boys is presented in Appendix K and a sample of a chart for girls is presented in Appendix L. Table 2 reveals the percentiles specific to age and sex that were used to classify the weight status in preadolescents in this study.

Table 2

*Percentiles Used to Determine Weight Status in Preadolescents*

<b>Percentile</b>	<b>Weight status</b>
Less than 5th percentile	Underweight
5th percentile to less than 85th percentile	Healthy weight
85th percentile to less than 95th percentile	At risk for overweight
Equal to or greater than the 95th percentile	Overweight

**Note:** Adapted from “Changes in Terminology for Childhood Overweight and Obesity” by Ogden and Flegal, 2010, National Health Statistics Reports, 25, June 25, 2010.

To get an accurate assessment of a preadolescents’ weight status the preadolescent should be measured at several different times because the amount of body fat changes with age. The levels of body fat which are considered “at risk of overweight” and “overweight” decline slightly from age 2 until age 5.5 and then rises gradually. By age 18, youth weight status categories are the same as those used with adults where BMIs in the range of 25-29.9 are considered overweight and BMIs of 30 and above are considered obese (Cole et al., 2000).

The BMI and weight status-percentile-for-age do not directly measure body fat, but weight status-for-age is significantly correlated with subcutaneous and total body fatness in preadolescents (Garrow & Webster, 1985; Kuczmarski, Ogden, Guo, et al., 2000). As a result, although the vast majority of preadolescents with a weight status-percentile-for-age over the 85th percentile may have too much body fat, very athletic kids, particularly athletic African-American teenage boys, may have a high weight status-for-age due to extra

muscle mass, not excess body fat. Therefore it's important that preadolescents with a weight status-percentile-for-age over the 85th percentile be evaluated by a health professional. CDC growth charts account for differences in gender but the charts do not take into consideration race or ethnic group membership.

The accuracy of weight status varies substantially according to the individual child's degree of body fatness (Barlow, 2007). Among obese preadolescents (or a weight status-for-age greater than or equal to the 95th percentile), weight status is a good indicator of excess body fat. However, among preadolescents who are at risk for overweight (or a weight status-for-age between the 85th and 94th percentiles), elevated weight status levels can be a result of increased levels of either fat or fat-free mass. Similarly, among relatively thin preadolescents, differences in weight status are often due to differences in fat-free mass.

**Conclusions about weight status.** Weight status should serve as an initial screening for children and preadolescents. A health care provider should integrate other factors into a health assessment, including evaluations of diet, physical activity, family history, and other appropriate health indicators (Barlow, 2007). Weight status is a reasonable indicator of body fat for both adults and preadolescent. Because weight status does not measure body fat directly, it should not be used as a diagnostic tool. Instead, weight status should be used as a measure to track populations and as a screening tool to identify potential weight problems in individuals (CDC, 2011).

## Summary

The overweight epidemic among preadolescents, in particular among those living in poverty, has become a major priority for public health (Barlow, 2007; Caprio et al., 2008). Weight status is currently the principal public health nutrition problem in the United States. As the prevalence of obesity has increased, the number of programs to prevent obesity have increased significantly (FRAC, 2010). However, the prevalence of preadolescents who are overweight or at risk for being overweight continues to increase (CDC, 2008; Ogden et al, 2008). Skinner et al. (2004) underscored the complexity of obesity prevention efforts because there are multiple potential causes of obesity.

Factors such as economics, race/ethnicity, society, and culture are related to the prevalence of obesity (Caprio et al., 2008). Past studies have shown that annual income is inversely related to the prevalence of obesity (James, Nelson, Ralph & Leather, 1997; Caprio, et al, 2008). Research has also revealed that families of low socioeconomic status and families who live in poverty have the highest risk for being overweight (Danielziek, et al., 2004). Other studies have shown that race or ethnicity is related to obesity (Caprio, 2008; TFAH, 2011). Specifically studies have shown that African Americans have higher rates of obesity than other segments of the population (Caprio et al.; Ogden et al., 2006; Ogden et al. 2010; TFAH; Wang & Beydoun, 2007).

Studies show that parents have a strong impact on their children's weight. Studies have revealed a link between preadolescents' dietary patterns and their parents' level of education (Kranz & Siega-Riz, 2002; Xie, Gillard, Li & Rockett,

2003). Healthier food choices tend to be higher for preadolescents with better educated parents (National Longitudinal Study of Preadolescent Health [NLSAH], 2005). Other studies have indicated a link between preadolescents' dietary patterns and their and parents' income (James, Nelson, Ralph & Leather, 1997; Caprio et al.). Parental obesity has also been shown to be a stronger predictor of adult obesity than a child's weight status (Whitaker et al., 1997).

Parental modeling and family meals are related to obesity in preadolescents (Harper & Sanders, 1975). Tibbs et al. (2001) suggested that parental modeling may be particularly significant in African American families because it builds on the strength of family and kinship networks. Frequency of family meals is positively correlated with the intake of recommended nutrients for proper growth (Neumark-Sztainer, Hannan, Story, Croll & Perry, 2003). Results from one study (NLSAH, 2005) revealed that shared family meals were positively associated with preadolescents' higher consumption of healthy foods. Children and preadolescents demonstrate a preference for healthier foods when such foods are readily available at home (Baranowski, Cullen & Baranowski, 1999; Story, Neumark-Sztainer & French, 2002).

Food insecurity and food accessibility have been linked to obesity. Several studies have indicated a strong association between food insecurity and obesity (Adams et al., 2003; Hampton, 2007; Townsend et al., 2001; Wilde & Peterman, 2006). According the Food Research and Action Center (FRAC, 2010) a number of households in the United States report challenges in the accessibility and affordability of fresh fruits and vegetables.



Excess weight is known to lead to severe, chronic diseases including Type II diabetes and asthma, yet in most cases, it is a preventable condition (Wisemandle, Maynard, Guo, & Siervogel, 2000). It is therefore important for educators, nutritionists, and health care professionals to gain better insight of how dietary intake impacts weight status in preadolescents. Through such knowledge, better prevention and intervention programs can be developed.

This chapter presented a summary of literature related to obesity in America. The focus was specifically on literature related to obesity in preadolescents. Chapter 3 will cover the research methodology that was used to conduct the study. Chapter 4 presents the result, and Chapter 5 presents the discussion and conclusion.

## **Chapter 3**

### **Research Method**

The purpose of the study was to assess whether the dietary intake variables of preadolescents and their caregivers predicted the weight status of preadolescents across the span of 18 months. The study also investigated the prevalence of overweight and at risk for overweight preadolescents across the span of 18 months. The focus of the study was on African American preadolescents participating in the Alabama Cooperative Extension System Programs. Chapter 2 presented the literature related to the variables on interest in this study. This chapter details the method that was used to collect data for this study. The chapter discusses the research design, the data collection procedures, the sampling frame and the sampling procedures.

#### **Research Design**

This exploratory study employed a quantitative, non-experimental, repeated measures research design. Leedy and Ormond (2005) assert that quantitative research is applied in order to explain, authenticate, or validate relationships. The researcher was interested in assessing the relationships between the variables of interest; therefore the quantitative research paradigm was appropriate for this study. The advantages of the quantitative research design made it appropriate for this study for the following reasons: the researcher was able to remain objective in the data collection process; the independent

variables (preadolescent's and their caregivers' dietary intake) and the dependent variable (preadolescent's weight status) were clearly stated; data for the dependent variable (preadolescent's weight status) were collected three times over a period of 18 months (Creswell, 2003).

The research was non-experimental because it was not possible to implement the major requirements of true experimental research such as random assignment of participants. In addition, the researcher was not able to manipulate the independent variable (weight status participants) in the study (Trochim & Donnelly, 2007). Therefore the non-experimental design was appropriate for this study because such an approach is good for an exploratory study where the researcher seeks to determine the relationship between variables but the researcher cannot use a true experimental approach.

The repeated-measures design enables researchers to collect data on a given variable or set of variables for the same group of participants on several different occasions (Leedy & Omrod, 2001; Stevens, 2009). According to Kilpatrick & Feeney (2007) the use of repeated measures designs offers the following advantages: fewer participants are needed; there is less random error because we hold people constant; we can extract variance due to people from other sources of error; and there is greater power to test within-subjects effects. With the repeated measures design each participant serves as his or her control (Leedy & Omrod, 2001) and smaller samples are needed. The repeated measures design was appropriate for this study because the researcher was interested in determining how preadolescent's dietary intake impacted their

weight status across time and how the prevalence of overweight and at risk for overweight preadolescents changed over time.

### **Sampling Frame**

A purposive sampling scheme was used to recruit participants for the study. This sampling procedure is used when a researcher has a specific purpose and is interested in specific groups (Trochim & Donnelly, 2007). The researcher was specifically interested in examining the relationship between the participants' dietary intake, their weight status, and their parents' dietary intake. Therefore the use purposive sampling was appropriate for this research.

### **Research Questions/Hypotheses**

Three research questions drove the focus of this study. The hypothesis for each question was stated in the null form. The null hypothesis proposes that there is not statistically significant relationship between the variables of interest in a given study (Howell, 2004). If statistical computations provide values that are significantly different, then the null form of the hypothesis is rejected and its alternative form is accepted (Black, 1999; Howell, 2008). The following three research questions were investigated in this study.

*Research Question 1.* How well does preadolescents' dietary intake predict their body mass index (BMI) across time?

*Null Hypothesis 1 (H<sub>0</sub>):* Preadolescents' self-reported dietary intake variables, as measured by the KFQ (total calories, carbohydrates, monounsaturated fat, polyunsaturated fat, protein, fiber, servings of vegetables), are not statistically significant predictors of their BMI as determined by their height and weight, over a span of 18 months.

*Alternate Hypothesis 1 (H<sub>A</sub>):* Preadolescents' self-reported dietary intake variables, as measured by the KFQ (total calories,

carbohydrates, monounsaturated fat, polyunsaturated fat, protein, fiber, servings of vegetables), are statistically significant predictors of their BMI as determined by their height and weight, over a span of 18 months.

*Research Question 2.* To what degree do caregiver self-reported dietary intake variables predict preadolescents' weight status as determined by their BMI?

*Null Hypothesis 2 (H<sub>0</sub>):* Caregiver self-reported dietary intake variables (total calories, carbohydrates, monounsaturated fat, polyunsaturated fat, protein, fiber, servings of vegetables), as measured by the HHHQ, are not statistically significant predictors of preadolescents' weight status, as determined by their BMI.

*Alternate Hypothesis 2 (H<sub>A</sub>):* Caregiver self-reported dietary intake (total intake of calories, carbohydrates, monounsaturated fat, polyunsaturated fat, protein, fiber, servings of vegetables), as measured by the HHHQ, are not statistically significant predictors of preadolescent's weight status, as determined by their BMI.

The null hypotheses for Research Questions 1 and 3 were assessed using multiple regression analysis, which is a parametric statistical procedure that is used to assess the degree to which a set of independent variables predicts an outcome or dependent variables (Howell, 2004; Mertler & Vanatta, 2005; Stevens, 2009). Therefore the use of multiple regression analysis is appropriate for testing the null hypothesis for this research questions. The independent variables for Research Question 1 were the preadolescents' daily dietary intake of total calories, protein, carbohydrates, calcium, monounsaturated fat, polyunsaturated fat, fiber, and servings of vegetables. The dependent variable was preadolescents' BMI. The independent variables for Research Question 2 were the caregivers' daily dietary intake of total calories, protein, carbohydrates, calcium, monounsaturated fat, polyunsaturated fat, fiber, and servings of vegetables. The dependent variable was preadolescents' weight status.

*Research Question 3.* What is the change in the prevalence of overweight and at risk for overweight preadolescents, as determined by their weight status, over a span of 18 months?

*Null Hypothesis 3 (H<sub>0</sub>):* There is not a statistically significant change in the prevalence of overweight and at risk for overweight preadolescents, as determined by their weight status, over a span of 18 months.

*Alternate Hypothesis 3 (H<sub>A</sub>):* There is a statistically significant change in the prevalence of overweight and at risk for overweight preadolescents, as determined by their weight status, over a span of 18 months.

The null hypothesis for Research Question 3 was tested using a repeated measures analysis of variance (rANOVA). The rANOVA procedure is used to assess how independent variables influence continuous dependent variables (Howell, 2004). The with-in subjects variable was the preadolescents' weight status. There was not between subjects variable for this research question.

### **Power and Sample Size Determination**

The reliability of results from a statistical analysis is partly a function the sample size from which the results were computed (Howell, 2004; Mertler & Vanatta, 2005; Stevens, 2009). An a priori determination of sample size establishes the minimum number of cases needed for achieving a desired significance level (Stephens). There were two major statistical procedures used to analyze data for this study; those procedures were the multiple regression analysis and the rANOVA. A separate sample size determination was conducted for each procedure.

In general, the minimum sample size for regression analysis is affected by the following a) level of desired power ( $\gamma$ ); b) accepted level of error ( $\epsilon$ ), and c)

the value of the squared population multiple correlation ( $\rho^2$ ) (Stevens, 2009). According to Stevens, using the parameters of  $\gamma = .80$ ,  $\epsilon = .05$ , and  $\rho^2 = .50$ , the minimum sample size needed to generate a reliable regression equation for 8 predictor variables (preadolescent dietary intake of total calories, carbohydrates, monounsaturated fat, polyunsaturated fat, protein, fiber, servings of vegetables) would be  $n = 103$ . Other research recommends that using a ratio of 15 responses per variable will produce a reliable regression equation (Mertler & Vanatta, 2005). Therefore, with 8 predictor variables and 15 participants per variable, approximately 120 participants (8 predictor variables X 15 participants per variable) would be needed to produce a reliable regression equation. The researcher used the above referenced parameters to determine that 103-120 participants would be needed to generate a reliable regression equation. Results regarding the number of participants and the adequacy of the obtained sample for the multiple regression analyses are presented in Chapter 4.

The minimum sample size for repeated measures is affected by the following a) level of desired power ( $\gamma$ ); b) effect size, and c) average correlations between the repeated measures, which in this study was preadolescent BMI (Stevens, 2009). For this study the desired level of power was set at  $\gamma = .80$ . A small effect size of .25 was chosen, and the average estimated correlations between BMI across the three time intervals was estimated to be  $r = .80$ . The table by Stevens revealed that a minimum sample size of  $n = 54$  was needed for the rANOVA. Results regarding the number of participants and the adequacy of the obtained sample for the rANOVA analyses are presented in Chapter 4.

## Setting

Participants in this study were from the Black Belt region of Alabama. The racial makeup of the Black Belt region was 52.24% African American (307,734 people), 45.87% White (270,175 people), 0.25% Native American (1,472 people), 0.52% Asian (3,067 people), 0.03% Pacific Islander (153 people), 0.31% from other races (1,850 people), and 0.78% from two or more races (4,590 people). Hispanics or Latinos of any race were 1.09% of the population (6,404 people). The median income for a household in the Black Belt region was \$27,130, and the median income for a family was \$35,698. Males had a median income of \$32,226 versus \$22,021 for females. The per capita income for the region was \$15,633. Another concern for the Black Belt Region is that 45% of the residents had not completed high school and lacked adequate health and social services (United States Census, 2010).

Appendix A shows a map of Macon County and the locations of the participating schools. There are a number of demographic variables that places residents in the county at an extremely high risk for the prevalence of individuals who are overweight. Based on data from the United States Census (2009), the estimated population of Macon County was 21,789, and of this number 81.8% were African Americans. The population density of Macon County is 40.8 persons per square mile (US Census, 2000). The percentage of persons under the age of 18 was 20%. Females represent 54.1% of the population. The home ownership rate was 67.3% in 2000 (US Census). The median household income was \$42,586, and the per capita money income was \$18,189 (US Census, 2008).



The percentage of the population participating in the Supplemental Nutrition Assistance Program (SNAP), formerly Food Stamp Program varied from 45-67%. The number of single parent families was approximately 59.2%, and the high school graduation rate was 64.6% (VOICES for Alabama's Children, 2011; Anne E. Casey Foundation, Kids Count Data, 2010). Therefore, many of the preadolescents and caregivers who were recruited for the study were potentially from families with limited resources.

Jasik et al. (2010) outlined a number of factors related to obesity. The researchers posited that social and cultural variables such as money, place of residence, and culture. The statistics regarding the social, economic, and cultural backdrop for the Black Belt communities clearly indicate that the sociocultural environment places children and preadolescents in those communities at a higher risk of obesity and obesity related outcomes.

## **Participants**

The sample for this study consisted of two distinct groups. One group consisted of preadolescents attending the targeted schools. The other group was the caregivers of the preadolescents targeted for participating in the study. The paragraphs that follow provide a description of each group.

**Preadolescents.** The participants attended schools in Macon County, Alabama, where over 90% of enrolled students in the county received free or reduced price lunch. The percentage of the population that was African American in these schools ranged from 90% to 100%. The socioeconomic status of the participants was not assessed. However, statistics revealed that 38.6% of

children ages 0-17 in Macon County live at or below the level of poverty (Voices for Alabama's Children, (2011).

A total of 400 preadolescents were recruited for participating in the study. The number of completed surveys that were completed at each data collection period was less than the number of anthropometric assessments taken at each collection. Table 3 illustrates the participants from each of the six schools who returned completed KFQs across the three data collection periods.

Table 4 shows summary descriptive statistics for the preadolescents from which the anthropometric assessments were taken. The subjects' age, sex, and adjusted BMI were calculated using the revised growth charts published by the CDC and the National Health Center (Kuczmarski, 2000). This table does not reflect the total number of participants who participated in all three data collection periods. During the first data collection period there were between 262 - 266 sets of anthropometric data. The number of complete anthropometric data varied from 222 to 241 at Time 2. At the final collection period there were 292 sets of completed anthropometric data. The sample contained 45% males and 55% females at Time 1. The sample contained 37% males and 63% female at Time 2. At the final data collection the sample was split 50%-50% between males and females.

Table 3

*Frequency Count of Returned Surveys for Each Data Collection Period*

	<i>n</i>	% of sample
<u>Time 1</u>		
1 Notasulga	10	5.5
2 Tuskegee	75	41.0
3 Macon County	52	28.4
4 DC Wolfe	18	9.8
5 Catholic School	7	3.8
6 Washington Public	21	11.5
Total	183	100.0
<u>Time 2</u>		
1 Notasulga	10	5.7
2 Tuskegee	61	34.7
3 Macon County	55	31.2
4 DC Wolfe	22	12.5
5 Catholic School	7	4.0
6 Washington Public	21	11.9
Total	176	100.0
<u>Time 3</u>		
1 Notasulga	14	5.0
2 Tuskegee	93	33.5
3 Macon County	73	26.1
4 DC Wolfe	29	10.4
5 Catholic School	12	4.3
6 Washington Public	30	10.8
Total	251	90.3
Missing	27	9.7
Total	278	100

As would be expected, the average age of the participants increased from Time 1 to Time 3. The average age increased by approximately 18 months from Time 1 to Time 3. The average height also increased from Time 1 to Time 3, but

the increase was not proportional. The average height only increased by 1 inch from Time 1 to Time 2; yet the average height increased by almost 3 inches from Time 2 to Time 3. This growth rate was consistent with expected growth rates for this age group. During the preadolescent years the average rate of growth is approximately 3 inches for females and 4 inches for males (Payne, & Isaac, 2007). The average BMI of the adolescents also increased from 21.42 at Time 1 to 23.31 at Time 3.

Table 4

*Summary Descriptive Statistics of Preadolescents' Age and Anthropometric Measurements Across the Three Time Intervals*

	<i>N</i>	Minimum	Maximum	<i>M</i>	<i>SD</i>
<u>Time 1</u>					
Age	266	9	13	10.44	.62
Height	262	51.8	72.0	59.03	3.24
Weight	262	56	242	107.80	35.59
BMI1	262	13.2	41.4	21.42	5.60
<u>Time 2</u>					
Age	241	10	13	10.89	.66
Height	223	52	73	60.18	3.28
Weight	223	58	262	117.03	39.88
BMI	222	14.0	45.0	22.40	6.14
<u>Time 3</u>					
Age	292	11	14	11.92	.68
Height	292	55	76	62.43	3.34
Weight	292	65	281	130.76	42.13
BMI	292	14.2	48.2	23.31	6.36

**Note:** Age is expressed in years, height is expressed in inches, weight is expressed in pounds, and BMI is expressed as pounds/inch<sup>2</sup>.

Table 5 shows the number of participants who returned surveys for all three data collection periods by schools. These participants were included in the rANOVA. The numbers show that only  $n = 83$  participants were in this group, thus indicating a 21% participation rate for the initial pool of 400 recruits. The data further shows that the largest percentage of participants (32.7%) came from Tuskegee Public Schools for each time interval. The smallest number of participants (6%) came from the Catholic school for each time interval.

Table 5

*Frequency Count for Participants Included in the rANOVA for Each School*

School	$n$	% of sample
missing	3	3.6
Catholic	5	6.0
D. C. Wolfe	8	9.6
Notasulga	11	13.3
South Macon	5	6.0
Tuskegee Public	27	32.5
Washington Public	24	28.9
Total	83	100.0

Table 6 presents a summary of descriptive statistics for the demographic data for the participants who were included in the rANOVA. As would be expected, the average age of the participants increased from Time 1 to Time 3. The average age increased by approximately 18 months from Time 1 to Time 3. The average height also increased from Time 1 to Time 3, but the increase was not proportional. The average height only increased by 1 inch from Time 1 to Time 2; yet the average height increased by almost 3 inches from Time 2 to Time 3.

3. The growth rate for the subsample was also consistent with expected growth rates for this age group. During the preadolescent years the average rate of growth is approximately 3 inches for females and 4 inches for males (Payne, & Isaac, 2007). The average BMI of the adolescents also increased from 21.40 at Time 1 to 21.89 at Time 3.

Table 6

*Summary Descriptive Statistics Age, Weight, Height, and BMI of Preadolescents Included in the rANOVA*

	<i>N</i>	Minimum	Maximum	<i>M</i>	<i>SD</i>
Age	81	10.00	13.00	10.41	.65
Height	81	53.25	66.25	59.35	2.98
Weight	81	58.25	207.00	107.43	35.07
BMI	83	14.0	35.3	21.40	5.59
Age	81	10.00	13.00	10.83	.67
Height	81	54.00	67.50	60.46	3.01
Weight	81	62.00	220.00	115.02	37.71
BMI	83	14.1	37.5	21.83	5.77
Age	81	11.00	14.00	11.84	.68
Height	81	56.50	69.50	62.70	2.85
Weight	81	70.00	250.00	130.14	41.97
BMI	82	14.7	42.6	21.89	5.67

**Caregivers.** Of the 400 participants who took home information packets, only 117 caregivers returned the HHFQ at the first time interval. The overall survey return rate for the caregivers was approximately 29%. The demographic data for the caregivers was collected during the first time interval, which was Fall 2002. Caregiver demographics, education level, and other characteristics were obtained at baseline by questionnaire, but not utilized for this study.

The returned surveys were screened for completeness and accuracy. Only HHFQs with complete data were retained for the data analysis. Completed HHFQ surveys were then matched to the corresponding KFQ surveys. The matching resulted in 59 matched pairs. Further screening of the surveys showed that 5 surveys were missing essential information needed for the study. The result was that there were 54 matched HHFQ and KFQ surveys used in the study. The demographic data for the caregivers was collected during the first time interval, which was Fall 2002.

### **Procedures**

Researchers from Auburn University Department of Human Sciences collaborated with the Macon County Board of Education, Saint Joseph Catholic School, and Alabama Cooperative Extension System to conduct this study during 2002-2004. Permission to conduct the study was provided by the Macon County Superintendent of Education and the Saint Joseph Catholic School Principal (see Appendix B). The researchers obtained approval from the Auburn University Institutional Review Board for the Use of Human Subjects in Research prior to conducting the study.

All participants were recruited from schools in rural Macon County, Alabama. Recruitment began when participants were in 5<sup>th</sup> grade and concluded when they were 6<sup>th</sup> grade. The recruitment procedures were consistent for all six locations. A presentation regarding the details of the study was delivered during homeroom class time. The presentation involved exhibits, handouts, and

incentives for participation. All 5<sup>th</sup> grade students enrolled in the participating schools were identified as being potentially eligible for participation.

An information packet was provided to each potential participant. Each packet contained an announcement letter (see Appendix C) that described the research and the purpose of the research. The packets also contained two copies of the caregiver consent form (see Appendix D) and the participant assent form (see Appendix E). The information packet also contained the Healthy Habits and History Questionnaires (see Appendix F) that was completed by the preadolescents' caregivers. Caregivers were defined as a blood relative or other individual who was responsible for purchasing and preparing food in the home. The information packet also included a copy of the KFQ (see Appendix G) that was completed by the preadolescents. The participants were instructed to return the complete packet of information back to the school.

The caregiver consent forms contained a description of the study. The consent forms also informed the caregivers' and the preadolescents that their participation in the study was completely voluntary. Only preadolescents who returned a consent form that was signed by a caregiver were allowed to participate in the study.

The HHFQs' were completed at home by the caregivers, and 117 were completed and returned during the first measurement period. Participants completed the KFQ in school during class time. The KFQ was completed on three different occasions across a period of approximately 18 months. The returned caregiver HHHQs were correlated with and matched to the



corresponding KFQ during the first time interval. Data from the HHHQ was only collected during the first time interval, therefore caregiver and preadolescent forms could only be matched for the first time interval.

The preadolescent participants were offered incentives for their participation. The incentives consisted of tangible, low cost items such as pencils, Frisbees, pens, kites, measuring cups and spoons, etc. At the completion of the data collection, each class was given a recognition event for their efforts.

### **Researcher Training**

All personnel who participated in the study were trained on how to collect data for the study. The purpose of the training was to deliver standardized instructions for collecting data. All data collection personnel were food and nutrition majors who were familiar with anthropometric assessment. Personnel were trained to use standardized methods for anthropometric measurements to minimize the risk of measurement error introduced by each examiner (Lohman, 1988). The six researchers practiced taking anthropometric measures and they recorded their observations. The training documents were reviewed and the practice sessions continued until researchers were able to accurately and repeatedly collect and document their measurements. These training sessions continued until the researchers achieved a 95% interrater reliability.

### **Instrumentation**

Most nutrition research is interested in the usual food intake of the individual. Consequently, many researchers have turned to food frequency

questionnaires as the most appropriate method for collecting. Food frequency questionnaires (FFQs) ask about usual frequency of consumption of a list of foods. Some FFQs ask about the individual's portion size for each food. Other questionnaires may assign a single portion amount, or ask the respondent to divide his/her own portion by a standard amount in order to estimate their frequency of consumption of the standard amount. Food questionnaires take between 20 minutes to 1-1/2 hours to complete the (Block Brief, 2000).

**Kid's Food Questionnaire.** The KFQ (see Appendix H) was developed for use with preadolescents between the ages 8-13 years. The KFQ assesses the frequency (times per day and week) of consumption of specified food items typically consumed by preadolescent. In addition to frequency of food intake, the KFQ also asks about the portion size of each food.

The information on the KFQs (Block Dietary Systems) were self-reported by the preadolescents. The KFQ was administered three times: October 2002, April 2003, and April 2004. The questionnaires were completed during school class time, and the administration took about 30 to 40 minutes. The survey was used to collect data on the participants dietary intake, time of day food consumed, frequency of food consumed, variety of foods consumed, and portion sizes. The participants were provided a set of measuring cups, measuring spoons and a food questionnaire serving size handout to help them determine the portion sizes of the foods they consumed. The portion sizes were described as small, medium, or large based on comparison to the food questionnaire

serving size handout. Appendix H shows the serving guide that the preadolescents used to determine their portion size of their food.

Before each data collection period researchers conducted a 20 minute demonstration to show participants how to determine their portion and serving sizes using measuring cups, spoons, and food models provided by Auburn University. After each demonstration the researchers provided a discussion session with participants on how to report and record their dietary intake. Members of the research team were available to provide instructions and assist preadolescents in completing the KFQ. The researchers did not collect any observational data to validate the preadolescents' self-reported food consumption.

The completed KFQs were returned to Block Dietary Data Systems for analysis and scoring. The scoring system reported information on various categories of food such as milk, fruits, meats, vegetables, snacks and sweet beverages. The data provided by the Block scoring system was used in the data analysis for this study.

**HHHQ** . The dietary intake of caregivers was assessed using the self-administered HHHQ (see Appendix F). Caregivers completed the HHHQs at home independently without instruction from the research team. Block Dietary Data Systems analyzed completed questionnaires. Data were collected from caregivers using the HHHQ at only one time period due to rural location and the difficulties experienced gaining access to caregivers.

The HHHQ is widely used in both epidemiological and clinical research and takes about 30 minutes to complete (Block et al., 1986). The questionnaire asks for the frequency (times per day, week, month or year or a few times per year) of consumption of specified food items. The HHHQ also asks for portion sizes of each food consumed. The portion sizes are reported as either small, medium, and large compared to food questionnaire serving size handout.

The HHHQ has been validated by a number of studies (Block, 1986; Block, 1990a; Block, 1990b; Jain, 1996). In a review of studies evaluating food frequency questionnaires for measuring dietary nutrient intakes in minority populations in the United States, Coates and Monteilh (1997) reported that most reliability correlation coefficients were in the range usually shown in assessments of questionnaires used in non-minority populations. Therefore, the HHHQ allows for a reliable and valid assessment of energy and nutrient intakes and provides for estimates of group mean intakes in a variety of adult groups (Block 1992; Smucker, 1989).

**Anthropometric assessment.** The anthropometric measurements of the participants were evaluated three times during October 2002, April 2003, and April 2004. Information was collected by the KFQ and the anthropometric measurements were assessed during the same week at all six locations. The anthropometric assessment techniques used in the study were standard in the nutrition field. Students were weighed in a private area. Participants were instructed to remove outerwear, such as heavy jackets and shoes. A Detecto 439 Medical Scale was used to determine the preadolescents' height in inches

and weight in pounds. The equipment was transported to each school site and calibrated by staff from the Auburn University Department of Nutrition, Dietetics and Hospitality Management. Appendix K displays the procedures that were used to conduct the anthropometric measures.

The body weight of each child was measured to the nearest 1/4<sup>th</sup> of a pound and height was rounded to the nearest 1/4<sup>th</sup> inch. These data were used to calculate the child's body mass index, which is the ratio of weight divided by height (Kuczmarski, 2002). The preadolescents' BMI and age were charted on growth charts that were developed by the CDC (2000) and the National Center for Health Statistics (2000) to determine each participant's age and sex adjusted BMI-for-age percentile. This percentile was used to determine the participants' weight status. Different charts were used for boys (see Appendix L) and girls (see Appendix M). Appendix N illustrates an example of a completed growth chart. The Ogden et al. (2010) classification system was then used to determine the participants' weight status according to the legend presented previously in Table 2.

### **Summary**

This chapter explained the how this exploratory study employed a quantitative, non-experimental, repeated measures research design to investigate the relationship between the variables of interest. The chapter presented the rationale as to why this research paradigm was appropriate for this study. The chapter also contained a description of the research questions, the hypotheses, and the statistical procedures used to test each hypothesis. The

independent variables were identified as the preadolescent's and their caregivers' dietary intake; and the dependent variable was identified as the preadolescent's BMI and weight status.

There was a brief description of the procedures used to determine the minimum sample size needed to attain the conventional power level of  $\gamma = .80$  for both the regression analysis and the rANOVA. The chapter presented a description of the setting from which the sample was recruited. Descriptive statistics were presented for the preadolescent and caregivers who participated in the study. The chapter described the procedures for recruiting participants and the procedures that were used for collecting data. The chapter also described how the anthropometric measures were taken for the preadolescents.

The chapter then presented an overview of the training that was given to researchers who collected data for the study. This discussion was then followed by a description of the instruments used to collect data from participants. The chapter ended with a discussion of the procedures that were used to conduct the anthropometric assessment. Chapter 4 presents a summary of the results obtained from the statistical procedures.

## **Chapter 4**

### **Results**

The purpose of the study was to assess whether the dietary intake variables of preadolescents and their caregivers predicted the weight status of preadolescents across the span of 18 months. The study also investigated the prevalence of overweight and at risk for overweight preadolescents across the span of 18 months. The focus of the study was African American preadolescents residing in rural Alabama.

This chapter reports the results of the data analysis. The chapter contains a summary of the demographic data for the participants who were included in the repeated measures design. The chapter contains an explanation of how the relevant statistical assumptions were assessed, and it includes a discussion of results from testing the null hypothesis for each research question.

#### **Predata Analysis**

Before conducting statistical procedures to test null hypotheses, the researchers conducted a series of predata analyses to assess the level of accuracy and validity of data collected for a given study (Mertler & Vanatta, 2005). The quality of the data affects the appropriateness and accuracy of interpretations made from the data. Prescreening data allows researchers to assess the degree to which analytical errors may be present and prescreening

allows researchers to interpret findings within an appropriate context (Onwuegbuzie & Daniel, 2003). The predata analysis phase should assess the following; accuracy of data collection and transcription; procedures for addressing missing data; level of measurement for dependent variable; adequacy of the sample size for each statistical procedure; and the degree to which the assumptions have been met for each statistical procedure.

**Accuracy of data.** During the predata analysis phase the researcher compared the preadolescents' self-reported daily caloric intake with their calculated BMI. During the analysis a number of inconsistencies were noted in the data. In several cases the reported caloric intake did not match up to what would be expected of the calculate BMI. For instance, on a number of occasions the participants' reported caloric intake was fewer than 1000 calories, however the BMI and the weight status placed the preadolescent in the overweight or obese categories. In other cases the participants' reported caloric intake was in excess of 4500 calories daily, however the BMI for-age-percentile placed the preadolescent in the normal category. The researchers concluded that these inconsistencies reflected inaccuracies in the self-reported data, which would in all likelihood have a negative impact on the results. The researcher noted the inconsistencies as limitations of the study.

**Level of measurement for dependent variable.** The appropriateness of using any intended statistical procedure depends on the level of measurement for the data. The two statistical procedures used in this were multiple regression and the repeated measures ANOVA, both of which required that the dependent



variable must be measured at the interval or ratio level (Stevens, 2009). The dependent variable in the study was BMI, which was calculated from the preadolescents' weight and height. Conceptually weight and height are considered ratio level variables in that each could theoretically have a value of zero. For the purpose of this study, BMI was considered a ratio level variable because it was calculated from two ratio level variables. Therefore the assumption for the ratio or interval level of measurement for the dependent variable, BMI, was met for this study.

**Missing data.** When prescreening data researchers should address the issue of missing data and discuss how the missing data was handled in the data analysis (Stevens, 2009). Missing data is problematic in research because it affects the generalizability of findings, decreases the amount of usable data in a data set, and ultimately decreases the power associated with a statistical test (Mertler & Vanatta, 2005; Stevens). It is therefore important that researchers make an a priori determination of how to handle missing data and summarizes the steps taken to address the missing data.

Table 4 revealed that the total number of preadolescents for which anthropometric data was collected ranged from  $n = 262$  at Time 1, to  $n = 242$  at Time 2, and to  $n = 292$  at Time 3. However, a close analysis of the data revealed that many of the records had missing data for one or more of the three data collection periods. Since the study was predicated upon a repeated measures design, the researcher further matched records for each of the three time periods before testing the null hypotheses for the research questions. After the three files

were merged in SPSS according to the preadolescents' names, there was only  $n=83$  matched for the preadolescents across all three time periods.

The researcher also matched preadolescent records to their caregivers' records. The researcher only had information on the caregivers for Time 1, therefore the preadolescent and parent match could only occur for Time 1. The matching process resulted in only 54 preadolescent/parent pairs. There were only 54 usable data fields for addressing Research Question 2.

**Adequacy of sample size.** The reliability of results obtained from a statistical analysis is partly a function the sample size from which the results were computed (Howell, 2004; Mertler & Vanatta, 2004; Stevens, 2009). There are minimum sample sizes needed for each statistical procedure. The next section will cover the assessment of the adequacy of the sample size for regression analysis and for the  $r$  ANOVA.

***Adequacy of sample size for regression analysis.*** The null hypothesis for Research Questions 1 and 2 were tested using multiple regression analysis. The a priori sample size determination referenced in Chapter 3 revealed that 103 – 120 participants would be needed to generate a reliable regression equation. After matching the preadolescents records across the three time periods, the remaining sample contained  $n = 83$ . An additional scan of the table presented by Stevens (2009) showed that the obtained sample size of  $n = 83$  represented a sample that would reduce the power of the statistical test to  $\gamma = .60$ . This meant that the regression analysis for Research Question 1 would only have a 60% chance of correctly rejecting the null hypothesis.

After matching the care giver data to the preadolescent data the total number of completed records was decreased to 54 records for the regression analysis for Research Question 2. An additional scan of the table presented by Stevens (2009) showed that the obtained sample size of  $n = 54$  reduced the power of the regression analysis for Research Question 2 to  $\gamma = .40$ . This meant that test would only have a 40% chance of correctly reject the null hypothesis.

The conventionally accepted level of judging the power for a statistical procedure is  $\gamma = .80$  (Mertler & Vanatta, 2005; Stevens, 2009). This sample size analysis revealed that the obtained sample for each of the regression analyses was not sufficient for obtaining the desired power of  $\gamma = .80$ . The researcher concluded that the small sample sizes may affect the accuracy and reliability of the findings, and in turn, the reliability of the obtained regression equations. The researcher addresses in detail the small sample sizes as limitations of the study in Chapter 5.

***Adequacy of sample size for rANOVA.*** The a priori sample size determination in Chapter 3 revealed that approximately 54 participants would be needed to obtain adequate power for the rANOVA. The review of the completed data for the preadolescents revealed a total of  $n = 83$  usable data sets across each of the three time periods. The researcher concluded that the obtained sample size was adequate for achieving the desired power level of  $\gamma = .80$

### **Testing Statistical Assumptions**

Testing statistical assumptions associated with a statistical procedure enables researchers to more accurately interpret their findings (Onwuegbuzie &

Daniel, 2003). Testing whether or not assumptions have been met allows researchers to assess the degree to which errors may impact the interpretation of results. The assumptions were tested separately for the regression analyses and for the rANOVA.

***Statistical assumptions for regression analysis.*** Multiple regression is a statistical analysis that has several assumptions: linearity, normality, homogeneity of variance or homoscedasticity, and absence of multicollinearity (Stevens, 2009). The linearity and normality assumptions can be assessed simultaneously by observing visual depictions of a distribution of scores on a graph such as a scatter plot or a histogram (Mertler & Vanatta, 2005). One such graph is the Normal P-P Plot of the Regression Standardized Residuals, which graphically compares the shape of a distribution of scores to the shape of the normal distribution. The shape of the normal distribution is represented by a 45° straight line. When data for a variable is normally distributed, the data on the P-P plot would form a straight 45° line. When the linearity assumption is upheld, the spread of scores would cluster closely to the 45° straight line. Statistical assumptions can also be examined by comparing the shape of the histogram of a distribution of scores plotted against the normal curve. Such a visual inspection would indicate the degree to which the pattern of scores approximates the shape of the normal curve (Mertler & Vanatta). The researcher tested the assumptions for linearity and normality for the dependent variable, preadolescent BMI, across each of the three time intervals. The results are presented in the paragraphs which follow.

*Linearity and normality assumptions.* Figure 2 shows the P-P plot for the preadolescents' BMI at Time 1. The graph reveals that the shape of the data points roughly approximated the shape of a straight line with some points falling above the line and some points falling below the line. The histogram in Figure 3 also shows that the BMI scores at Time 1 also approximated the shape of the normal curve. The researcher concluded that the assumptions of normality and linearity were upheld for the data collected at Time 1.

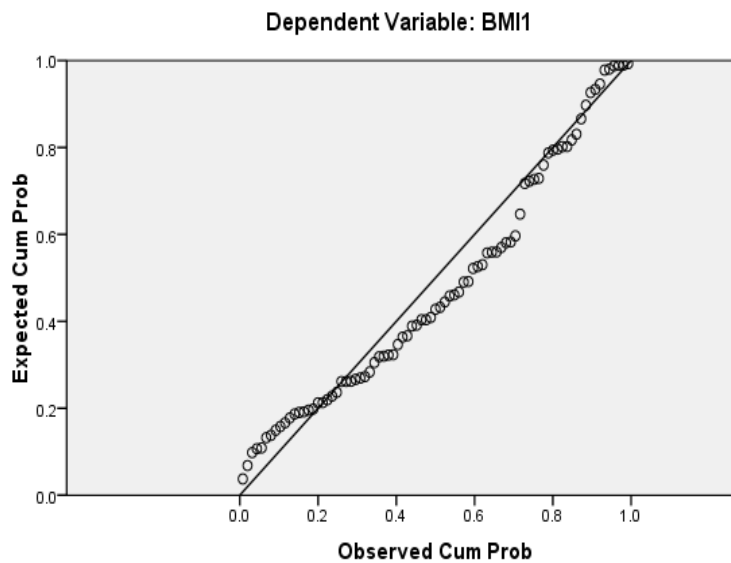


Figure 2. Normal P-P Plot for preadolescents' BMI at Time 1.

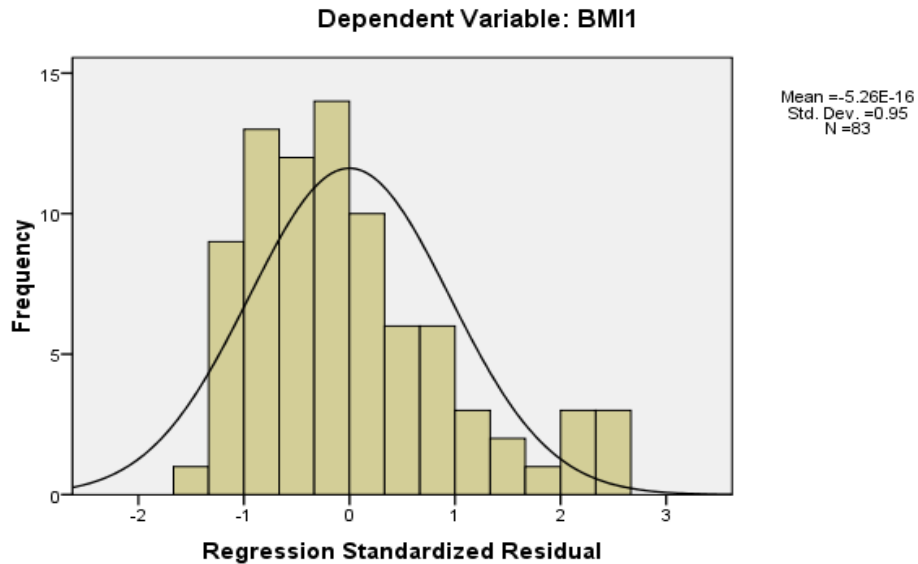


Figure 3. Histogram of score for preadolescents' BMI at Time 1.

Figure 4 shows the P-P plot for the preadolescents' BMI at Time 2. The graph reveals that the shape of the data points roughly approximated the shape of a straight line. The histogram in Figure 5 also shows that the BMI scores approximated the shape of the normal curve. The researcher concluded that the assumptions of normality and linearity were upheld for data collected at Time 2.

Figure 6 shows the plot for the BMI scores of preadolescents at Time 3. The graph reveals that the shape of plot roughly approximated the shape of a straight line with some points falling above and some points falling below the line. The histogram in Figure 7 also shows that the BMI scores at Time 3 approximated the shape of the normal curve. The researcher concluded that the assumptions of normality and linearity were upheld for data collected at Time 3.

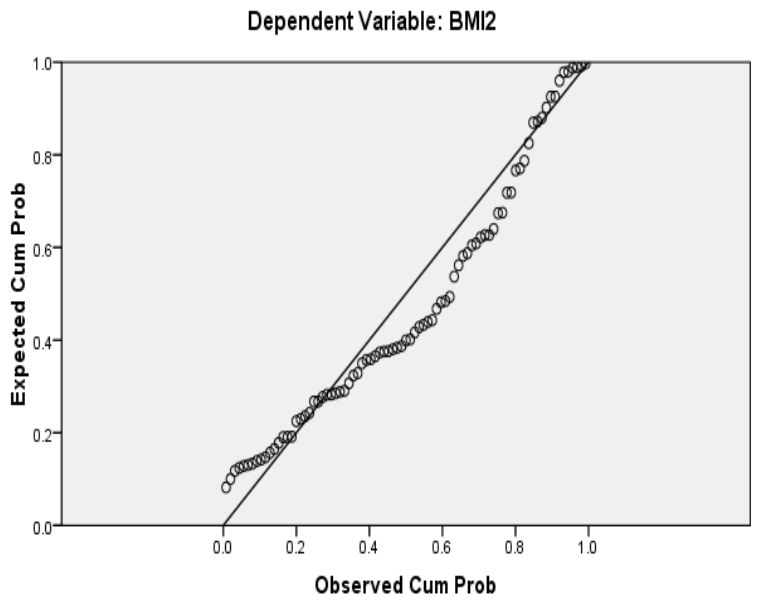


Figure 4. Normal P-P plots for preadolescents' BMI at Time 2.

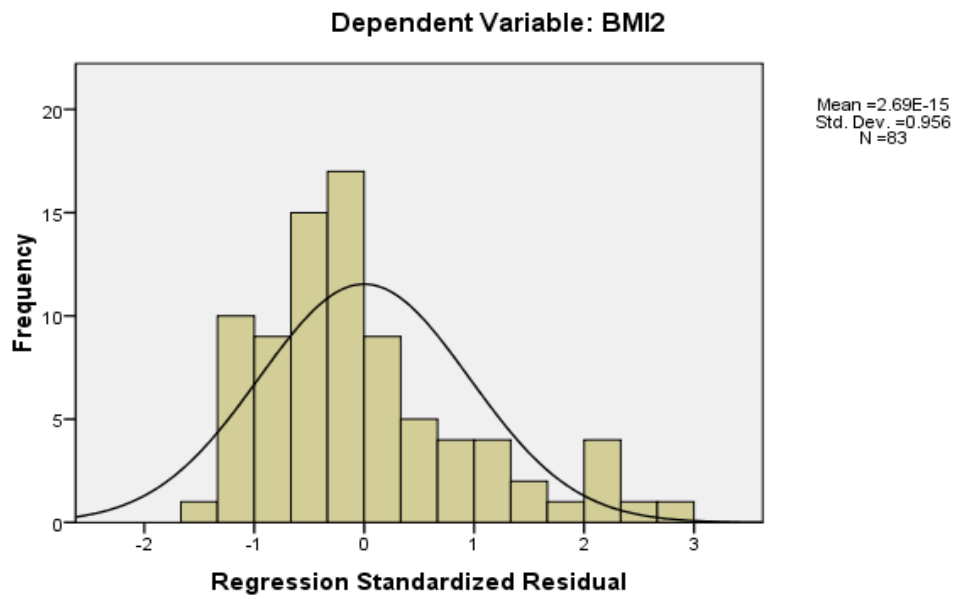


Figure 5. Histogram of scores preadolescents' BMI at Time 2.

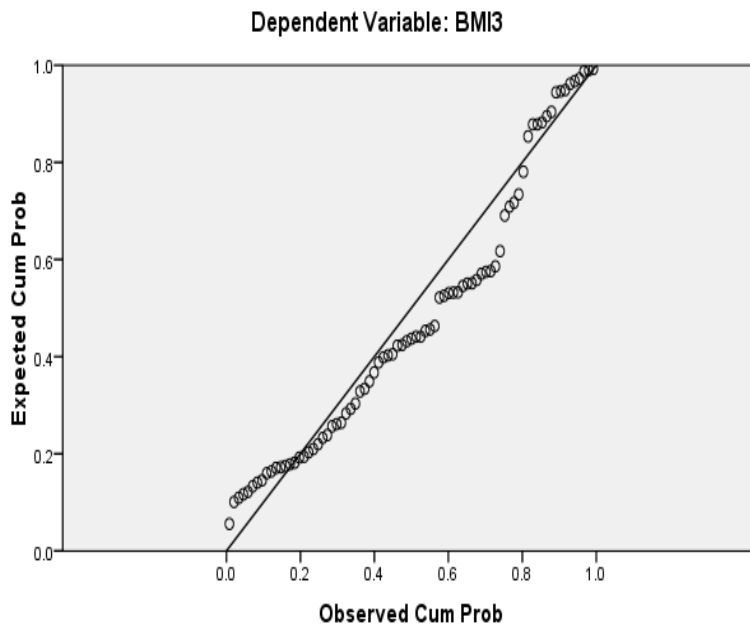


Figure 6. Normal P-P plot for preadolescents' BMI at Time 3.

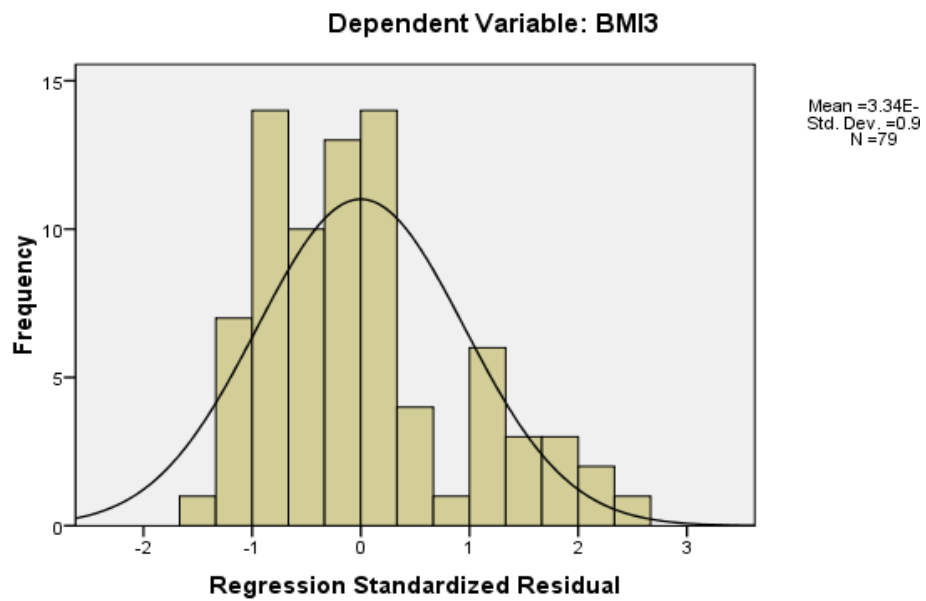


Figure 7. Histogram of scores for preadolescents' BMI at Time 3.

*Homoscedasticity assumption.* The homogeneity of variance assumption assumes that there are equal variances across the scores for the continuous variables (Mertler & Vanatta, 2005). This assumption can be tested by



examining bivariate scatter plots for the continuous variables of interest. The scatter plots will show elliptical shapes when the homoscedasticity assumption is upheld (Mertler & Vanatta). In Research Question 1 the continuous variables of interest were the preadolescents' dietary intake of total calories, carbohydrates, monounsaturated fat, polyunsaturated fat, protein, fiber, and servings of vegetables. Figures 8, 9, and 10 show the scatter plots for the independent variables of interest at Time 1 through Time 3 respectively. The figures reveal that each bivariate scatter plot shows an elliptical shape. The researcher concluded that the homoscedasticity assumption was upheld for each set of data.

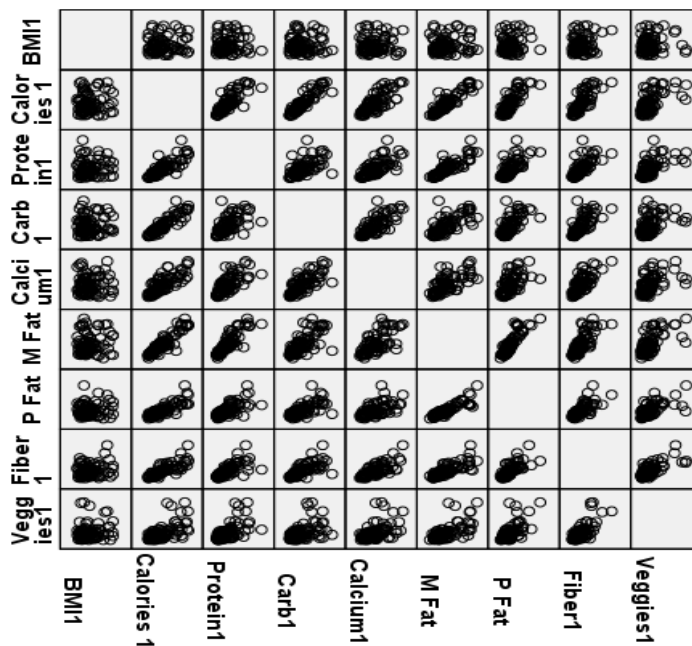


Figure 8. Scatterplot for mean values of preadolescents' dietary intake variables at Time 1.

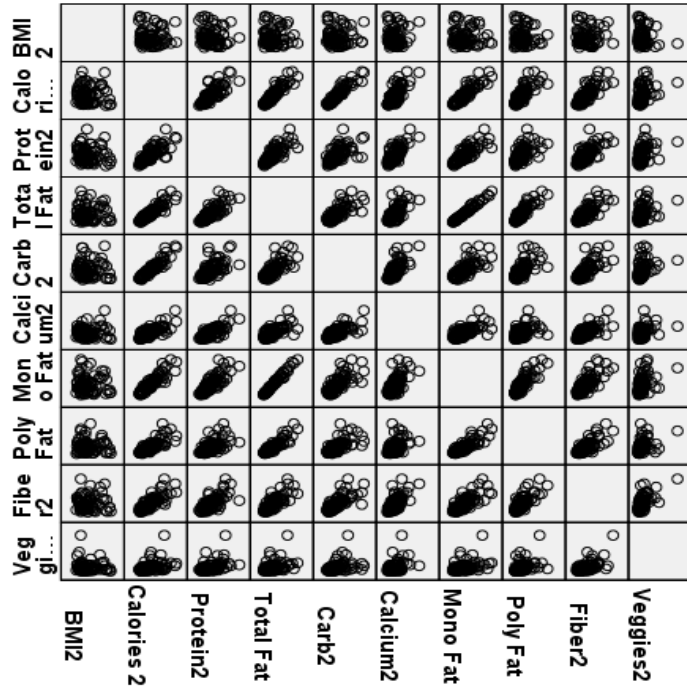


Figure 9. Scatterplot for mean values of preadolescents' dietary intake variables at Time 2.

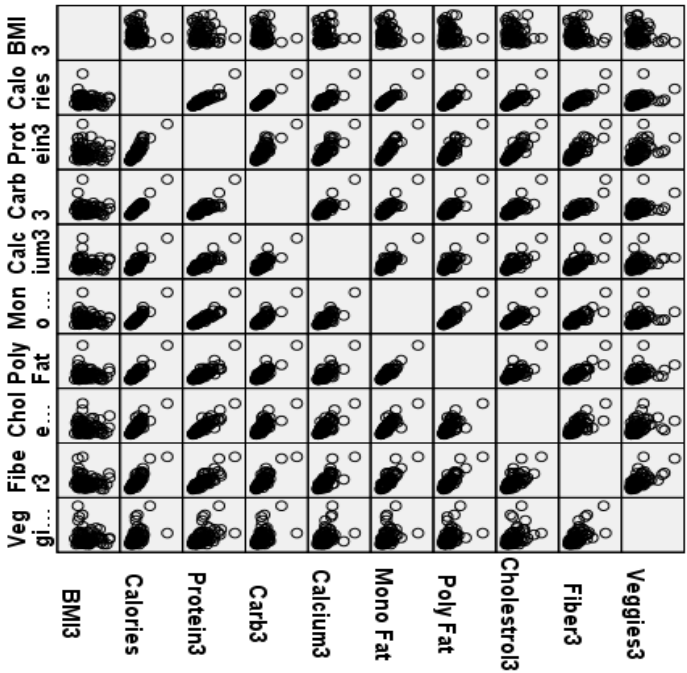


Figure 10. Scatterplot for mean values preadolescents' dietary intake variables at Time 3.

In Research Question 2 the continuous variables of interest were the caregivers' dietary intake of calories, carbohydrates, monounsaturated fat, polyunsaturated fat, protein, fiber, servings of vegetables. Figure 11 shows that each of the bivariate scatter plots showed an elliptical shape. The researcher concluded that the homoscedasticity assumption was upheld.

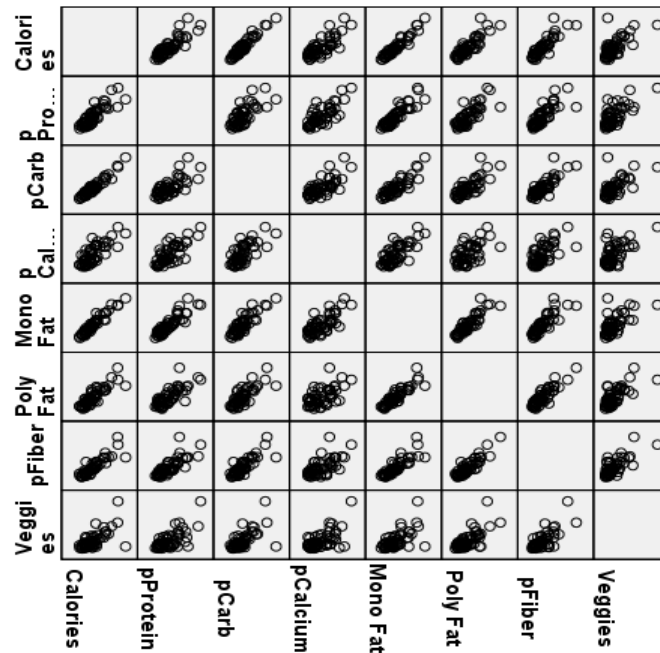


Figure 11. Scatterplot for mean values of caregivers' dietary intake variables at Time 1.

*Multicollinearity assumption.* A major concern in regression analysis is multi-collinearity, which indicates a high degree of correlation ( $r \geq .80$ ) between the independent variables (Mertler & Vanatta, 2005). Multicollinearity in this study was assessed by examining the correlation matrix for the predictor variables and through the collinearity diagnostics produced by SPSS. Tables 7, 8 and 9 present correlation matrices for the preadolescents' BMI and the mean values for their dietary intake variables across the three time intervals respectively. Results revealed that BMI was not significantly correlated with any of the mean values for

the dietary variables. The results showed a high degree of multicollinearity,  $r \geq .80$ , among mean values for the dietary intake variables. At Time 1 there was a high degree of multicollinearity between total calorie intake and all variables except servings of vegetables ( $r = .59$ ). Table 7 also reveals multicollinearity between monounsaturated fat and protein ( $r = .88$ ) and between monounsaturated fat and polyunsaturated fat ( $r = .89$ ).

The data analysis at Time 2 revealed that there continued to be a high degree of multicollinearity between the independent variables, as presented in Table 8. There continued to be a high correlation between total calorie intake and all of the independent variables except calcium ( $r = .77$ ) and servings of vegetables ( $r = .38$ ). There was also high degree of correlation between monounsaturated fat and protein ( $r = .82$ ) as well as between monounsaturated fat and polyunsaturated fat ( $r = .86$ ).

Review of the data at Time 3 as presented in Table 9 showed that the patterns of multicollinearity continued to exist. There continued to be a high degree of multicollinearity between total calorie intake and all of the independent variables except servings of vegetables ( $r = .43$ ). There was a high degree of multicollinearity between protein intake and all of the independent variables except servings of vegetables ( $r = .43$ ). Calcium intake was highly correlated with monounsaturated fat ( $r = .82$ ). There was a high degree of multicollinearity between monounsaturated fat and polyunsaturated fat ( $r = .94$ ) and between monounsaturated fat and protein intake ( $r = .86$ ). Data from Time 3 also showed a high degree of multicollinearity between polyunsaturated fat and fiber ( $r = .88$ ).

Table 7

*Correlation Matrix for Preadolescents BMI and Their Dietary Intake Variables for Time 1*

Variables		BMI	Calories	Protein	Carbohy- drates	Calcium	Monounsa- turated fat	Polyunsat- urated fat	Fiber	Servings of Veggies
BMI	<i>r</i>	1.000								
	<i>Sig.</i> )									
Calories	<i>r</i>	.093	1.000							
	<i>Sig.</i>	.404								
Protein	<i>r</i>	.076	.843**	1.000						
	<i>Sig.</i>	.496	.000							
Carb	<i>r</i>	.056	.921**	.616**	1.000					
	<i>Sig.</i>	.618	.000	.000						
Calcium	<i>r</i>	.033	.806**	.719**	.752**	1.000				
	<i>Sig.</i>	.766	.000	.000	.000					
Monounsaturated fat	<i>r</i>	.116	.923**	.879**	.716**	.700**	1.000			
	<i>Sig.</i>	.297	.000	.000	.000	.000				
Polyunsaturated fat	<i>r</i>	.133	.838**	.716**	.678**	.589**	.892**	1.000		
	<i>Sig.</i>	.232	.000	.000	.000	.000	.000			
Fiber1	<i>r</i>	.209	.814**	.719**	.715**	.763**	.786**	.740**	1.000	
	<i>Sig.</i>	.058	.000	.000	.000	.000	.000	.000		
Servings of Veggies	<i>r</i>	.135	.586**	.597**	.434**	.482**	.633**	.624**	.706**	1.000
	<i>Sig.</i>	.223	.000	.000	.000	.000	.000	.000	.000	

**Note:** \*\*. Correlation is significant at the 0.01 level (2-tailed). Sig. is 2-tailed for all tests.  $n = 83$  for all correlations.

Table 8

*Correlation Matrix for Preadolescents BMI and Their Dietary Intake Variables Time 2*

		BMI	Calories	Protein	Carbohy- drates	Calcium	Monounsa- turated fat	Polyunsat- urated fat	Fiber	Veggies
BMI	<i>r</i>	1.000								
	Sig.									
Calories	<i>r</i>	-.040	1.000							
	Sig.	.723								
Protein	<i>r</i>	-.069	.805**	1.000						
	Sig.	.534	.000							
Carbohydrates	<i>r</i>	-.027	.943**	.627**	1.000					
	Sig.	.810	.000	.000						
Calcium	<i>r</i>	.054	.772**	.760**	.722**	1.000				
	Sig.	.626	.000	.000	.000					
Monounsa- turated fat	<i>r</i>	-.046	.912**	.826**	.738**	.661**	1.000			
		.678	.000	.000	.000	.000				
Polyunsat- urated fat	<i>r</i>	-.020	.796**	.591**	.664**	.429**	.862**	1.000		
		.855	.000	.000	.000	.000	.000			
Fiber	<i>r</i>	.028	.809**	.717**	.735**	.682**	.774**	.768**	1.000	
		.800	.000	.000	.000	.000	.000	.000		
Veggies	<i>r</i>	-.112	.381**	.420**	.344**	.358**	.371**	.370**	.621**	1.000
		.314	.000	.000	.001	.001	.001	.001	.001	

**Note:** \*\*Correlation is significant at the 0.01 level (2-tailed). Sig. is 2-tailed for all tests.  $n = 83$  for all correlations.

Table 9

*Correlation Matrix for Preadolescents BMI and Their Dietary Intake Variables for Time 3*

		BMI	Calories	Protein	Carbohy- drates	Calcium	Monounsa- turated fat	Polyunsat- urated fat	Fiber	Veggies
BMI	<i>r</i>	1.000								
	Sig.									
Calories	<i>r</i>	-.086	1.000							
	Sig.	.450								
Protein	<i>r</i>	-.070	.908**	1.000						
	Sig.	.542	.000							
Carbohydrates	<i>r</i>	-.071	.976**	.818**	1.000					
	Sig.	.532	.000	.000						
Calcium	<i>r</i>	-.065	.855**	.829**	.813**	1.000				
	Sig.	.570	.000	.000	.000					
Monounsa- turated fat	<i>r</i>	-.113	.963**	.927**	.889**	.820**	1.000			
	Sig.	.320	.000	.000	.000	.000				
Polyunsat- urated fat	<i>r</i>	-.095	.929**	.844**	.871**	.778**	.945**	1.000		
	Sig.	.407	.000	.000	.000	.000	.000			
Fiber	<i>r</i>	-.111	.891**	.838**	.867**	.760**	.863**	.884**	1.000	
	Sig.	.328	.000	.000	.000	.000	.000	.000		
Servings of Veggies	<i>r</i>	-.113	.427**	.489**	.426**	.376**	.369**	.391**	.656**	1.000
	Sig.	.320	.000	.000	.000	.000	.001	.000	.000	

**Note:** \*\*Correlation is significant at the 0.01 level (2-tailed). Sig. is 2-tailed for all tests.  $n = 83$  for all correlations.

The best solution for addressing multicollinearity is to understand the causes and remove the sources of multicollinearity (Motulsky, 2002). Multicollinearity occurs because two (or more) variables are related and essentially measure the same constructs (Stevens, 2009). Upon reviewing the correlation matrices in Tables 7, 8 and 9, it was apparent that total calorie intake was highly correlated with most all other independent variables.

The researcher also addressed the multicollinearity among the independent variables by reviewing the collinearity statistics generated by SPSS. The collinearity statistics report information on the variance inflation factor (VIF) and the tolerance. By convention, the VIF generated by SPSS measures the degree to which a variable correlates with all other variables in the regression model (Mertler & Vanatta, 2005). Values of VIF that are greater than 10 indicate the presence of highly correlated variables. The tolerance factor also measures the degree of multicollinearity between independent variables and varies from 0 to +1. Values less than .10 for the tolerance factor should be investigated further (Mertler & Vanatta). Table 10 shows the collinearity statistics across the three time intervals. The results revealed that the VIF for calories, protein, carbohydrates, and monounsaturated fat exceeded the cut value of 10 across the three time intervals. The VIF for polyunsaturated fat exceeded 10 for Time 2 and Time 3. The VIF for fiber exceeded 10 for Time 3. An analysis of the data also revealed that the tolerance values also exceeded the minimum recommended value of .10 for at least one of the independent variables across all three time periods. The researcher removed total calories from the regression equation and



then reassessed the multicollinearity assumption by viewing the collinearity statistics generated by SPSS.

Table 10

*Collinearity Statistics for Dietary Intake Variables Across Time*

Independent Variable	<u>Time 1</u>		<u>Time 2</u>		<u>Time 3</u>	
	Tolerance	VIF	Tolerance	VIF	Tolerance	VIF
Calories	.00	662.26	.001	680.96	.00	854.46
Protein	.042	23.93	.046	21.90	.03	34.84
Carbohydrates	.005	186.93	.004	232.45	.00	277.09
Calcium	.242	4.14	.212	4.72	.19	5.13
Monounsaturated fat	.010	97.93	.015	68.09	.01	83.50
Polyunsaturated fat	.153	6.53	.082	12.26	.05	22.15
Fiber	.214	4.68	.150	6.65	.07	13.48
Servings of Veggies	.432	2.31	.515	1.94	.33	2.99

The researcher proceeded to recalculate the collinearity statistics with calories removed from the regression model. Results in Table 11 revealed a change in the overall collinearity statistics for Time 1 and Time 3. However, at Time 3 four independent variables (protein, monounsaturated fat, polyunsaturated fat, and fiber) still obtained VIFs that exceeded the cut value of 10. The tolerance value also exceeded .10 for at least one independent variable across all three time periods.

At this point the researcher concluded that it would not be possible to correct the source of multicollinearity across the three time intervals without substantially reducing the number of independent variables. The researcher

decided to acknowledge the presence of multicollinearity and to discuss it as a limitation of the research. In addition, Motulsky (2002) indicated that multicollinearity has little effect on results if the objective is prediction. Consequently the researcher chose to retain calories as a variable for further statistical analyses because the overall goal of the research was prediction. The researcher concluded that the multicollinearity should have little effect on the prediction model.

Table 11

*Collinearity Statistics for Independent Variables with Calories Removed Across the Three Time Intervals*

Independent Variable	Time 1		Time 2		Time 3	
	Tolerance	VIF	Tolerance	VIF	Tolerance	VIF
Protein1	.18	5.65	.19	5.22	.07	14.70
Carb1	.32	3.08	.30	3.31	.14	7.18
Calcium1	.27	3.64	.25	3.96	.22	4.56
Monounsaturated fat	.08	12.53	.09	11.03	.03	30.85
Polyunsaturated fat	.17	5.96	.14	7.27	.06	15.63
Fiber	.22	4.56	.17	5.90	.08	11.99
Servings of Veggies	.44	2.27	.56	1.79	.33	2.98

**Statistical assumptions for rANOVA.** One aim of this research was to investigate the change in preadolescent weight status over time, which indicated that the study was a repeated measures design (Howell, 2004). The repeated measures design is used when the same data on a group of participants is collected over time (Mertler & Vanatta, 2005). The researcher assessed whether the preadolescents' BMI changed over the period of 18 months. The

assumptions for repeated measures rANOVA were tested before running the statistical procedures. The following four primary assumptions for rANOVA were assessed: level measurement for the dependent variable, normality, and sphericity. In this study the BMI was the independent variable.

*Level of measurement for dependent variable.* The dependent variable in this research, which was BMI, is considered to be an interval level variable. This assumption was previously addressed in the previously analysis of assumptions for regression. Therefore this assumption was also met for the rANOVA.

*Normality.* The normality assumption was also addressed through the use of histograms, and scatter plots during the analysis of the assumptions of regression analysis. The normality assumption was upheld in the initial analysis, therefore the assumption was upheld for the rANOVA.

*Sphericity.* The sphericity assumption assesses whether or not the variance-covariance within groups is approximately equal. This assumption is important when there are more than two levels of the dependent variable (Stevens, 2009). There were three levels of the dependent variable in this study. Mauchly's test of sphericity was used to test this assumption. By convention when the significance of the test is  $p \leq .05$ , sphericity cannot be assumed. Results of the analysis showed  $\chi^2=141.54$  with obtained  $p = .000$ , therefore the sphericity assumption was not upheld for this data set. According to Stevens (2009) when the sphericity assumption is not held the resulting  $F$  value from rANOVA will be positively biased with the result that the null hypothesis may be falsely rejected too frequently. Stevens further suggested that researchers can compensate for this

bias by interpreting the Greenhouse-Geisser estimate produced in the SPSS output to judge the significance of the obtained  $F$  value. The results of the test for sphericity was not upheld; therefore the Greenhouse-Geisser value was used to judge the significance of the obtained  $F$  value.

### **Data Analysis**

After the statistical assumptions for each statistical procedure was addressed, the null hypotheses for each research question was addressed along the findings for each relevant statistical procedure. Three research questions were addressed in this study. Results for the data analysis associated with each research question are presented in the paragraphs that follow.

### **Research Questions/Hypothesis**

*Research Question 1.* How well does preadolescents' self-reported daily dietary intake predict their body mass index (BMI) across time?

*Null Hypothesis 1 ( $H_0$ ):* Preadolescent dietary intake variables, as measured by the KFQ (total intake of calories, carbohydrates, monounsaturated fat, polyunsaturated fat, protein, fiber, servings of vegetables), are not statistically significant predictors of their BMI as determined by their height and weight, over a span of 18 months.

*Alternate Hypothesis 1 ( $H_A$ ):* Preadolescents' dietary intake variables, as measured by the KFQ (total intake of calories, carbohydrates, monounsaturated fat, polyunsaturated fat, protein, fiber, servings of vegetables), are statistically significant predictors of their BMI as determined by their height and weight, over a span of 18 months.

A summary of the descriptive statistics for each of the independent variables and the dependent variable is presented in Table 12. The null hypothesis for Research Question 1 was assessed using multiple regression analysis. Multiple regression is a parametric statistical procedure that is used to assess the degree to which a set of independent variables predicts an outcome

or dependent variables (Howell, 2008; Mertler & Vanatta, 2005; Stevens, 2009). A separate regression equation was calculated for each time interval. Table 13 presents a summary ANOVA for each analysis. Table 16 displays the regression model for each time interval. For each time interval SPSS generated only one regression model with all dependent variables entered in the equation. The results revealed that neither ANOVA was statistically significant. Therefore the null hypothesis for Research Question 1 was accepted. Results indicated that preadolescents' dietary variables were not statistically significant predictors of their BMI across the 18 months.

Table 12

*Descriptive Statistics for the Independent Variables and the Dependent Variable Across Three Time Intervals*

Variable	Time 1		Time 2		Time 3	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
BMI	21.40	5.59	21.83	5.77	21.35	4.74
Calories	1665.35	898.61	1534.17	790.71	1874.00	1446.13
Protein	57.35	37.00	49.55	26.92	58.92	43.26
Carbohydrates	213.15	121.98	199.05	113.01	238.83	188.15
Calcium	452.37	247.60	423.71	251.22	673.82	530.99
Monounsaturated fat	26.97	16.33	24.65	13.94	30.78	25.53
Polyunsaturated fat	11.71	7.16	11.67	7.41	14.96	13.22
Fiber	11.14	7.14	10.25	6.73	11.32	9.56
Servings of Veggies	1.44	1.51	1.28	1.49	1.33	1.45
Total n	83	83	83	83	79	79

Table 13

*Summary ANOVA for Regression Models Across Three Time Intervals*

Time interval		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	284.22	8	35.53	1.15	.34 <sup>a</sup>
	Residual	2280.52	74	30.82		
	Total	2564.74	82			
2	Regression	221.28	7	31.61	.94	.48 <sup>a</sup>
	Residual	2512.55	75	33.50		
	Total	2733.83	82			
3	Regression	119.69	9	13.30	.56	.82 <sup>a</sup>
	Residual	1633.68	69	23.69		
	Total	1753.38	78			

a. Predictors: (Constant), Servings of Veggies, Mono Fat, Calcium3, Cholesterol3, Carbohydrates3, Fiber3, Poly Fat, Protein3, Calories

b. Dependent Variable: BMI

Table 14

*Summary of Regression Model Statistics for Each Time Interval*

Time	R	R <sup>2</sup>	Adjusted R <sup>2</sup> Square	Std. Error of the Estimate	Change Statistics				
					R <sup>2</sup> Change	F Change	df1	df2	Sig. F Change
1	.33 <sup>a</sup>	.11	.02	5.55	.11	1.153	8	74	.3
2	.26 <sup>a</sup>	.08	-.02	5.83	.08	.817	8	74	.59
3	.26 <sup>a</sup>	.07	-.05	4.87	.07	.562	9	69	.82

*Research Question 2.* What is the relationship between caregiver self-reported dietary intake and preadolescents' weight status?

*Null Hypothesis 2 (Ho);* There is no statistically significant relationship between caregiver self-reported dietary intake (total daily intake of calories, protein, carbohydrates, calcium, monounsaturated fat, polyunsaturated fat, fiber, and servings of veggies) and preadolescent's weight status, as determined by their BMI and age.

*Alternate Hypothesis 2 (H<sub>A</sub>):* There is a statistically significant relationship between caregiver self-reported dietary intake (total calories, carbohydrates, monounsaturated fat, polyunsaturated fat, protein, fiber, servings of vegetables) and preadolescents' weight status, as determined by their BMI and age.

The null hypothesis for Research Question 2 was assessed with a multiple regression analysis. The independent variables was caregiver self-reported dietary intake of calories, protein, carbohydrates, calcium, monounsaturated fat, polyunsaturated fat, fiber, and servings of veggies. Table 15 presents summary descriptive statistics of the caregivers' dietary intake. The dependent variable was preadolescents' weight status, as determined by their height and weight. The summary ANOVA results revealed that the regression model was not statistically significant  $F(7, 45) = 6.00, p = .56$ . The researcher accepted the null hypothesis; there was no statistically significant relationship between caregiver self-reported dietary intake and preadolescent's weight status, as determined by their BMI and age.

Table 15

*Summary of Descriptive Statistics for Caregiver's Dietary Intake*

Variable	<i>M</i>	<i>SD</i>	<i>n</i>
BMI1	22.23	6.51	53
Protein	48.37	24.78	53
Carbohydrates	201.45	104.57	53
Calcium	463.10	242.82	53
Monounsaturated Fat	24.86	13.34	53
Polyunsaturated Fat	11.50	7.14	53
Fiber	10.44	6.82	53
Servings of Veggies	1.38	1.42	53

*Research Question 3.* What is the change in the prevalence of overweight and at-risk for being overweight status, as determined by BMI, in preadolescents across time?

*Null Hypothesis 3 (H<sub>0</sub>):* There is not a statistically significant change in the prevalence of overweight and at-risk for overweight status, as determined by BMI, in preadolescents over a span of 18 months.

*Alternate Hypothesis 3 (H<sub>A</sub>):* There is a statistically significant change in the prevalence of overweight and at-risk for overweight status, as determined by BMI, in preadolescents in the middle grades over a span of 18 months.

The null hypotheses for Research Question 3 was tested using a repeated measures analysis of variance (rANOVA). The rANOVA procedure is used to assess how independent variables influence continuous dependent variables (Howell, 2004). The with-in subjects variable was preadolescent weight status. The researcher interpreted the Greenhouse-Geisser estimate to interpret the significance of the *F*-test because the assumption of sphericity was not upheld (Mertler & Vanatta, 2005). Results showed a statistically significant,  $F = 6.00$ ,  $p = .01$ , partial  $\eta^2 = .07$ , difference in the weight classification of the preadolescents across the three time intervals. The null hypothesis for Research Question 3 was rejected. However, the power of this finding was only .73, indicating that the test was only powerful enough accurately reject the null hypothesis 73% of the time. This obtained power was less than the established convention of .80. The researcher therefore cautions that the significant finding could be due to chance occurrence. This finding suggested that the number of preadolescents who were overweight or obese changed over the 18 months of the study.

Table 16 presents a summary of the frequency counts of the preadolescents' weight status across time. The results revealed that the



percentage of preadolescents in the rANOVA subsample that were classified as being overweight or at risk of being overweight decreased from 47% at Time 1, to 43.4% at Time 2, to less than 21.9% at Time 3. This finding was not anticipated.

Table 16

*Frequency Counts of the Weight Status for Preadolescents' Included in the rANOVA Across Time*

Weight status	<i>n</i>	% of sample
<u>Time 1</u>		
Underweight	2	2.4
Normal	42	50.6
At Risk	17	20.5
Overweight	22	26.5
Total	83	100.0
<u>Time 2</u>		
Underweight	1	1.2
Normal	46	55.4
At Risk	14	16.9
Overweight	22	26.5
Total	83	100.0
<u>Time 3</u>		
Underweight	4	4.8
Normal	60	72.3
At Risk	2	2.4
Overweight	16	19.3
Total	82	98.8
Missing System	1	1.2
Total	83	100.0

In light of the significant findings for Research Question 3, the researcher conducted a post hoc analysis to determine whether the change in prevalence for at risk for overweight and overweight preadolescents was statistically significant. The z-test of proportions was used to compare the change in prevalence across the three time periods (Joosse, 2011). Results from the larger sample ( $N= 292$ ) and smaller subsample ( $n= 83$ ).

Table 17 presents the summary table of the prevalence of at risk for overweight and overweight preadolescents in the larger sample. The results revealed that the percentage of preadolescents in the larger sample that were classified as being overweight or at risk of being overweight increased from 36.23% at Time 1, to 41.18% at Time 2, but decreased slightly to 40.75 at Time 3. Results from the z-test showed that there was not a statistically significant difference in the change in prevalence in at risk for overweight and overweight in the larger sample ( $n = 292$ ) across the three time intervals. The overall prevalence increased, but the increase was not statistically significant.

Table 17

*Frequency Count of Weight Status of Larger Sample at Each Data Collection Period*

Weight Status	<i>n</i>	% of sample
		<u>Time 1</u>
Underweight	6	2.29
Normal	161	61.45
At risk for overweight	42	16.03
Overweight	53	20.23
Total	262	100.00
		<u>Time 2</u>
Normal	130	58.82
At risk for overweight	33	14.94
Overweight	58	26.24
Total	221	100.0
		<u>Time 3</u>
Underweight	6	2.05
Normal	167	57.19
At risk for overweight	47	16.10
Overweight	72	24.65
Total	292	100.0

Results from the z-test did reveal a statistically significant difference in the prevalence in overweight and at risk for overweight preadolescents in the smaller subsample. The change in prevalence from T1 to T2 was not statistically significant. However, there was a statistically significant difference in the change in prevalence from T1 to T3 ( $z=3.15$ , 95% CI[.11, .39],  $p = .0004$ ). There was also a statistically significant difference in the change in prevalence from T2 to T3 ( $z=2.96$ , 95% CI[.07, .35],  $p = .003$ ). The findings indicate a statistically significant decline in the prevalence of overweight and at risk for overweight preadolescents in the smaller subsample. The results also showed a statistically significant difference between the larger sample and smaller subsample at T3 ( $z=3.53$ , 95% CI[.07, .35],  $p = .0004$ ).

## **Summary**

This chapter presented results from the statistical analyses conducted for this study. The chapter began by discussing the predata analysis steps that were conducted. The predata analysis assessed the accuracy of the data that were collected, the accuracy of the sample size. The researcher also summarized the procedures that were used to handle missing data. The chapter also discussed how the researcher assessed the level of measurement for the dependent variable. The chapter contained a detailed discussion of how the statistical assumptions for multiple regression (linearity, normality, and homoscedasticity) and rANOVA (linearity, normality, and sphericity) were tested.

The latter part of the chapter presented the results for each research question. The null hypothesis for Research Question 1 was accepted. Results

indicated that preadolescents' dietary variables were not statistically significant predictors of their BMI across the 18 months. The null hypothesis for Research Question 1 was accepted. Results revealed that there was no statistically significant relationship between caregiver self-reported dietary intake and preadolescent's weight status, as determined by their BMI and age. The null hypothesis for Research Question 3 was rejected. Results revealed that there was a significant change in the prevalence of overweight and at risk for overweight preadolescents across the 18 months. However, the power of this finding was only .73, indicating that the test was only powerful enough accurately reject the null hypothesis 73% of the time. This obtained power was less than the established convention of .80.

Results showed overall prevalence overweight and at risk for overweight preadolescents in the larger sample ( $n = 292$ ) increased, across time but the increase was not statistically significant. In contrast, the findings indicated a statistically significant decline in the prevalence of overweight and at risk for overweight preadolescents in the smaller subsample across time. The results also showed a statistically significant difference between the larger sample and smaller subsample at T3. Chapter 5 contains the discussion and conclusions regarding the findings from Chapter 4.

## **Chapter 5**

### **Discussion, Conclusion and Recommendations**

This exploratory, quantitative research investigated whether preadolescent dietary intake and their caregivers' dietary intake predicted obesity rates among African American preadolescents participating in the Alabama Cooperative Extension System Programs. The study also investigated the change in prevalence of overweight and at risk for overweight preadolescents during an eighteen month time period. This chapter discusses the findings from the data analysis presented in Chapter 4. This chapter also discusses the limitations of the study and presents a discussion of future research. The chapter ends with a discussion of the practical application of the findings from the study. The chapter begins by presenting findings from the data analyses relative to the literature presented in Chapter 2.

#### **Preadolescent Dietary Intake Variables as Predictors of BMI**

Research Question 1 investigated whether preadolescent dietary intake variables could be used to predict their BMI. A separate regression analysis was conducted for each of the three time periods. Results from the regression analyses revealed that none of the three ANOVAs were statistically significant. Therefore, the null hypothesis for Research Question 1 was accepted. Results indicated that preadolescents' dietary intake of calories, protein, carbohydrates,

calcium, monounsaturated fat, polyunsaturated fat, fiber, and servings of vegetables was not correlated with their weight status.

For the current study the researcher had some reservations regarding the accuracy of the preadolescents' and their caregivers self-reported dietary intake. The preanalysis phase revealed numerous inconsistencies between calculations of caloric intake and the participants BMI. For instance there were several cases where data showed individual the caloric intake to be 1200 calories or less, yet the participants BMI and BMI-for- age percentile placed them in the at risk for overweight or overweight categories. In other cases the data showed total caloric intake of greater than 2500 calories, yet the BMI-or- age percentile placed the participants in the normal weight category. These inconsistencies support previous research, which indicated that individuals may have difficulty self-reporting dietary intake (Bohlschild et al., 1997; Roumelioti and Leotsinidis, 2009). While a number of studies have shown self-reported data to be inaccurate, other studies have shown the opposite to be true (Bendixen et al., 2004; Jones & Frongillo, 2007; Wilde & Peterman, 2006). The researcher speculates that preadolescents in this study did not give accurate reportings of their dietary intake.

The findings from Research Questions 1 were counterintuitive to what one would expect regarding the relationship between dietary intake and weight status.

There is ample empirical research which shows that dietary intake variables such

as total caloric intake are positively related to weight status. However, this relationship was not revealed in this study. Again, the results may be largely related to the participants underreporting of their total dietary intake. A large percentage of the students came from families that received supplementary food assistance. The participants may have feared that a true report of the food they consumed may have had a negative impact on the food assistance the family received. In order to avoid possible negative consequences, the participants may have intentionally underreported their food consumption.



### **Caregiver Dietary Intake Variables as Predictors of Preadolescent BMI**

The second research question investigated whether or not the caregiver's dietary intake predicted the preadolescents' weight status at Time 1. Results from the regression model were not statistically significant. The caregivers' dietary intake did not predict the preadolescents' weight status. This finding differed from results of previous research. Other studies have revealed a link between preadolescents' dietary patterns parents' level of education (Kranz & Siega-Riz, 2002; Xie, Gillard, Li & Rockett, 2003) and parental income level (James, Nelson, Ralph & Leather, 1997). Although parents determine what foods are available through their choices in purchasing and serving foods, preadolescent's preferences are important determinants of what they actually eat (Birch, 1999). The limited demographic information collected for the caregivers made it impossible to measure the impact of caregiver variables on the weight status of the participants.

### **Change in Weight Status Across the Three Time Intervals**

The third research question examined the change in prevalence of the weight status in preadolescents across time. Results from the repeated measures ANOVA showed a statistically significant difference in the weight classification of the preadolescents across the three time intervals. This finding suggested that the number of preadolescents for the subsample of participants who were overweight or obese changed over the 18 months of the study. The results revealed that the percentage of preadolescents in the repeated measures that were classified as being overweight or at risk of being overweight decreased

from 47% at Time 1, to 43.4% at Time 2, to less than 21.9% at Time 3. The null hypothesis for research question 3 was rejected. However, the power of this finding was only .73, indicating that the test was only powerful enough to detect true differences 73% of the time. This obtained power was less than the established convention of .80. The researcher cautioned that the significant finding could be due to chance occurrence.

The findings from Research Question 3 did not support any of the literature presented in Chapter 2 of this dissertation. The research did not address the decline in the prevalence of obesity in preadolescents. However, there are a number of factors that may have contributed to this result. The clinical limitations of weight status should be considered a surrogate measure of body fatness because it is a measure of excess weight rather than excess body fat. Factors such as age, sex, ethnicity, and muscle mass can influence the relationship between weight status and body fat. Also, weight status does not distinguish between excess fat, muscle, or bone mass, nor does it provide any indication of the distribution of fat among individuals (Ogden et al., 2010).

Findings regarding the BMI and subsequent weight status of the preadolescents across the three time intervals were contradictory. Data from the larger sample of participants indicated that the average BMI increased across the three time intervals (21.42, 22.40, and 23.1 respectively). The prevalence of adolescents who were overweight or at risk for overweight also increased across the three intervals increased (36.3, 41.18, and 40.75 respectively). These results support previous research which has indicated the prevalence of overweight and

at risk for overweight preadolescents to be 30% in rural Alabama (TFAH, 2011; Voices for Alabama, 2010). These findings also show that the prevalence rate in Alabama has been double or more the national rate of approximately 15% (CDC, 2010).

In contrast, data for the subsample which returned surveys for all three time periods showed a different trend. Data from the smaller sample of participants indicated that the average BMI remained fairly constant across the three time intervals (21.40, 21.83, and 21.89 respectively). However, the prevalence of adolescents who were overweight or at risk for overweight decreased across the three intervals increased (47%, 43.43%, and 21.9% respectively). These results support previous research which has indicated the prevalence of overweight and at risk for overweight preadolescents to be 30% in rural Alabama (TFAH, 2011; Voices for Alabama, 2010). These findings also show that the prevalence rate in Alabama has been double or more the national rate of approximately 15% (CDC, 2010).

Findings from the Z-test of proportions (Joosse, 2011) supported the finding which showed a change in the prevalence of overweight and at risk for overweight preadolescents across time. Results showed that while the overall prevalence increased in the larger sample, the increase was not statistically significant. In contrast, there was a statistically significant change in prevalence from T1 to T2 and from T2 to T3 for the smaller subsample. The findings indicate a statistically significant decline in the prevalence of overweight and at risk for overweight preadolescents in the smaller subsample. The results also showed a

statistically significant difference between the larger sample and smaller subsample at T3. The prevalence of overweight and at risk for overweight was significantly higher in the larger sample compared to the subsample.

The decline in prevalence overweight and at risk for overweight preadolescents among the subsample compared to the larger sample was not anticipated. There may have been some self-selection bias in the subsample that was not accounted for in the data collection. Therefore, the researcher can only speculate on what factors may have contributed to the results. It is noteworthy that the participants in the subsample completed all three data collection periods. This finding indicates the subsample may have been a more highly motivated group of students. Also, parents of this subsample may have been more involved in the monitoring the dietary intake of the preadolescents. The parents may have been more health conscious and may have ensured that the preadolescents ate healthy meals. In addition, the preadolescents themselves may have been more conscious about their weight or body image and they may have taken steps to actively change their weight status. The participants in the subsample may have been more involved in school and after school activities such as sports. A change in physical activity may have contributed to the findings for the subsample.

### **Limitations**

While informative, the findings from this research are not without limitations. Though research assistants were trained in data collection and analysis procedures, human error is a possibility in a study of this magnitude.

For instance, even though the research assistants were well trained in properly using the tools to measure the preadolescents' height and weight, there could have been errors when recording the actual measurements. The amount of missing data indicates that there were some omissions.

There may have even been elements associated with the participants that contributed to errors in the data collection. For instance when the participants were weighed they may have been wearing heavier clothing than when they were measured at other times. Preadolescents may have been wearing heavier clothing during the fall collection period, than during the spring collection periods. Also there may have been problems in taking measurements for height such as the participants not standing still during the anthropometric assessment. This section addresses some of the factors that limit the generalizability of the findings from this study.

Anthropometric data are specific to the populations which they describe. There are a wide variety of factors that influence human body dimensions. For instance, different ethnic groups have different physical characteristics. African Americans tend to have proportionally longer legs than people of European descent. Eastern people (Asians) have proportionally shorter lower limbs. Therefore, the use of a single set of anthropometric measures to assess body fat or obesity may lead to bias against some ethnic groups.

Another limitation of the study was related to discussions regarding the reliability (or reproducibility) and validity of dietary studies. In early studies, Block and Hartman (1989) warned that the reproducibility and validity of dietary studies

was affected by many factors. Among those factors were variables such as respondents' ability to accurately self-report dietary habits; the degree of variability permitted by the instrument; the error-proneness of the response format; quality control of coding and keying; and real dietary changes in the time between the two administrations of the questionnaire. Other researchers (Bohlscheid-Thomas, Hoting, Boeing, & Wahrendorf, 1997) have indicated that food questionnaires may tend to overestimate food consumption. A recent study indicated, "that dietary intake cannot be estimated without the possibility of error and that great attention should be given when selecting and employing the most appropriate dietary data collection..." (Roumelioti & Leotsinidis, 2009).

The geographical area in which the data were collected also presented limitations to the study. For instance data were collected from caregivers only once due to the rural location and the difficulties experienced gaining access to caregivers. The researcher acknowledges that the Black Belt area which was the focus of this study represented a restricted range of demographics in terms of socioeconomic status and race/ethnicity. The sample of participants from schools in this area represented a specific subpopulation of the United States. The researcher therefore understood that the results may not be indicative of results that might have been obtained from a more representative, cross section of preadolescents.

An additional limitation was the study did not take into account the notion that genetic predispositions might have affected the weight status of the preadolescents in the study. Past research has indicated that there are a number

of genetic factors which predispose preadolescents to obesity (Douchis, Hayde & Wilfley, 2001; Lumeng, 2005). Food preferences, such as the preference for sweet and high fat foods, also predispose individuals to obesity. Humans are born with a preference for sweet taste (Beauchamp & Moran, 1982). This study did not directly assess whether food preferences were related to weight status.

Metabolic syndrome may also predispose individuals to obesity (Jasiik, et al. 2008). This syndrome (also known as insulin-resistance syndrome) consists of a cluster of traits that include hyperinsulinemia, obesity, hypertension, and hyperlipidemia that is found in 30-50% of overweight preadolescent. The metabolic syndrome is “believed to be triggered by a combination of genetic factors in combination with environmental factors such as excess calorie intake and reduced levels of physical activity” (Daniels et al., 2005, p. 2002). Other genetic conditions that are associated with obesity include, but are not limited to, Prader-Willi syndrome, Bardet-Biedl syndrome, Cohen syndrome (American Academy of Pediatrics, 2003). These genetic predispositions may have contributed to the increased prevalence of at risk for overweight and overweight in the larger sample.

The genetic factors that influence weight are risk factors that cannot be changed. However, recognition and acknowledgment of the genetic predispositions of obesity is an important consideration when designing obesity prevention programs. These factors must be considered and any prevention or intervention program must inform individuals of those genetic predispositions and inform individuals of how those dispositions could impact their weight.

The self-reported data from the preadolescents and their caregivers posed an additional limitation for the study. A number of researchers have indicated that self-reported data is not always accurate. For instance, Jones and Frongillo, (2007) conducted studies which showed that participants' self-reported body weight data were subject to non-response bias depending on how the data was obtained. Cook and Campbell (1979) revealed that when it comes to self-reporting information, subjects (a) tend to report what they believe the researcher expects to see or (b) report what they feel reflects positively on their own abilities, knowledge, beliefs, or opinions. Another concern about self-reported data centers on whether subjects are able to accurately recall past behaviors. Cognitive psychologists have warned that the human memory is fallible (Schacter, 1999) and thus the reliability of self-reported data is tenuous. Preadolescents may not have the best recall of their dietary behavior over a period of time (Rowland, 1990).

Many of the participants may have intentionally underreported their food consumption. Many of the families of children attending schools in the Black Belt region receive supplemental food assistance and the majority of the children receive free or reduced lunch. Some of the children may have underreported their food consumption because of fear of adverse consequences if others felt they were over consuming food. The preadolescents may have feared that someone might think they did not need the supplemental food assistance. There may have been fear that accurate reporting would lead to a decrease or denial of food assistance.



Another limitation of the study relates to the sample size for the regression analysis. The obtained sample size of  $n = 83$  was inadequate for obtaining a stable regression equation. An a priori sample size determination revealed that in order to produce a reliable regression equation data for approximately 103 to 120 preadolescents would be needed for each of the time previous. The sample size determination was made using suggestions from two sources to (Mertler & Vanatta, 2005; Stevens, 2009). After matching the preadolescents records across the three time periods, the remaining sample contained  $n = 83$ . After matching the parent data to preadolescent data for Research Question 3, the total number of completed records was decreased to 54 records. Loss of subjects across the three time periods severely reduced sample the size. The small sample sizes may have negatively affected the accuracy and reliability of the obtained regression equations.

Another limitation may be that the time interval for the data collection was too short to accurately gauge the relationship between dietary intake and BMI. The growth and development rates are very fast for children but decline with age. There are also differential growth rates for males and females. During puberty boys begin a growth spurt from around 11.5 years of age, this lasts until around 14 years of age. The growth spurt in girls starts earlier, at around 9 years of age. The growth spurt in girls reaches its maximum rate around 12 years old and is completed by around 16 years of age. At the same time height is changing, relative body proportions change as well. Therefore the anthropometric measures may not have been the most effective method for calculating weight

status for the preadolescents included in this study. This growth rates for the preadolescents in this study was consistent with expected growth rates for this age group. During the preadolescent years the average rate of growth is approximately 3 inches for females and 4 inches for males (Payne, & Isaac, 2007). Therefore it is not possible to attribute the differences in weight status across time to an uneven growth rate.

The lack of demographic data on the caregivers presented another limitation. The absence of that data prevented the researcher from comparing the current findings to previous research which links preadolescent weight status to parental education (Kranz & Siega-Riz, 2002; Xie, Gillard, Li & Rockett, 2003) and parental income level (James, Nelson, Ralph & Leather, 1997). Parents are key role models for their preadolescents. Preadolescents of today are more likely to observe their parents model eating and activity behaviors that do not promote energy balance (Whitaker, 2004). Family meals also play a significant role in preventing unhealthy weight control practices among preadolescents (Neumark-Sztainer, Wall, Story & Fulkerson, 2004).

Another limitation is the there was limited communication with the caregivers.. The researchers relied upon the preadolescents to deliver the information packets to their caregivers and also to return the completed packet. Researchers cannot know how many of the 400 participants actually delivered the surveys to their caregivers. It is also not possible to know how many forms were completed and returned by the caregivers but not delivered by the

preadolescents. Direct communication with the parents about the study and the goals of the study may have increased participant involvement.

An additional limitation is that there was no follow-up upon completion of the study. A follow-up action of some sort may have provided additional details that could have helped to frame the results. For instance, a follow-up of some sort with the 83 preadolescents who were part of the decline in prevalence of overweight or at risk for overweight may have provided some insight about the factors that contributed to the decline. Researchers could have interviewed the preadolescents to gather information about eating habits and other behaviors that may have facilitated the change in weight status.

The final limitations pertain to the information gathered from the caregivers. The first limitation is that data was not collected from the caregivers across time. This omission made it difficult to determine if the weight status of caregivers changed in the same way as the preadolescent BMI. Therefore the researcher cannot conclude whether the results in change in the preadolescent BMI or weight status was to foods consumed at home or elsewhere.

It is common knowledge that gender and age can be the reason for a difference in BMI or weight status for a population. However, because of the small sample size the subjects were not divided by gender age. It is possible that the inclusion of gender and age represented in the sample could have skewed the results. A larger sample would insure a better cross section of weight status.

### **Implications**

Results reveal that there is an urgent need for overweight and obesity prevention programs in the Macon County, Alabama and Alabama Black Belt counties. The statistics from the larger sample suggests that the prevalence of at risk for overweight and overweight obesity in preadolescents in the study the Black Belt counties has reached epidemic levels.. Preadolescents who are obese are more likely to have risk factors associated with cardiovascular diseases such as high blood pressure and high cholesterol (Freedman et al., 2007). A diagnosis of obesity increases the likelihood of hospitalization by as much as two to three times (Marder & Chang). “The standards of care on the management and treatment of pediatric obesity emphasize a heightened focus on screening for adolescents classified as overweight, as part of a new commitment to early intervention” (Jasik et al., 2010, p. 2012). Healthcare providers have the potential to assist in improving obesity onset through early identification, diet education, and making suggestions for healthy behaviors for their home environment.

### **Suggestions for Future Research**

Additional studies need to be conducted to determine the degree to which preadolescent’s dietary intake influences their BMI and subsequent weight status. The studies need to be carefully controlled and conducted in order to overcome some of the limitations presented in this study. Presented below are some examples of actions that can be taken to overcome the limitations presented in this study.

The amount of self-reported data must be minimized. Instead of relying upon preadolescent recall of their dietary intake, meals could be carefully prepared and measured. The researcher could keep track for perhaps a week period of time the preadolescents' actual consumption of food, through observational data. This would improve the accuracy.

Using more than one measurement technique may be needed for an accurate assessment of weight status, particularly in preadolescents of non-Caucasian descent (Chai et al., 2003). Other measures are skin fold thickness and waist, hip and thigh circumferences. Body composition can also be measured by bioimpedance analysis (BIA) and dual energy X-ray absorptiometry (DXA) (Pietrobelli, 2004).

### **Conclusions**

Sociocultural theory posits that the social, economic, and cultural environment in which a person lives impacts that person's behavior (Kublin et al, 1989). Jasik and colleagues (2010) outlined a number of social, cultural, and economic variables that are related to obesity. Some studies show that families who live in poverty have the highest risk for being overweight (Barlow, 2007; Caprio, et al., 2008; Danielsik, et al., 2004; TAFH, 2011). Findings from this study have shown that the social, economic, and cultural constraints faced by preadolescents who live in the Black Belt region at a sociocultural disadvantage when it comes to obesity and obesity related program. Results from the study indicates that there is an need for prevention and intervention efforts that promote better health among preadolescents. through dietary intake and weight

status.

Although further research is needed, results suggest that dietitians could play a vital role in encouraging caregivers to incorporate food modeling into their parenting style for family meals. Providing opportunities, programs and policies within this population that promote and encourage wellness and healthful eating practices would greatly benefit this population as a whole. Improving home eating behaviors, where the largest proportion of total daily and energy from low-nutrient, energy-dense foods are consumed (especially from sugar-sweetened beverages, chips, and baked goods) is warranted. At schools, consumption of energy from low-nutrient, energy-dense foods may be reduced by limiting children's access to competitive foods and beverages, enforcing strong school

With an increasing number of people experiencing symptoms of and complications from lifestyle and diet-induced obesity, there is an *epidemic* public health crisis. Therefore, the government, the medical community, families and individuals need a better understanding of factors which contribute to the obesity epidemic in preadolescent. It is through this understanding that steps can be taken to reduce and halt the progression of the epidemic.

## REFERENCES

- American Academy of Pediatrics (2005). Breastfeeding and the use of human milk. *Pediatrics*, *115*(2), 496-506.
- American Dietetic Association. (2008) Position of the American Dietetic Association: Nutrition guidance for healthy children ages 2 to 11 years. *American Dietetic Association*, *15*, 623–631.
- American Academy of Pediatrics Committee on Nutrition. (2003). Prevention of pediatric overweight and obesity. *Pediatrics*, *112*, 424-430.
- Ard, J. D. (2007). Unique perspectives on the obesogenic environment. *Journal of General Internal Medicine*, *22*(7), 1058-1060.
- Auburn University Outreach. Bridging the Divide. March 2004
- Ball, K., Crawford, D., & Owen, N. (2000). Too fat to exercise? Obesity as a barrier to physical activity. *Australian and New Zealand Journal of Public Health*, *24*, 331-333.
- Baranowski, T., Cullen, K. W., & Baranowski, J. (1999). Psychosocial correlates of dietary intake: advancing dietary intervention. *Annual Review of Nutrition*, *19*, 17-40.
- Barlow, S. (2007). Expert Committee Recommendations Regarding the Prevention, Assessment, and Treatment of Child and Adolescent Overweight and Obesity: Summary Report. *Pediatrics*, *120* (4), S164 - S192. doi: 10.1542/peds.2007-2329C)
- Baskin, M. L., Ard, J., Franklin, F., & Allison, D. B. (2005). Prevalence of obesity in the United States. *Obesity Review*, *6*(1): 5-7.
- Baskin, M. L., Ahluwalia, H. K., & Resnicow, K. (2001) Obesity intervention among African-American children and adolescents. *Pediatric Clinics of North America*, *48*(4), 1027-1039.
- Betancourt, J. F. (2004). Cultural competence: Marginal or mainstream movement? *New England Journal of Medicine*, *351* (10), 953-954.

- Beauchamp, G. K. & Moran, M. (1982). Dietary experience and sweet taste preference in human infants. *Appetite*, 3, 139-52.
- Birch, L. L. & Fisher, J. (1998). Development of eating behaviors among adolescent and adolescents. *Pediatrics*, 101, 539-549.
- Birch, L. L., & Marlin, D. W. (1982). I don't like it; I never tried it: Effects of exposure to food on two-year-old adolescent's food preferences. *Appetite*, 4, 353-360.
- Blair, S. N. (2003). Revisiting fitness and fatness as predictors of mortality. *Clinical Journal of Sport Medicine*, 13, 319-320.
- Blankenau, J. (2009). *Nutrition, Physical activity and obesity in rural America*. Center for Rural Affairs.
- Block, G. (2004). Foods contributing to energy intake in the US: data from NHANES III and NHANES 1999-2000. *Journal of Food Composition and Analysis*, 17, (3-4), 439-447.
- Block, G., Hartman, A. M., Dresser, C. M., Carroll, M. D., Gannon, J., & Gardner, L. (1986). A data-based approach to diet questionnaire design and testing. *American Journal of Epidemiology*, 124, 453-469.
- Block, G., Coyle, L. M., Hartman, A. M., & Scoppa, S. M. (1994). Revision of dietary analysis software for the Health Habits and History Questionnaire. *American Journal of Epidemiology*, 139, 190-196.
- Block, G., Woods, M., Potosky, A., & Clifford C. (1990). Validation of a self-administered diet history questionnaire using multiple diet records. *Journal of Clinical Epidemiology*, 43, 1327-1335.
- Block, G., Hartman, M., & Naughton, D. (1990). A reduced dietary questionnaire: development and validation. *Epidemiology*, 1, 58-64.
- Bowman, S. A., Gortmaker, S. L., Ebbeling, C. B., Pereira, M. A. & Ludwig, D. S. (2004). Effects of fast-food consumption on energy intake and diet quality among adolescent in a national household survey. *Pediatrics*, 113(1), 112-118.
- Briefel, R. R., Reidy, K., Karwe, V. & Devaney, B. (2004). Feeding infants and toddlers study: improvements needed in meeting infant feeding recommendations. *Journal of the American Dietetic Association*, 104, s31-s37.



- Caprio, C., Stephens, R. D., Drenowski, A., Kaufman, F. R., Palinkas, L. A., Rosenbloom, A. L., & Schwimmer, J. B. (2008). *Influence of race, ethnicity, and culture on childhood obesity: Implications for prevention and treatment. Diabetes Care* November, 31 (11), 2211-2221. doi: 10.2337/dc08-9024.
- Centers for Disease Control (2011). *National diabetes fact sheet: national estimates and general information on diabetes and prediabetes in the United States, 2011*. Atlanta, GA: U.S. Department of Health and Human Services.
- Centers for Disease Control and Prevention National Health and Nutrition Examination Survey. (2009). <http://www.cdc.gov/nchs/about/major/nhanes/datalink.htm>. Accessed June 3, 2010.
- Centers for Disease Control and Prevention National Center for Health Statistics (2009). <http://www.cdc.gov/nchs/fastats/overwt.htm>.
- Centers for Disease Control and Prevention: National Center for Chronic Diseases Prevention and Health Promotion. (2004). *Defining Overweight and Obesity*. <http://www.cdc.gov/nccdphp/dnpa/obesity/defining.htm>.
- Chai, D., Kaluhiokalani, N., Little, J., Hetzler, R., Zhang, S., Mikami, J. & Ho, K. (2003). Childhood overweight problem in a selected school district in Hawaii. *American Journal of Human Biology*, 15, 164-177.
- Coates, R. J., Monteilh, C. P. (1997). Assessments of food-frequency questionnaires in minority populations. *American Journal of Clinical Nutrition*, 65 (suppl):1108S–15S.
- Cohen, J. & Cohen, P. (1988). *Applied multiple regression/correlations analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ; Lawrence Erlbaum.
- Cohen, J. (1992). A power primer. *Psychological Bulletin*, 112, 155-159.
- Cole, T. J., Bellizzi, M. C., Flegal, K. M., & Dietz, W.H. (2000). Establishing a standard definition for child overweight worldwide: International survey. *British Medical Journal*, 320, 1240-1243.
- Collins, C., Watson, J., & Burrows, T., (2010). Measuring Dietary intake in children and adolescence in the context of overweight and obesity. *International Journal of Obesity*, 34, 103-115.

- Costanzo, P. R. & Woody, E. Z. (1985). Domain-specific parenting styles and their impact on the child's development particular deviance: The example of obesity proneness. *Journal of Social and Clinical Psychology, 3*, 425-445.
- Crespo, C. J., Smit, E., Troiano, R. P., Bartlett, S., Macera, C. & Anderson, R. (2001). Television watching, energy intake, and obesity in US adolescent: results from the Third National Health and Nutrition Examination Survey, 1988-1994. *Archives of Pediatric and Adolescent Medicine, 155*, 360-365.
- Cromatis, J and Bucholz, S. (2008). Defining the "Rural" in Rural America: The use of different definitions of rural by Federal agencies reflects the multidimensional qualities of rural America." *Amber Waves*. June <http://www.ers.usda.gov/AmberWaves/June08/Features/RuralAmerica.htm>
- Cullen, K. W., Lara, K. M., de Moor, C. (2002). Adolescent's dietary fat intake and fat practices vary by meal and day. *Journal of the American Dietetic Association, 102*, 1773-1778.
- Daniels, S. R., Arnett, D. K., Eckel, R. H., Gidding, S. S., Hayman, L. L., Kumanyika, S., Robinson, T. N., Scott, B. J., St. Jeor, S. & Williams, C. L. (2005). Overweight in adolescent and adolescents: Pathophysiology, consequences, prevention and treatment. *Circulation, 111*, 1999-2012.
- Daniels, S. R., Khoury, P. R., Morrison, J. A. (1997). The utility of body mass index as a measure of body fatness in adolescent and adolescents: differences by race and gender. *Pediatrics, 99*, 804-807.
- Danielzik, S., Czerwinski-Mast, M., Langnäse, K., Dilba, B., & Müller, B. (2004). Parental overweight, socioeconomic status and high birth weight are the major determinants of overweight and obesity in 5-7 y-old children: Baseline data of the Kiel Obesity Prevention Study. *International Journal of Obesity, 28*, 1494-1502.
- Data from USDA ERS Food Review, Vol. 25, Issue 3. Converted to real dollars.
- Davy, B. M., Harrell, K, Stewart, J, King, D. S. (2004). Body weight status, dietary habits, and physical activity levels of middle school-aged children in rural Mississippi. *Southern Medical Journal, 97*, 571-577.
- Desor, J. A. & Beauchamp, G. K. (1987). Longitudinal change in sweet preferences in humans. *Physiology and Behavior, 39*, 639-641.

- Dewey, K. B. (1998). Growth characteristics of breast-fed compared to formula-fed infants. *Biology of the Neonate*, 74, 94-105.
- Dewey, K. G. (2003). Is breastfeeding protective against child obesity? *Journal of Human Lactation*, 19, 9-18.
- DiClemente, C.C. and Velasquez, M.W. (2002). Motivational Interviewing and the Stages of Change. In W. R. Miller & S. Rollnick, *Motivational interviewing: Preparing people for change* (2nd ed. pp. 217-250). New York: Guilford Press.
- Dietz, W. H. (2004). Overweight in childhood and adolescence. *New England Journal of Medicine*, 350, 855-857.
- Dietz, W. H. (2004). The effects of physical activity on obesity. *Quest*, 56, 1-11.
- Dietz, W. H., & Gortmaker, S. L. (1985). Do we fatten our adolescent at the television set? Obesity and television viewing in adolescent and adolescents. *Pediatrics*, 75, 807-812.
- Dietz, W. H. & Gortmaker, S. L. (2001). Preventing obesity in adolescent and adolescents. *Annual Review of Public Health*, 22, 337-353.
- Dietz, W. H., (2001). Breastfeeding may help prevent childhood overweight. *Journal of the American Medical Association*, 285, 2506.
- Drewnowski, A., & Nicole, D. (2005). Food Choices and Diet Costs: an Economic Analysis. The American Society for Nutritional Sciences. *The Journal of Nutrition*, 135, 900-904.
- Drewnowski, A. & Specter, S. E. (2004). Poverty and obesity: the role of energy density and energy costs. *American Journal of Clinical Nutrition*, 79, 6-16.
- Durant, N., Baskin, M. L., Thomas, O., & Allison, D. B. (2008). School-based obesity treatment and prevention programs: all in all, just another brick in the wall? *International Journal of Obesity*, 32(12),1747-51.
- Faith, M., Francis, L., Sherry, B., Scanlon, K., & Birch, L. L. (2001). Relationship between maternal feeding style and child energy intake and body composition: findings from a quantitative and qualitative literature review. *Obesity Research*, 9, 123S.
- Falk, W. W. & Rankin, B. H. (1992). The Cost of Being Black in the Black Belt. *Social Problems* 39(3), 299-313.

- Finkelstein, E. A., Trogon, J. G., Cohen, J. W., & Dietz, W. (2009). Annual medical spending attributable to obesity: Payer- and service-specific estimates. *Health Affairs*, *28*(5), w822-w831.
- Fisher, J. O., Birch, L. L., Smiciklas-Wright, H. & Picciano, M. F. (2000). Breast-feeding through the first year predicts maternal control in feeding and subsequent toddler energy intakes. *Journal of the American Dietetic Association*, *100*, 641-646.
- Flegal, K. M. & Troiano, R. P. (2000). Changes in the distribution of body mass index of adults and adolescent in the US population. *International Journal of Obesity and Related Metabolic Disorders*, *24*, 807-818.
- Food Research and Action Center [FRAC]: Alabama. (2001). Profile: federal nutrition programs. [On-line]. Available: [http://www.frac.org/html/federal\\_food\\_programs/states/l.html](http://www.frac.org/html/federal_food_programs/states/l.html)
- Food Research and Action Center How Improving Federal Nutrition Program Access and Quality Work Together to Reduce Hunger and Promote Healthy Eating. Issue Briefs for Child Nutrition Reauthorization, Number 1. January 2010. [http://frac.org/pdf/CNR01\\_qualityandaccess.pdf](http://frac.org/pdf/CNR01_qualityandaccess.pdf)
- Foster, G. D, Nonas, C., (2004). Managing Obesity: a clinical guide. *American Dietetic Association*.
- French, S. Story, M., Neumark-Sztainer, D., Fulkerson, J. & Hannan P. (2001). Fast-food restaurant use among adolescents: association with nutrient intake, food choices and behavioral and psychosocial variables. *International Journal of Obesity*, *25*, 1823-1833.
- Freedman, D. S., Zuguo, M., Srinivasan, S. R., Berenson, G. S., & Dietz, W. H. (2007). Cardiovascular risk factors and excess adiposity among overweight adolescent and adolescents: the Bogalusa Heart Study. *Journal of Pediatrics*;150(1):12–17.
- Freedman, D. S., Mei, Z., Srinivasan, S. R., Berenson, G. S., & Dietz, W. H. (2007). Cardiovascular risk factors and excess adiposity among overweight adolescent and adolescents: the Bogalusa Heart Study. *Journal of Pediatrics*. Jan, 150(1),12–17.e2.
- Freedman, D. S., Khan, L. K., Dietz, W. H., Srinivasan, S. R., & Berenson, G. S. (2001). Relationship of childhood overweight to coronary heart disease risk factors in adulthood: The Bogalusa Heart Study. *Pediatrics*, *108*, 712–718.

- Freedman, D. S., Kettel, L., Serdula, M. K., Dietz, W. H., Srinivasan, S. R., & Berenson, G. S. (2005). The relation of childhood weight status to adult adiposity: The Bogalusa Heart Study. *Pediatrics*, 115, 22–27.
- Freedman, D., Wang, J., Thornton, J. C, et al. (2009). Classification of body fatness by body mass index-for-age categories among adolescent. *Archives of Pediatric and Adolescent Medicine*, 163, 801–811.
- Gallagher, D., et al. (1996). How useful is weight status for comparison of body Fatness across age, sex and ethnic groups? *American Journal of Epidemiology*, 143, 228–239.
- Garrow, J. S., & Webster, J. (1984). Quetelet's index (W/H<sup>2</sup>) as a measure of fatness. *International Journal of Obesity*, 9, 147–153.
- Gleason, P., & Sutor, C. (2001). Children's diets in the mid-1990s: dietary intake and its relationship with school meal participation. Special nutrition programs; report no. CN-01-CD1. Alexandria, VA: US Department of Agriculture, Food and Nutrition Service. Accessed 8/17/04.  
<http://www.fns.usda.gov/oane/MENU/Published/CNP/cnp.htm>
- Gordon-Larsen, P., Adair, L. S., Popkin, B. M. (2003). The relationship of ethnicity, socioeconomic factors, and overweight in U. S. adolescents. *Obesity Research*, 11, 121-129.
- Gordon-Larsen, P., Griffiths, P., Bentley, M. E., Ward, D. S., Kelsey, K., Shields, K. & Ammerman, A. (2004). Barriers to physical activity: Qualitative data on caregiver-daughter perceptions and practices. *American Journal of Preventive Medicine*, 27(3), 218-223.
- Gortmaker, S. I., Peterson, K., Wiecha, J., Sobol, A., Dixit, S., Fox, M. K. & Laird, N. (1999). Reducing obesity via a school-based interdisciplinary intervention among youth: Planet Health. *Archives of Pediatrics and Adolescent Medicine*, 153, 409-418.
- Grummer-Strawn, L. M. & Mei, Z. (2004). Does breastfeeding protect against pediatric overweight? Analysis of longitudinal data from the Centers for Disease Control and prevention Pediatric Nutrition Surveillance System. *Pediatrics*, 113(2), 81-86.
- Guo, S. S., & Chumlea, W. C. (1999). Tracking of body mass index in adolescent in relation to overweight in adulthood. *American Journal of Clinical Nutrition*, 70, S145–148.

- Harris, R. P., & Zimmerman, J. N. (2003). Adolescent and Poverty in the Rural South. Economic and Workforce Development. Southern Rural Development Center. November 2003, No. 2.
- Harper, L. V., & Sanders, K. M. (1975). The effect of adults' eating on young adolescent's acceptance of unfamiliar foods. *Journal of Experimental Child Psychology*, 20, 206-214.
- Haskell WL, Lee IM, Pate RR, et al. (2007). Physical activity and public health: Updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. *Medical in Science and Sports in Exercise*, 39,1423–1434.
- Heinig, M. J., Nommsen, L. A., Peerson, J. M. Lonnerdal, B. & Dewey, K. G. (1993). Energy and protein intakes of breast-fed and formula-fed infants during the first year of life and their association with growth velocity: the DARLING study. *American Journal of Clinical Nutrition*, 58, 152-161.
- Hernandez, B., Gortmaker, S. L., Colditz, G. A., Peterson, K. E., Laird, N. M., & Parra-Cabrera, S. (1999). Association of obesity with physical activity, television programs and other forms of video viewing among adolescent in Mexico City. *International Journal of Obesity*, 23, 845-854.
- Howell, D. C. (2004). *Fundamental statistics for the behavioral sciences* (5<sup>th</sup>ed.).Belmont, CA: Thomson/ Wadsworth.
- Institute of Medicine, Food and Nutrition Board, Standing Committee on the Scientific Evaluation of Dietary Reference Intakes, Subcommittees on Upper Reference Levels of Nutrients and Interpretation and Uses of Dietary References Intakes, Panel on Micronutrients. Dietary reference intakes for energy, carbohydrate, fiber, fat, fatty acids, cholesterol, protein and amino acids (macronutrients). Washington, DC: National Academy Press, 2002 (prepress). Available to read at: URL: <http://www.nap.edu/>. Accessed 8/17/04.
- Institute of Medicine (IOM) *Adequacy of Evidence for Physical Activity Guidelines Development: Workshop Summary*. Washington, DC: The National Academic Press; 2007.
- Jasik, B. B, Adams, S. H., Erwin, C. E., & Ozer, E. (2011). The association of BMI status with adolescent preventive screening. *Pediatrics* 128 (2), e317-e323.
- Jeffery, R. W., & Utter, J. (2003). The changing environment and population

obesity in the United States. *Obesity Research*, 11, 12S-22S.

Johnson, M. S., Figueroa-Colon, R., Herd, S. L., Fields, D. A., Sun, M., Hunter, G. R., & Goran, M. I., (2000). Aerobic fitness, not energy expenditure, influences subsequent increase in adiposity in black and white adolescent. *Pediatrics*, 106, e50.

Joose, S. A. (2011). *Two-proportion Z-test calculator*. Available from <http://in-silico.net/statistics/ztest>

Kaplan, R. M., & Saccuzzo, D. P. (2009). *Psychological testing: Principles, applications, and issues*. Belmont, CA: Thomson-Wadsworth.

Kennedy, B. M., Ard, J. D., Harrison, L., Jr, Conish, B. K., Kennedy, E., Levy, E. J., & Brantley, P. J. (2007). Cultural characteristics of African Americans: Implications for the design of trials that target behavior and health promotion programs. *Ethnicity and Disease*, 17(3), 548-54.

Keita, A. D., Casazza, K., Thomas, O., & Fernandez, J. R. (2009). Neighborhood-level disadvantage is associated with reduced dietary quality in children. *Journal of the American Dietetic Association*, 109(9), 1612-6.

Kilpatrick, L. A. & Feeney, B. C. (2007). *SPSS for windows step by step: A simple guide and reference 15.0 update (8<sup>th</sup> ed.)*. Pearson Education. Inc.

Kolbo, J. R., Khoury, A. J., Bounds, W., & Lee, J. (2007). Overweight and Obesity in the South: Prevalence and related healthcare costs among population groups. Southern Rural Development Center. Number 13.

Kubik, M. Y., Lytle, L. A., Hannan, P. J., Perry, C. L. & Story, M. (2003). The association of the school food environment with dietary behaviors of young adolescents. *American Journal of Public Health*, 93, 1161-1173.

Kuczmarski, R. J, Ogden, C. L., Guo S. S., et al. (2002). 2000 CDC growth charts for the United States: Methods and development. National Center for Health Statistics. *Vital Health Statistics*, 11(246).

Kumanyika S, Grier S. 2006. Targeting interventions for ethnic minority and low-income populations. *Future Child*, 16,187–207.

Kushi, L. H., Byers, T., Doyle, C., Bandera, E. V., McCullough, M. T., et al. (2006). American Cancer Society guidelines on nutrition and physical activity for cancer prevention: reducing the risk of cancer with healthy food choices and physical activity. *CA: A Cancer Journal for Clinicians*, 56, 254–281.

- Leedy, P. D. & Ormrod, J. E. (2001). *Practical research: planning and design* (7<sup>th</sup> ed.) Upper Saddle River, NJ: Prentiss-Hall.
- Lamerz, A., Kuepper-Nybelen, J., Wehle, C., Bruning, N., Trost-Brinkhues, G., Brenner, H., Hebebrand, J., and Herpertz-Dahlmann, B. (2005). Social class, parental education, and obesity prevalence in a study of six-year-old children in Germany. *International Journal of Obesity*, 29, 373–380.
- Leibel, R. L., Rosenbaum, M. & Hirsch, J. (1995). Changes in energy expenditure resulting from altered body weight. *New England Journal of Medicine*, 332, 621-628.
- Li, R., Zhao, Z., Mokdad, A., Barker, L., Grummery-Strawn, L. (2003). Prevalence of breastfeeding in the United States: the 2001 National Immunization Survey. *Pediatrics*, 111, 1198-1201.
- Li, C., Ford, E. S., Zhao, G., Mokdad, A. H. (2009). Prevalence of pre-diabetes and its association with clustering of cardiometabolic risk factors and hyperinsulinemia among US adolescents: NHANES 2005–2006. *Diabetes Care*, 32, 342–347.
- Liem, D. G., Mars, M., & De Graff, C. (2004). Sweet preferences and sugar consumption of 4- and 5-year-old adolescent: role of parents. *Appetite*, 43, 235-245.
- Livingstone, M. B. E., Robson, P. J., & Wallace, J. M. Issues in dietary intake assessment of children adolescents. *British Journal of Nutrition*, 92 (suppl): S213-S22.
- Marder, W. D., & Chang, S. (2006) Childhood obesity: Costs, treatment patterns, disparities in care, and prevalent medical conditions. *Thompson Medstat Research Brief*.
- Mares-Perlman J. A., Klein B. E. K., Klein, R., Ritter, L. L., Fisher, M. R., Freudenheim, J. L. (1993). A diet history questionnaire ranks nutrient intakes in middle-aged and older men and women similarly to multiple food records. *The Journal of Nutrition*, 123, 489-501.
- Mennella, J. A. & Beauchamp, G. K. (1991). Maternal diet alters the sensory qualities of human milk and the nursing's behavior. *Pediatrics*, 99, 737-744.
- Mennella, J. A., Johnson, A. & Beauchamp, G. K. (1995). Garlic ingestion by pregnant women alters the odor of amniotic fluid. *Chemical Senses*, 20, 207-209.



- Meich, R. A., Kumanyika, S. K., Stettler, N., Link, B. G., Jo C, Phlelan, J. C., & Chang, V. W. (2006). trends in the association of poverty with overweight among US. adolescents, 1971-2004. *Journal of the American Medical Association, 295*(20), 2385-2393.
- Merten, M. J., Wickrama, K. A. S., & Williams, A. L. (2008). Adolescent Obesity and Young adult psychosocial outcomes: gender and race differences. *Journal of Youth and Adolescence, 37*, 1111-1122.
- Mertler, C. A., & Vanatta, R.A. (2005). *Advanced and multivariate statistical methods (3<sup>rd</sup> ed.)* Glendale, CA; Pyrczak Publishing.
- Miller, W. R., Rollnick, S. (2002). *Motivational Interviewing: Preparing People for Change*. 2nd Edition. New York: Guilford Press.
- Mokdad, A.H., Serdula, M.K., Dietz, W.H., Bowman, B.A., Marks, J.S., Kaplan, J.P. 1999). The spread of the obesity epidemic in the United States, 1991-1998. *Journal of the American Medical Association, 282*, 1519-22.
- Mokdad, A., et al., Actual Causes of Death in the United States, 2000. (2004). *Journal of the American Medical Association; 291*,1238-1245.
- Morton, J. F., & Guthrie, J. F. (1998). Changes in children's total fat intakes and their food group sources of fat, 1989-91 versus 1994-95: Implications for diet quality. *Family Economics and Nutrition Review, 11*(3), 44-57.
- Morrison, J. A., Alfaro, M. P., Khoury, P., Thornton, B.B. & Daniels, S. R. (1996). Determinants of resting energy expenditure in young black girls and young white girls. *Journal of Pediatrics, 139*, 637-642.
- Morbidity and Mortality Weekly Report. CDC. Differences in Prevalence of Obesity Among Black, White, and Hispanic Adults --- United States, 2006—2008, July 17, 2009 / 58(27);740-744.
- Morrison, J. A., Payne, G., Barton, B., Khoury, P. R., Crawford, P. (1994). Mother- daughter correlations of obesity and cardiovascular disease risk factors in black and white households. *American Journal of Public Health, 84*,1761-1767.
- Motulsky, H. (2002). *Multicollinerity in multiple regression*. Retrieved from <http://www.graphpad.com/articles/Multicollinerity.htm>
- Myers, E. F. (2005) Childhood Overweight. American Dietetic Association Evidence Analysis Library. *Journal of the American Dietetic Association* May 2005, supplement, S79.

- National Center for Health Services, CDC. (1999). Prevalence of overweight among adolescent adolescents. [On-line]. Available: <http://cdc.gov/nchs/products/pubs/pubd/hestats/over99fig1.htm>.
- National Institutes of Health: National Institute of Diabetes, Digestive and Kidney Diseases. "Statistics Related to Overweight and Obesity: The Economic Costs." <http://www.win.niddk.nih.gov/statistics/index.htm>. Accessed: December 2004.
- National Survey of Adolescent's Health, 2010.
- Needham, B. L., & Crosnoe, R. (2005). Overweight status and depressive symptoms during adolescence. *Journal of Adolescent Health* 36(1), 48-55.
- Neumark-Sztainer, D., Hannan, P. J., Story, M., Croll, J. & Perry, C. (2003). Family meal patterns: associations with sociodemographic characteristics and improved dietary intake among adolescents. *Journal of the American Dietetic Association*, 103, 317-322.
- Neumark-Sztainer, D., Wall, M., Story, M. & Fulkerson, J.A. (2004). Are family meal patterns associated with disordered eating among adolescents? *Journal of Adolescent Health*, 35, 350-359.
- Ogden, C. L., Carroll, M. D., Lester, R. C., McDowell, M. A., Tabak, C. J., & Flegal, K. M. (2006). Prevalence of Overweight and Obesity in the United States, 1999-2004. *Journal of the American Medical Association*, 295(13),1549-1555. doi: 10.1001/Journal of the American Medical Association.295.13.1549
- Ogden, C. L., Carroll, M. D., Curtin, L. R., Lamb, M. M., & Flegal, K. M. Prevalence of High Body Mass Index in US Adolescent and Adolescents, 2007–2008. *Journal of the American Medical Association* 2010;303:242–249.
- Ogden, C. L., Carroll, M. D., Flegal, K. M. (2003). Epidemiological trends in overweight and obesity. *Endocrinology and Metabolism Clinics of North America*, 32, 741-760.
- Ogden, C. L., Carroll, M. D., Flegal, K. M. (2008). high body mass index for age among us adolescent and adolescents, 2003–2006. *Journal of the American Medical Association*, 299, 2401–2405.
- Ogden, C. L., Troiano, R. P., Briefel, R. R., Kuczmarski, R. J. Flegal, K. M. & Johnson, C. L. (1997). Prevalence of overweight among preschool adolescent in the United States, 1971 through 1994. *Pediatrics*, 99, e1-e7.

- Office of the Surgeon General. The Surgeon General's Vision for a Healthy and Fit Nation. Rockville, MD, U.S. Department of Health and Human Services; 2010.
- Olson, C. N. M. & Gemmill, K. P. (1981). Association of sweet preference and food selection among four to five year old adolescent. *Ecology of Food and Nutrition*, 11, 145-150.
- Onwuegbuzie, O. J., & Daniel. L. J. (2003). Typology of analytical and interpretational errors in quantitative and qualitative educational research. *Current Issues in Education* [Online], Number 2.
- Ormrod, J.E. (1999). *Human learning (3rd ed.)*. Upper Saddle River, NJ: Prentice- Hall.
- Pajares, F. (2007). *Elements of a proposal*. Available from the author. Retrieved September 15, 2011 from <http://www.des.emory.edu/mfp/proposal.html>
- Parsons, T. J., Power, C., Logan, S. & Summerbell, C. D. (1999). Childhood predictors of adult obesity: a systematic review. *International Journal of Obesity*, 23, (suppl 8), S1-S107.
- Patrick, H., & Nicklas, T. A. (2005). A review of family and social determinants of adolescent's eating patterns and diet quality. *Journal of the American College of Nutrition*, 24(2), 83-92.
- Pate, R. R., Pratt, M., Blair, S. N, et al. (1995). Physical activity and public health: A recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. *Journal of the American Medical Association*, 273, 402-407.
- Patterson, P. D. , Moore, C. G., Probst, J. C., & Shinogle, J. A. (2004). Obesity and physical activity in rural America. *Journal of Rural Health*, 97, 571-577.
- Payne, V. G., & Isaacs, L. D. (2007). *Human Motor Development: A Lifespan Approach* (7th ed.). Mayfield Publishing Company: Mountain View, CA.
- Peters, J. C. (2004). Social change and obesity prevention: Where do we begin? *Nutrition Today*, 39(3), 112-116.
- Pietrobelli, A. (2004). Outcome measurements in paediatric obesity prevention trials. *International Journal of Obesity*, 28, S86-S89.
- Pietrobelli, A., Faith, M. S. Allison, D. B., Gallagher, D., Chiumello, G., &

- Heymsfield, S. B. (1998). Body mass index as a measure of adiposity among adolescent and adolescents: A validation study. *Journal of Pediatrics*, 132, 204-210.
- Pirouznia, M. (2001). The association between nutrition knowledge and eating behavior in male and female adolescents in the US. *International Journal of Food Science and Nutrition*, 52, 127-132.
- Probstt, J. C., Samuels, J., Jaspersen, K. P., Willert, K., Swann, R. S., & McDuffie, J. A. (2002). Minorities in Rural America: an overview of population characteristics. South Carolina Rural Health Center,
- Rampersaud, G. C., Bailey, L. B., & Kauwell, G. P. (2003). National survey beverage consumption data for adolescent and adolescents indicate the need to encourage a shift toward more nutritive beverages. *Journal of the American Dietetic Association*, 103, 97-100.
- Rolland-Cachera, M. F., Deheeger, M., Akrouf, M., & Bellisle, F. (1995). Influence of macronutrients on adiposity development: a follow-up study of nutrition and growth from 10 months to 8 years of age. *International Journal of Obesity*, 19, 573-578.
- Rollnick S, Miller, WR and Butler CC Motivational Interviewing in Healthcare: helping patients change behavior. 2008
- Ronette, R. Br., Ander, W., Philip, M. G. (2009). Consumption of Low-Nutrient, Energy-Dense Foods and Beverages at School, Home, and Other Locations among School Lunch Participants and Nonparticipants. *Journal of the American Dietetic Association*, 109(2), Supplement, Pages S79-S90.
- Roper, D. (2011). *The Statistics Calculator, V3.0*. Retrieved from <http://danielsoper.com/statcalc3/calc.aspx?id=17>
- Ross, C. E., & Mirowsky J. (2001). Neighborhood disadvantage, disorder, and health. *Journal of Health and Social Behavior*, 42(3), 258-76.
- Saha, C., Eckert, G. J., Pratt, J. H. & Shankar, R. R. (2005). Onset of overweight during childhood and adolescence in relation to race and sex. *Journal of Clinical Endocrinology and Metabolism*, 90, 2648-2652.
- Salbe, A. D., Weyer, C., Harper, I., Lindsay, R. S., Ravussin, E. & Tataranni, P. A. (2002). Assessing risk factors for obesity between childhood and adolescence: II. Energy metabolism and physical activity. *Pediatrics*, 110, 307-314.

- Samuel-Hodge, C. D., Gizlice, Z., Cai, J., Brantley, P. J., Ard, J. D., & Svetkey L. P. (2010). Family functioning and weight loss in a sample of african americans and whites. *Annual Behavioral Medicine, 40*(3), 294-301.
- Serdula, M.K., Ivery, D., Coates, R.J., Freedman, D.S., Williamson, D.F., & Byers, T. (1993). Do obese adults become obese adolescent? *Preventive Medicine, 22*,167-177.
- Schooover, H. & Muller, M. (2006). Institute for Agriculture and Trade Policy. Environment and Agriculture Program. November 2006.
- Skinner, J.D., Carruth, B.R., Bounds, W., & Ziegler, P.J. (2002). Adolescent's food preferences: a longitudinal analysis. *Journal of the American Dietetic Association, 102*,1638-1647.
- Slyper, A. H., (2004). The Pediatric obesity epidemic: causes and controversies. *Journal of Clinical Endocrinology and Metabolism, 89*(6), 2540-2547.
- Sothorn, M. (2004). Obesity prevention in adolescent: Physical activity and nutrition. *Nutrition, 20*, 704-708.
- Stephens, J.P. (2009) *Applied multivariate statistics for social sciences (5<sup>th</sup> ed.)* New York, NY; Routledge.
- Stettler, N., Zemel, B. S., Kumanyika, S., Stallings, V. A. (2002). Infant weight gain and childhood overweight status in a multicenter, cohort study. *Pediatrics, 109*, 194-199.
- Stokes, M.M. Adolescent Nutrition: needs and recommendations for practice.
- Story, M. (1992). *Nutritional requirements during adolescence*. In: McAnarney ER, Kreipe RE, Orr DE, Comerchi GD, eds. *Textbook of adolescent medicine*. Philadelphia: WB Saunders, 1992;75-84.
- Story, M., Neumark-Sztainer, D. & French, S. (2002). Individual and environmental influences on adolescent eating behaviors. *Journal of the American Dietetic Association, 102*, S40-S51.
- Strong, W. B., Malina, R. M., Bumke, C. J., Daniels, S. R., Dishman, R. K., Gutin, B., Hergenroeder, A. C., Must, A., Nixon, P. A., Pivarnik, J. M., Rowland, T. Trost, S. & Trudeau, F. (2005). Evidence-based physical activity for school-age youth. *Journal of Pediatrics, 146*, 732-737.
- Swinburn, B., Egger, G. & Raza, F. (1999). Dissecting obesogenic environments:

the development and application of a framework for identifying and prioritizing environmental interventions for obesity. *Preventive Medicine*, 29, 563-570.

Subar, A. F., Krebs-Smith, S. M., Cook, A., & Kahle, L. L. (1998). Dietary sources of nutrients among US children, 1989- 1991. *Pediatrics*, 102(4), 913-923.

Sun, M., Gower, B. A., Nagy, T. R., Trowbridge, C. A., Dezenberg, C., & Goran, M I. (1998). Total, resting, and activity-related energy expenditures are similar in Caucasian and African-American adolescent. *American Journal of Physiology*, 274, E232-E237.

Taveras, E.M., Scanlon, K. S., Birch, L., Rifas-Shiman, S. L, Rich-Edwards, J. W. & Gillman, M. W. (2004). Association of breastfeeding with maternal controln of infant feeding at age 1 year. *Pediatrics*, 114(5), d577-e583.

Tibbs, T., Haire-Joshu, D., Schectman, K. B., Brownson, R. C., Nanney, M. S., Houston, C. & Auslander, W. (2001). The relationship between parental modeling, eating patterns, and dietary intake among African-American parents. *Journal of the American Dietetic Association*, 101, 535-541.

Troiano, R. P., & Flegal, K. M. (1998). Overweight adolescent and adolescents: Description, epidemiology and demographics. *Pediatrics*, 101(3):497-504.

Troiano, R. P., Briefel, R. R., Carroll, M. D., & Bialostosky, K. (2000). Energy and fat intakes of children and adolescents in the United States: Data from the national health and nutrition examination surveys. *American Journal Clinical Nutrition*, 72(5),1343S-1353S. T

Trust for America's Health, 2010. Retrieved (September 5, 2011) at <http://healthyamericans.org/reports/obesity2010/>

United States Department of Agriculture (2010). Dietary Guidelines for Americans ( ). Retrieved ( ) at

U.S. Bureau of the Census. (1996. Rev.10/14/97). Poverty'96. [On-line]. Available: <http://www.census.gov/hhesx.poverty/poverty'96/pu96state.html>.

U.S. Department of Health and Human Services. The Surgeon General's call to action to prevent and decrease overweight and obesity. [Rockville, MD]: U.S. Department of Health and Human Services, Public Health Service, Office of the Surgeon General; [2001]. Available from: U.S. GPO, Washington.

U.S. Department of Health and Human Services. *Healthy People 2010*. 2nd ed.

With Understanding and Improving Health and Objectives for Improving Health. 2 vols. Washington, DC: U.S. Government Printing Office, November 2000.

Videon, T. M. & Manning, C. K. (2003). Influences on adolescent eating patterns: the importance of family meals. *Journal of Adolescent Health, 32*, 365-373.

Wareham, N. J., Van Sluijs, E. M. & Ekelund, U. (2005). Physical activity and obesity prevention: a review of the current evidence. *Proceedings of the Nutrition Society, 64*, 229-247.

Wang, Y., & Beydoun, M. A. (2007). The obesity epidemic in the United States—gender, age, socioeconomic, racial/ethnic, and geographic characteristics: a systematic review and meta-regression analysis. *Epidemiology Review, 29*, 6–28.

Weight-control Information Network [WIN] (2010). National Institute of Diabetes and Digestive and Kidney Diseases National Institutes of Health (NIH). Overweight and Obesity Statistics Retrieved from <http://win.niddk.nih.gov/statistics/>

Wells, J. C. (1998). Is obesity really due to high energy intake or low energy expenditure? *International Journal of Obesity, 22*, 1139-1140.

Willett, W. (1989). *Nutritional Epidemiology*. New York: Oxford University Press.

Williams, C. L., Bollella, M., & Wynder, E. L. (1995). A new recommendation for dietary fiber in childhood. *Pediatrics, 96*(5), 985-988.

Wisemandle, W., Maynard, L.M., Guo, S.S., Siervogel, R.M. Childhood weight, stature, and body mass index among never overweight, early on-set overweight, and late-onset overweight groups. *Pediatrics* 2000; 106: E14.

Whitaker, R. (2004). *A Review of Household Behaviors for Preventing Obesity in Adolescent*. Mathematica Policy Research Inc. Accessed at <http://www.mathematica-mpr.com/publications/pdfs/householdbehaviors.pdf>

Whitaker, R. C., Wright, J. A., Pepe, M. S., Seidel, K. D., & Dietz, W.H. (1997). Predicting obesity in young adulthood from childhood and parental obesity. *New England Journal of Medicine, 37*(13), 869–873.

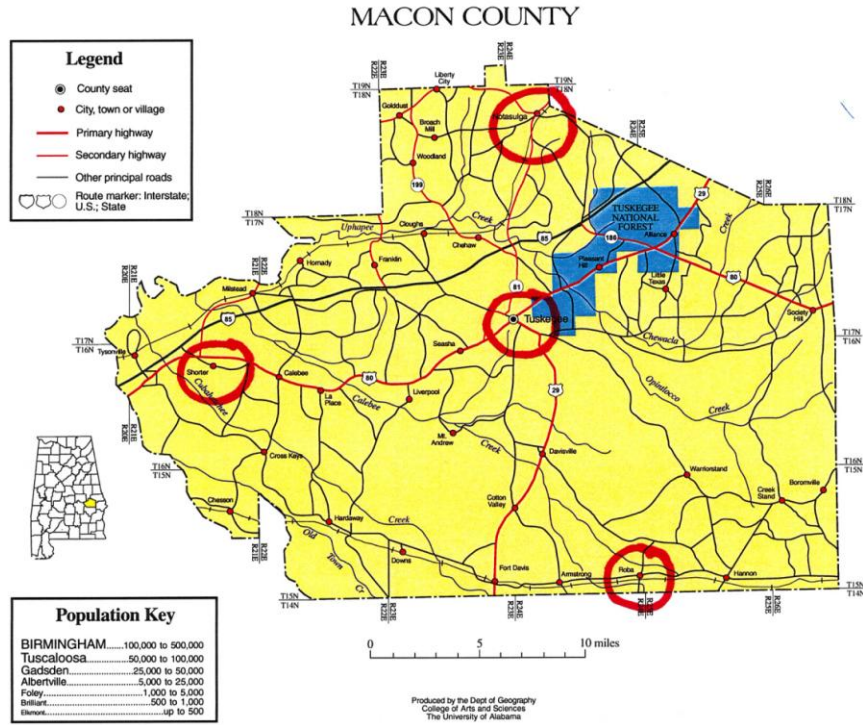
World Health Organization (2002). *Diet, Nutrition, and the Prevention of Chronic Disease*. Geneva: FAO-WHO.





# Appendix A

## Map of Macon County, Alabama



*Appendix B*

Descriptive Statistics of the Participants by Gender for all Three Time Periods

Characteristics	Gender	<i>n</i>	<i>M</i>
<i>Period 1 - October 2002</i>			
Age	F	131	10.3±0.5
	M	136	10.6±0.7
Weight (inches)	F	130	110.1 ± 35.4
	M	133	105.2 ± 35.4
Height (inches)	F	130	59.5 ± 3.2
	M	133	58.6 ± 3.3
BMI (lbs/ft <sup>2</sup> )	F	130	21.6 ± 5.8
	M	133	21.2 ± 5.4
<i>Period 2 - April 2003</i>			
Age	F	128	10.8 ± 0.6
	M	121	11.0 ± 0.7
Weight (inches)	F	120	119.2 ± 39.5
	M	104	114.2 ± 40.2
Height (inches)	F	120	60.7 ± 3.1
	M	104	59.6 ± 3.5
BMI (lbs/ft <sup>2</sup> )	F	120	22.5 ± 6.3
	M	104	22.3 ± 6.0
<i>Period 3 - April 2004</i>			
Age	F	141	11.8 ± 0.6
	M	151	12.0 ± 0.7
Weight (inches)	F	141	134.6 ± 42.4
	M	151	127.4 ± 41.6
Height (inches)	F	141	62.6 ± 2.8
	M	151	62.3 ± 3.8
BMI (lbs/ft <sup>2</sup> )	F	141	23.9 ± 6.8
	M	151	22.7 ± 5.9

Appendix C

Letter from Superintendent of Macon County Schools

**Macon County Board of Education**



Mr. Willie C. Thomas  
Superintendent of Education

501 South School Street  
Post Office Box 830090  
Tuskegee, Alabama 36083-0090  
(334) 727-1600  
Fax: (334) 724-9990

Mrs. Katy Campbell, *President*  
Mr. Stanley F. Gray, *Vice President*  
Mr. Aaron Robinson, *Member*  
Mr. Alfonso Robinson, *Member*  
Mr. Harold C. White, *Member*

October 9, 2002

Ms. Kajuandra A. Harris  
Alabama Cooperative Extension System  
P.O. Box 830629  
Tuskegee, AL 36083-0629

Dear Ms. Harris:

This communication is to inform you that permission is granted for you and Dr. Weese to conduct research in with fifth graders at the following schools:

1. Notasulga High School
2. D. C. Wolfe Elementary School
3. South Macon Elementary School; and
4. Washington Public School.

Should you need additional assistance or directions, please let me know.

Sincerely,

Willie C. Thomas  
Superintendent of Education

C:Mr. Theodore Samuel  
Dr. Dorothy Khonyongwa  
Mrs. Doris Coleman

## Appendix D

### Letter to Parents/Caregiver

*Auburn University*

Auburn University, Alabama 36849-5605  
College of Human Science

Department of Nutrition and Food Science  
328 Spidle Hall

Telephone: (334) 844-3261  
FAX: (334) 844-3268

Dear Parents:

This letter is to let you know what we are asking you and your child to do to help us with our study.

First of all, there may be a letter in the folder for you to sign to give us approval for you and your child to fill out the sheets we are sending. Please sign this letter and send it back to us. For each of the sheets your child fills out and brings back, they will get a prize.

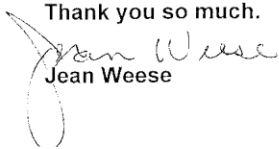
The yellow sheets that your child has is for him or her to write down all the foods that they eat for three days. Two of these days need to be Monday, Tuesday, Wednesday or Thursday. One of these days need to be Friday, Saturday or Sunday. This includes all foods and snacks that they eat at home and at school. We want to know what food and how much of the food is eaten. We also need to know how the food was cooked for example, fried chicken leg. Please help your child write down this information. We are including a sample sheet so that you can see just how to fill it out. This will help us know what kinds of foods people eat so that we can help them eat healthier foods.

The green sheet is to let us know what your child does while playing and doing chores at home and at school. We want to know what they did the day before and what they normally do everyday.

We are also sending home a form for you to fill out about the foods you eat. All you have to do is fill in the circle (please use a pencil) which tells what foods you eat, how often you eat this food and how much. We have included a picture to help you tell us how much of each food you eat.

We want to thank you for helping us and letting your child help us so that we can help people choose better foods to eat.

Thank you so much.

  
Jean Weese

Appendix E

Caregiver Consent Form



Auburn University, Alabama 36849-5605  
College of Human Science

Department of Nutrition and Food Science  
328 Spidle Hall

Telephone: (334) 844-3261  
FAX: (334) 844-3268

**Parental Informed Consent for Diet Quality in Rural Alabama**

You and your child are invited to participate in a study of the diets of children and the individuals that prepares their food to be conducted by Jean Weese, Ph.D., Associate Professor and Janet Johnson Graduate Student in the Department of Nutrition and Food Science. We hope to record the type of food that is eaten by people living in rural Alabama. You and your child were selected because your child participates in the 4-H program.

If you decide to participate, Jean Weese, Janet Johnson, and your county 4-H Leader will give your child a food frequency form and ask them to fill it out at school and one for you to fill out at home. This form will ask how often you eat certain foods, like green beans, cornbread or drinks such as colas and orange juice. After you and your child fill out the forms, this information will be sent to Auburn University to see what adults and children in rural Alabama eat. The form will take a few minutes to fill out.

Our goal is to learn what adults and children really eat in Alabama. We will ask you to complete this form at the beginning and near the end of the school year. We will also ask your child to fill out a similar form at the beginning and near the end of the school. Also, we will ask your child to fill out a form about their physical activity. For completing all the diet records and questionnaires, your child will be given a special lunch with their entire class. Also if the forms that are sent home are returned completed, your child will receive additional gifts.

There are no risks to you or your child for participating in this research project. The information we gather will be kept completely confidential. We will assign a number to your child and to you to keep the information confidential. The information obtained in this research study will be used to develop nutrition education programs especially designed to meet the needs of children and adults in the rural south. All information collected will be reported in a group format. No child or adult will be singled out in the report but the information will go in as a group report.

If you or your child chooses to participate in this research project you can withdraw at anytime and you may withdraw any information that has been collected from you and your child. Your decision to participate or not, will not jeopardize your relationship with the Alabama Cooperative Extension System or Auburn University.

\_\_\_\_\_  
Subject's initials

Page 1 of 2

HUMAN SUBJECTS  
OFFICE OF RESEARCH  
PROJECT #01-071 MR 0166  
APPROVED 6/14/01 TO 6/11/03

**Page 2: Parental Informed Consent for Diet Quality in Rural Alabama**

If you have any questions, we will be glad to answer them at anytime now or later. Contact either Jean Weese, Ph.D. at [jweese@aces.edu](mailto:jweese@aces.edu) or Janet Johnson at [johns16@auburn.edu](mailto:johns16@auburn.edu) or call **(334) 844-3269**. You may also ask any questions of your child's teacher or the 4-H leader. You will be provided a copy of this form to keep.

For information regarding your rights as a participant in this study you may contact the Office of Research Programs, Ms. Jeanna Sasser at (334) 844-5966 or [sassejb@auburn.edu](mailto:sassejb@auburn.edu) or Dr. Steve Shapiro at **(334) 844-6499** or [shapisk@auburn.edu](mailto:shapisk@auburn.edu).

HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE WHETHER OR NOT YOU AND YOUR CHILD WILL PARTICIPATE IN THIS PROJECT. YOUR SIGNATURE INDICATES YOUR WILLINGNESS TO PARTICIPATE.

\_\_\_\_\_ I will participate in this study.

\_\_\_\_\_  
Parent's or Guardian's Signature

\_\_\_\_\_  
Date

\_\_\_\_\_ I consent for my child, \_\_\_\_\_, to participate in this study.

\_\_\_\_\_  
Parent's or Guardian's Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Investigator's signature

\_\_\_\_\_  
Date

*Appendix F*  
Preadolescent Assent Form

*Auburn University*  
Auburn University, Alabama 36849-5605  
College of Human Science

Department of Nutrition and Food Science  
328 Spidle Hall

Telephone: (334) 844-3261  
FAX: (334) 844-3268

**Participants Informed Assent for Diet Quality in Rural Alabama**

We would like for you to help us in a study about the diets of children in rural Alabama. This study will be conducted by Jean Weese, Ph.D., Associate Professor and Janet Johnson Graduate Student in the Department of Nutrition and Food Science. We hope to find out the type of food that is eaten by children living in rural Alabama. You were selected because you participate in the 4-H program.

If you decide to participate, Jean Weese, Janet Johnson, and your county 4-H Leader will give you two forms that we will ask you complete. One will ask you how often you eat certain foods this is called a food frequency form. This form will ask how often you eat certain foods, like green beans, cornbread or drink beverages such as orange juice. The second form will ask you about your physical activity. Last we would like to weigh you and see how tall you are. For completing the diet records and questionnaire you will be given a special lunch with your entire class. Also if you bring the forms back to class that we ask for you will receive additional gifts.

There are no risks to you for participating in this study. The information we gather will be kept completely confidential. We will assign a number to you to keep the information confidential. The information obtained in this study will be used to develop nutrition education programs especially designed to meet the needs of children in the rural south. All information collected will be reported in a group format. No person will be singled out in the report but the information will go in as a group report.

If you choose to participate in this research project you can withdraw at anytime and you can withdraw any information that has been collected from you. Your decision to participate or not will not jeopardize your relationship with the Alabama Cooperative Extension System or Auburn University.

If you have any questions, we will be glad to answer them at anytime. If you have any questions later, we will be happy to answer them for you. Contact either Jean Weese, Ph.D. at [weesej@auburn.edu](mailto:weesej@auburn.edu) or Janet Johnson at [johns16@auburn.edu](mailto:johns16@auburn.edu) or call 1-334-844-3269. You can also ask questions of your teacher or your 4-H leader. You will be provided a copy of this form to keep.

\_\_\_\_\_  
Subject's initials

Page 1 of 2

HUMAN SUBJECTS  
OFFICE OF RESEARCH  
PROJECT # 01-071 MR 0106  
APPROVED 6/14/01 TO 6/11/03

**Page 2: Participants Informed Assent for Diet Quality in Rural Alabama**

For information regarding your rights as a participant in this study you may contact the Office of Research Programs, Ms. Jeanna Sasser at (334) 844-5966 or [sassejb@auburn.edu](mailto:sassejb@auburn.edu) or Dr. Steve Shapiro at (334) 844-6499 or [shapisk@auburn.edu](mailto:shapisk@auburn.edu).

HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE WHETHER OR NOT YOU AND YOUR CHILD WILL PARTICIPATE IN THIS PROJECT. YOUR SIGNATURE INDICATES YOUR WILLINGNESS TO PARTICIPATE.

\_\_\_\_\_  
Subject's Signature                      Date

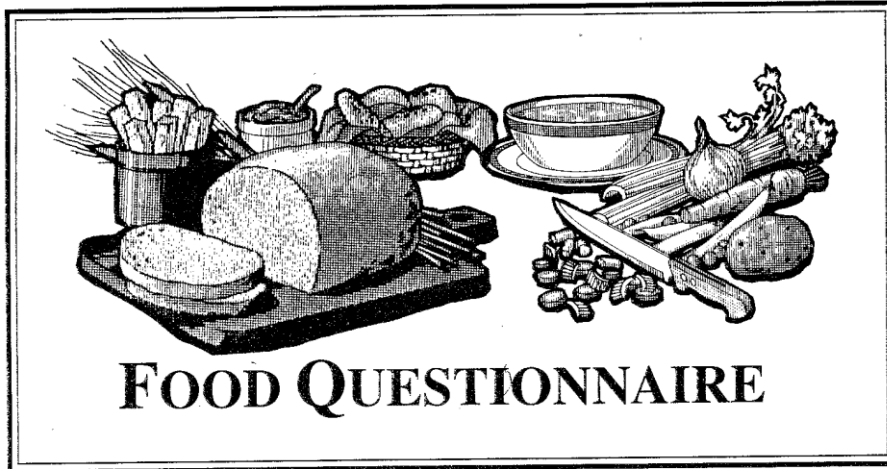
\_\_\_\_\_  
Investigator's signature                      Date

HUMAN SUBJECTS  
OFFICE OF RESEARCH  
PROJECT # 01-071 MR 0106  
APPROVED 6/14/01 TO 6/11/05



Appendix G

Health Habits and History Questionnaire



This form asks about your usual food intake over the past year. It takes about 30 minutes to complete. Please follow these instructions:

- Answer each question as best you can – estimate if you aren't sure.
- Use only a #2, ordinary pencil.
- Be certain to completely blacken in each of your answers, and erase completely if you make any changes.
- Do not make any other marks on this form.
- If you wish to make comments, please use a separate piece of paper.

11 LAST NAME 25 FIRST MI

35 STREET ADDRESS

59 CITY 73 STATE

76 ZIP CODE

86 PHONE NO.

ID NUMBER

1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9	9

SOCIAL SECURITY NUMBER

1	1	1	1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9	9	9	9	9

SEX

Male

Female

If female, are you pregnant or breast feeding?

No

Yes

Not female

AGE

1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9

WEIGHT pounds

1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9

HEIGHT ft. in.

	00
	01
	02
3	03
4	04
5	05
6	06
	07
	08
	09
	10
	11

HHHQ.BLOCK.95 Phone or fax: (510) 704-8514

PLEASE DO NOT WRITE IN THIS AREA

30821

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During the past year have you taken any vitamins or minerals regularly (at least once a week)?

- No       Yes, fairly regularly       Yes, but not regularly

IF YES, WHAT DO YOU TAKE FAIRLY REGULARLY?

VITAMIN TYPE	HOW OFTEN				FOR HOW MANY YEARS?					
	DON'T TAKE	1-3 DAYS PER WEEK	4-6 DAYS PER WEEK	EVERY DAY	LESS THAN 1 YR.	1 YEAR	2 YEARS	3-4 YEARS	5-9 YEARS	10+ YEARS
<b>Multiple Vitamins</b>										
Regular Once-A-Day, Centrum, or Thera type	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Antioxidant combination type	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Single Vitamins (not part of multiple vitamins)</b>										
Vitamin A (not beta-carotene)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Beta-carotene	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vitamin C	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vitamin E	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Calcium or Tums	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Iron	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Zinc	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Selenium	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

If you take multiple vitamins

- Do you usually take types that  contain minerals (iron, zinc, etc.)  do not contain minerals  Don't know

If you take Vitamin C or Vitamin E:

How many milligrams of **vitamin C** do you usually take, on the days you take it?

- 100    250    500    750    1000    1500    2000    3000+

How many IUs of **vitamin E** do you usually take, on the days you take it?

- 100    200    300    400    600    800    1000    2000+

The next section is about your *usual* eating habits over the past year.

**FIRST:** Mark the column to show HOW OFTEN, on the average, you ate the food during the past year.

**SECOND:** Mark the column to show HOW MUCH you usually eat of each food.

- Sometimes the "how much" is asked as number of pieces, such as 1 egg, 2 eggs or 3 eggs. Mark your serving size as the number you usually eat ON THE DAYS YOU EAT IT.
- Sometimes the "how much" is asked as small-medium-large (S-M-L).

A "medium" portion is shown for each food, but only as a guideline. The "medium" portion that will actually be used in the calculations is larger for men than for women, and larger for young people than for older people. Mark "small" if you think you usually eat a smaller portion of that food than other people of your age and sex. Mark "large" if you eat more of it than other people of your age and sex.

**SAMPLE:** This person eats one orange about twice a week, and eats a medium serving of other fruit about three times a week.

TYPE OF FOOD	HOW OFTEN								HOW MUCH			
	NEVER OR LESS THAN ONCE PER MONTH	1 PER MON.	2-3 PER MON.	1 PER WEEK	2 PER WEEK	3-4 PER WEEK	5-6 PER WEEK	EVERY DAY	MEDIUM SERVING	YOUR SERVING SIZE		
										S	M	L
Oranges	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	1 medium	<input type="radio"/> 1/2	<input checked="" type="radio"/> 1	<input type="radio"/> 2
Other fruit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	1/2 cup	<input type="radio"/> S	<input checked="" type="radio"/> M	<input type="radio"/> L

DO NOT WRITE IN THIS SHADED AREA

SUMMARY QUESTIONS	AVERAGE USE LAST YEAR									
	LESS THAN ONCE PER WEEK	1-2 PER WEEK	3-4 PER WEEK	5-6 PER WEEK	1 PER DAY	1 1/2 PER DAY	2 PER DAY	3 PER DAY	4+ PER DAY	
a. How often do you use fat or oil in cooking?	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. About how many servings of vegetables do you eat, not counting salad or potatoes?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. About how many servings of fruit do you eat, not counting juices?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. About how many servings of cold cereal do you eat?	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. About how many glasses of milk (or chocolate milk) do you drink?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**What kinds of fat do you usually use in cooking (to fry or stir-fry)? Mark the one or two you use most often.**

Don't know       Pam or no oil       Lard, fatback, baconfat       Crisco shortening  
 Stick margarine       Soft tub margarine       Low calorie margarine  
 Butter       Olive oil or canola oil       Corn oil, vegetable oil

**What kinds of fat do you usually add to vegetables, potatoes, etc.? Mark the one or two you use most often.**

Don't add fat       Lard, fatback, baconfat       Crisco shortening  
 Stick margarine       Soft tub margarine       Low calorie margarine  
 Butter       Whipped butter       Olive oil

**When you eat the following foods, how often do you eat a low-fat or non-fat version of that food?**

Cheese       Always low-fat       Sometimes       Rarely low-fat  
Ice cream or yogurt       Always low-fat       Sometimes       Rarely low-fat  
Salad dressing       Always low-fat       Sometimes       Rarely low-fat  
Cake or cookies       Always low-fat       Sometimes       Rarely low-fat

**When you drink orange juice, how often do you drink a calcium-fortified brand?**

Usually       Sometimes       Rarely

**How often do you add salt to your food?**       Seldom       Sometimes       Often

**How often do you eat the skin on chicken?**       Seldom       Sometimes       Often

**How often do you eat the fat on meat?**       Seldom       Sometimes       Often

**How do you like your meat cooked?**       Rare       Medium       Well done

**Do you smoke cigarettes now?**

No  
 Yes **IF YES, on the average, about how many cigarettes a day do you smoke now?**  
 1 - 5       6 - 14       15 - 24       25 - 34       35 or more

**About how many times have you gone on a diet to lose weight?**

Never       1 - 2       3 - 5       6 - 8       9 - 11       12 or more

**Is your health**

Excellent       Very Good       Good       Fair       Poor

**What language do you usually speak at home?**

English       Spanish       Something else

**Are you**

Hispanic       White, not Hispanic       African American       Asian, Pacific Islander, Native American

**THANK YOU VERY MUCH FOR TAKING THE TIME TO FILL OUT THIS QUESTIONNAIRE**  
Please take a moment to fill in any questions you may have skipped.

PLEASE DO NOT WRITE IN THIS AREA

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Appendix H

Kid's Food Frequency Questionnaire

Sheet: Kids © 2000 BDDS, Phone (510)-704-8514 www.nutritionquest.com

# KIDS' FOOD QUESTIONNAIRE

Child's name \_\_\_\_\_  
 Today's Date \_\_\_\_\_  
 This survey is about all the food your child eats, either at home or at school or at a friend's house. Please fill it out together. There are no right or wrong answers. It is very important that we learn what your child actually eats, not what he or she should eat. The survey will take about 30 minutes.

- Use ONLY a number 2 pencil, NOT a pen
- Fill in the circles completely
- Erase completely if you make changes

Correct Mark ●  
 Incorrect Marks ⊗ ⊘ ⊙ ⊚

Child's Sex     Male     Female

Child's weight:      Pounds

Child's Age         Last week, was your child's diet typical of the way he or she usually eats?  
 Yes  
 No, he was sick  
 No, another reason

Child's height:      Feet      Inches

**OFFICE USE ONLY**

TODAY'S DATE    MO.    DAY    YR.

0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9

AGE

0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9

WEIGHT    pounds

0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9

HEIGHT    ft. in.

0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9

**RESPONDENT ID NUMBER**

0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9

The next pages are about the foods your child eats. PLEASE READ THE DIRECTIONS on the back of the enclosed serving size pictures. Please ask your child about every food on the list.

PLEASE DO NOT WRITE IN THIS AREA

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Think about every time you ate anything in the past week. You can tell me you didn't eat a food at all in the past week, or that you ate it one day last week, two days last week, 3-4 days, 5-6 days, or every day.

	"How many days last week"					USUAL AMOUNT EATEN IN ONE DAY
	1 DAY	2 DAYS	3-4 DAYS	5-6 DAYS	EVERY DAY	
<b>Remember what you ate at home, at school, from snack machines, or from a restaurant. Either at home or at school, did you eat any Cold cereal, like Corn Flakes, Frosted Flakes or any other kind?</b>	YES <input type="radio"/> → How many days? → NO <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	See pictures. Which bowl? <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D
Last week, did you have Milk on cereal?	YES <input type="radio"/> → How many days? → NO <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Did you eat any Hot cereal, like oatmeal?	YES <input type="radio"/> → How many days? → NO <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	See pictures. Which bowl? <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D
Last week, did you eat any Eggs, including breakfast sandwiches with eggs?	YES <input type="radio"/> → How many days? → NO <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	How many eggs do you usually eat in 1 day? <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 Just a bite <input type="radio"/>
Did you eat any Bacon or sausage, including breakfast sandwiches with sausage?	YES <input type="radio"/> → How many days? → NO <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Did you eat any Pancakes, waffles or French Toast?	YES <input type="radio"/> → How many days? → NO <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	How many? <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3
Either at home or at school, did you eat Granola bars, breakfast bars, oatmeal raisin bars, or pop tarts?	YES <input type="radio"/> → How many days? → NO <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	How many? <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3
Last week, did you eat any Cinnamon buns or muffins?	YES <input type="radio"/> → How many days? → NO <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	How many? <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3
With breakfast, did you drink any Milk, chocolate milk or hot chocolate? (Don't include milk on cereal)	YES <input type="radio"/> → How many days? → NO <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	How many glasses or cartons for breakfast? <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3
At home or at school, did you drink any Milk with lunch?	YES <input type="radio"/> → How many days? → NO <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	How many glasses or cartons for lunch? <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3
Last week, did you drink any Milk with dinner or a snack?	YES <input type="radio"/> → How many days? → NO <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	How many glasses or cartons for dinner? <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3
Now tell me about the kind of milk you usually drink at home.	<input type="radio"/> Whole milk <input type="radio"/> Reduced-fat (2%) milk <input type="radio"/> Low-fat (1%) milk <input type="radio"/> Non-fat milk <input type="radio"/> Lactaid milk <input type="radio"/> Rice milk <input type="radio"/> Soy milk <input type="radio"/> Don't know					

**PLEASE DO NOT WRITE IN THIS AREA**

TYPE OF FOOD	HOW OFTEN								HOW MUCH			
	NEVER OR LESS THAN ONCE PER MONTH	1 PER MON.	2-3 PER MON.	1 PER WEEK	2 PER WEEK	3-4 PER WEEK	5-6 PER WEEK	EVERY DAY	MEDIUM SERVING	YOUR SERVING SIZE		
										S	M	L
<b>EXAMPLE: Bananas</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	1 medium	<input type="radio"/> 1/2	<input checked="" type="radio"/> 1	<input type="radio"/> 2
Bananas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	1 medium	<input type="radio"/> 1/2	<input type="radio"/> 1	<input type="radio"/> 2
Apples, applesauce	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	1 medium	<input type="radio"/> 1/2	<input type="radio"/> 1	<input type="radio"/> 2
Oranges (not including juice)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	1 medium	<input type="radio"/> 1/2	<input type="radio"/> 1	<input type="radio"/> 2
Grapefruit (not including juice)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	1/2 medium	<input type="radio"/> 1/4	<input type="radio"/> 1/2	<input type="radio"/> 1
Cantaloupe	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	1/4 medium	<input type="radio"/> 1/8	<input type="radio"/> 1/4	<input type="radio"/> 1/2
Peaches, apricots (fresh, in season)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	1 medium	<input type="radio"/> 1/2	<input type="radio"/> 1	<input type="radio"/> 2
Peaches, apricots (canned or dried)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	1 medium or 1/2 cup	<input type="radio"/> S	<input type="radio"/> M	<input type="radio"/> L
Prunes, or prune juice	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	1/2 cup	<input type="radio"/> S	<input type="radio"/> M	<input type="radio"/> L
Watermelon (in season)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	1 slice	<input type="radio"/> S	<input type="radio"/> M	<input type="radio"/> L
Strawberries, other berries (in season)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	1/2 cup	<input type="radio"/> S	<input type="radio"/> M	<input type="radio"/> L
Any other fruit, including kiwi, fruit cocktail, grapes, raisins, mangoes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	1/2 cup	<input type="radio"/> S	<input type="radio"/> M	<input type="radio"/> L
				1 WEEK		3-4 WEEK						
Fiber cereals like raisin bran, granola or shredded wheat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	1 medium bowl	<input type="radio"/> S	<input type="radio"/> M	<input type="radio"/> L
Sweetened cereals like frosted flakes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	1 medium bowl	<input type="radio"/> S	<input type="radio"/> M	<input type="radio"/> L
Other cold cereals like corn flakes or cheerios	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	1 medium bowl	<input type="radio"/> S	<input type="radio"/> M	<input type="radio"/> L
Cooked cereal like oatmeal, oat bran or grits	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	1 medium bowl	<input type="radio"/> S	<input type="radio"/> M	<input type="radio"/> L
Milk on cereal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	1/2 cup	<input type="radio"/> S	<input type="radio"/> M	<input type="radio"/> L
Breakfast bars, granola bars, power bars	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	1 serving	<input type="radio"/> S	<input type="radio"/> M	<input type="radio"/> L
Breakfast shakes, diet shakes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	1 serving	<input type="radio"/> S	<input type="radio"/> M	<input type="radio"/> L
Pancakes or waffles	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	2 med.	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3
Eggs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	1 egg=sml. 2 eggs=med.	<input type="radio"/> ① egg	<input type="radio"/> ② eggs	<input type="radio"/> ③ eggs
Egg substitutes, Egg Beaters, egg whites	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	2 eggs	<input type="radio"/> ① egg	<input type="radio"/> ② eggs	<input type="radio"/> ③ eggs
Sausage or bacon	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	2 patties or pieces	<input type="radio"/> ① piece	<input type="radio"/> ② pieces	<input type="radio"/> ③ pieces
Cottage cheese	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	1/2 cup	<input type="radio"/> S	<input type="radio"/> M	<input type="radio"/> L
Other cheeses and cheese spreads (regular or lowfat)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	2 slices or 2 ounces	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3
Yogurt, frozen yogurt (regular or lowfat)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	8 oz. container	<input type="radio"/> 5 oz.	<input type="radio"/> 8 oz.	<input type="radio"/> 10 oz.

Appendix I

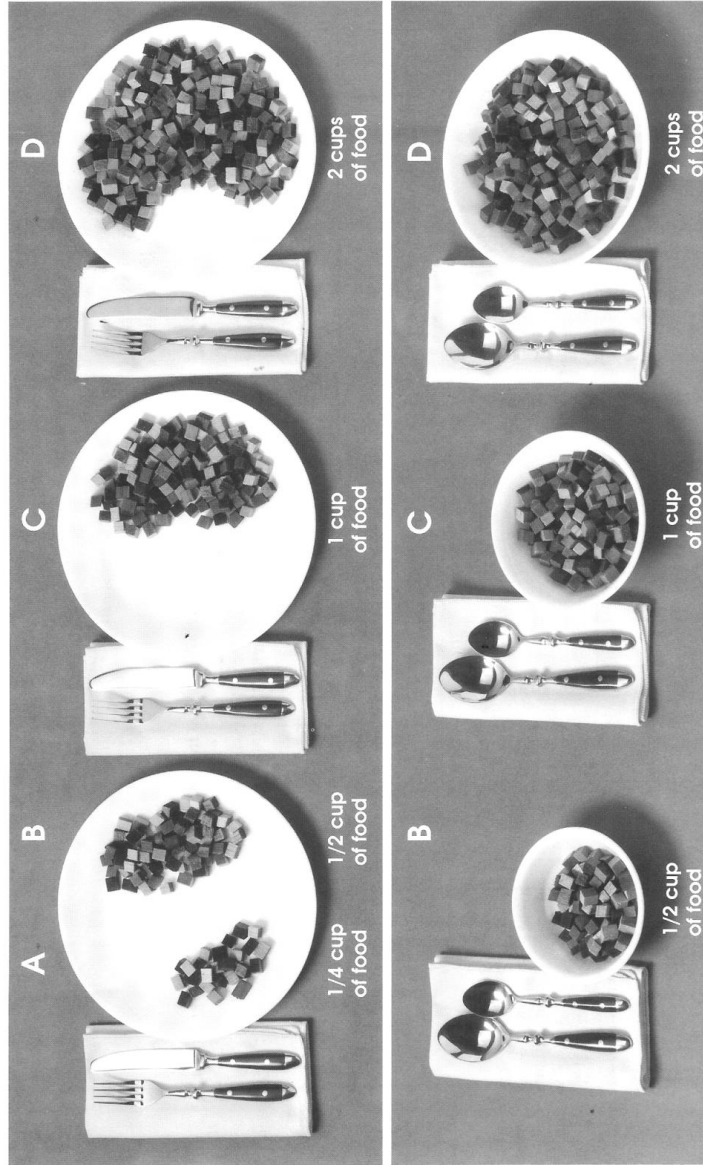
Serving Size Guide

FOOD QUESTIONNAIRE

Serving Size Choices

Keep this in front of you while you are filling out The Food Questionnaire. You may use either the plates or the bowls to help you choose your serving size.

Choose A, B, C or D: **A** = 1/4 Cup of Food **B** = 1/2 Cup of Food **C** = 1 Cup of Food **D** = 2 Cups of Food



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# Appendix J

## Food Questionnaire Guide

### How to fill out the Food Questionnaire

For each food on the survey,

Ask your child whether he or she ate it in the past week.

▶ If the food was not eaten last week, mark "No" and go to next food.

▶ If it was eaten, ask these two questions:

1. "How many days last week did you eat it?"

Mark the bubble that shows the number of days the food was eaten.

In the EXAMPLE, the child had EGGS two days last week, and HOT CEREAL on one day last week.

2. "How much" of the food was eaten on the days he or she ate it.

The pictures will help for some foods.

In the EXAMPLE, the child usually had a C-sized bowl of hot cereal. And ONE EGG on the days he ate eggs.

EXAMPLE	If yes		"How many days last week?"					USUAL AMOUNT EATEN IN ONE DAY:				
	Yes	No	1 DAY	2 DAYS	3-4 DAYS	5-6 EVERY DAY	How many do you usually have in one day?	How many do you usually have in one day?	See pictures. Which bowl?			
Last week, did you eat any Pancakes?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	How many days? →	How many days? →	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Last week, did you eat any Eggs, including breakfast sandwiches with eggs?	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	How many days? →	How many days? →	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Last week, did you eat any Hot cereal, like oatmeal?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	How many days? →	How many days? →	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>

NOTE: There is no A-size bowl.

If your child is not sure, it is okay to guess

Now, please turn this form over to see the portion size pictures, and begin the food questions.



## *Appendix K*

### Anthropometric Assessment

The Equipment used for and methods used to obtain anthropometric measurements are:

#### Weight

A properly calibrated balance beam was used to weigh children and adolescents.

The scale had the following qualities:

- Weights in 0.1 kg (100 gm) or 1/4 lb increments
- Has a stable weighing platform that can be easily set at zero
- Can be calibrated through professional service or by standard known weight.

#### Height

A metal measuring rod attached to a scale was used. Selection criteria included:

- Measure in 0.1 cm or 1/8 inch increments.
- Be stable with a large base.
- Have a horizontal headpiece at least 3 inches wide that can be brought into contact with the most superior part of the head.

#### Weight Measuring Procedure

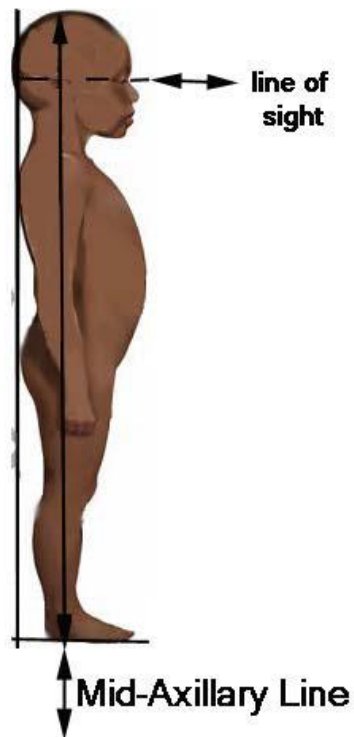
- Scale is set at zero reading.
- Scale is set on firm surface, preferably uncarpeted floor. Student removes shoes and heavy outer clothing such as sweater, jacket, vest and empties pockets.
- Student steps on center of the platform, with back toward the scale, both feet on platform, and stands still.
- Read weight value to nearest ¼ pound or 0.1 (1/10) kilogram
- Student was not provided with the results of the screening\*.
- Record weight immediately on data form before child gets off scale
- When using a balance beam scale, return weights to zero position before subsequent student is weighed.

#### Height Measuring Procedure

- Student removes shoes.
- Student removes hair ornaments, buns, braids to extent possible.

- Student stands with back against rule.
- Bring legs together, contact at some point (whatever touches first).
- Knees not bent, arms at sides, shoulders relaxed, feet flat on platform.
- Back of body touches/has contact with rule at some point.
- Body in straight line (mid-axillary line parallel to rule) (*fig1*).
- Head in appropriate position – check Frankfort plane (*fig 2*).
- Lower headpiece snugly to crown of head with sufficient pressure to press hair. Read value at eye level.
- Measure to nearest 0.1 (1/10) cm or 1/8 inch (repeat measurements should agree within .1 cm or 1/4 inch.)
- Record value immediately on data form.

***The Mid-Axillary Line-Position of body for height measurement.*** While taking height measurements, make sure that the mid-auxiliary line is parallel to the measuring rod.



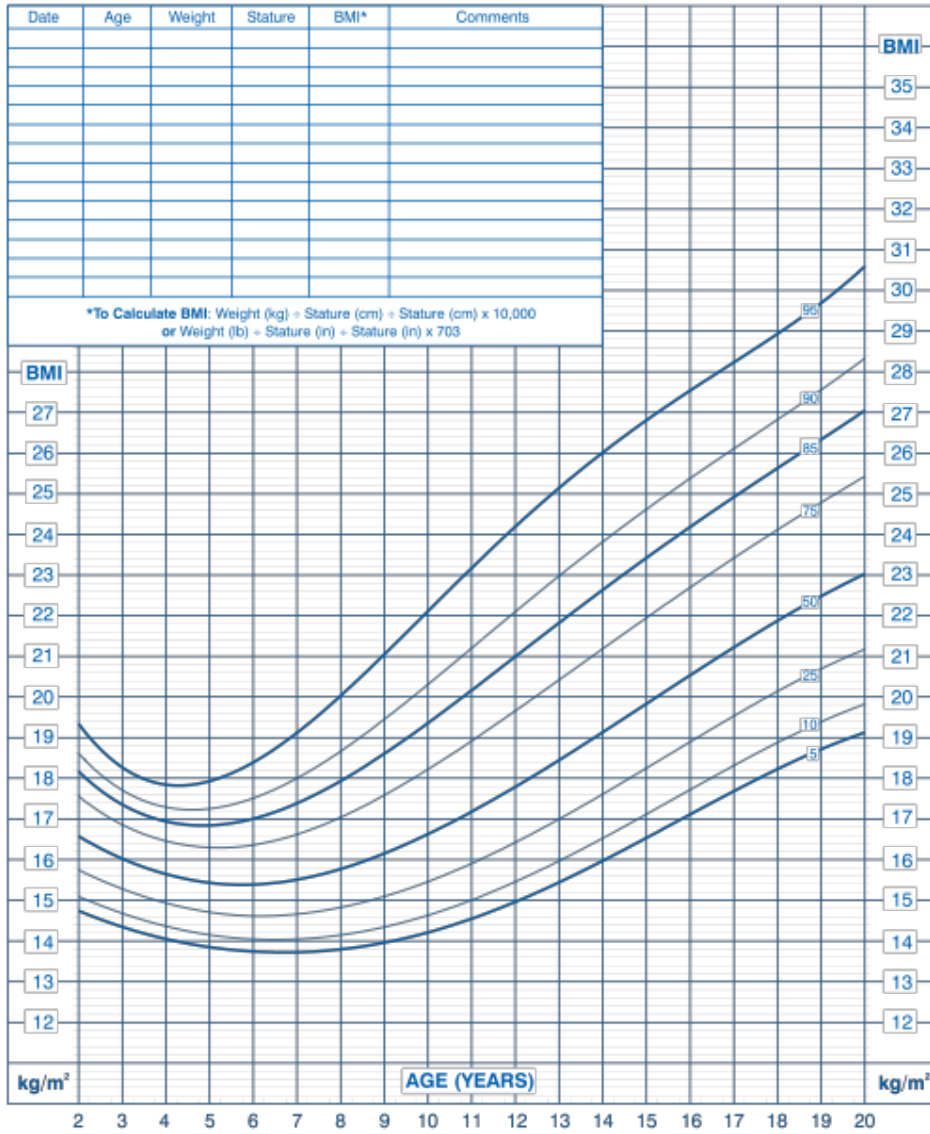
# Appendix L

## Growth Chart for Boys

### 2 to 20 years: Boys Body mass index-for-age percentiles

NAME \_\_\_\_\_

RECORD # \_\_\_\_\_



Published May 30, 2000 (modified 10/16/00).  
SOURCE: Developed by the National Center for Health Statistics in collaboration with  
the National Center for Chronic Disease Prevention and Health Promotion (2000).  
<http://www.cdc.gov/growthcharts>



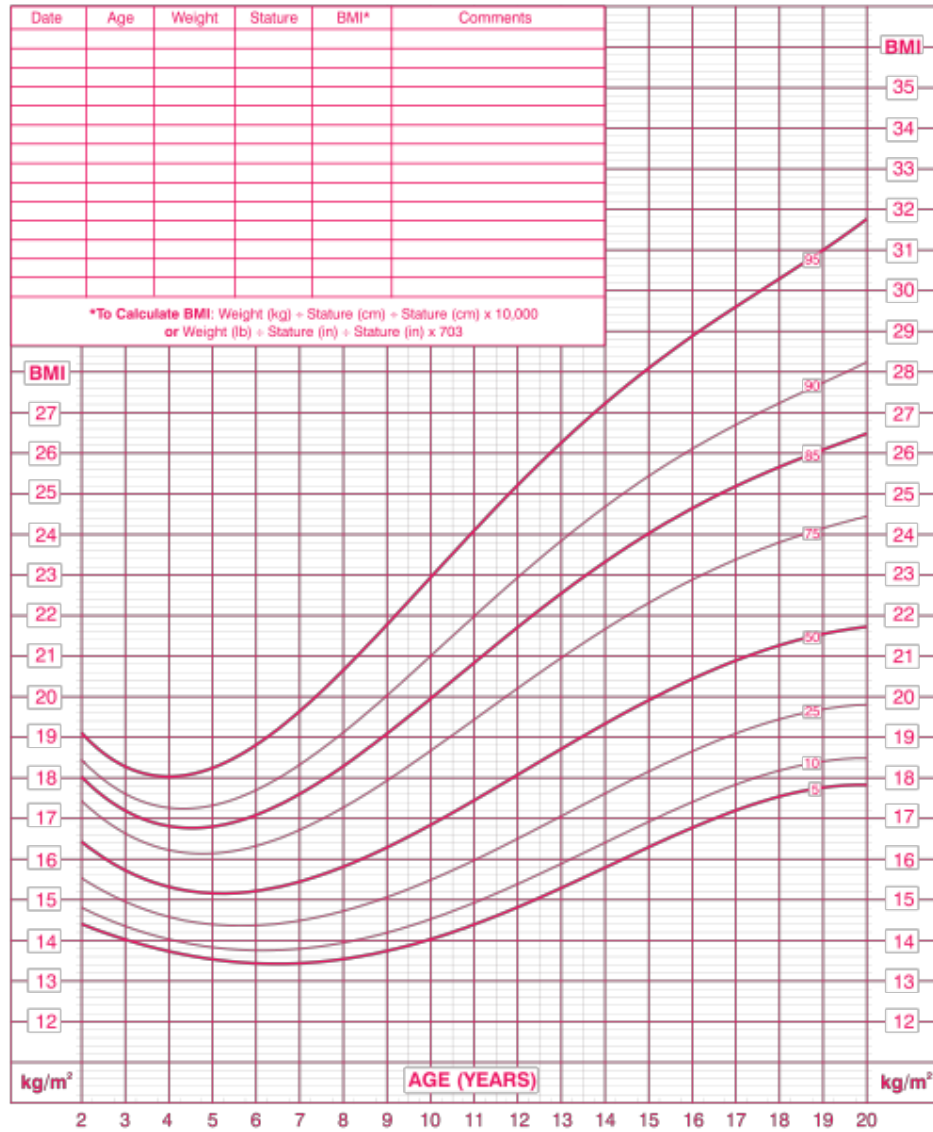
## Appendix M

### Growth Chart for Girls

#### 2 to 20 years: Girls Body mass index-for-age percentiles

NAME \_\_\_\_\_

RECORD # \_\_\_\_\_



Published May 30, 2000 (modified 10/16/00).  
SOURCE: Developed by the National Center for Health Statistics in collaboration with  
the National Center for Chronic Disease Prevention and Health Promotion (2000).  
<http://www.cdc.gov/growthcharts>



Appendix N

Sample of Completed Growth Chart

