2007

Relation between weight status, gender, ethnicity and the food and activity choices of 6th and 9th graders

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Relation Between Weight Status, Gender, Ethnicity and

the Food and Activity Choices of 6th and 9th Graders

by

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A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
Department of Psychological and Social Foundations
College of Education
University of South Florida

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Date of Approval:

March 20, 2007

Keywords: Overweight, Obesity, Teenagers, Dietary Intake, Physical Activity

Acknowledgments

I would like to thank my committee members for all of the time they spent assisting me with this research project. I am thankful to you all for teaching me each phase of the research process and how to carry out each phase while upholding the highest standards of ethics and rigor. I want to thank Dr. Bradley-Klug for helping me to find a way to study the variables I am passionate about and for her role as a teacher and a mentor. I want to thank Dr. Dedrick for helping me to understand the importance of evaluating the method of a research study so that the data are presented in an appropriate manner. I want to thank Dr. Armstrong for being a strong supporter of my educational experience and for supporting me in the topic of pediatric overweight. I want to thank Dr. Raffaele Mendez for teaching me how to engage in the research process my first year of graduate school and for contributing to this document. Finally, I want to thank Dr. Ashley for participating in both the proposal and final defenses. Her expertise on this topic is invaluable.

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ABSTRACT

The present study examined the relationship between the variables weight status (expected weight, at-risk for overweight, and overweight), ethnicity, and gender and the dependent variables dietary intake and physical activity behaviors among adolescents. Data presented in this study were collected using the Nutrition and Exercise Survey for Students, which was completed by 535 6th grade and 9th grade students across 3 middle- and 2 high-schools in southwest Florida. Multivariate analysis of variance (MANOVA) was used to identify differences in dietary intake and physical activity behaviors between groups.

The primary questions related to interactions and main effects between the variables weight category, ethnicity, and gender and the dependent variables dietary intake and physical activity behaviors. Weight category was determined by computing each participant's body mass index percentile (BMI = weight in kilograms/height in meters^2).

The findings of this study indicate that there are group differences in dietary intake behaviors among 6th graders and physical activity behaviors among 6th and 9th grade participants. With respect to dietary intake behaviors, an interaction was observed for gender and ethnicity, and main effects were observed for weight category and gender. Follow-up univariate F-tests were significant for weight category on meat/beans and junk food consumption; and gender differences on meat/beans consumption. All obtained effect sizes were small.

For physical activity behaviors, a main effect was observed for gender among 6th grade participants and interaction was observed for gender and ethnicity among 9th grade participants. The follow-up univariate F-tests were significant for gender differences on total and vigorous activity behaviors (males had higher means than females) and small effect sizes were observed. The follow-up univariate F-tests for the gender and ethnicity interaction were not significant.

Implications for the field of school psychology are discussed within the primary, secondary, and tertiary prevention model. Within this framework, a discussion of how school psychologists can assist in creating environments that encourage health-supporting behaviors at the individual and school-wide levels will be presented. Further, the need for school psychologists to collaborate with other health professionals to address overweight and some of its physical and mental health consequences is provided.

Chapter 1

Introduction

Statement of the Problem

The increasing number of overweight children and adolescents in the United States is widely recognized as a serious public health issue (Troiano, 2002). Over the past 30 years, the proportion of young Americans who are overweight has increased from approximately 5% in the early 1970s to 15% in 2000 (Goran, Ball, & Cruz, 2003). The prevalence of overweight continues to increase dramatically such that it has been recognized as a chronic disease, affecting many demographic groups, including children and adolescents (Loke, 2002; Strauss & Pollack, 2001; Troiano, 2002; Wang, 2001). The U.S. Surgeon General expressed his views on the essential elements to prevent chronic diseases and obesity in a report published by the Centers for Disease Control and Prevention (CDC):

> As a society, we can no longer afford to make poor health choices such as being physically inactive and eating an unhealthy diet; these choices have led to a tremendous obesity epidemic. As policy makers and health professionals, we must embrace small steps toward coordinated policy and environmental changes that will help Americans live longer, better, healthier lives. (2003, p. 1)

Because of the dramatic increase in prevalence of pediatric overweight over the past three decades, it is now imperative to determine the correlates of overweight in youth.

Problems Associated with Pediatric Overweight

Individuals who are overweight are at increased risk for hypertension, adverse lipid profiles, type II diabetes, early orthopaedic problems, and some types of cancer, as well as psychosocial consequences (Loke, 2002). Likewise, overweight adolescents are at increased risk for developing these diseases in adulthood, as overweight children are more likely to become overweight adults. Annual obesity-related medical costs for children ages 6-17 years have reached $127 million, making childhood obesity an economic burden as well (Goran et al., 2003).

The incidence of type II diabetes has emerged as a critical health issue in overweight children (Goran et al., 2003; Sorof & Daniels, 2002). One study reported a 10-fold increase in the incidence of type II diabetes in adolescents between 1982 and 1994 (Pinhas-Hamiel et al., 1996). It appears that African-American, Hispanic American, and Native American adolescents are at an even greater risk for developing the disease. However, some researchers suggest that this increase in prevalence can be partially explained by increased surveillance and improved screening methods in clinical practice (Goran et al., 2003).

Over the past 20 years, researchers have determined that hypertension is a threatening disease process in adolescents as well as adults (Rocchini, 1999). Incidence estimates range from 0.5 to 11% of youth under the age of 18 as being affected by hypertension. Hypertension can be a precursor to cardiovascular disease if not properly managed, and can be associated with myocardial hypertrophy, persistent headaches, blurred vision, convulsions, and coma in the worst of cases. Hyperlipidemia is another known risk factor for the development of adult-onset heart disease associated with overweight. It results in abnormalities of lipid metabolism and can ultimately result in a higher serum LDL cholesterol concentration, a higher plasma cholesterol level, higher triglyceride levels, and atherogenesis. Diets that contain high levels of saturated fat and cholesterol content are implicated in hyperlipidemia.

Orthopaedic problems may be especially troublesome for youth who are overweight. Excess weight places an extreme burden on the lower limbs and is associated with orthopaedic diseases such as bilateral tibia vara (knee pain resulting from bowed legs), slipped upper femoral epiphyses (hip pain arising from abnormal forces on the femoral growth plate), and pes planus (poor foot arches) (Loke, 2002). Loke suggested that while these orthopaedic problems may put an individual at increased risk for osteoarthritis in adulthood, perhaps more immediately troublesome is their effect on a child's ability to exercise, "thus creating a vicious cycle, with increasing and worsening obesity and joint disease" (p. S703).

Theoretical Framework of Pediatric Overweight

A complex myriad of factors have been implicated in the development and expression of pediatric overweight. There are a number of syndromes associated with childhood overweight, which are classified as genetic (e.g., Turner syndrome, Prader-Willi syndrome), endocrine (e.g., hypothyroidisms, growth hormone deficiency), and others (e.g., Cohen syndrome, Carpenter syndrome). The cause of primary overweight in children and adolescents, a condition not associated with a syndrome, appears to be more closely associated with environmental factors such as lack of physical activity, unhealthy eating behaviors, or a combination of the two (Saelens & Daniels, 2003).

A developmental-systems perspective to the expression of pediatric overweight formed the theoretical basis of the present study (Mash & Dozois, 2003). This perspective is consistent with both transactional and ecological views, and emphasizes the importance of individual, family, social, community, and cultural factors in predicting and understanding development (Mash & Dozois, 2003). Toward this end, emphasis is placed on individual behaviors related to overweight (i.e., dietary intake and physical activity) and the environments (i.e., family, school, community) in which these behaviors are developed and maintained.

Rationale for the Study

Although dietary intake and physical activity behaviors have been identified in the literature as primary factors associated with the development and expression of overweight, research is needed to determine the influence of other variables or secondary factors. For example, it is important to determine whether certain subgroups (i.e., youth of different ethnic backgrounds or socio-cultural backgrounds, youth of different genders, etc.) are at higher risk for pediatric overweight due to the types of health behaviors in which they engage (Neumark-Sztainer, Story, Hannan, & Croll, 2002). If patterns emerge in which some subgroups are at higher risk for poor dietary intake behaviors but not at risk for poor physical activity behaviors, appropriate interventions can be designed to meet the group's specific strengths and needs. Similarly, it also is important to determine if overweight youth engage in more health-compromising behaviors than average weight youth with regard to dietary intake and physical activity. Furthermore, it is important to determine the behaviors in which they are engaging (e.g., either less physical activity or increased consumption of unhealthy foods, or both of these behaviors combined) so that interventions can be developed to promote the attainment of a healthy weight. Finally, it is also important to identify child-perceived barriers to engaging in healthy eating and physical activity behaviors.

The CDC (2003) suggested that creating environments that promote and support regular physical activity and healthy eating behaviors is essential to reducing the overweight epidemic. School systems may be primary targets for creating such environments because children and adolescents spend a large portion of their day in school. School systems also can serve as a forum for the implementation of prevention and intervention programs that may help in the battle against the current overweight epidemic. As obesity has escalated to the status of a "national epidemic," more than ever there is a need for a proactive approach to overweight that emphasizes primary prevention.

Purpose of the Study

Many researchers (Beech, Rice, Myers, Johnson, & Nicklas, 1999; Forshee & Storey, 2003; Munoz, Krebs-Smith, Ballard-Barbash, & Cleveland, 1997; Videon & Manning, 2003) have provided evidence that adolescents are consuming inadequate servings of fruits, vegetables, and grains. Though a secular trend of inadequate consumption has been documented (Munoz et al., 1997), there are also significant differences in consumption levels among specific subgroups (e.g., defined by race, age, SES) (Neumark-Sztainer et al., 2002). With respect to physical activity, data collected in the last decade indicate a substantial decline in physical activity levels for adolescents in all 50 of the United States (Hayman, 2002). Therefore, it comes as no surprise that adolescents are increasingly reporting higher levels of engagement in sedentary activities, such as TV viewing, computer activities, and/or playing video games. Although it is clear that adolescents are not consuming adequate servings of healthy foods nor are they engaging in adequate levels of physical activity, to date, very few investigations have examined the differences in dietary intake and physical activity behaviors of children and adolescents among different weight categories. As such, it is difficult to say with certainty that these variables alone are contributing to the overweight epidemic in young Americans.

The purpose of this study was to determine whether there is a relationship between weight status (expected weight, at-risk weight, and overweight), as measured by body mass index (BMI), ethnicity, and gender and the dependent variables of dietary intake and physical activity behaviors among 6th- and 9th graders. Additionally, this study sought to identify student-perceived barriers to consuming fruits and vegetables and engaging in physical activity. Specifically, the research questions and hypotheses included:

1. What is the relationship between weight status, gender, and ethnicity and the dependent variables of dietary intake (fruit/vegetables, dairy, meat/beans, grains, and junk foods) among 6th- and 9th-grade students?

   Hypothesis 1a: It was hypothesized that overweight adolescents would consume more dairy food, meat/beans, and 'other' foods and less fruit/vegetables and grain products. This hypothesis was not generated based on previous research because there is a lack of studies that have explored this question.

   Hypothesis 1b: It was expected that there would be a relationship between gender and dairy food intake, with males more likely than females to consume the daily recommended servings of dairy. This hypothesis was based on the research by Munoz et al. (1997) and Neumark-Sztainer et al. (2002). No other significant relationships between variables are expected.

2. What are student-perceived barriers to consuming five combined servings of fruits and vegetables per day among 6th- and 9th-grade students?

   Hypothesis 2: It was hypothesized that the majority of participants would report "not liking the taste" and "not liking the ones served at school". This hypothesis was based on previous findings from focus-group research conducted by Baranowski et al. (1993), Cullen et al. (1998), and Hearn et al. (1998).

3. What is the relationship between weight status, gender, and ethnicity, and the dependent variables of physical activity (total, vigorous activity and moderate activity) among 6th- and 9th-grade students?

   Hypothesis 3a: It was hypothesized that overweight adolescents would engage in less physical activity than expected weight peers. This hypothesis was based on the research by Boutelle, Neumark-Sztainer, Story, and Resnick (2002) and Maffeis, Zaffanello, and Schultz (1997).

   Hypothesis 3b: It was expected that there would be a relationship between gender and physical activity, with males more likely than females to meet the weekly recommendations for physical activity. This hypothesis was based on the research by Andersen, Crespo, Bartlett, Cheskin, and Pratt (1998), Gordon-Larsen, McMurray, and Popkin (1999), and Troiano (2002).

   Hypothesis 3c: It was hypothesized that there would be a relationship between ethnicity and gender and physical activity, with Black and Latino females less likely than White females to meet the weekly recommendations. This hypothesis was based on the research by Andersen et al. (1998) and Curtiss (2004).

Hypothesis 3d: It was expected that there would be a relationship between ethnicity and gender and physical activity, with Latino males less likely than Black and White males to meet the weekly recommendations. This hypothesis was based on the research by Andersen et al. (1998).

4. What is the relationship between weight status, gender, and ethnicity, and the dependent variable sedentary activity among 6th- and 9th-grade students?

   Hypothesis 4a: It was hypothesized that overweight adolescents would engage in more sedentary activity. This hypothesis was based on the research by Boutelle et al. (2002) and Maffeis et al. (1997).

   Hypothesis 4b: It was expected that there would be a relationship between ethnicity and sedentary activity, with Black and Latino adolescents engaging in higher levels of sedentary activity than White adolescents. This hypothesis was based on the research by Andersen et al. (1998), Curtiss (2004), Dowda, Ainsworth, Addy, Saunders, and Riner (2001), and Troiano (2002). No other significant relationships between variables are expected.

5. What are student-perceived barriers to engaging in daily physical activity/exercise among 6th- and 9th-grade students?

   Hypothesis 5: It was hypothesized that students would select “I don’t like it” and “I am not good at it” as barriers to engaging in daily physical activity. This hypothesis was not supported by previous research studies. Previous research conducted by Fahlman, Hall, and Lock (2006) identified “It makes me sweat too much,” “I don’t feel like it," and "It makes me unattractive" as student-perceived barriers to physical activity. These specific responses were not included on the Nutrition and Exercise Survey for Students (NESS) but might be reported in the 'Other' space where students write in their own responses.

Significance of the Study

There is a dearth of literature on whether the eating and physical activity behaviors of youth in different weight categories (expected weight, at risk weight, and overweight) are different or similar. Although it is clear that food choices and activity level influence adiposity, the behaviors of children and adolescents in different weight categories have not been explored in detail. Because many interventions focus on changing eating behaviors and increasing levels of physical activity, it seems logical to study the behaviors of youth in different weight categories. In this way, if certain patterns of behaviors emerge as typical in a specific group, interventions can be designed that directly address those patterns of behaviors. Identification of patterns of dietary intake and physical activity behaviors between different weight groups may provide school staff, medical professionals, and parents with direction for creating intervention programs designed to improve the nutritional choices of adolescents and increase their levels of physical activity. Similarly, little research has focused on the student-perceived barriers to eating fruits and vegetables and engaging in daily physical activity. This information is also important for intervention planning and implementation such that environmental barriers are reduced and facilitators are implemented.

Definition of Terms

Body Mass Index. Body mass index refers to a ratio (weight in kilograms/height in meters^2) that is used as a measure of adiposity.

Overweight. Overweight was defined as a body mass index percentile score ≥ 95th percentile (Cole et al., 2000).

At-risk weight. At-risk weight was defined as a body mass index percentile ≥ 85th percentile < 95th percentile (Cole et al., 2000).

Expected weight. Expected weight was defined as a body mass index percentile score ≥ 5th percentile < 85th percentile (Cole et al., 2000).

Dietary intake. Dietary intake refers to the number of servings of food from a particular food group (e.g., fruits/vegetables, meat/beans, dairy, grains and junk food) that participants reported consuming per day.

Developmental-systems perspective. This perspective emphasizes the importance of individual, family, social, community, and cultural factors in predicting and understanding development (Mash & Dozois, 2003).

Junk food. Junk food was defined by any of the examples provided on the *Nutrition and Exercise Survey for Students* (e.g., soda, potato chips, candy bars, etc.).

Chapter 2

Review of Selected Literature

Overview

The purpose of this chapter is to present a discussion of the dietary intake and physical activity behaviors in which children and adolescents engage that contribute to the development and expression of pediatric overweight. Toward this end, a review of the literature discussing the recent rise in pediatric overweight will be presented, followed by a presentation of methods to assess weight and body mass index. Then a discussion of the nongenetic (environmental) influences on overweight will be introduced, more specifically, dietary intake and physical activity behaviors, including the student-perceived barriers to consuming five combined servings of fruits and vegetables per day and engaging in daily physical activity.

Overweight and Obesity

According to data from the National Health and Nutrition Examination Survey III (NHANES III, 1988-1994), overweight among children has increased among all age, race, and gender groups over the past 30 years (Sorof & Daniels, 2002). More specifically, data analyses published by the Centers for Disease Control and Prevention (CDC) indicated that about 10 to 15% of children and adolescents are overweight within every age and gender group (2002). In particular, among adolescents (12-17 years of age), the percentage of overweight increased similarly for both boys and girls from 5% in 1970 to 14% in 1999.

More recent data from the National Longitudinal Survey of Youth (NLSY; Strauss & Pollack, 2001) found slightly higher prevalence rates of overweight compared to those of the NHANES III. The NLSY was a cohort study that included 8,270 children ages 4 to 12 years and monitored overweight trends in children from 1986-1998. In this study approximately 20% of youth were overweight.

Although a secular trend in the increase of pediatric obesity has been documented, more recent data suggest that overweight is more common among specific population subgroups. For example, data from the NLSY indicated that overweight increased fastest among minorities and southerners, creating major demographic differences in the prevalence of pediatric overweight by 1998. Among African American and Hispanic populations, the number of children with a BMI greater than the 85th percentile increased significantly, but nonsignificantly for Caucasian children. While overweight prevalence was similar in western and southern states in 1986, by 1998 the overall prevalence had increased to 10.8% in western states and to 17.1% in southern states (Strauss & Pollack, 2001).

Neumark-Sztainer and Hannan (2000) assessed the prevalence of dieting and disordered eating among adolescents using the Commonwealth Fund Surveys of the Health of Adolescent Girls and Boys and found that approximately 24% of the population was overweight. This study utilized a nationally representative sample of 6,728 adolescents in grades 5 to 12. Another finding of this study was that disordered eating behaviors were strongly correlated with overweight status.

The state of Florida has similar percentages of high school students who are overweight as compared to national averages. In 2003, 12% of all Florida high school students were overweight compared to 12% nationally (CDC, 2004). A study by Curtiss (2004) indicated that approximately 24% of students in a large, urban high school in southwestern Florida were overweight. Data from the Youth Risk Behavior Surveillance Survey found that high school males in Florida had higher rates of overweight compared to females, 17.4% versus 9.4%, respectively. However, high school females were more likely to think they were overweight (36.1%) and had made more attempts to lose weight (59.3%) than high school males (23.5% and 29.1%, respectively) (CDC, 2004).

Health Complications Associated with Obesity

Physical Health

Beyond measurement validity, Dietz and Robinson (1998) proposed that the clinical validity of body mass index (BMI) as a measure of adiposity is even more important to consider. They defined clinical validity as "whether the BMI in children and adolescents is associated with current or future morbidity rates" (Dietz & Robinson, 1998, p.191). Among adults, it is clear that an increased BMI is associated with a number of health problems (e.g., heart disease, type II diabetes, high blood pressure, and some forms of cancer) and higher mortality rates (Dietz & Robinson, 1998). Fewer data are available from child and adolescent studies, although some associations have been demonstrated between BMI and increased blood pressure, adverse lipoprotein profiles, non-insulin-dependent diabetes mellitus, and early atherosclerotic lesions (Dietz & Robinson, 1998; Wright, Parker, Lamont, & Craft, 2001).

Morrison, Frederick, Sprecher, Khoury and Daniels (1999) found an association between increased BMI and higher levels of total cholesterol (plasma lipids and lipoproteins) in a cross-sectional study of body composition and cardiovascular disease (CVD) in African American and Caucasian children from 1975 through 1990. An examination of total cholesterol levels for females found that mean cholesterol was higher in the 1989-1990 study cohorts than those of the 1973-1975 cohorts. Additionally, in the 1989-1990 cohorts there also were significant increases in the prevalence of elevated cholesterol.

In contrast to these findings, Wright et al. (2001) found that BMI at age 9 years was significantly correlated with BMI at age 50 years but not with percentage body fat at age 50. In addition, there was an inverse association between BMI at age 9 and measures of lipid and glucose metabolism in both genders and with blood pressure in women at age 50. However, when adult percentage fat instead of BMI was adjusted for, only the inverse associations with triglycerides and total cholesterol in women remained significant (Wright et al., 2001).

These data suggest that being thin in childhood did not offer protection against adult fatness or health risk, and that percentage body fat may be a more accurate predictor of adult health risk. However, these findings should be interpreted cautiously because data were only available for a relatively small number of participants at both periods (n = 412) and follow up was only to age 50. Therefore, the researchers used proxy markers for morbidity and not the actual outcomes.

Moving beyond looking only at the physical consequences of overweight, Schwimmer, Burwinkle, and Varni (2003) examined health-related quality of life (QOL) in obese children and adolescents compared with children who are healthy or those diagnosed as having cancer. Health-related quality of life (QOL) is a multidimensional construct that includes physical, emotional, social, and school functioning (Schwimmer et al., 2003).

During the study, the selected participants included 106 children and adolescents between the ages of 5 and 18 years, who had been referred to an academic children's hospital for evaluation of obesity. Parents, children, and adolescents each completed a pediatric QOL inventory (PedsQL 4.0; Varni, Burwinkle, Seid, & Skarr, 2003). The inventory was self-administered for all participants except children ages 5 to 7 years. The researchers hypothesized that children and adolescents who were overweight would have worse health-related QOL findings as seen in other pediatric chronic health conditions (Schwimmer et al., 2003).

Findings of the study indicated that compared with healthy children, obese children and adolescents reported significantly lower health-related QOL in all domains (e.g., physical, emotional, social, and school functioning). Sixty-five percent of the sample had one or more obesity-related comorbid condition: diabetes mellitus (3.8%), obstructive sleep apnea (6.6%), tibia vara (1.9%), polycystic ovary syndrome (2.8%), non-alcoholic fatty liver disease (28.3%), hyperinsulinemia (51.9%), and dyslipidemia (36.8%) (Schwimmer et al., 2003). Nine children (8.5%) had asthma, reflecting national prevalence data, and anxiety or depression was present in 14 children and adolescents (13.2%), which is higher than the national prevalence. There were no significant differences in QOL scores by gender or ethnicity, and neither age nor SES were significantly correlated with QOL scores.

Notably, Schimmer et al. (2003) also reported that obese children and adolescents missed more days from school (*M* = 4.2, *SD* = 7.7 days) than healthy children and adolescents (*M* = 0.7, *SD* = 1.7 days). Although the reasons for absenteeism were not explored, these data are similar to the rates of absenteeism found in children and adolescents with other chronic diseases such as diabetes and asthma (Vetiska, Glabb, Periman, & Daneman, 2000).

Acknowledged limitations of this study concern the process of subject recruitment and the degree of obesity encountered. The children and adolescents were selected based on having been referred for evaluation and treatment of obesity. Furthermore, the cohort studied had a mean BMI *z* score of 2.6 (*SD* = 0.5), which is a BMI of approximately 38 in an adult and is in the range of severely obese. These findings may not generalize to samples of children and adolescents with lesser degrees of obesity.

Mental Health

Investigations on psychosocial and behavioral variables associated with obesity have revealed significant differences between overweight and non-overweight adolescents (Datar, Sturm & Magnabosco, 2004; Falkner et al., 2001; Pesa, Syre, & Jones, 2000; Tershakovec, Weller, & Gallagher, 1994). Pesa et al. (2000) used data from female participants of the National Longitudinal Study of Adolescent Health (*n* = 3,197) to determine whether overweight female adolescents differ from normal and underweight female adolescents with respect to a set of psychosocial factors, while controlling for body image. Body image was measured by participants' responses (e.g., underweight, slightly underweight, about the right weight, slightly overweight, and overweight) to a question about how they think of themselves in terms of weight. A multivariate analysis of variance was used to test whether the two groups differed with respect to measures of depression, self-esteem, trouble in school, school connectedness, family connectedness, sense of community, autonomy, protective factors, and grades (Pesa et al., 2000).

Results from the study revealed a significant difference between groups on the combined set of psychosocial factors without controlling for body image and controlling for body image. Prior to controlling for body image, significant differences between the overweight and normal/underweight groups were observed for the following variables: grades (self-report of A, B, C, etc.); self-esteem (e.g., "…you have a lot of good qualities;…you feel you are just as good as other people";…etc.); depression (e.g., "How often were each of these things true during the past week:…you were bothered by things that usually don't bother you?...you felt you couldn't shake the blues, even with help from your friends and family?"...etc.); trouble in school (e.g., "How often during the past month did you have trouble getting along with teachers….with students?...paying attention?"…etc.), and protective factors (e.g., "How much do you feel that adults care for you?" etc.) (Pesa et al., 2000). Furthermore, the factors grades and self-esteem were the most powerful in defining the overall differences among groups. However, after adjusting for body image, self-esteem was only a modest contributor towards defining group differences, while grades continued to make a strong contribution. Additionally, Pesa et al. (2000) found that depression was no longer significant. This suggests that when body image is statistically controlled, depression is not a factor in differentiating overweight and non-overweight female adolescents.

In summary, a major finding of this study was that low self-esteem among overweight female adolescents might be better explained by body image as opposed to the physical condition of overweight. This may be an important discovery for educators and health professionals when they are planning curriculum to educate students on healthy body weight and the choices adolescents can make to achieve a healthy body weight.

Falkner et al. (2001) examined social, educational and psychological correlates of weight status in an adolescent population. They analyzed data collected with an anonymous, classroom-administered survey from a population-based sample of 9,943 (5,201 females) students in grades 7, 9, and 11. Results of this study indicated that obese girls, compared with average weight peers, were less likely to hang out with friends in the week prior, more likely to report serious emotional problems in the last year, and more likely to report hopelessness and suicide attempt in the last year. In addition, they also were more likely to report being held back a grade and to consider themselves poor students compared with average weight girls.

Similarly, overweight boys, compared with average weight peers, were more likely to report not hanging out with friends in the last week and feeling that their friends do not care about them, as well as having serious emotional problems in the last year and considering themselves poor students. Interestingly, underweight boys reported an almost identical pattern of responses. Although underweight boys were more likely to dislike school, obese and overweight boys were more likely to report having future expectations of quitting school.

A strength of the present study is that adjusted models were created to account for confounding variables such as grade, race, social class and the random effect of school. In addition, a large sample size was utilized. A final strength of the study is the proportion of students who were overweight and obese (as measured by body mass index) in the sample mirrored national statistics. The lack of racial diversity in the sample limits the generalizability of these results as race was dichotomized as “white” (approximately 73% of the sample) versus “other” due to small group sizes for the minority racial groups. A replication of this study using a racially diverse sample is worthy of consideration. Another limitation of the present study is that no data were provided with regard to the reliability and validity of the items used to assess social, educational, and psychological correlates of weight status. A brief reference to the technical adequacy of these items would have been appropriate and helpful for evaluating the quality of the instrument.

A study by Tershakovec and colleagues (1994) found that in a group of Black, inner-city school children in Philadelphia, children who were obese, as measured by triceps skinfold thickness (TSF), had significantly more behavior problems and were more often placed in special education classes than their peers. This study was conducted at a public elementary school with third and fourth grade children ($N = 60$) who were of lower socio-economic status as measured by parent education and income. Obesity was defined as a TSF greater than the 85th percentile using age-, gender-, and race-specific norms. Parent responses to the Achenbach Child Behavior Checklist (CBCL; Achenbach, 1991), and the Hyperactivity Subscale of the Conners’ Ratings Scales—Revised (CRS-R; Conners, 1997) were collected during interviews, as well as the child’s birth weight and family income. School performance information (number of absences and placement in remedial classes) was collected from school records. The data were analyzed using an analysis of covariance to test for differences in behavior problems and school performance between obese and non-obese children, while controlling for effects of birth weight, age, gender, family income and school absences.

Descriptive results of this study indicated that in general, sample participants had higher Overall, Internalizing, and Externalizing *t* scores on the CBCL than the population mean. However, the mean hyperactivity subscale score from the Conners' was not different from the population mean. The population means to which the authors referred were not described, and one must assume they are referring to the mean scores of the most recent test standardization samples. In this study sample, over half (54%) the students had a special education placement and a little less than half (45%) had failed one or more grades. Thus, it seems reasonable that their scores would differ from the standardization sample. Furthermore, students are placed into special education for a variety of disabilities that render them unable to learn in a manner that parallels typically developing peers. It is possible that some of the students in the sample who had a special education placement had a medical diagnosis that contributed to their behavioral problems and/or their overweight status.

An analysis of covariance was utilized to evaluate behavior and school performance differences of participants who were obese as compared to the remainder of participants. After controlling for demographic variables, the research team found that children who were obese had significantly more behavior problems as measured by the CBCL. Gender differences were observed for girls on the 'sex problems' subscale ($p < .05$) with girls with a TSF above the 85th percentile scoring higher than boys. On the Conners' hyperactivity subscale, participants with a TSF above the 85th percentile had significantly higher *t* scores ($p < .01$) than non-overweight peers.

This study has several limitations that are worthy of mentioning. First, as mentioned previously, it was unclear as to which population means the sample was being compared in the descriptive statistics. Second, the sample size (N = 60) was very small, especially given the number of variables that were analyzed. Finally, this sample is very homogeneous in the sense that all participants were Black, of lower socio-economic status, the majority had a Special Education Placement, and from one elementary school in Philadelphia. Thus, results may not be generalizable beyond this sample.

A more recent study by Datar et al. (2004) focused on the relationship between childhood overweight and academic performance in school. The data analyzed in this study were from a nationally representative sample of first-time kindergartners from the Early Childhood Longitudinal Study (N = 11, 192). The researchers utilized multivariate regression techniques to estimate the independent association of overweight status with math and reading scores of kindergarten and first grade students. Before controlling for SES, parent-child interaction, birth weight, physical activity, and television watching an effect was found whereby overweight children had significantly lower math and reading test scores compared with nonoverweight children.

Children were given individually administered math and reading assessments in a two-stage assessment. In the first stage a routing test was used to guide selection of the second stage tests which contained items of appropriate difficulty for the level of ability obtained from the routing test. Item response theory (IRT) scale scores were computed for all children to account for students' taking different versions of the tests. These scores were standardized on a t scale.

On average, nonoverweight students performed approximately 1.5 points higher than their overweight peers before controlling for sociodemographics. However, after controlling for socioeconomic differences these effects weakened. For boys, overweight status was not significantly associated with reading test scores, but overweight boys did score 1.22 points lower, on average, than their nonoverweight peers in math. For girls, test scores did not differ in math or reading. The researchers found that in their sample not controlling for socioeconomic status overestimated the strength of the relationship between overweight status and test scores. Specifically, children from families with an income greater than $75,000 and mothers who completed more than a bachelor's degree were significantly less likely to be overweight and also had significantly higher scores on reading and math tests.

Overall, other variables such as mother's education, race/ethnicity, and numbers of hours of television or video watched per day were greater predictors of scores on math and reading tests than overweight status. The authors suggested that these results indicate that "overweight is a marker, but not a causal factor, affecting academic performance" (Datar et al., 2004, p. 67). The authors noted that being overweight is easily observable by students compared with social characteristics and that its association with decreased academic performance may lead to social stigma as early as the first two years of elementary school.

This study included several strengths worthy of mentioning. First, the sample size was extremely large and nationally representative based on 1998 concensus data. Second, data were collected on multiple sociodemographic variables known to impact school readiness skills and academic performance. Third, the authors utilized IRT scale scores to adjust for different versions of tests that were administered, and the reliability indices were very high for reading and math (.93 and .92, respectively). A potential limitation of this study is the limited age range of sample participants. These results cannot be generalized to students beyond the first 2 years of elementary school.

Body Mass Index

As the prevalence of childhood overweight and obesity continues to increase at dramatic rates, the need for a widely accepted measure to assess this serious medical condition has become critical. Measurements of skinfold thickness, body density and weight-for-height are some of the most common measures utilized to assess body composition. Skinfold thickness consists of using a caliper to measure skinfold thickness at a specific body part, usually the tricep, abdomen, or upper thigh. It offers a direct measurement of subcutaneous fat and is well correlated with percentage body fat but inter-observer agreement is usually not high and measurements of fatter individuals are difficult to reproduce (Dietz & Bellizzi, 1999).

Measurements of body density are determined either by underwater weighing or dual-energy X-ray absorptiometry (DXA). Both measures are expensive and require a significant amount of time. In underwater weighing, the weight of the individual is divided by the volume of water displaced by the individual, corrected for air in the lungs and in the GI tract. Then, body composition is estimated on assumed densities of fat mass and fat-free mass (Dietz & Bellizzi, 1999). The use of DXA has become an alternative measure of density. Dual-energy X-ray absorptiometry measures bone density directly and thus can adjust for the composition of fat-free mass. It offers several advantages over underwater weighing, such as immersion is not required so a wider age range of individuals can be assessed, it appears to be less dependent on assumptions about the density of fat-free mass, and no correction is required for residual air in the lungs (Dietz & Bellizzi, 1999).

At present, expert committees from various international health institutes (e.g., World Health Organization [WHO], International Obesity Task Force [IOTF], Centers for Disease Control and Prevention [CDC]) support the use of body mass index (BMI) to help define adult obesity and recommend its use for children and adolescents. However, no consensus exists on the utility of the BMI for children and adolescents (Dietz & Robinson, 1998). For example, the WHO recommends using the BMI 85th percentile to define overweight and the 5th percentile for underweight, with all values in between considered to be in the "expected" range (Wang, 2001). The CDC BMI-for-age growth charts recommend slightly different percentiles. Using age- and gender-specific reference data, values below the 5th percentile are considered underweight; values from the 5th up to the 84.9th percentile are considered an expected weight; from the 85th to 94.9th percentile is considered at risk of being overweight; and at the 95th percentile and above, children and adolescents are classified as overweight (CDC, 2003). These growth curves were developed based on cross-cultural research conducted by Cole, Bellizzi, Flegal, and Dietz (2000) whereby data were collected on approximately 95,000 young people ranging in age from 0-25 years across six countries. The researchers constructed centile curves for BMI for each dataset (separated by country) using the LMS method (Cole et al., 2000).

Proponents of the use of BMI as a measure of adiposity for children and adolescents argue that it is simple, inexpensive, and noninvasive; it correlates with subcutaneous total body fatness in adolescents; and has statistical properties that make it a reliable and valid screening tool (Chen et al., 2002; Rosner et al., 1998). Additionally, Hesketh, Wake, Waters, Carlin and Crawford (2003) found that the BMI is a stable measure of child adiposity for the majority of children and stability appears to increase with age. Moreover, Dietz and Robinson (1998) suggested that clinicians will increasingly use BMI because it is easily calculated from height and weight, two routine measures used in clinical settings and included in medical records.

In a review of the strengths and limitations of existing approaches to the measurement of childhood obesity, Dietz and Bellizzi (1999) reported strong correlations of percentage body fat with BMI in boys and girls of different ages and ethnic groups. They analyzed the results of five empirical studies that evaluated the correlations between BMI and one of two common measurements of body density, underwater weighing, and dual-energy X-ray absorptiometry (DXA, a full body measure of bone density). The resulting correlation coefficients of percentage body fat measured with underwater weighing and BMI were lower than those measured with DXA and BMI, respectively.

All of the studies Dietz and Bellizzi (1999) reviewed had approximately 100 participants with equal samples of boys and girls, which were similarly grouped into age-based categories. However, only two of the studies examined children and adolescents in non-white racial or ethnic groups (Dietz & Bellizzi, 1999). Although correlation coefficients between percentage body fat and BMI for Caucasian and African American children appeared comparable across all ages, African American children had lower percentages of body fat than did Caucasian children with the same BMI (Dietz & Bellizzi, 1999). Dietz and Bellizzi concluded that BMI should be used cautiously in the assessment of overweight across populations until more studies involve ethnic groups other than Caucasians.

Although expert panels such as the International Task Force on Obesity, the European Childhood Obesity Group, and the National Center for Health Statistics support the BMI as a reasonable index of adiposity in children and adolescents, they acknowledge some important limitations to this approach (Dietz & Robinson, 1998). First, because studies on the relationship between percent body fat and BMI have been predominantly exclusive to Caucasian and African American children in a limited number of countries, caution is required when applying BMI cutoff points to assess the prevalence of obesity in other ethnic populations (Chen et al., 2002; Dietz & Bellizzi, 1999; Dietz & Robinson, 1998). Second, most of the "growth curves" have been derived from cross-sectional surveys as opposed to longitudinal studies; therefore, caution is necessary when inferring longitudinal patterns of growth. The resulting curves "may not reflect individual, birth-cohort, or secular-trend effects that may alter longitudinal trajectories of growth among individuals or groups" (Dietz & Robinson, 1998, p. 192).

With these limitations acknowledged, expert panels recommend that growth charts only be used as a first level screening tool. If a child has a BMI value that is outside the expected range for age, the child should be referred for further clinical assessment by a health care provider (Rosner et al., 1998). The health care provider will determine if a more sophisticated and/or comprehensive measure of adiposity is necessary.

Nongenetic Influences on Overweight

Multiple factors are related to the high prevalence of pediatric overweight. Although genetic/endogenous factors (e.g., genes and metabolism) contribute to the development of overweight and obesity (Kiess et al., 2001; Saelens & Daniels, 2003), recent data from the National Longitudinal Survey of Youth (Strauss & Pollack, 2001) indicate that overweight increased so significantly and steadily among all ethnic groups between 1986 and 1998 that it could not be fully explained by genetics. Additionally, the average weight of children who were overweight had increased between 1986 and 1998 (Strauss & Pollack, 2001). This trend is similar to that observed for adults (Hayman, 2002), and suggests that non-genetic/environmental (potentially modifiable) factors may be contributing more to the epidemic than genetic factors.

The following section will present specific discussions of the non-genetic factors that influence pediatric overweight. Toward this end, a thorough discussion of the impact of dietary intake and physical activity behaviors will be presented as these two factors have been well-documented in the literature to contribute to overweight. Within the discussions of dietary intake and physical activity behaviors, factors that have been documented in the literature to impact these behaviors will be presented at the beginning of each discussion.

Dietary Intake

The purpose of this section is to provide a comprehensive discussion of the current trends in dietary intake patterns of adolescents. This section begins with an overview of dietary intake behaviors and then introduces gender, ethnicity, and SES as environmental factors that impact dietary intake behaviors. A discussion of the impact of

BMI on dietary intake will not be provided due to the paucity of research on this factor. To date, very few investigators have explored whether overweight children and adolescents have different dietary intake patterns from their expected weight peers.

The majority of American adolescents are not eating a balanced diet (Neumark-Sztainer et al., 2002). Research on dietary intake patterns of adolescents (Beech et al., 1999; Middleman, Vazquez, & Durant, 1998; Munoz et al., 1997; Neumark-Sztainer et al., 2002) overwhelmingly suggests that adolescents are consuming inadequate servings of fruits, vegetables and grains, and excessive amount of fats and sugars based on the recommendations of the Food Guide Pyramid (US Department of Agriculture [USDA], 1992). At present, the USDA recommends that adolescents eat a minimum of the following number of servings from each food group: grains (6 servings), vegetables (3 servings), fruits (2 servings), dairy (2-3 servings), and meat (3 ounces or 1 serving).

Munoz et al. (1997) examined food intake of 3,307 children and teenagers with the US Department of Agriculture's 1989-1991 Continuing Surveys of Food Intakes by Individuals. They compared the food intake of these children and adolescents with the USDA recommendations and found that 16% of the sample did not meet any recommendations, and 1% regularly ate foods from all five food groups (grains, vegetables, fruits, dairy products, meat/proteins). With respect to fruit and vegetable consumption, less than 36% of participants met the recommendations. Caucasian participants had the highest number of servings of grains and dairy, and African Americans had the highest number of servings of vegetables and meat.

A major strength of the Munoz et al. (1997) study was that in addition to the number of servings of vegetables and fruits youth consumed, they also examined the number of servings of grains, dairy products, and meat products consumed. There have been limited reports on child and adolescent intakes of these latter groups relative to the 2004 Pyramid recommendations. Looking at particular food groups in isolation prohibits a more comprehensive understanding of child and adolescent eating behaviors. Furthermore, if youth are eating too few vegetables and fruits it is important to investigate whether their behaviors are similar or different across the other food groups.

A study conducted by Curtiss (2004) investigated the relation between dietary intake and weight status (overweight versus expected weight as measured by body mass index) in a large, urban southwest Florida school district. The Nutrition and Exercise Survey for Students (NESS) was used to collect data on food choices and exercise behaviors of 179 adolescents. Students in both weight categories reported consuming similar servings across all food groups (e.g., fruits and vegetables, dairy, meat/beans, breads, and junk foods). With regard to fruit and vegetable consumption, overweight students (BMI $\geq$ 25) reported consuming similar servings a day as expected weight students (BMI $\leq$ 24.9). Student-reported behaviors were relatively similar across all food groups based on comparisons of the means and standard deviations. Overweight students reported, on average, consuming similar portions of dairy foods, meat/beans, breads, and junk foods when compared to expected weight students.

A strength of this study is that it is one of the first to assess adolescent behaviors across all food groups simultaneously. Previous studies have focused primarily on dairy consumption, fruit and vegetable consumption, and some studies have looked at grain consumption among adolescents. Another strength worthy of mention is that the sample was culturally diverse and included approximately equal proportions of students who identified themselves as African American, Latino and Caucasian. A potential limitation of this study is related to the relatively small sample size and the fact that, in general, research indicates that adolescents tend to overestimate behavior on self-report instruments.

As mentioned previously, fruit and vegetable consumption among adolescents has been the focus of the majority of studies looking at adolescent dietary intake. Six of seven food intake questions on the 2001 Youth Risk Behavior Surveillance Survey (CDC, 2003) assess intake of fruit/fruit juices and vegetables, and the remaining item asks about dairy product consumption. A driving force behind the focus on fruit and vegetable consumption is that certain types of cancer, diabetes, hypertension, and cardiovascular disease have been linked to inadequate consumption of fruits and vegetables (Block, Patterson, & Subar, 1992; Cavadini, Siega, & Popkin, 2000; Nicklas, Farris, & Smoak et al., 1988; Steinmetz, & Potter, 1996).

Cohort studies on intake of fruits and vegetable have demonstrated their protective effect against cancer (CDC, 2003a). A major concern of health professionals is the impact of poor eating patterns on healthy adolescent growth and development (Society for Adolescent Medicine, 1999). Furthermore, poor eating habits formed in adolescence may continue into adulthood, increasing future risk for development of disease and compromised health (Videon & Manning, 2003).

Numerous surveys have reported that among adolescents, consumption of fruit and vegetables is significantly lower than the recommended amount (Beech et al., 1999; Middleman et al., 1998; Videon & Manning, 2003). Videon and Manning (2003) produced estimates of the frequency of adolescents' (*N* = 18,177) consumption of fruits, vegetables, and dairy foods based on data from the National Longitudinal Study of Adolescent Health (Add Health 1995). The results demonstrated that large percentages of adolescents reported eating fewer than the recommended servings of vegetables (71%), fruits (55%), and dairy foods (47%), and that these patterns differed by race, SES, and parental presence at the evening meal.

Gender

In 1997, Munoz et al. reported differences in adolescent eating patterns across all of the food groups by gender, age, and ethnicity. When food group intakes were averaged, females did not meet minimum recommendations for any group, whereas males met minimum recommendations for grains, vegetables, and meat. Additionally, males were more likely than females to meet dairy recommendations.

Findings of gender differences on intake of fruits and vegetables (F&V) among adolescents are equivocal. Neumark-Sztainer et al. (2002) found inadequate fruit and vegetable consumption to be more prevalent and statistically significant among males than females. In spite of these findings, Beech et al. (1999) reported no significant differences between males and females. Interestingly, Beech et al. found that girls reported being more confident in their ability to eat five servings of F&V per day than did boys.

Gender differences in fat, calcium, and grain intake have also been reported in the literature (Neumark-Sztainer et al., 2002). Results of data from the Minnesota Adolescent Health Survey (MAHS) found that higher percentages of boys (65.1%), compared with girls (47.7%), were consuming 30% or more of their total energy from fat and 10% or more from saturated fat (Neumark-Sztainer et al., 2002). Boys' higher consumption of total energy from fat may be partially explained by the fact that they are more likely than girls to meet the grain, dairy, and meat recommendations (Munoz et al., 1997). Specifically, dairy and meat products can contain high amounts of fat depending on the type of product and/or how it is prepared (whole milk vs. skim; fried chicken vs. grilled chicken breast). In the study by Curtiss (2004), a statistically significant main effect was found for gender on dairy consumption. Boys reported, on average, a mean of 3.29 (*SD* = 1.89) servings of dairy products and girls reported a mean of 2.45 (*SD* = 1.76) servings of dairy products. Despite the statistical significance of this finding, both boys and girls reported meeting the daily recommended servings.

A goal of Healthy People 2010, a comprehensive, nationwide health promotion and disease prevention program developed by the US Department of Health and Human Services (Neumark-Sztainer et al., 2002), is to increase the proportion of persons 2 years and older (target: 75% of all people) who consume no more than 30% of calories from fat and less than 10% of calories from saturated fat. In the MAHS study, lower percentages of girls were consuming the recommended amounts of calcium and grains, which may have been attributed to higher total calorie consumption among the boys (mean = 2252 ± 1111 calories) compared to girls (mean = 2014 ± 1015 calories) (Neumark-Sztainer et al., 2002). Another factor that may contribute to lower percentages of girls meeting recommendations is that girls are significantly more likely to report eating nothing for breakfast than are boys (Videon & Manning, 2003).

Ethnicity

Across ethnic groups, inconsistent patterns of food intake activity have been reported. Beech et al. (1999) reported significant ethnic differences in the frequency of fruit and vegetable intake, with Caucasian adolescents reporting the highest mean consumption (2.70 servings), followed by Hispanics (2.55 servings) and African Americans (2.31 servings). Standard deviations were not reported in this article. This study was conducted in the Archdiocese of New Orleans School System where 83% of eligible participants were Caucasian, 9% Hispanic, and 5% African American and results may not be generalizable to urban public high schools.

Neumark-Sztainer et al. (2002) reported contrary findings where fruit and vegetable intake was lowest among Caucasian adolescents in a sample of 4,746 students from public middle and high schools in the Minneapolis, St. Paul, and Osseo school districts in Minnesota. Hispanic adolescents had the highest percentages of fruit and vegetable intake with 39.1% of girls and 32.5% of boys meeting the Healthy People 2010 target of five combined servings of F&V a day. The ethnic backgrounds of students in this sample were representative of the respective school districts with 48.5% Caucasian, 19% African American, 19.2% Asian American, 5.8% Hispanic, 3.5% Native American, and 3.9% mixed or other.

Overall, the differences in dietary intake among different ethnic groups are equivocal, and studies suggest that both geographic location and ethnicity may affect consumption of F&V (Gower & Higgins, 2003). A lucid finding is that mean food group intake for the adolescent population as a whole is below even minimum recommendations for fruits, vegetables, and grains (Gower & Higgins, 2003; Munoz et al., 1997; Neumark-Sztainer et al., 2002; Story, Neumark-Stzaner, & French, 2002). In the study by Curtiss (2004), adolescents reported consuming, on average, about 3.25 servings of grains a day, far below the recommended 6 daily servings. Interestingly, Curtiss also found that students reported consuming more than the daily recommended servings for meats ($M = 3.30$). However, none of the other aforementioned studies measured whether or not adolescents were consuming too many servings of meat or dairy products, or foods from any food group for that matter. This information would be valuable in terms of understanding whether or not adolescents are eating too many items from particular food groups and would be useful to guide the development of interventions addressing student knowledge of healthy food choices and behavior modification.

Socio-economic Status

Some research demonstrates that a higher percentage of children in higher income categories are meeting the fruit and dairy recommendations with adolescents in lower income categories more likely to consume insufficient F&V (Lowry, Kann, Collins, & Kolbe, 1996; Munoz et al., 1997). Additionally, Videon and Manning (2003) found higher levels of parental education was associated with increased vegetable, fruit, and dairy food consumption. However, two studies (Neumark-Sztainer et al., 2002; Munoz et al., 1997) found that youths with the lowest SES reported the second highest intake levels of F&V (behind youths from the higher SES categories). Both studies reported similar findings on the relationship of SES and fat consumption. These findings are difficult to interpret and have not been consistently documented in the literature. It may be that parents from the lowest and highest SES groups both know the benefits of fruit and vegetable consumption and thus encourage their children to eat these foods. At the same time, both groups may avoid purchasing as many items from the other food groups, but for parents in the highest SES group it may be a matter of choice, while parents in the lowest SES group may not be able to afford to make such a choice.

Barriers to Consuming Fruits and Vegetables

Few studies have focused on the reasons why people and more specifically children, are not consuming adequate servings of F&V. In the past five years, as the issues of pediatric and adult overweight and obesity increasingly are discussed as public health concerns, researchers have begun to identify more environmental variables that contribute to the weight crisis. It is hypothesized that some environmental variables that may affect the consumption of F&V may include time, money, and availability, and thus these are now perceived as "barriers" to consuming F&V. As such, some studies have focused on adult-reported barriers to consuming F&V as being related to low-income status and how income level might affect consumer attitudes and behaviors with regard to F&V availability and consumption (Cawley, 2006; Dibsdall, Lambert, Bobbin, & Frewer, 2003; Topolski, Boyd-Bowman, & Ferguson, 2003).

A few studies have established that fresh foods are more expensive in grocery stores that serve lower SES neighborhoods than those that serve higher SES neighborhoods (Cawley, 2006). In a recent publication by the Woodrow Wilson School of Public and International Affairs at Princeton University and the Brookings Institute, an entire article titled *Markets and childhood obesity policy* was devoted to discussing the relation between market prices for energy-dense foods versus less energy-dense foods (e.g., fresh F&V) and how it relates to childhood obesity policy. A critical finding in this report is that fresh food prices have increased most for low SES populations, which is one factor that contributes to the consumption of cheaper, energy-dense foods (e.g., prepackaged, processed foods containing higher concentrations of fats and sugars) (Cawley, 2006).

Dibsdall and colleagues (2003) analyzed low-income consumers' attitudes and behaviors towards F&V, with a focus on access to, affordability, and motivation to consume F&V. Questionnaires were mailed to 3,000 homes owned by a United Kingdom housing association in East Anglia, England. Part I of the questionnaire assessed attitudes and behavior toward eating F&V across six sub-scales (e.g., Choice, Health, Change, Transport, Affordability, and Organic), whereas Part II elicited demographic information (e.g., age, employment, smoker versus non-smoker, marital status, and gender).

The sample consisted primarily of women (78%) with a mean age of 46.5 ± 20.0 years. The majority of the sample was between 17 and 50 years, and two thirds of participants lived alone (e.g., single, divorced/separated or widowed). Approximately 18% of participants were employed full time, and the majority of them were manual/unskilled or semi-skilled laborers (e.g., cooks, cleaners, delivery drivers) (Dibsdall et al., 2003).

Data analyses revealed that attitudes varied considerably based on key demographic variables. For example, one analysis indicated that mens' and womens' attitudes towards eating F&V differed significantly. However, follow-up analyses indicated that this difference was only significant for the 'Change' sub-scale meaning that women were more likely than men to consider eating more F&V to lose weight or protect themselves against cancer (Dibsdall et al., 2003). Age of participants also influenced attitude scores; specifically, younger participants were less likely to believe they were eating healthily and enjoyed F&V less than participants in increasing age groups.

Interestingly, the oldest group reported being the least likely to change their diet to eat more F&V and also were more likely to use public transportation to do shopping than younger groups (Dibsdall et al., 2003).

In terms of access to food, about 88% of participants strongly/moderately agreed that the places in which they shopped have a wide choice of fresh F&V. Fifty-seven percent strongly agreed that they had access to a wide choice of food shops in their local area; and the majority indicated that getting to a grocery store was easy to do, that they did most of their shopping in large supermarkets, and that they shopped more than once a week. Few people complained about the choice of fresh, frozen or canned F&V available to them.

Dibsdall et al. (2003) also analyzed affordability and found that 76.5% of participants reported believing that F&V were affordable in the store where they primarily shopped. Interestingly, although the majority of participants (75%) thought F&V were reasonably priced, 53.5% thought buying more F&V would be difficult due to high costs. The participants who reported between 0-2 servings of F&V a day were most likely to report they could not afford to budget for more F&V.

With regard to motivation to eat healthily, Dibsdall et al. (2003) found that participants who had the lowest reported levels of F&V consumption (0-2) perceived they had less choice than those reporting to eat 5 or more servings a day. Nearly 75% of participants reported believing they ate healthily, however the large majority (82%) reported to consume 4 or fewer servings of F&V per day. Interestingly, participants who reported consuming the daily recommended 5 servings of F&V a day tended to be in the age group 51-70 years, and were mostly female and widowed, while those reporting to eat 0-2 servings a day tended to be young, single, male, smokers, and unemployed. Dibsdall et al. concluded that these findings were consistent with the "view that people who make one 'unhealthy' lifestyle choice, for example smoking, are more likely to make others such as eating a poor diet" (p. 165).

Overall, this study made several contributions to the literature in terms of key findings. First, in this sample, accessibility to F&V was not really an issue, but it should be mentioned that the large majority of participants lived in an urban setting with access to an affordable and reliable public transportation system. These findings may not be replicated in rural settings, or in modern-day American cities in which urban sprawl is predominant and people must rely on automobiles for quick, easy travel. Second, the findings in terms of affordability issues were paradoxical in that 34% reported lack of money prevented them from eating healthily and yet only 4% disagreed with the statement that they eat healthily. Dibsdall et al. (2003) hypothesized that people may be more likely to report 'lack of money' as a barrier to consuming healthy foods rather than to consider other explanations. For example, it is possible that they had become comfortable with their current F&V purchasing habits and considered buying additional F&V as an added expense as opposed to exchanging other food items for F&V. Dibsdall et al. indicated that 'buying more' of something could be a psychological barrier as opposed to a real financial barrier.

Finally, Dibsdall et al. (2003) found that with regard to motivation to eat healthily, more than 70% of participants reported believing that they ate a healthy diet. Yet, only 18% reported consuming the recommended 5 combined servings of F&V daily. The researchers hypothesized that a potential barrier based on these results could be a lack of awareness/education as to what constitutes a healthy diet. It is possible that people do not truly understand the details of consuming a healthy diet, especially in modern day where many foods are marketed as healthy and have names that suggest they contain fruits when in reality they are processed, sugar-dense items. In addition, to what extent the general public is truly knowledgeable about what constitutes a serving size across the various food groups can be questioned.

Topolski and colleagues (2003) examined the quality of foods available to people in neighborhoods of varying SES (high, medium, and low SES). The issue of availability of fresh produce has been identified as a potential barrier to adequate F&V consumption (Cawley, 2006). In this study, median incomes from the 2000 U.S. census and median house prices were used to measure SES. Topolski et al. had participants (18 students with 12 females in an upper-level psychology course) use two methods to rate their perceptions of fruit quality (appearance and taste): 1) a relative ranking of each fruit and 2) a 9-point Likert scale. Fresh fruit was purchased from three sites of two different supermarket chains (chains X and Z) in a mid-sized southern city (6 total stores). Strawberries, bananas, and green grapes were bought the night before the study from the three different store sites of two major grocery stores. Fruit placed in the lowest left corner of the display shelf was always purchased for the experiment to guarantee unbiased fruit selection. All fruits were placed on identical white papers.

Results from the appearance scales were consistent with Topolski et al.'s (2003) main hypothesis whereby a main effect was observed for perceived freshness based on the SES of the neighborhood in which the store was located. Thus, fruit bought in stores in lower SES neighborhoods was rated as appearing less fresh than fruit purchased in higher SES neighborhoods on both rating scales. In addition, an interaction was observed for supermarket chain and SES of neighborhood. Significant differences in fruit quality were observed for both chains X and Z between low and high SES stores, but only chain Z revealed differences between its low and middle SES sites based on participant ratings (Topolski et al., 2003).

Results from the taste scales also indicated that fruits from lower SES neighborhoods received lower ratings for taste than fruits from higher SES neighborhoods based on both rating scales. Interestingly, participants were much more likely to refuse to taste fruits bought in lower SES neighborhoods. In fact, three participants refused to taste fruits purchased from chain Z located in a low-SES neighborhood.

Overall, results of this study indicated that participants rated fruits bought at two chain grocery stores from lower SES neighborhoods as both appearing and testing less fresh than their counterparts in higher SES neighborhoods. Thus, given the same supermarket chain, differential quality of produce items can exist depending on the location of the store (lower-class neighborhood versus higher-class neighborhood). Further, Topolski and colleagues (2003) argue that similar results could be obtained if other forms of perishable foods were analyzed for freshness and taste; specifically, meats and vegetables.

A notable strength of this study is it provided a solid methodology that could be replicated in other regions of the US to test freshness and taste of different types of perishable goods across different neighborhoods of different income levels. Given that people of color and people who are poor are generally less healthy than their White, wealthier counterparts, it seems important that this body of research be expanded in order to uncover disparities in access to high quality foods at the institutional level. A potential limitation in the present study is that the sample was very small and consisted solely of college students, thus it would be interesting to see how people of different education levels would rate foods in a similar study.

Cullen et al. (1998) identified factors influencing F&V consumption by collecting data through focus groups with Boy Scouts and their parents in Houston, TX. They interviewed 99 African American and European American Urban Scouts (ages 10-16 years) and their parents and had 85 boys complete 24-hour dietary recalls. Essentially the researchers were collecting data on factors influencing F&V consumption among boys in order to evaluate a potential intervention that would increase F&V consumption.

Through the Urban Scouts and parent focus groups, many issues were identified as contributing to F&V consumption. Among the Urban Scouts ($N = 99$), the following issues were identified as influencing F&V consumption: 1) not liking the taste (particularly vegetables), which the boys compared to the taste of sweet candy; 2) mothers did not teach them when they were little (to consume F&V); 3) vegetables were not easily accessible; 4) not liking the ones served at school; 5) the ones served at school are sold as alternate items; 6) peers do not approve of vegetable consumption (fruits are more accepted than vegetables); and 7) boys' F&V preparation skills are limited (Cullen et al., 1998). Parent groups ($N = 39$) identified the following issues as influencing their child's F&V consumption: 1) the tastes (children do not like them); and 2) they expected their sons to fix their own raw-vegetable snacks. Overall, it appears that among the scouts and parents alike, taste was a major barrier to consuming F&V. In addition, boys did not seem to find F&V readily accessible nor did they have knowledge of how to prepare F&V and thus, F&V were not a snack of choice. In addition, boys' reported not liking the F&V options at school. This finding coupled with the home findings indicates that across the settings where children had opportunities to eat F&V they may not have had *easy* access to *preferred* F&V.

This study provided interesting insight on boys' perspectives of factors that influence F&V consumption. The results of this study are limited in terms of generalizability, however, in that they sampled a small group of boys (N = 99) (particularly boy scouts) and parents (N = 39) in a large, urban city in Texas. Information on participant SES was not provided so these results cannot necessarily be generalized to boys who cannot afford to participate in boy scout groups. Furthermore, Cullen et al. (2006) did not provide much in the way of quantitative data (descriptive statistics) to illustrate the percentage of students or parents who agreed with each of the factors identified in this study as influencing F&V consumption. Despite these limitations, this study identified a number of factors influencing F&V consumption that could be targeted for intervention and provided a methodological outline for conducting a similar study in the future on other child populations.

Baranowski et al. (1993) conducted focus groups with 4th- and 5th-grade students to design a school nutrition program that targeted increasing F&V consumption. In this study 235 students (Afro-Americans and Anglo-Americans), predominantly of lower socioeconomic background, were interviewed from one public elementary school in the Richmond County School System. Fifteen parents were also interviewed. The results of these focus groups revealed that consuming more F&V was considered a problem of the environment, affect, and skills (Baranowski et al., 1993).

The environment refers to the environments in which families buy, prepare, choose and/or consume various F&Vs, such as, grocery stores, convenience stores, markets, restaurants, homes, schools and daycares, etc. As such, these environments can be at the institutional level (families, schools, fast-food restaurants, friends' houses) or at the individual-child level. Whether or not F&Vs were available for children (individual level) depended on things that happened earlier at the institutional level. The children reported that they participated in food shopping with their families and sometimes in meal preparation, such that they had some input over food availability in the home environment. Parents indicated that they did not serve F&V to their children that they themselves did not like (Baranowski et al., 1993). At school, children indicated that the vegetables were often cold and not prepared in an appealing manner. In addition, the researchers observed that the school had a store, but only candy was offered for purchase. Thus, it appears that children may have limited choices in their natural environments with regard to availability of F&V.

In terms of affect, both childrens' general liking of foods was explored and their expectancies of whether or not the food is "good" for their health or not. Barnowski et al. (1993) found that most children liked most fruits but that this was not true for vegetables where children reported to like only one or a small number of vegetables (particularly, corn). Children reported liking the vegetables they consumed in the home, and there was high variability as to which vegetables were liked or disliked, for example, greens were strongly liked and strongly disliked by children. Furthermore, greens were reported as not eaten when served at school, especially when they were not prepared in a way in which children typically consume them in the home. With regard to shorter-term expectancies associated with F&V consumption, children identified many positive (e.g., Fun: peeling is fun; juicy is fun; popping them in your mouth is fun; Builds muscles: be big & strong; avoid fatness; Look pretty: beautiful, etc.) and a few negative expectancies (e.g., Makes you "go to the bathroom"; Makes you "toot"; Gets stuck in teeth; Can be allergic to them). With regard to longer-term expectancies associated with F&V consumption, children identified a few positive (mostly related to appearing physically attractive) and no negative expectancies.

Finally, Baranowski et al. (1993) identified a final factor that influenced F&V consumption titled 'behavioral capability' (e.g., the knowledge and skills necessary to perform a task). In general, children could name the basic food groups and knew how to classify foods in the correct group. However, differentiating junk foods from snacks was more difficult for students. In addition, there was confusion with regard to whether or not chips are a vegetable since their primary source is corn or potatoes, as well as confusion on whether fruit roll-ups and fruit chews contained enough fruit content to be considered a fruit. Curtiss (2004) also found that children were similarly confused on how to classify items such as potato chips, fruit roll-ups, and fruit chews, as well as drinks that are marketed as fruit punch like *Hawaiian Punch*. Finally, the researchers found that children tended to believe that if a food tastes good it must be unhealthy; and on the contrary, if a food tastes bad it must be healthy.

Overall, these results point to the fact that children's consumption levels of F&V are affected by multiple variables, and results of this study point toward variables of the environment (increasing F&V availability), affect (preferences for F&V and beliefs about their nutritional content), and behavioral capability (teaching children skills in F&V preparation) (Baranowski et al., 1993). The results of this study were replicated in another study conducted by Hearn et al. (1998). Thus, in order to increase F&V consumption among children and adolescents, interventions must be designed to address a number of variables and may need to involve parents as well. As always, focus groups provide qualitative data and have methodological limitations such as, group dynamics, self-report of information, and a limited range of questions. However, this study identified several factors that can be conceptualized as possible barriers to consuming F&V among children and further survey data are warranted to clarify the prevalence of these beliefs among other populations.

In summary, a number of variables have been identified as barriers to F&V consumption in the literature. Among adults, variables like access to grocery stores; having choices of fresh, frozen or canned F&V; affordability; and lack of awareness/education of which foods are part of a healthy diet were identified as possible barriers to F&V consumption. For children, barriers to F&V consumption seemed to fall within the categories identified by Baranowski et al. (1993) and supported by other researchers. First, barriers of the environment, such as availability at home or at school; parents encouraging F&V consumption; availability at fast-food restaurants; and especially, availability of preferred F&V items. Second, barriers of affect were identified, such as preferences for F&V that are commonly served in the home; whether or not peers approved of eating different F&V; and beliefs about the nutritional content of F&V. Finally, barriers related to behavioral capability were identified such as child knowledge and ability to prepare F&V snacks and the knowledge and skill to correctly classify different foods into their food group category.

Other Factors

A complex myriad of factors are associated with adolescent eating behaviors. Some of the factors that influence adolescent food choices are related to individual influences like food preferences, taste, and sensory perceptions of food, self-efficacy, and knowledge. Social-environmental influences have also been implicated, for example, family environment, demographic characteristics (ethnicity, SES, culture, age, and gender), family meals, peers, and the media/advertising; and finally, physical-environmental influences such as school environment, fast-food restaurants, vending machines and convenience stores (Hayman, 2002; Middleman et al., 1998; Story et al., 2002). These influences are just starting to receive attention in the literature; however, at present the degree to which each of them influences pediatric overweight is not clear. The present study does not include these factors because they are difficult to measure within a school setting and valid tools to assess these factors are still being developed. A comprehensive review of these influences is available (Hayman, 2002).

In summary, numerous studies have identified that American adolescents are not eating a balanced diet. More specifically, adolescents as a whole are consuming inadequate servings of fruits, vegetables and grains, and excessive servings of fats and sugars based on the recommendations of the Food Guide Pyramid. Although some studies suggest that specific ethnic groups are more likely to consume adequate servings of some food groups than others, the research is equivocal and no consistent patterns of food intake can be identified. However, gender and SES differences have resulted in consistent patterns. Boys are more likely than girls to meet the grain, dairy, and meat recommendations, and also consume higher percentages of calories from fat. With regard to SES, youth from higher income categories are more likely to meet the fruit and dairy recommendations when compared to youth in lower income categories, but interestingly, youth from the lowest SES categories report the second highest intake levels of F&V.

Physical Activity

The purpose of this section is to provide a comprehensive discussion of the current trends in physical activity patterns of adolescents. This section begins with an overview of physical activity behaviors and then introduces the variables gender, ethnicity, and BMI as environmental factors that impact physical activity behaviors. A discussion of the impact of SES on physical activity will not be provided due to the paucity of research on this factor.

Data from seminal nationwide surveys, the Youth Risk Behavior Surveillance System (YRBSS), the National Longitudinal Study of Adolescent Health (Add Health), and Third National Health and Nutrition Examination Survey (NHANES III), demonstrate that the percentage of students who participate in physical education classes in high school has steadily decreased over the last decade. For example, 59.6% of surveyed students (grades 9-12) reported participating in physical education classes in 1995, but two years later only 48.8% reported participation (Dowda et al., 2001). The percentage of students participating in daily physical education classes decreased even further in 1997 to 27% (CDC, 1997). Furthermore, on the 2001 Youth Risk Behavior Surveillance System (YRBSS), Florida youth were less likely to engage in physical education than U.S. high school students in general (CDC, 2003). Traditionally, physical education classes provided students with the opportunity "to learn about physical activity and exercise, develop behavioral and motor skills that support lifelong activity, and encourage physical activity outside of physical education classes" (Andersen et al., 1998, p. 938). As such, the decline in physical education participation may result in significant public health implications.

A report of the Surgeon General (CDC, 2003) recommends that adolescents engage in at least three bouts of moderate to vigorous physical activity per week during which they sweat or breathe hard for 20 minutes or more on each occasion. Additionally, moderate physical activity is recommended on a daily basis, with a minimum of five bouts a week, and includes engaging in any of the following activities for at least 30 minutes: walking two miles, mowing the lawn or performing household chores (e.g., mopping), skipping rope, and riding a bike.

Regular physical activity is associated with a number of positive health benefits. Physical activity is particularly important for the development and maintenance of healthy bones, muscles, and joints; to help control weight gain and reduce body fat; and to prevent or delay the development of high blood pressure (CDC, 1997). It can also help to increase flexibility, balance, and endurance (CDC, 1997). Additionally, Pate, Trost, Levin, and Dowda (2000) found a positive association between physical activity engagement and health related behaviors (i.e., increased consumption of F&V, decreased engagement in cigarette or marijuana use and alcohol consumption).

Prevalence estimates of the number of bouts of vigorous physical activity per week for U.S. children (8-16 years) from NHANES III data indicate that overall, 80% of children reported engaging in vigorous physical activities that made them sweat or breathe hard three or more times per week (Andersen et al., 1998; Dowda et al., 2001). In the 1996 Add Health study, 33.2% (*N* = 13,157) of the adolescents reported that they participated in five or more episodes of moderate to vigorous physical activity per week (Gordon-Larsen, McMurray & Popkin, 1999). Based on data from the National Health Interview Survey, the CDC reported that only 65% of adolescents engaged in the recommended amount of vigorous physical activity in 1999. As a result, the CDC has incorporated a physical activity and fitness objective in the *Healthy People 2010* campaign targeted toward adolescents: increase the proportion of adolescents who engage in vigorous physical activity that promotes cardiovascular fitness at least 3 days per week for 20 or more minutes per session (CDC, 2001).

Gender

Nationally and in the state of Florida, boys of all ethnic groups report higher levels of engagement in vigorous physical activity, exercise programs and sports participation than girls report (Andersen et al., 1998; Dowda et al., 2001; Gordon-Larsen et al., 1999; Pate et al., 2000). For example, data from the 2003 YRBSS indicated that 73.1% of male youth in the U.S. participated in vigorous activity in three of the last seven days, compared with 59.1% of female youth (CDC, 2004). The percentage of Florida male and female youth engaging in vigorous activity was very similar to the national prevalence 73.8% and 55.8%, respectively (CDC, 2004). Male youth are also more likely to participate in high school and/or non-school sports teams (Pate et al., 2000).

Andersen et al. (1998) reported high prevalence rates of vigorous physical activity engagement for both boys and girls with data from NHANES III. In their study, 85% of boys reported vigorous physical activity engagement compared to 74% of girls. A phenomenon central to both gender groups is a decrease in bouts of physical activity engagement with increasing age and/or grade level (Andersen et al., 1998; Gordon-Larsen et al., 1999; Troiano, 2002). Statistics released by the CDC indicated that 68.5% of 9th-grade students reported engaging in vigorous physical activity compared to 55% of 12th graders (CDC, 2004). In regards to participation in daily physical education classes, 55% of high school students nationally and 45.6% of high school students in Florida reported such behavior (CDC, 2004).

Ethnicity

Nationally and in the state of Florida, African American (54.8%) and Hispanic (59.3%) youth are less likely than Caucasian (65.2) youth to engage in vigorous activity and moderate physical activity and more likely to report no vigorous/moderate physical activity in the last seven days (Andersen et al., 1998; CDC, 2004). In contrast, data from the 2003 YRBSS indicate that African Americans (33%) and Hispanics (36.7%) are more likely to participate in daily physical education classes than their Caucasian (24.9%) peers (CDC, 2004).

The 1996 Add Health study reported small ethnic differences in the number of episodes of moderate to vigorous physical activity per week for males (Gordon-Larsen et al., 1999). Two studies (Andersen et al., 1998; Gordon-Larsen et al., 1999) observed an interaction between gender and ethnicity, with minority females engaging in much lower levels of moderate to vigorous physical activity compared to Caucasian females. Almost half of the African American females and 41.6% of Hispanic females in the study reported engaging in 0-2 sessions of vigorous physical activity per week.

In a study on sports participation and health-related behaviors among U.S. youth, Pate et al. (2000) reported that Caucasian students (65.6%) were more likely than African American (55.2%) or Hispanic students (52.5%) to report sports participation. Pate et al. found that participation on sports teams was associated with an increase in many positive health behaviors. For example, for males and females across all ethnicities, sports participants were more likely to report eating F&V on the previous day and more likely to report three or more 20-minute sessions of vigorous physical activity in the previous week.

In regards to engagement in sedentary activities (e.g., watching television and videos, playing computer and video games), African American and Hispanic youth report higher levels of engagement compared to Caucasian youth (Andersen et al., 1998; Curtiss, 2004; Dowda et al., 2001; Gordon-Larsen et al., 1999; Pate, Heath, Dowda, & Trost, 1996; Troiano, 2002). Nationwide, approximately 26-30% of youth reported watching four or more hours of television per day (Andersen et al., 1998; Dowda et al., 2001). Gordon-Larsen et al. (1999) analyzed mean number of hours of television per week and mean composite inactivity hours per week (TV and video viewing, and computer and video game playing) and found that African Americans reported the highest levels of inactive engagement followed by Hispanics and Caucasians. Specifically, African Americans reported 29.7 composite inactivity hours per week, followed by Hispanics (22.2 hours) and Caucasians (19.3 hours).

BMI

Boutelle et al. (2002) evaluated weight control behaviors, eating, and physical activity behaviors among obese, overweight, and non-overweight adolescents. Their results showed that there is an inverse relationship between weight status in male and female adolescents and engagement in vigorous physical activity three or more times per week. As compared to the non-overweight group, overweight and obese youth were significantly less likely to report three or more bouts of physical activity per week (Boutelle et al., 2002).

Other studies (Maffeis et al., 1997; Mayer, 1975) have found that obese children are less likely to participate in moderate or vigorous activity and more likely to participate in sedentary activity. In contrast, Huttenen, Knip, and Paavilainen (1986) found no difference in the time non-overweight and obese children spent in physical activity, but obese children were less likely to participate in formal sports teams and received lower grades in physical education in school. Similarly, Curtiss (2004) found no difference in adolescents' self-reported engagement of vigorous and moderate physical activity. Overall, the literature is scant on whether or not BMI is associated with decreased participation in physical activity. Furthermore, the existing studies reported mixed results, and there is a need for further investigations in order to obtain a clearer understanding of the relationship between weight status and engagement in physical activity.

Barriers to Engaging in Daily Physical Activity

Although the amount of time students spend in physical activities within school settings is on the decline, very few studies have examined the reasons for this decline or lack of physical activity involvement (Barroso, McCullum-Gomez, Hoelscher, Kelder, & Murray, 2005). Barroso et al. (2005) evaluated the barriers to quality physical education (PE) curriculum as reported by elementary school PE specialists using a survey adapted from the CATCH Institutionalization School Staff Questionnaire. Specialists who participated in the Coordinated Approach to Child Health (CATCH) program in Texas from 2000 to 2003 were recruited for participation in this study. The CATCH program was designed to prevent risk factors for cardiovascular disease in addition to type 2 diabetes and obesity.

In total, 596 of 1599 CATCH specialists (37%) responded to the survey over the 4-year study. Participants were asked to indicate their level of agreement with eight items on a five-point Likert-type scale (1 = strongly disagree to 5 = strongly agree). The eight barriers included (1) inadequate indoor and/or outdoor facilities, (2) insufficient number of PE specialists, (3) low level of principal support, (4) low priority relative to other academic subjects, (5) inadequate financial resources, (6) large class size, (7) insufficient time in school day, and (8) insufficient equipment and materials. The respondents were mostly female (~62%) and white (~60%), and had an average of greater than 10 years teaching experience (Barroso et al., 2005).

The barriers to quality PE that were most commonly reported across the 4-year study included large class size and low priority relative to other academic subjects. Other barriers that ranked high were inadequate financial resources and inadequate indoor and/or outdoor facilities. Respondents were also provided an opportunity to comment on their teaching experiences by writing in their response in a comment section. These qualitative data supported the data obtained from the survey rankings, and identified two additional themes: insufficient number of PE specialists and lack of support from other teachers and parents.

A couple of strengths of this study are worthy of mention. First, the study included a relatively large sample size based on survey response rates ranging from 20.9% to 58.6% over the 4-year study. Second, the researchers utilized a mixed-methodology design. In addition to collecting quantitative data based on responses to survey items, the research team provided participants with an opportunity to make qualitative comments. A potential limitation to the interpretation of scores obtained from the survey is that the authors failed to provide information on survey reliability and validity. Also, the generalizability of the research may be limited to the perspectives of white, female PE teachers due to sample characteristics.

Barriers to engagement in physical activity can also be identified at a community level. Gordon-Larsen and colleagues (2006) analyzed the relationship between access to recreational facilities in community settings (or lack thereof) and its impact on physical activity and overweight in US adolescents. The authors also assessed the relations between community physical activity and recreational facilities and individual-level physical activity and overweight. The independent variables included population density, proportion of population with college degree or higher, and proportion of population who identified as 'nonwhite'. These data were obtained from the 1990 Census of Population and Housing Summary Tape File 3A. Using data from the National Longitudinal Study of Adolescent Health (*N* = 20,745), residential locations of US adolescents were geocoded using Geographic Information Systems (GIS) technology whereby an 8.05-km buffer was drawn around each residence resulting in 42,857 census-block groups. The authors used the census-block groups to explore the relation between the independent variables and access to physical activity facilities.

To identify the physical activity facilities the 4-digit Standard Industrial Classification codes (SIC) were utilized. Additionally, a textual query was developed to identify YMCA/YWCA facilities which do not have their own unique SIC codes. The types of physical activity and recreational facilities identified in this study included: schools, public facilities (e.g., public beaches, pools, tennis courts, etc.), youth organizations (e.g., YMCA/YWCA), parks, public fee facilities (e.g., physical fitness, bicycle rentals, public golf courses), instructional facilities (e.g., dance studios, martial arts, basketball instruction), outdoor facilities (e.g, sporting and recreational camps, swimming pools), and member clubs (e.g., athletic club and gymnasium, tennis club, etc.).

Results of this study indicated that a wide variety of physical activity facilities were available in census-block groups where there was a higher proportion of college-educated people, whereas less-advantaged block groups were significantly less likely to have a variety of facilities. Additionally, there was a significant interaction between the proportion of the population with a college education and the high-minority population on access to facilities (Gordon-Larsen et al., 2006). In block groups where 55% of the people were college educated, the relative odds of having at least 1 facility was significant for all facility types. As the percentage of minority population increased (e.g., from 5% minority to 95% minority), the relative odds of having at least 1 facility decreased slightly. This decrease was more extreme across various proportions of minority populations in the low-educated groups. When only 5% of the block group had a college education and 5% was minority, the odds ratio of having at least 1 facility was significantly lower than the 55% college educated group. The ratio decreased even further for the 5% college educated 95% minority group. Clearly, education status and minority status both affected access to physical activity facilities.

Individual analyses examined the relative odds of overweight and engaging in moderate-vigorous physical activity (≥5 bouts of engagement per week). Not surprisingly, the results indicated that relative odds of overweight decreased with increasing number of physical activity facilities per block group (Gordon-Larsen et al., 2006). A 5% decrease in the odds of overweight was associated with having only 1 facility per block group as opposed to no facility. Similarly, having just 1 facility was associated with increased odds of engaging in moderate-vigorous physical activity. In census-block groups with 7 facilities, adolescents living in this area were 32% less likely to be overweight and 26% more likely to be highly active as compared to adolescents who lived in block groups with no facilities (Gordon-Larsen et al., 2006).

Overall, the results of this study indicated that adolescents from families with lower levels of education and from ethnic minorities are at risk for lack of access to physical activity facilities. The inequality in access to physical activity facilities may be considered a major barrier to engagement in physical activity recommendations and may also be associated with increased proportion of overweight status. Acknowledged limitations in the present study include its cross-sectional design, and lack of consideration for other factors in the environment that may equally impact obesity and health-related behaviors such as, neighborhood walkability, land use, and grocery store distribution. A major strength of this study is that it provides crude associations between census-block level demographics and access to physical activity facilities at a national level. Additionally, the research design incorporated sophisticated technologies to provide most accurate data number and type of physical activity facilities available.

A recent publication by Fahlman and colleagues (2006) examined the relation between ethnicity and socioeconomic status (SES) and barriers to exercise among female high school students. In this study, 1,314 students completed a survey on which 7 questions assessed perceived barriers to exercise, 5 assessed activity level and 3 were demographic questions. The barrier survey items were tested for internal consistency reliability using Cronbach's alpha and were found to be reliable. Participant's BMI and percent body fat also were assessed in this study and included as dependent variables.

Results of this study demonstrated significant main effects for ethnicity and SES and ethnicity x SES interaction. The researchers conducted *post hoc* analyses which revealed ethnic differences across all dependent variables. In terms of barriers to engagement in physical activity, Hispanic females reported the highest levels of perceived barriers, followed by African Americans, and White females. The main effect for SES indicated that Low SES females reported higher levels of barriers as compared to High SES peers. Minority students had the highest proportion of overweight based on BMI and minority students also had higher percent body fat as compared to White peers.

To identify barriers to physical activity, participants chose between the following responses: 1) agree, 2) neutral, and 3) disagree. A closer look at the responses to barrier items based on ethnicity revealed that high percentages of African Americans agreed with the following three barriers to being physically active: 1) *exercise makes me look unattractive* (79%), 2) *I do not feel safe in my neighborhood* (~75%), and 3) *it makes me sweat too much* (71%). Hispanic students responded somewhat differently and high percentages reported that they agreed with the following barriers to being physically active: 1) *I don't feel like it* (80%), 2) *exercise makes me look unattractive* (75%), and 3) *exercise is uncomfortable* (71%). For White participants, the following responses had the highest percentage of 'agree' responses: 1) *it makes me sweat too much* (31%), 2) *it makes me tired* (31%), and 3) *exercise is uncomfortable* (30%). Overall, Fahlman and colleagues (2006) found that White participants reported higher percentages of 'disagree' responses across all of the barrier items, thus, perceiving fewer barriers to exercise. Interestingly, African American and Hispanic females were more likely to believe that exercise was a barrier to maintaining an attractive appearance, whereas the majority (85%) of White females disagreed with this statement. This perception may be a contributing factor to the higher proportion of overweight among minority participants in the present study and is worthy of future investigation.

Self-acknowledged limitations of this study included that the research was conducted on a selected sample representing female students in a Midwestern city and cannot necessarily be generalized to other samples. In addition, the survey data were based on adolescent self-report and participants may have responded in ways they believed were socially desirable. Several strengths are also worthy of mention. First, this study is reportedly one of the first to examine barriers to exercise by ethnicity and SES in female adolescents. Specifically, this study examined differences among Whites, African Americans and Hispanics, whereas previous studies have focused solely on differences between Whites and African Americans. Additionally, the methods utilized in this study consisted of a large sample, a measurement tool that has evidence of reliability with previous sets of data scores, and rigorous data analyses that included Bonferroni corrections and Tukey *post hoc* tests to control for type I error and make pairwise comparisons for ethnicity.

Wilson, Williams, Evans, Mixon and Rheaume (2005) identified preferences for physical activity and motivational themes for increasing physical activity among minority and low-SES populations (all students were enrolled in the free or reduced-price lunch program at their school). In this study, 51 adolescents (25 males, 72% African American) in the 6^{th} and 7^{th} grades participated in same-gender focus groups conducted by trained moderators that focused on physical activity.

Although this study did not directly assess barriers to engagement in physical activity, one might infer barriers based on student identified motivational themes for physical activity. The eight motivational themes that emerged across gender included: 1) fun, 2) health benefits, 3) choice of activities, 4) sport-based physical activity, 5) physical activity with friend, 6) to prevent boredom, 7) skill-based physical activity, and 8) outdoor physical activity. Both boys and girls indicated that they wanted to engage in physical activity "to have fun" and that they believed it was important for health benefits. Girls also frequently reported that having a choice of activities would motivate them and they seemed to be interested in a wider variety of activities than boys (i.e., jump rope, swimming, roller-skating and jogging). Boys frequently reported wanting to be able to engage in sport-based activities that involved teams (i.e., football, basketball, soccer). Thus, it might be inferred that potential barriers to engagement in physical activity possibly include boring activities, activities that do not provide health benefits, lack of choice in activities, and activities that do not involve friends.

Participants were also questioned about their preferences for mixed or same-gender groups while engaging in physical activities. Female participants indicated that they would prefer same-gender groups, whereas male participants indicated they wanted to engage in mixed-gender groups (Wilson et al., 2005). Boys also indicated that they believed girls were just as capable as boys at playing sports and girls indicated that they believed boys were more interested in 'showing off' during physical activities. This finding may have implications for school-based physical activity programs given the fact that girls are considerably less likely than boys to meet federal recommendations for vigorous and moderate physical activity. If girls were afforded more opportunities to engage in same-gender activities, their activity levels in school may increase and thus, a potential barrier to engagement in physical activity might be removed.

These findings are limited in that the study was conducted on a small sample (N = 51) in a southeastern region of the Untied States. Another limitation is that adolescents were asked questions in a focus-group format in front of their peers which may have biased participant responses. However, this study contributed to the literature in that it identified motivational themes and preferences for engaging in physical activity in underserved, low-SES and minority students. These findings might be useful in school-wide physical education and sports activity programming. In addition, these findings indicate that it might be appropriate for school staff to include students when making programming decisions for promoting physical activity behaviors.

Finally, a study by Brener et al. (2006) examined the percentage of US schools meeting the recommendations in the School Health Index (SHI), a self-assessment and planning tool that allows schools to identify the strengths and weaknesses of their health policies and programs. Data from the School Health Policies Program Study (SHPPS) 2000 were collected through personal interviews with faculty and staff at schools and utilized for this study. The SHPPS questions were matched to SHI items to determine the percentage of schools meeting recommendations for physical education and other physical activity programs.

Nine-hundred twenty one schools completed interviews related to physical education policies and programs. Of these schools, only 6.2% indicated meeting the SHI criterion of 225 minutes of physical education per week at the middle- and high-school levels and 8.0% of elementary schools met the criterion of 150 minutes of physical education per week (Brener et al., 2006). Among middle- and high-schools, few schools met the criteria for adequate teacher-student ratio, individualized physical activity/fitness plans, promote community physical activities, and instruction for special health care needs.

Given what is known about the trend for decreased opportunities for physical education and recess in schools, these data are not surprising. Few schools require daily physical education for students at the elementary and secondary levels. Because many students who are at-risk for overweight come from low-SES environments in which there are fewer parks and recreation facilities in which to safely engage in physical activity, it becomes even more important that these children have opportunities for physical activity while at school. When schools do not provide this opportunity, these children are placed at higher risk for poor health outcomes.

A self-acknowledged limitation of this study is that originally the SHPPS and the SHI were designed for different purposes; thus matching some items was difficult and in some cases only 1 SHPPS item was used to measure a specific SHI item (Brener et al., 2006). On the other hand, it is worth mentioning that in the present study the research team was thorough in their description of the design and statistical analyses. This study has demonstrated that there is much work to be done with regard to increasing opportunities for physical activity in the schools, and that coordinated school health programs are in need to help schools meet physical activity standards that promote good health.

To summarize, youth across the United States are increasingly becoming more sedentary and less physically active. The percentage of students participating in daily physical education classes continues to decline and Florida youth are less likely to engage in physical education than U.S. high school students in general. Overall, boys of all ethnicities report higher levels of engagement in all types of physical activity than girls. Ethnic variations do exist. African American and Hispanic youth are more likely to report participation in daily physical education classes, but are less likely than Caucasian youth to engage in physical activity. Several barriers to engagement in physical activity have been identified in the literature; these include community barriers like inequality in access to physical activity facilities; school-wide barriers such as, insufficient time in school, inadequate financial resources, low priority relative to other subjects, and large class size; and student perceived barriers, for example, believing exercise makes one look unattractive, and exercise makes one sweat.

Conclusion

"The development and expression of obesity is influenced by the interaction of genetic and non-genetic factors" (Hayman, 2002, p. 213). Non-genetic factors such as dietary intake and physical activity are generally viewed as targets for intervention because of the degree to which they are modifiable influences on overweight and obesity. As obesity in children and adolescents becomes an epidemic of global proportions, the need for effective interventions becomes paramount.

School systems have long served as the forum for overweight programs and interventions have mostly been focused on children who are already overweight (Saelens & Daniels, 2003). However, now that overweight has become a national public health issue, the need for a paradigm shift is evident. It seems logical that a proactive approach to overweight that focuses on primary prevention would be preferred, especially since childhood overweight has been associated with increased risks of a number of cardiovascular diseases, type II diabetes, as well as an increased risk of adult overweight and obesity, and associated morbidities (Williams et al., 2002).

In order to create effective prevention and intervention programs for childhood overweight, it is important to have a comprehensive understanding of the types of behaviors in which children and adolescents engage that are associated with weight gain. While dietary intake and physical activity behaviors have been identified in the literature as factors associated with the development and expression of overweight, there remains much to learn. If there is a relationship between weight status and dietary intake and physical activity, it would be reasonable to assume that these would be targets for behavioral modification. The present study examines the relationship between weight status, as measured by body mass index, and dietary intake and physical activity behaviors.

Chapter 3

Method

The present study assessed the differences in eating behaviors and physical activity behaviors of 6th- and 9th-grade students who were at an expected weight, at-risk weight, or overweight according to their body mass index percentile (BMI percentile). Eating behaviors and physical activity also were compared by gender and ethnicity. The primary variables were BMI percentile, dietary intake, and physical activity behaviors; whereas the secondary variables included gender and ethnicity. This chapter describes the participants, setting, instrumentation, independent and dependent variables, procedures, and data analyses.

District Characteristics

The schools were located in a large school district in southwest Florida in which there are 52 middle- and 29 high-schools. Three middle schools and two high schools were chosen as the sites for data collection because the school district was conducting BMI screenings at these schools as part of a state-wide mandate from the Florida Department of Education (FL DOE) to monitor student growth patterns. In addition, these schools were participating in the *Steps to a Healthier US Initiative* (*Steps*) as pilot schools for the implementation of programs that encourage health-promoting behaviors. This initiative is funded by the U.S. Department of Health and Human Services, and its focus is to promote health among county residents by addressing risk factors associated with obesity, overweight, asthma, and diabetes (e.g., poor nutrition, physical inactivity, and tobacco use). Finally, this district was selected because a relationship between the university and the school district had been established through collaborative efforts on a similar project in the 2002-2003 academic year.

School Characteristics

All of the schools were Title I schools (schools that receive federal dollars in order to hire more staff or invest in supplementary programs for reading and mathematics based on a minimum of 40% of the student body population eligible for free or reduced lunch), and all schools employed full-time support personnel (i.e., school psychologist, guidance counselors, social worker, and school nurse). All schools, except Middle School A, provided a general education curriculum in combination with another type of curriculum (3 provided magnet curriculae and 1 provided an alternate curriculum). Middle School A only provided a magnet curriculum. Both high schools begin the academic day at 7:25 am and High School A ends the academic day at 2:50 pm and High School B ends the academic day at 2:45 pm. Middle School A begins the academic day at 7:30 am and ends at 2:30 pm and Middle Schools B and C both begin at 9 am and end at 4 pm. None of the schools permit students to leave school during lunch hours. High School A is the only school to offer a lunch car with healthy options. None of the schools were found to have any special policies with regard to nutrition education or physical education. Table 1 provides an overview of school demographics based on the 2004-2005 academic year taken from the county school district web-site.

Table 1

Characteristics of Schools and Samples

School	Enrollment	% Minority	% Eligible free/reduced lunch	Grade enrollment	*n*	% Participation
HS A	2,093	71	51	553	80	14.4
HS B	1707	89	64	484	123	25.4
MS A	611	82	74	200	142	71
MS B	908	83	76	330	219	66.4
MS C	834	89	82	275	100	36.4

Participant Characteristics

Archival data were accessed for the purpose of this study from the public school district in which participating schools were located. Data were provided to this examiner from the School Health Services Department. Data from 664 students in grades 6 and 9 were retrieved and analyzed. Surveys were administered to all students who were present during general education PE or health classes on the date of data collection as part of the mandatory curriculum. Students with disabilities and/or eligible for ESE services participated in this study if they were enrolled in general education PE or health classes. In order to maintain confidentiality, participant names and student identification numbers were not disclosed to this researcher.

Inclusion criteria. In order to meet inclusion criteria students had to have complete data for all of the following variables: BMI percentile, ethnicity, gender, age, and dietary intake and physical activity behaviors. Only students who had a BMI percentile greater than the 5th percentile were included in this study. Students who self-identified as Black/African American, Latino/Hispanic, and White/Caucasian were included, and students who identified with any other racial or ethnic group were excluded. Throughout the remainder of the manuscript these groups will be abbreviated to Black, Latino, and White. Data from other racial or ethnic groups were not utilized in the present study due to the anticipated insufficient number of participants that would self-identify as belonging to "other" groups to perform powerful statistical analyses. In addition, all students who were present on the day of survey administration were included and all students who were absent were excluded and were not given the opportunity to participate when they returned to school.

Inclusion criteria were met by 535 (81%) of the 664 6th and 9th grade students who were surveyed and screened. Of those participants who were not included, 31 were excluded because they did not have BMI scores. Twenty-four of the 31 students without BMI scores were from Middle School C. Based on a review of the data that were available for these 24 students, no trends were observed. Students from Middle School C completed the surveys in a large-group format. Because students at Middle Schools A and B completed the surveys in small groups during PE class, staff at these schools were able to closely supervise these students. Data from 3 students were excluded because they did not report gender and 15 were excluded because they did not report ethnicity. Another 70 students across all five schools were excluded because they did not meet ethnic inclusion criteria (i.e., they identified with an ethnic group other than Black, White or Latino). Furthermore, 15 students were excluded due to BMI percentiles below the 5th percentile (underweight).

Instrumentation

Socio-demographic variables. Gender, school grade, ethnicity, and age were based on self-report data obtained from the Nutrition and Exercise Survey for Students (Curtiss, 2005). Ethnicity was assessed with the following question: "Do you think of yourself as (1) African American or Black, Non-Hispanic; (2) Caucasian or White, Non-Hispanic; (3) Hispanic American or Latino American; (4) Native American or Alaskan Native; (5) Asian American or Pacific Islander; or (6) Other:_______." Participants were asked to choose one response.

Body mass index. One independent variable in the present study was body mass index percentile (BMI percentile). Participants' BMIs were calculated with the ratio weight in kilograms/height in meters^2. To calculate this measurement one of the following instruments was utilized: a BMI wheel, a BMI calculator, a palm pilot with a BMI calculator program, or the online program BlubberBuster.com. These are the tools that the FL DOE approved for use in calculating BMI and all use the formula mentioned previously. To convert the scores to BMI percentiles, a growth chart was downloaded from the Centers for Disease Control (CDC) web-site that provided the L (the Box-Cox transformation), M (median), and S (generalized coefficient of variation) parameters needed to generate exact percentiles and z scores along with the percentile values for the 3rd, 5th, 10th, 25th, 50th, 75th, 90th, 95th, and 97th percentiles by gender and month of age. The investigator used these percentile scores to write SPSS syntax that converted all BMI scores to percentile scores. The BMI percentile scores are based on cross-cultural research conducted by Cole et al. (2000).

Beam balance scales were used to measure weight with participants wearing no shoes, heavy jackets or sweaters. Similarly, height was measured with participants wearing no shoes and standing erect against a wall-mounted scale. All BMI screenings occurred during school hours (between 8:00 a.m. and 2:30 p.m.) and were conducted by the school nurse.

Nutrition and Exercise Survey for Students. The Nutrition and Exercise Survey for Students (NESS; Curtiss, 2005), previously named The Nutrition/Physical Activity Questionnaire for High School (Curtiss, 2004), was utilized to obtain all data for this study (see Appendix A). The original survey was developed through a joint effort between county school district staff and a faculty member from the School Psychology Program at the University of South Florida. The original survey was used at High School A during the 2002-2003 academic year to obtain descriptive information regarding student demographics (10 items), eating behaviors (6 items), exercise behaviors (8 items), and how students rated themselves on a range of categories (8 items) (e.g., grades, looks, friends, weight, happiness, etc.). The present researcher became familiar with this tool after volunteering to participate in the data analysis of the 2002-2003 data collection and modified this survey for the present research study. The survey was revised significantly based on information collected from cognitive interviews and a pilot study. This information, as well as information on reliability and validity of the NESS can be found in Appendix B. Results from the scores obtained during the pilot study indicated moderate internal consistency reliability for the dietary and physical activity scales (.44 and .64, respectively).

Procedure

Data collection. The data utilized in this study were obtained from the Nutrition and Exercise Survey for Students (NESS), which was completed by 664 6th- and 9th-grade students who were present during PE or health classes on the date of site data collection across five school sites (3 middle and 2 high schools) in a school district in southwest Florida. The data collection process began with screening students' BMIs in November (2005). Students were called down to their respective school clinic between 8:00 am – 2:30 pm during physical education class periods. A classroom roster was utilized to store the data whereby the school nurse filled in the following information: date, weight and height, BMI, and BMI percentile. These data were stored in a locked file cabinet in the nurse's office.

The survey data were collected in March and April (2006) in cooperation with School Health Services, the Physical Education and Health Education Departments, and staff from *Steps.* Table 2 provides a summary of the timeframe in which each school completed all screenings. The elapsed time between BMI screenings and NESS administrations ranged between 1 to 5 months.

Table 2

Summary of Time Frame between BMI screenings and Administration of the NESS

School	BMI Screened	NESS Administered	Time Elapsed
High School A	November 2005	March 6, 2006	~3 months
High School B	February 2005	March 15, 2006	~ 1 month
Middle School A	November and December 2005	March 15, 2006	~3-4 months
Middle School B	November and December 2005	April 19, 2006	~4-5 months
Middle School C	November 2005	April 27, 2006	~5 months

Each school received a set of same-colored surveys to administer. The five schools had different colors (i.e., High School A = pink, High School B = white, Middle School A = blue, Middle School B = green, Middle School C = yellow) so that when the data were entered for analysis, schools could receive individual feedback on their students' behaviors. These surveys were completed during PE and health classes based on the discretion of the school nurse and school staff. PE teachers were instructed on how to administer the survey by a *Steps* staff member who was also on site for data collection. All student questions were addressed by the physical education or health teacher during the survey administration. Students completed the survey individually under the direct supervision of the teacher and when they were finished they raised their hand for their teacher to collect the survey. The survey also was available in Spanish for any students who did not feel comfortable completing the survey in English. It was translated by the translation staff in the public school district. However, data collected from surveys in Spanish were not analyzed because the Spanish version has never been piloted and thus, no scores are available to assess validity or reliability.

The physical education teacher had a copy of the classroom roster with each student's BMI and as he/she collected the survey he/she wrote the student's BMI on the top of the survey. Staff from *Steps* assisted in this process and double-checked each survey to be sure the physical education teacher had accurately transcribed the student's BMI and then they put the survey into an envelope. When the classroom administration was complete, the teacher sealed the envelope and gave it to the staff member from *Steps* for storage in a central location.

This study did not require parental consent because the information was collected as part of the general health and physical education curriculum for the 2005-2006 school year. Furthermore, no identifying information was included on the surveys. All students who completed a survey remained anonymous. Approval was obtained from the county school district by the primary researcher in order to access the data for this study, and approval was obtained from the Institutional Review Board at the University of South Florida.

Data scoring. The principal investigator used two software packages to organize and analyze the data. Excel of the Microsoft Office XP Standard for Students and Teachers (Version 2002) and the Statistical Package for the Social Sciences (SPSS) software (Version 14 1999). First, participants were assigned a number in Excel (which also was written on their survey) and then the BMI of participants was entered into the spreadsheet, followed by their demographic information and dietary intake responses. BMI data were then converted to BMI percentile scores. The NESS core scales encompass nutrition/dietary intake (7 items), and physical activity behaviors (8 items of which 4 were analyzed in the present study). For all dietary intake questions, participants selected a response that ranged from 0-7 servings of a particular food group per day. Dietary intake items were entered directly as reported so that higher scores indicated increased number of servings consumed. Participant responses were compared to the recommendations of the USDA Food Guide Pyramid (U.S. Department of Agriculture [USDA], 1992). Item 7 assessed student-perceived barriers to consuming five combined servings of fruits and vegetables (F&V) per day and was entered directly as reported.

For the first four physical activity items, participants selected a response that ranged from 0-7 days of physical activity per week. These data were entered directly as reported so that higher scores indicated greater amounts of physical activity behaviors and thus, were compared to the recommendations of *Healthy People 2010* (CDC, 2001b). The final item related to physical activity assessed the amount of time per school day (Monday-Friday) participants reported engaging in sedentary activities. Responses ranged from 0 hours per day to 5 or more hours per day and were also entered as reported with higher scores indicating greater amounts of physical inactivity behaviors. Item 8 assessed student perceived barriers to engaging in daily physical activity and was entered as reported.

Data Analyses. The data were entered by a graduate student from the USF School Psychology Program. The investigator reviewed 20% of the data at random to ensure they were entered correctly. Data entry errors were negligible. The investigator further checked the data using Microsoft Excel to ensure that no out of range values were detected for each column variable. If an out of range value was detected, the survey was accessed to correct the value.

First, descriptive statistics were calculated for each socio-demographic variable, and for dietary intake and physical activity behaviors. In addition, internal consistency reliability of scores obtained from the NESS was calculated using Cronbach's alpha in order to determine reliability in assessing dietary intake and physical activity behaviors (Glass & Hopkins, 1996). On the dietary intake scale (5 items), internal consistency reliability coefficients of .71 were obtained for scores obtained from both 6th grade and 9th grade students. On the physical activity scale (3 items), internal consistency reliability coefficients of .76 and .77 were obtained for scores obtained from 6th and 9th grade students, respectively. Inter-item correlation matrices for dietary intake, physical activity, and dietary intake by physical activity are provided in Appendices C-K for the 6th and 9th grade samples separately, as well as the total sample.

A multivariate analysis of variance (MANOVA) was used to determine whether an overall difference in dietary intake and physical activity behaviors existed between weight status groups for 6th grade and 9th grade students separately. A 3(weight status) x 3(ethnicity) x 2(gender) MANOVA was conducted for the set of 6 dietary intake variables. A similar MANOVA was conducted for the 4 physical activity variables. These analyses began by checking the following assumptions: (1) participants are randomly sampled from the population of interest, (2) observations are statistically independent of one another, (3) univariate and multivariate normality, and (4) equal population covariance matrices for the p dependent variables (Bray & Maxwell, 1985). The primary questions in this study related to main effects between the independent variables weight status, ethnicity, and gender and the dependent variables dietary intake and physical activity behaviors. However, the researcher first looked for interactions between the independent variables so that the findings for main effects were not confounded.

MANOVA was used because the dietary and physical activity variables were viewed as interrelated sets. Bray and Maxwell suggest that MANOVA typically involves a two-step process. First, the researcher tests the null hypothesis of no differences in the means for the different groups, and if significance is found, the second step is to explain group differences with follow-up tests. The MANOVA analyses were followed up by univariate F tests for each dependent variable to provide information concerning the variables that are most important for group separation (Bray & Maxwell, 1985). To control for Type I error, alpha was set at the .05 level of probability. Finally, effect sizes were reported as a measure of practical significance so that more objective interpretations of the magnitude of the effect and its practical significance could be derived (Onwuegbuzie & Teddlie, 2003).

Multivariate analyses require the use of a large sample size (Bruning & Kintz, 1987). Although an appropriate sample size has not been established, a general rule is that "the total sample size of the sample should be at least 20 times the number of dependent variables times the number of experimental groups compared" (Brunig & Kintz, 1987, p. 230). In the present study, 3 groups were utilized with six dependent variables recorded for dietary intake and four dependent variables for physical activity, such that minimum sample sizes of 360 and 240, respectively, should have been used. Sample sizes of approximately 354 and 173 participants were obtained for 6th grade and 9th grade students, respectively. There was not a sufficient number of participants in each of the conditions; however, MANOVA is fairly robust given unequal cell sizes and SPSS provides a statistical adjustment for this statistic.

The two questions that assessed student-perceived barriers to engaging in healthy behaviors were analyzed using descriptive statistics. Specifically, for both items, the response frequencies were provided, as well as percentages.

Chapter 4

Results

This chapter presents the results addressing each of the following research questions:

1. What is the relationship between weight status, gender, and ethnicity and the dependent variables of dietary intake (fruits/vegetables, dairy, meat/beans, grains, and junk foods) among 6th- and 9th-grade students?
2. What are student-perceived barriers to consuming five combined servings of fruits and vegetables per day among 6th- and 9th-grade students?
3. What is the relationship between weight status, gender, and ethnicity, and the dependent variables of physical activity (total, vigorous activity and moderate activity) among 6th- and 9th-grade students?
4. What is the relationship between weight status, gender, and ethnicity, and the dependent variable sedentary activity among 6th- and 9th-grade students?
5. What are student-perceived barriers to engaging in daily physical activity/exercise among 6th- and 9th-grade students?

Sample characteristics of participants who met inclusion criteria are presented first, followed by a discussion of the tests of assumptions associated with multivariate analysis of variance (MANOVA). Next, an analysis of the interactions among the independent variables is presented followed by an analysis of any main effects. Finally, the results of the MANOVA and univariate follow-up tests looking at group differences in dietary intake behaviors are presented followed by the MANOVA and univariate follow-up tests looking at group differences in physical activity behaviors. Results for 6th-grade participants are presented first, followed by results for 9th-grade participants for dietary intake questions and physical activity questions, respectively.

Participant Characteristics

Table 3 presents a description of the sample. Approximately 59.8% (n = 320) of the sample were in the expected weight range (BMI < 85th percentile and BMI ≥ 5th percentile); 18.7% (n = 100) were in the at-risk weight range (BMI ≥ 85th percentile and BMI < 95th percentile); and 21.5% (n = 115) were in the overweight range (BMI ≥ 95th percentile). The participants were primarily Black (52.9%), followed by Latinos (34%), and Whites (13.1%). The majority of participants were in the 6th grade (66.5%) and were male (52.5%).

Table 3

Sample Characteristics of Participants

Characteristic	Overweight BMI ≥ 95th percentile	At-risk weight BMI ≥ 85th percentile < 95th percentile	Expected Weight BMI < 85th percentile and ≥ 5th percentile
BMI Percentile, No. (%)	115 (21.5)	100 (18.7)	320 (59.8)
Ethnicity, No. (%)			
Black	58 (20.4)	50 (17.7)	175 (61.8)
Latino	44 (24.2)	36 (19.8)	102 (56)
White	13 (18.6)	14 (20)	43 (61.4)
Gender, No. (%)			
Male	59 (20.9)	55 (19.6)	167 (59.4)
Female	56 (22)	45 (17.7)	153 (60.2)

Table 3 (Continued).

Characteristic	Overweight BMI ≥ 95th percentile	At-risk weight BMI ≥ 85th percentile ≤ 95th percentile	Expected weight BMI < 85th percentile and ≥ 5th percentile
Grade, No. (%)			
6th	82 (23)	58 (16)	216 (61)
9th	32 (19)	40 (24)	95 (57)

Note. $N = 535$

Figure 1 displays a comparison of the percentages of males and females who were overweight in each ethnic group. For the Latino students, there was a slightly greater percentage of males who were overweight than females, 26.5% and 21.4%, respectively. A similar trend was observed for the White students where a slightly greater percentage of males were overweight than females, 20% and 17.1%, respectively. The Black group was the only one in which a higher percentage of females were overweight than males, 23.7% and 17.6%, respectively.

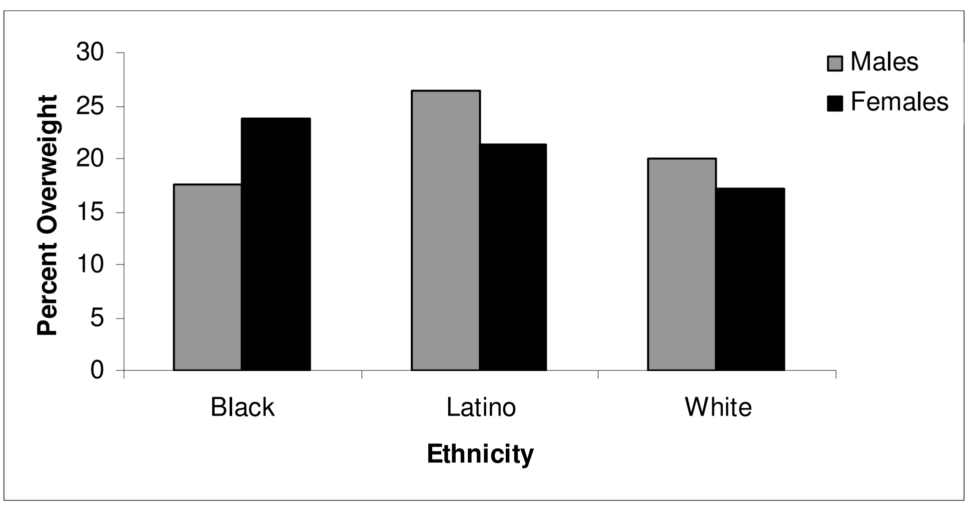

Figure 1. Comparison of males and females who were overweight by ethnic group. Sample sizes for males: Black, n = 26; Latino, n = 26, and White, n = 7; Sample sizes for females: Black, n = 32; Latino, n = 18, and White, n = 6.

Figure 2 displays a comparison of the percentages of males and females who were at-risk weight in each ethnic group. For all ethnic/racial groups, there was a slightly greater percentage of males who were at-risk weight than females: Latino, 20% and 18%, respectively; Whites, 23% and 16%, respectively; and Black, 23.7% and 17.6%, respectively. Chi-Square tests were conducted to determine if there was a significant difference between the percentages in weight categories by ethnic groups. The obtained statistics are presented for males and females, respectively, $\chi^2(4, n = 281) = 3.9, p = .420$ and $\chi^2(4, n = 254) = .926, p = .893$.

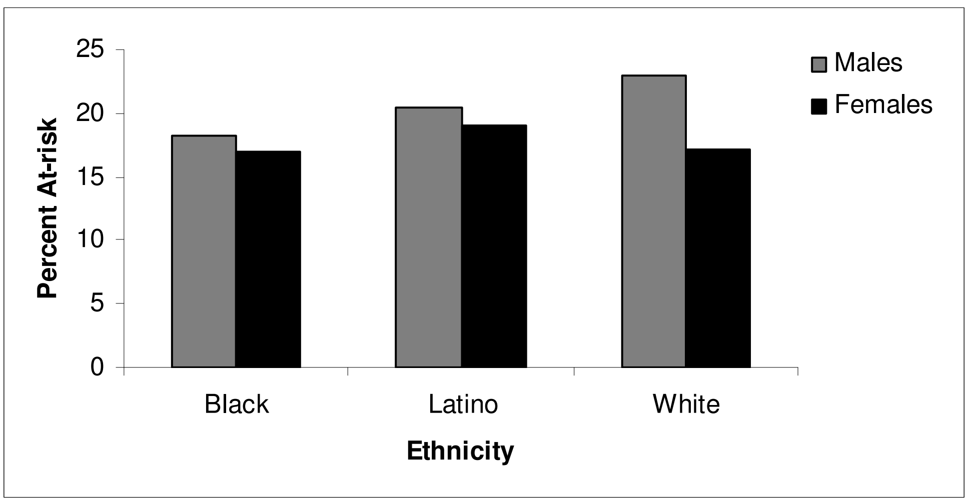

Figure 2. Comparison of percent of males and females who were at-risk weight by ethnic group. Sample sizes for males: Black, $n = 27$; Latino, $n = 20$, and White, $n = 8$; Sample sizes for females: Black, $n = 23$; Latino, $n = 16$, and White, $n = 6$.

Figure 3 displays a comparison of the percentages of males and females who were overweight in each ethnic group for 6th grade participants. For the Latino students, there was a greater percentage of males who were overweight than females, 46.5% and 37.5%, respectively. A similar trend was observed for the White students where a slightly greater percentage of males were overweight than females, 14% and 10%, respectively. The Black group was the only one in which a higher percentage of females were overweight than males, 52.5% and 39.5%, respectively. Chi-Square tests were conducted to determine if there was a significant difference between the percentages in weight categories by ethnic groups. The obtained statistics are presented for males and females, respectively, $\chi^2(4, n = 191) = 2.8, p = .578$ and $\chi^2(4, n = 171) = 1.381, p = .848$.

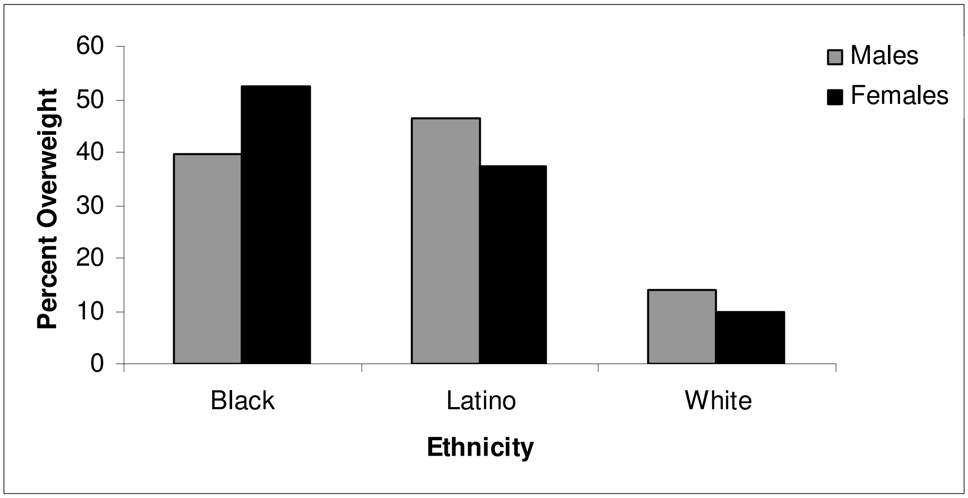

Figure 3. Comparison of males and females who were overweight by ethnic group for 6th graders. Sample sizes for males: Black, $n = 17$; Latino, $n = 20$, and White, $n = 6$; Sample sizes for females: Black, $n = 21$; Latino, $n = 15$, and White, $n = 4$.

Figure 4 displays a comparison of the percentages of males and females who were at-risk weight in each ethnic group for 6th graders. For the Black and Latino groups, there was a slightly greater percentage of males who were at-risk weight than females: Black, 41.9% and 41.4%, respectively; and Latino, 48.4% and 41.4%, respectively. For the White group, a greater percentage of females were at-risk for overweight than males: White, 17.2% and 9.7%, respectively. Chi-Square tests were conducted to determine if there was a significant difference between the percentages in weight categories by ethnic groups. The obtained statistics are presented for males and females, respectively, $\chi^2(4, n = 191) = 2.8, p = .578$ and $\chi^2(4, n = 171) = 1.381, p = .848$.

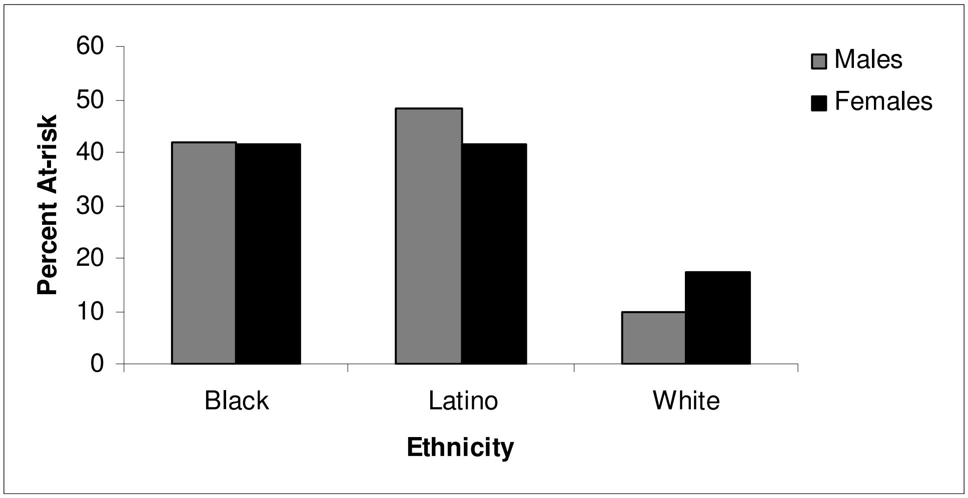

Figure 4. Comparison of percent of males and females who were at-risk weight by ethnic group for 6th graders. Sample sizes for males: Black, *n* = 13; Latino, *n* = 15, and White, *n* = 3; Sample sizes for females: Black, *n* = 12; Latino, *n* = 12, and White, *n* = 5.

Figure 5 displays a comparison of the percentages of males and females who were overweight in each ethnic group for 9th graders. For the Latino students, there was a slightly greater percentage of males who were overweight than females, 37.5% and 18.8%, respectively. In the White and Black groups, a higher percentage of females were overweight than males: White, 12.5% and 6.3%, respectively; and Black, 68.8% and 56.3%, respectively.

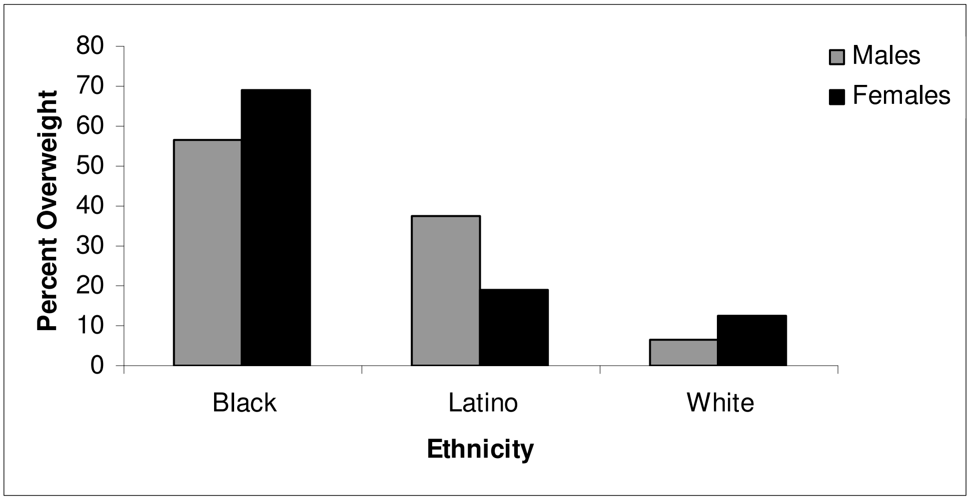

Figure 5. Comparison of males and females who were overweight by ethnic group for 9th graders. Sample sizes for males: Black, $n = 9$; Latino, $n = 6$, and White, $n = 1$; Sample sizes for females: Black, $n = 11$; Latino, $n = 3$, and White, $n = 2$.

Figure 6 displays a comparison of the percentages of males and females who were at-risk weight in each ethnic group for 9th graders. In the Latino and Black groups, a higher percentage of females were overweight than males: Latino, 25% and 20.8%, respectively; and Black, 68.8% and 58.3%, respectively. In the White group a greater percentage of males were at-risk weight compared to females, 20.8 and 6.3, respectively. Chi-Square tests were conducted to determine if there was a significant difference between the percentages in weight categories by ethnic groups. The obtained statistics are presented for males and females, respectively, $\chi^2(4, n = 90) = 3.9$, $p = .416$ and $\chi^2(4, n = 83) = .783$, $p = .941$.

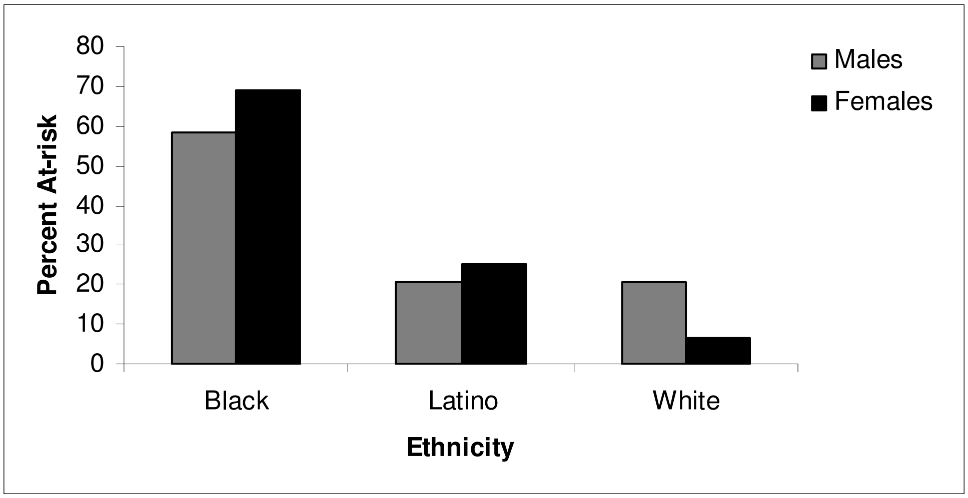

Figure 6. Comparison of percent of males and females who were at-risk weight by ethnic group for 9th graders. Sample sizes for males: Black, *n* = 14; Latino, *n* = 5, and White, *n* = 5; Sample sizes for females: Black, *n* = 11; Latino, *n* = 4, and White, *n* =1.

Dietary Intake

MANOVA for Dietary Intake for 6th Graders

The dependent variables were fruit and vegetables (F&V), dairy, meat/beans, breads and junk food, scaled from 0 to 7 servings per day. The data were screened prior to conducting the 3(weight status) x 2(gender) x 3(ethnicity) factorial MANOVA to test for the four assumptions: (1) participants are randomly sampled from the population of interest, (2) independence of observations, (3) multivariate normality, and (4) equal population covariance matrices for the *p* dependent variables (Stevens, 2002). The sample sizes, means, and standard deviations for all of the 6th grade groups across each dietary intake variable are displayed in Table 4.

Table 4

Means and Standard Deviations on Dietary Intake Variables for 6th Graders

	F&V[a]		Dairy		Meat/Beans		Bread		Junk Food	
Group	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Weight										
Expected weight	6.24	2.89	3.04	1.86	4.09	1.96	3.48	1.78	5.18	1.92
At-risk weight	6.57	2.8	3.26	2.11	3.29	2.19	3.02	1.98	3.93	2.17
Overweight	6.45	3.00	3.30	2.00	3.30	1.85	3.20	1.80	4.40	2.11
Gender										
Male	6.33	2.90	3.30	1.98	3.92	1.97	3.32	1.86	4.84	2.04
Female	6.35	2.90	2.95	1.87	3.62	2.04	3.36	1.79	4.74	2.08
Ethnicity										
Black	6.33	3.03	2.88	1.98	3.83	2.02	3.34	1.86	5.03	2.08
Latino	6.45	2.72	3.43	1.98	3.81	1.98	3.29	1.79	4.66	2.05
White	6.05	2.99	3.18	1.45	3.45	2.03	3.50	1.79	4.32	1.96

Note. $n = 356$. Dependent variables scaled from 0 to 7 servings per day. [a]F&V = fruits and vegetables.

A convenience sample was utilized for this study that was assumed to represent the larger population of 6th grade students enrolled in urban, Title I middle schools in the school district. With regard to independence of observations, the observations were assumed to be independent because all students completed the surveys alone under the supervision of their teacher. Multivariate normality was assessed for each of the 18 groups by examining box plots for multivariate outliers and examining each group’s skewness and kurtosis values across each dependent variable (see Appendix L).

Only 1 (expected weight group of Black males) of the 18 groups met the assumption of multivariate normality (i.e., no extreme outliers and both skewness and kurtosis values equal to or less than ± 1) across all 5 dependent variables. This group had the largest sample size when compared to all other groups (n = 61). Another 9 groups met the assumption of multivariate normality for at least 3 out of 5 dependent variables. Four groups met the assumption of multivariate normality for at least 2 out of 5 dependent variables, and 2 groups met criteria for only 1 out of 5 dependent variables. The groups at-risk weight White male, at-risk weight White female, overweight White male and overweight White female appeared to violate the normality assumption most but they all had sample sizes of 6 or fewer. A closer analysis of this table revealed that for the most part the groups had skewness and kurtosis values slightly over ± 1; however, as the sample size decreased groups tended to violate the normality assumption with greater skewness and kurtosis values (at-risk weight and overweight White participants). In addition, the means and standard deviations appeared to be similar across groups and no patterns of variability were observed. Using Box's M test the hypothesis of equal covariance matrices on the dependent variables across groups was rejected, F = 1.32, p = .002. Based on these results and what is known about the robustness of MANOVA, it seemed reasonable to proceed with the multivariate analysis; however, it is recommended that the significance levels be interpreted with caution.

There was no evidence for an interaction between gender and weight status, Wilks Lambda = .98, $F(10, 664)$ = .79, p = .63, between weight status and ethnicity, Wilks Lambda = .96, $F(20, 1102)$ = .76, p = .77, or between weight status, ethnicity and gender, Wilks Lambda = .94, $F(20, 1102)$ = 0.97, p = .49. There was an interaction between gender and ethnicity, Wilks Lambda = .93, $F(10, 664)$ = 2.47, p = .007. There was no evidence of a main effect for ethnicity, Wilks Lambda = .98, $F(10, 664)$ = .75, p = .68.

Main effects were observed for weight status, Wilks Lambda = .93, $F(10, 664) = 2.59$, $p = .004$, and for gender, Wilks Lambda = .97, $F(5, 332) = 2.39$, $p = .038$. Additional analyses were conducted aimed at identifying how groups differed on the dependent variables.

Tests of between-subjects effects were conducted to find differences among the groups (weight status, ethnicity, and gender) on each dependent variable utilizing a Bonferonni adjustment to control for experimentwise error ($\alpha_{EW} = .01$) . Table 5 summarizes the probability values (*p*-values) for the between-subjects effects. There was a statistically significant interaction between gender and ethnicity on dairy consumption ($p = .000$). Figure 7 displays the interaction between gender and ethnicity.

Table 5

Probability Values for Between-Subjects Effects for 6th Graders

Group	F&V[a]	Dairy	Meat/Beans	Breads	Junk Food
Gender x Ethnicity	.404	.000*	.047	.099	.051
Weight Status	.814	.964	.006*	.120	.003*
Gender	.435	.027	.003*	.354	.131
Ethnicity	.908	.287	.712	.354	.131

Note. $n = 354$. Significant at .01 level. [a]F&V = fruits and vegetables.

Effect sizes were computed for the interaction between gender and ethnicity on dairy consumption using Cohen's *d* ($d = M_1 - M_2$ / pooled SD; 0.2-0.5 = "small"; 0.5-0.8 = "medium"; > 0.8 = "large") (Cohen, 1988). For Black participants the effect size was small, $d = -0.20$, and male participants reported consuming fewer dairy servings per day, on average, than females ($M = 2.69$, $SD = 1.85$, $M = 3.09$, $SD = 2.12$, respectively). For White participants the effect size was medium, $d = 0.51$, and male participants reported consuming more servings per day of dairy, on average, than females (M = 3.55, SD = 1.74, M = 2.83, SD = 1.01, respectively). Finally, for Latino participants the effect size was medium, d = 0.61, and male participants reported consuming more servings per day of dairy, on average, than females (M = 3.97, SD = 1.99, M = 2.82, SD = 1.78, respectively). In summary, effect sizes were medium for White and Latino participants and a small effect size was obtained for Black participants.

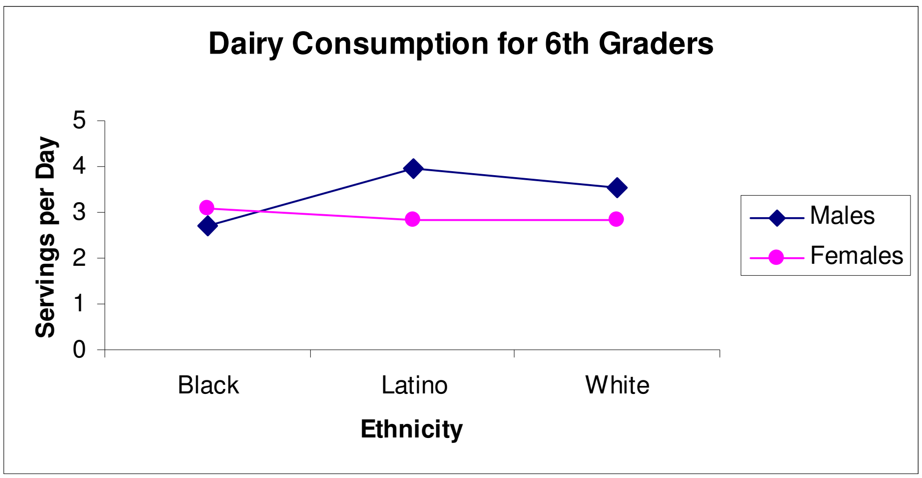

Figure 7. Males' and females' mean scores by ethnicity on dairy. Males (n = 188), (Black, n = 91), (Latino, n = 75), (White, n = 22); females (n = 167), (Black, n = 78), (Latino, n = 67), (White, n = 22).

There were two statistically significant effects for weight status on meat/beans consumption (p = .006) and junk food (p = .003) consumption. There was a statistically significant effect for gender on meat/beans consumption (p = .003). The effects for weight status were followed-up with Tukey's HSD (α_{FW} =.01). The Tukey tests were conducted to make pairwise comparisons between each weight status group on the dependent variables.

For weight status group differences on meat/beans consumption, pairwise Tukey tests (α_{FW} =.01) were significant for expected weight versus at-risk weight groups (*p* = .01) and expected weight versus overweight groups (*p* = .007). Effect sizes were computed for expected weight versus at-risk weight, expected weight versus overweight, and at-risk weight versus overweight. Expected weight had the highest mean (*M* = 4.09, *SD* = 1.96), followed by overweight, and at-risk weight (*M* = 3.30, *SD* = 1.85, *M* = 3.29, *SD* = 2.19, respectively). The effect sizes for all comparisons were small: expected weight versus at-risk weight (*d* = 0.20), expected weight versus overweight (*d* = 0.58), and at-risk weight versus overweight (*d* = -0.002). For weight status group differences on junk food consumption, the mean for expected weight was larger than that of the at-risk weight or overweight groups (*M* = 5.18, *SD* = 1.90, *M* = 3.93, *SD* = 2.17, and *M* = 4.40, *SD* = 2.11, respectively). The effect sizes for all comparisons were small: expected weight versus at-risk weight (*d* = 0.31), expected weight versus overweight (*d* = 0.20), and at-risk weight versus overweight (*d* = -0.12). For gender differences on meat/beans consumption, the mean for the males was larger than that of the females (*M* = 4.15, *SD* = 2.04 and *M* = 4.02, *SD* = 1.86, respectively), and the effect size was small, *d* = .07. Figures 4 and 5 visually display the mean differences between weight categories for dietary intake for males and females, respectively. In summary, all effect sizes were small.

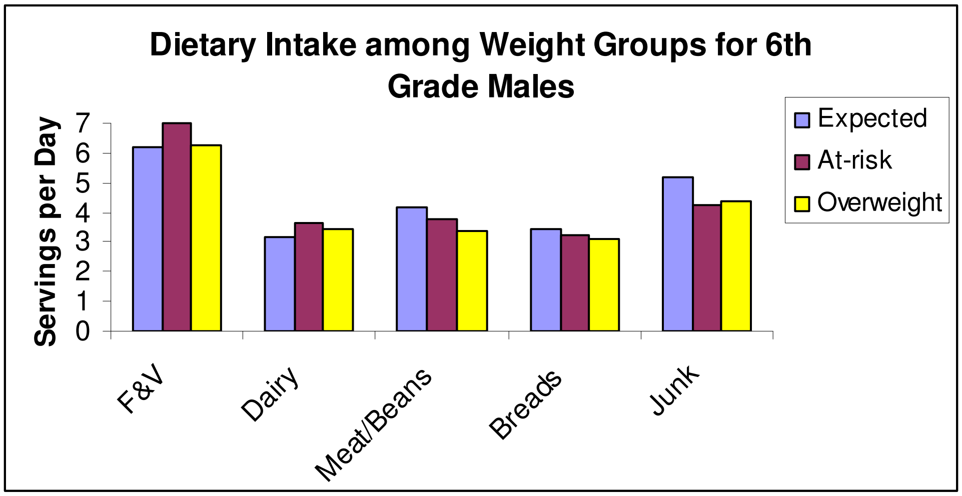

Figure 8. Sixth grade males' mean scores on dietary intake variables by weight status (n = 188).

F&V = Fruit/vegetables.

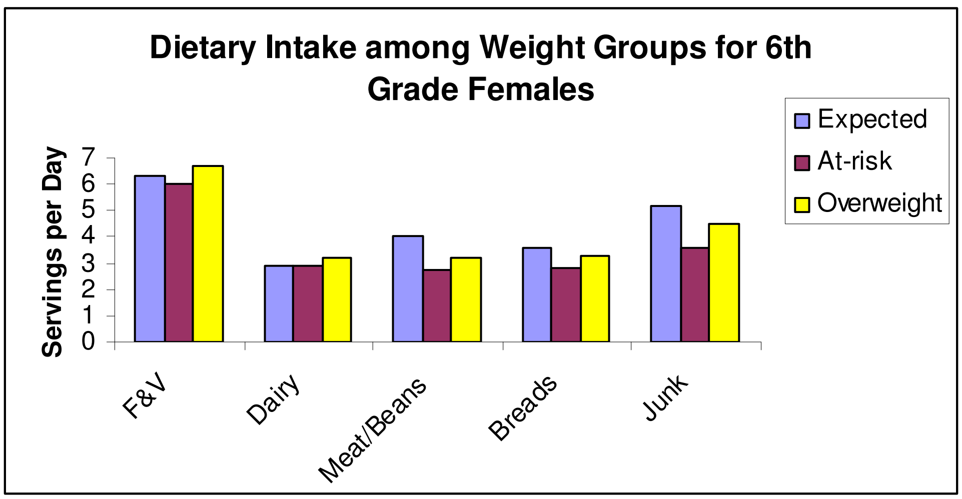

Figure 9. Sixth grade females' mean scores on dietary intake variables by weight status (n = 167).

F&V = Fruit/vegetables.

MANOVA for Dietary Intake for 9th Graders

The dependent variables were fruit and vegetables (F&V), dairy, meat/beans, breads and junk food, scaled from 0 to 7 servings per day. The data were screened prior to conducting the 3(weight status) x 2(gender) x 3(ethnicity) factorial MANOVA to test for the four assumptions: (1) participants are randomly sampled from the population of interests, (2) independence of observations, (3) multivariate normality, and (4) equal population covariance matrices for the *p* dependent variables (Stevens, 2002). The sample sizes, means, and standard deviations for all of the 9th grade groups across each dietary intake variable are displayed in Table 6.

Table 6

Means and Standard Deviations on Dietary Intake Variables for 9th Graders

	F&V[a]		Dairy		Meat/Beans		Bread		Junk Food	
Group	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Weight										
Expected weight	5.63	2.98	3.17	1.86	3.89	2.07	3.33	1.94	4.05	1.94
At-Risk	6.05	3.09	3.38	2.12	3.85	2.10	3.70	1.65	4.33	1.91
Overweight	6.46	3.18	2.88	1.85	3.91	1.86	3.06	1.68	3.16	2.29
Gender										
Male	5.76	3.03	3.37	1.92	3.64	2.03	3.33	1.84	3.80	2.00
Females	6.51	3.02	2.88	1.90	4.04	1.94	3.43	1.70	4.28	2.33
Ethnicity										
Black	6.42	3.05	3.05	1.93	3.95	2.01	3.60	1.79	4.32	2.10
Latino	5.35	2.71	3.38	2.09	3.67	1.88	2.86	1.81	3.64	2.43
White	5.96	3.40	3.13	1.63	3.52	2.11	3.13	1.42	3.24	1.90

Note. n = 168. Dependent variables scaled from 0 to 7 servings per day. [a]F&V = fruits and vegetables.

A convenience sample was utilized for this study that was assumed to represent the larger population of 9th grade students at urban, Title I high schools in the school district. With regard to independence of observations, the observations were assumed to be independent because all students completed the surveys alone under the supervision of their teacher. Multivariate normality was assessed for each of the 18 groups by examining box plots for multivariate outliers and examining each group's skewness and kurtosis values across each dependent variable (see Appendix M).

Only 1 (expected weight group of Black females) of the 18 groups met the assumption of multivariate normality (i.e., no extreme outliers and both skewness and kurtosis values equal to or less than ± 1) across all 5 dependent variables. This group had the largest sample size when compared to all other groups ($n = 32$). Another 9 groups met the assumption of multivariate normality for at least 3 out of 5 dependent variables. Three groups met the assumption of multivariate normality for at least 2 out of 5 dependent variables, and 5 groups met criteria for only 1 out of 5 dependent variables. The groups expected White male, expected White female, at-risk Latino male, at-risk Latino female, and at-risk White male appeared to violate the normality assumption most but they all had sample sizes of 7 or fewer. Skewness and kurtosis values could not be computed for the groups at-risk White female, overweight White male and overweight White female due to sample sizes of 2 or fewer participants. A closer analysis of this table revealed that for the most part the groups had skewness and kurtosis values slightly over ± 1; however, as the sample size decreased groups tended to violate the normality assumption with greater skewness and kurtosis values (at-risk and overweight White participants). Furthermore, the means and standard deviations appeared to be similar across groups and no patterns of variability were observed. Using Box's M test the hypothesis of equal covariance matrices on the dependent variables across groups was rejected, $F = 1.24$, $p = .03$. Based on these results and what is known about the robustness of MANOVA, it seemed reasonable to proceed with the multivariate analysis.

There was no evidence for an interaction between gender and weight status, Wilks Lambda = .93, $F(10, 284) = 1.10$, $p = .36$, between weight status and ethnicity, Wilks Lambda = .87, $F(20, 472) = .99$, $p = .47$, between gender and ethnicity, Wilks Lambda = .95, $F(10, 284) = .70$, $p = .729$, or between weight status, ethnicity and gender, Wilks Lambda = .85, $F(20, 472) = 1.18$, $p = .26$. There was no evidence of a main effect for weight status, Wilks Lambda = .92, $F(10, 284) = 1.25$, $p = .26$, and for gender, Wilks Lambda = .97, $F(5, 142) = .984$, $p = .429$, or ethnicity, Wilks Lambda = .92, $F(10, 284) = 1.29$, $p = .24$. Appendices N and O visually display the mean differences between weight status groups for dietary intake for males and females, respectively.

Student-Perceived Barriers to Consuming F&V

Tables 7 and 8 summarize the responses to the question regarding student-perceived barriers to consuming five combined servings of F&V per day. These data were reported bivariately as opposed to being broken down across all of the independent variables (weight status, gender, and ethnicity, 36 total cells) due to the relatively small response rate to these questions. Overall, both 6th grade and 9th grade students most commonly selected the response “I do not like the F&Vs served at school” as a barrier to consuming five combined servings of F&V per day. Students were able to choose more than one response if appropriate. Students were only asked to respond to this item if they did not consume, on average, five combined daily servings of F&V. For the “Other” response, students were able to write in an answer that best described them. However, for the most part students wrote in answers like: “I don’t like it,” “I don’t like to cook them,” and “I just don’t eat that much of it.”

Table 7

6th Grade Participants' Perceived Barriers to F&V Consumption

Group	I don't like the taste of F&V[a]	F&V[a] are not served in my house	I do not like the F&V[a]s served at school	Other
6th Grade Students, % (No.)	28% (40)	7% (10)	48.5% (69)	16% (23)

Note. n = 142. [a]F&V = fruits and vegetables.

Table 8

9th Grader Participants' Perceived Barriers to F&V Consumption

Group	I don't like the taste of F&V[a]	F&V[a] are not served in my house	I do not like the F&V[a]s served at school	Other
9th Grade Students, % (No.)	16% (13)	23% (19)	36% (30)	25% (21)

Note. n = 83. [a]F&V = fruits and vegetables.

Physical Activity

MANOVA for Physical Activity for 6th Graders

The dependent variables for physical activity were vigorous activity, moderate activity, and sedentary activity. Vigorous and moderate activities were scaled from 0 to 7 days per week. Sedentary activity was scaled from 0 to 5 or more hours per day. The data were screened prior to conducting the 3(weight status) x 2(gender) x 3(ethnicity) factorial MANOVA to test for the four assumptions: (1) participants are randomly sampled from the population of interests, (2) independence of observations, (3) multivariate normality, and (4) equal population covariance matrices for the *p* dependent variables (Stevens, 2002). The sample sizes, means, and standard deviations for all of the 9th grade groups across each dietary intake variable are displayed in Table 9.

Table 9

Means and Standard Deviations on Physical Activity Variables for 6th Grade Participants

	Total activity		Vigorous activity		Moderate activity		Sedentary activity	
Group	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Weight								
Expected weight	3.98	2.19	3.35	2.23	3.15	2.31	3.75	1.78
At-Risk	4.56	2.25	4.00	2.27	3.19	2.19	3.72	1.77
Overweight	3.70	2.33	3.09	2.33	2.96	2.38	3.81	1.79
Gender								
Male	4.43	2.14	3.71	2.18	3.34	2.31	3.68	1.71
Females	3.54	2.26	3.06	2.33	2.86	2.28	3.84	1.84
Ethnicity								
Black	3.71	2.12	3.08	2.21	3.20	2.34	3.85	1.75
Latino	3.71	2.12	3.08	2.21	2.90	2.25	3.70	1.80
White	4.66	2.06	3.62	2.31	3.45	2.39	3.61	1.80

Note. *n* = 356. Dependent variables total, vigorous and moderate activities were scaled from 0 to 7 days a week. The dependent variable sedentary activity was scaled from 0 to 6 (0 = no sedentary activity; 1 = less than 1 hour per day; 2 = 1 hour per day; 3 = 2 hours per day; 4 = 3 hours per day; 5 = 4 hours per day; 6 = 5 or more hours per day.

A convenience sample was utilized for this study that was assumed to represent the larger population of 6th grade students at urban, Title I middle schools in the school district. With regard to independence of observations, the observations were assumed to be independent because all students completed the surveys alone under the supervision of their teacher. Multivariate normality was assessed for each of the 12 groups by examining box plots for multivariate outliers and examining each group's skewness and kurtosis values across each dependent variable (Appendix P).

None of the 18 groups met the assumption of multivariate normality (i.e., no extreme outliers and both skewness and kurtosis values equal to or less than ± 1) across all 4 dependent variables. Four groups met the assumption of multivariate normality for at least 3 out of 4 dependent variables. Four groups met the assumption of multivariate normality for at least 2 out of 4 dependent variables, and six groups met criteria for only 1 out of 4 dependent variables. The groups expected weight Black females, at-risk weight Black female, at-risk weight White male, and overweight White female appeared to violate the normality assumption most. The at-risk weight White male and overweight White female groups had sample sizes of 3 and 4, respectively. However, the Black female groups both had larger sample sizes. A closer look at these two groups indicated that they were somewhat negatively skewed. Kurtosis values could not be computed for the group at-risk White male due to a sample size of 3 participants. A closer analysis of this table revealed that for the most part the groups had skewness and kurtosis values slightly over ± 1; however, as the sample size decreased groups tended to violate the normality assumption with greater skewness and kurtosis values (overweight White participants). Furthermore, the means and standard deviations appeared to be similar across groups and no patterns of variability were observed. Using Box's M test the hypothesis of equal covariance matrices on the dependent variables across groups was not rejected, $F = 1.09$, $p = .21$. Based on these results and what is known about the robustness of MANOVA, it seemed reasonable to proceed with the multivariate analysis.

There was no evidence for an interaction between gender and weight status, Wilks Lambda = .98, $F(8, 630) = .82$, $p = .58$, between gender and ethnicity, Wilks Lambda = .99, $F(8, 630) = .43$, $p = .90$, between weight status and ethnicity, Wilks Lambda = .93, $F(16, 963) = 1.39$, $p = .14$, or between weight status, ethnicity and gender, Wilks Lambda = .96, $F(24, 1100) = .60$, $p = .94$. There was no main effect for weight status, Wilks Lambda = .97, $F(8, 630) = 1.14$, $p = .34$, and for ethnicity, Wilks Lambda = .96, $F(8, 630) = 1.67$, $p = .10$. The main effect for gender was statistically significant, Wilks Lambda = .96, $F(4, 315) = 2.98$, $p = .02$. Additional analyses were conducted to determine which groups differed on which of the dependent variables.

Tests of between-subjects effects were conducted to find differences between the gender group on each dependent variable utilizing a Bonferonni adjustment to control for experimentwise error ($\alpha_{EW} = .0125$). Gender differences were found on the dependent variables total activity ($p = .001$) and vigorous activity ($p = .01$). On total activity, the mean for the males was larger than that of the females ($M = 4.43$, $SD = 2.14$ and $M = 3.54$, $SD = 2.26$, respectively), and the effect size was small, $d = 0.40$. On vigorous activity, the mean for the males was larger than that of the females ($M = 3.71$, $SD = 2.18$ and $M = 3.06$, $SD = 2.33$, respectively), and the effect size was small, $d = 0.29$.

Although there was no main effect for weight status, the mean scores of males and females were graphed for physical activity and sedentary activity to provide a visual representation of how these groups differed. Males had similar mean differences between weight groups on the variables total, vigorous and moderate activity (see Figure 10), and had similar mean scores on sedentary activity (see Figure 11). For females, there was more separation between weight status groups on the variables total and vigorous activity (see Figure 12), but the two groups had fairly similar mean scores on moderate activity (see Figure 12) and sedentary activity (see Figure 13).

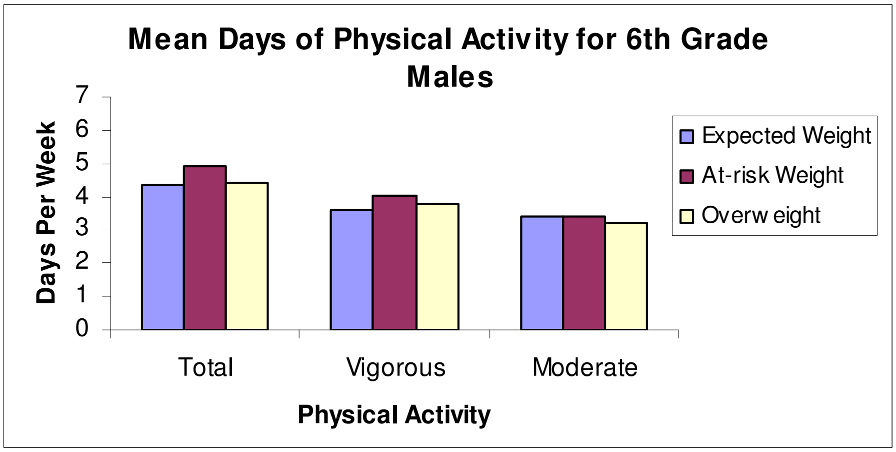

Figure 10. Males' mean scores on physical activity variables by weight status (*n* = 187). Overweight (*n* = 43), at-risk weight (*n* = 30) and expected weight (*n* = 114).

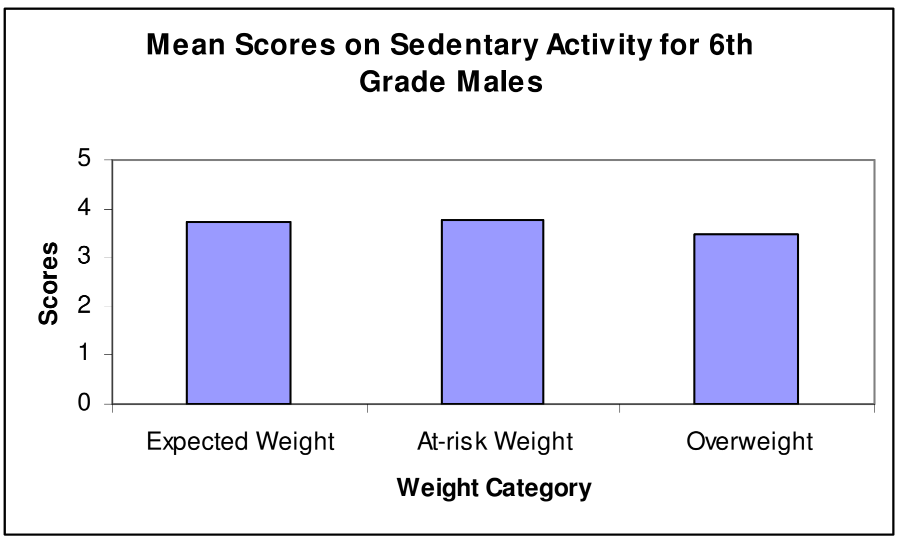

Figure 11. Males' mean scores on sedentary activity variable by weight status (*n* = 187). Overweight (*n* = 43), at-risk for overweight (*n* = 30) and expected weight (*n* = 114).

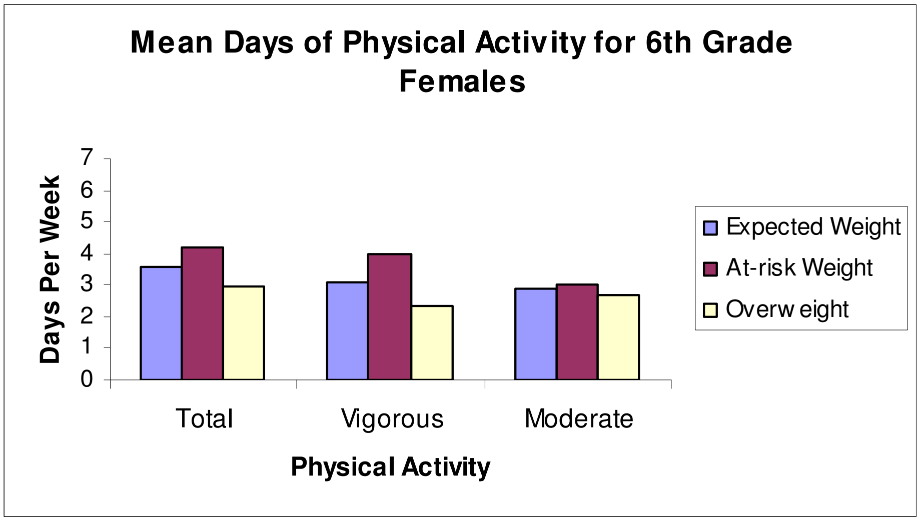

Figure 12. Females' mean scores on physical activity variables by weight status (n = 169). Overweight (n = 40), at-risk weight (n = 29) and expected weight (n = 100).

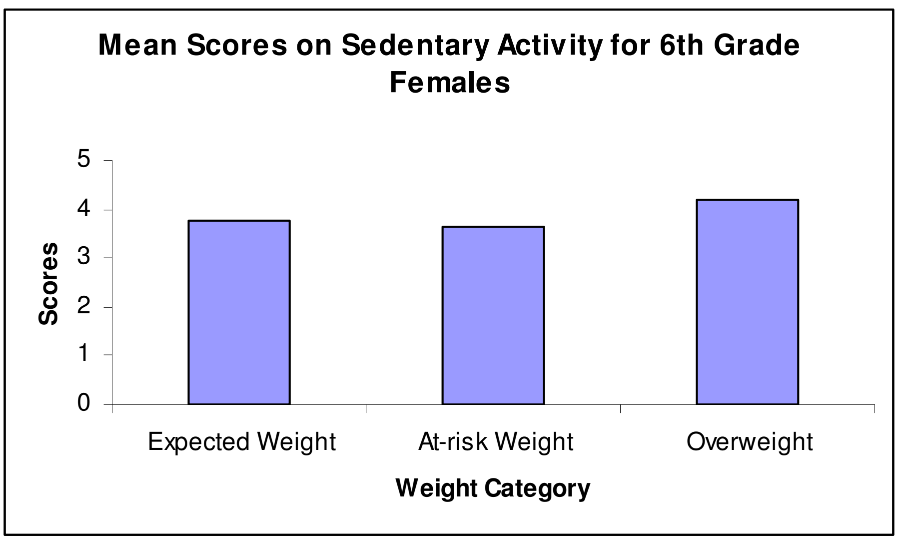

Figure 13. Females' mean scores on sedentary activity variables by weight status (n = 169). Overweight (n = 40), at-risk weight (n = 29) and expected weight (n = 100).

Effect sizes also were computed for each of the variables to provide further insight on how the groups differed on the dependent variables. On the dependent variable total physical activity, the effect sizes for pairwise weight status comparisons for males were all small (e.g., overweight versus at-risk weight, d = -0.22; overweight versus expected weight, d = 0.05; and at-risk weight versus expected weight, d = 0.27). On the dependent variable vigorous physical activity, the effect sizes for pairwise weight status comparisons for males were all small (e.g., overweight versus at-risk weight, d = -0.11; overweight versus expected weight, d = 0.08; and at-risk weight versus expected weight, d = 0.20). On the dependent variable moderate physical activity, the effect sizes for pairwise weight status comparisons for males were all small (e.g., overweight versus at-risk weight, d = -0.07; overweight versus expected weight, d = -0.07; and at-risk weight versus expected weight, d = 0.00). Finally, on the dependent variable sedentary activity, the effect sizes for pairwise weight status comparisons for males were all small (e.g., overweight versus at-risk weight, d = -0.18; overweight versus expected weight, d = -0.14; and at-risk weight versus expected weight, d = 0.03). Thus, for males all pairwise comparisons resulted in small effects.

On the dependent variable total physical activity, the effect sizes for pairwise weight status comparisons for females ranged from small to medium (e.g., overweight versus at-risk weight, d = -0.57; overweight versus expected weight, d = -0.30; and at-risk weight versus expected weight, d = 0.27). On the dependent variable vigorous physical activity, the effect sizes for pairwise weight status comparisons for females ranged from small to medium (e.g., overweight versus at-risk weight, d = -0.73; overweight versus expected weight, d = -0.32; and at-risk weight versus expected weight, d = 0.39). On the dependent variable moderate physical activity, the effect sizes for pairwise weight status comparisons for females were all small (e.g., overweight versus at-risk weight, d = -0.13; overweight versus expected weight, d = -0.08; and at-risk weight versus expected weight, d = 0.05). Finally, on the dependent variable sedentary activity, the effect sizes for pairwise weight status comparisons for females were all small (e.g., overweight versus at-risk weight, *d* = 0.28; overweight versus expected weight, *d* = -0.22; and at-risk weight versus expected weight, *d* = 0.06). Thus, for females the majority of effect size comparisons were small with the exception of overweight versus at-risk weight on total physical activity, and overweight versus at-risk weight on vigorous activity.

MANOVA for Physical Activity for 9th Graders

The dependent variables for physical activity were vigorous activity, moderate activity, and sedentary activity. Vigorous and moderate activities were scaled from 0 to 7 days per week. Sedentary activity was scaled from 0 to 5 or more hours per day. The data were screened prior to conducting the 3(weight status) x 2(gender) x 3(ethnicity) factorial MANOVA to test for the four assumptions: (1) participants are randomly sampled from the population of interests (2) independence of observations, (3) multivariate normality, and (4) equal population covariance matrices for the *p* dependent variables (Stevens, 2002). The sample sizes, means, and standard deviations for all of the groups across each physical activity variable are displayed in Table 10.

A convenience sample was utilized for this study that was assumed to represent the larger population of 9th grade students in the school district. With regard to independence of observations, the observations were assumed to be independent because all students completed the surveys alone under the supervision of their school teacher. Multivariate normality was assessed for each of the 12 groups by examining box plots for multivariate outliers and examining each group's skewness and kurtosis values across each dependent variable (see Appendix Q).

Table 10

Means and Standard Deviations on Physical Activity Variables for 9th Grade Participants

	Total Activity		Vigorous Activity		Moderate Activity		Sedentary Activity	
Group	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Weight								
Expected weight	3.58	2.22	2.95	2.15	2.45	2.18	3.73	1.91
At-Risk	3.46	2.22	3.18	2.18	3.03	2.43	3.92	2.03
Overweight	3.56	2.17	3.16	2.17	2.45	2.14	3.52	1.67
Gender								
Male	4.11	2.14	3.62	2.23	3.00	2.39	3.48	1.81
Females	2.95	2.11	2.45	1.90	2.16	1.99	4.00	1.94
Ethnicity								
Black	3.31	2.26	3.06	2.19	2.53	2.20	3.58	1.97
Latino	4.03	1.95	2.78	1.92	2.14	2.09	3.92	1.63
White	3.91	2.19	3.39	2.33	3.52	2.43	4.18	1.89

Note. n = 170. Total, vigorous and moderate activity were scaled from 0 to 7 days a week. Sedentary activity was scaled from 0 to 6 (0 = no sedentary activity; 1 = less than 1 hour per day; 2 = 1 hour per day; 3 = 2 hours per day; 4 = 3 hours per day; 5 = 4 hours per day; 6 = 5 or more hours per day.

None of the 18 groups met the assumption of multivariate normality (i.e., no extreme outliers and both skewness and kurtosis values equal to or less than ± 1) across all 4 dependent variables. One group met the assumption of multivariate normality for at least 2 out of 4 dependent variables. Ten groups met the assumption of multivariate normality for at least 1 out of 4 dependent variables, and seven groups did not meet criteria for any of the 4 dependent variables. A closer look at the 18 groups revealed that

13 had sample sizes of 13 or fewer. An analysis of the table revealed that for the most part the groups had skewness and kurtosis values slightly over ± 1. Using Box's M test the hypothesis of equal covariance matrices on the dependent variables across groups was not rejected, $F = .999$, $p = .486$. Based on these results and what is known about the robustness of MANOVA, it seemed reasonable to proceed with the multivariate analysis.

There was no evidence for an interaction between gender and weight status, Wilks Lambda = .94, $F(8, 284) = 1.15$, $p = .32$, or between weight status and ethnicity, Wilks Lambda = .88, $F(16, 434) = 1.19$, $p = .27$, or between weight status, ethnicity and gender, Wilks Lambda = .96, $F(24, 1100) = .60$, $p = .94$. There was an interaction between gender and ethnicity, Wilks Lambda = .89, $F(8, 284) = 2.04$, $p = .042$. There was no main effect for weight status, Wilks Lambda = .98, $F(8, 284) = .39$, $p = .93$, for ethnicity, Wilks Lambda = .93, $F(8, 284) = 1.30$, $p = .24$ and for gender, Wilks Lambda = .97, $F(4, 142) = 1.09$, $p = .36$.

Tests of between-subjects effects were conducted to find differences among the groups (weight status, ethnicity, and gender) on each dependent variable utilizing a Bonferonni adjustment to control for experimentwise error (α_{EW} =.0125). Table 11 summarizes the probability values (*p*-values) for the between-subjects effects. Due to the Bonferonni adjustment none of the between-subjects effects reached significance.

Table 11

Probability Values for Between-Subjects Effects for 9th Grade Participants

Group	Total Activity	Vigorous Activity	Moderate Activity	Sedentary Activity
Gender x Ethnicity	.079	.015	.027	.135

Note. n = 163. Alpha level was set a priori to .0125.

Although there was no main effect for weight status, the mean scores of males and females were graphed for physical activity and sedentary activity to provide a visual representation of how these groups differed. Males had similar mean differences between weight groups on the variables total, vigorous and moderate activity (see Figure 14), and had similar mean scores on sedentary activity (see Figure 15). For females, there was more separation between weight status groups on the variables total and vigorous activity (see Figure 16), but the two groups had fairly similar mean scores on moderate activity (see Figure 16) and sedentary activity (see Figure 17).

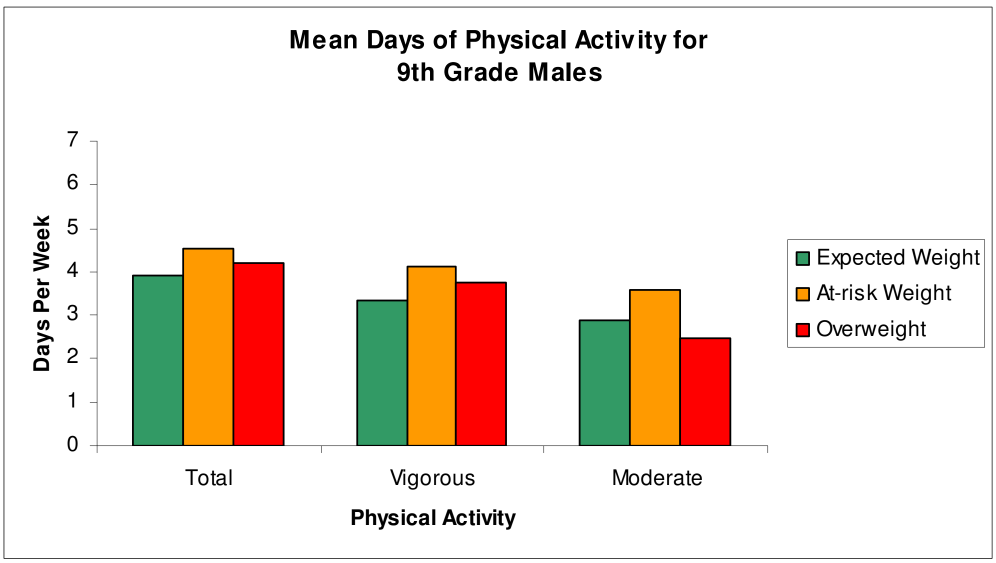

Figure 14. Males' mean scores on physical activity variables by weight status (n = 87). Overweight (n = 16), at-risk weight (n = 23) and expected weight (n = 48).

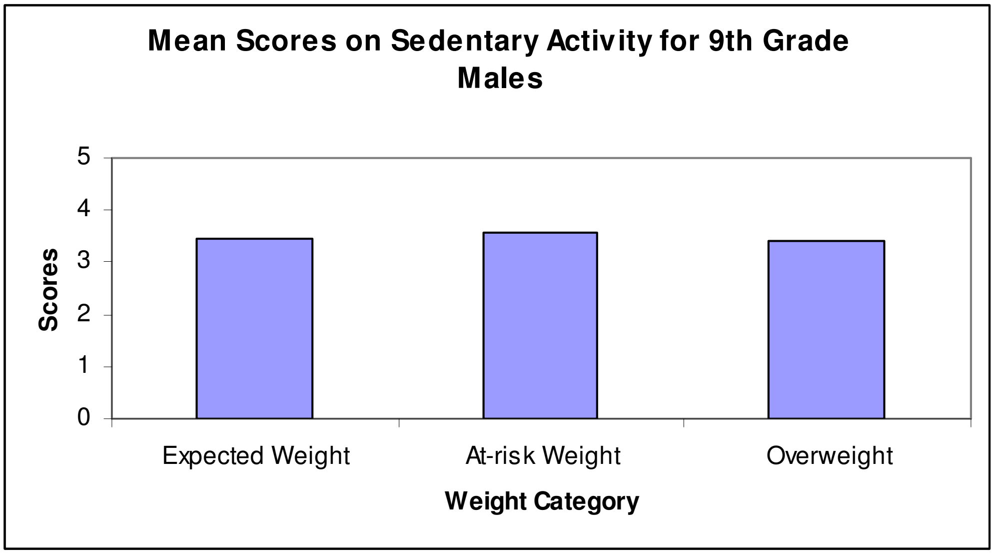

Figure 15. Males' mean scores on sedentary activity variable by weight status (n = 84). Overweight (n = 15), at-risk weight (n = 23) and expected weight (n = 46).

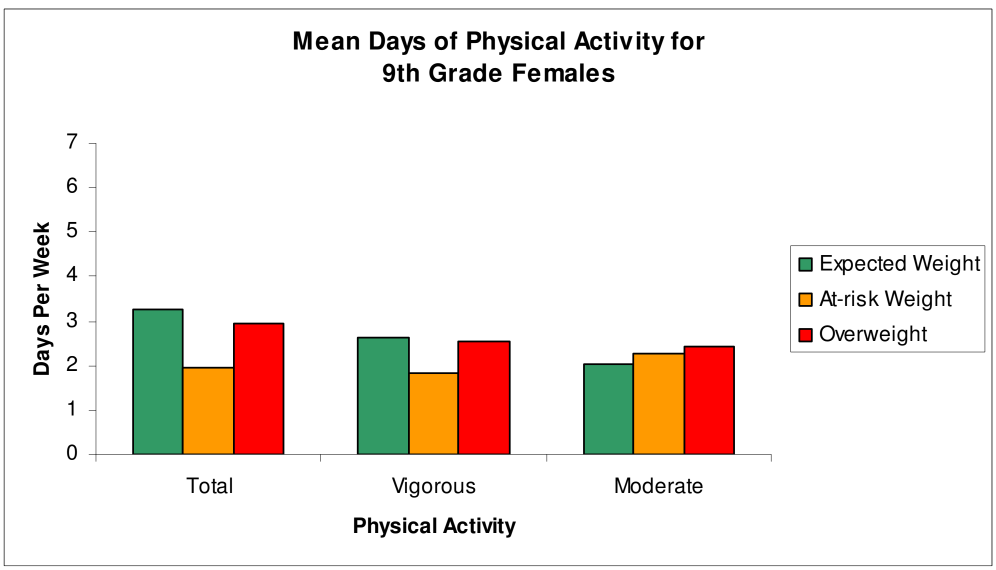

Figure 16. Females' mean scores on physical activity variables by weight status (n = 83). Overweight (n = 16), at-risk weight (n = 16) and expected weight (n = 51).

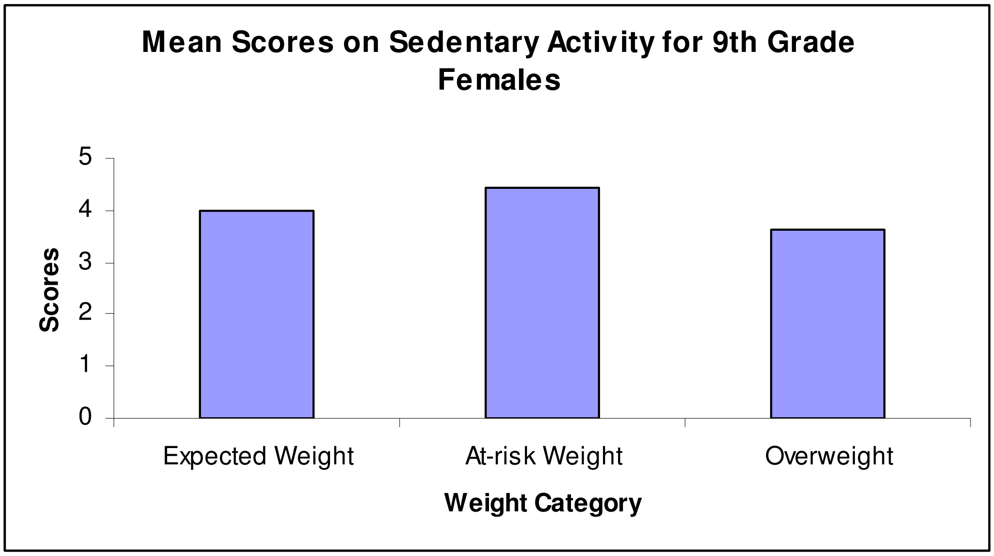

Figure 17. Females' mean scores on physical activity variables by weight status (n = 83). Overweight (n = 16), at-risk weight (n = 16) and expected weight (n = 51).

Effect sizes were also computed for each of the variables to provide further insight on how the groups differed on the dependent variables. All obtained effect sizes were small for 9th grade males and are summarized in Table 12. For 9th-grade females, the majority of obtained effect sizes were small with the exception of overweight versus at-risk weight and at-risk weight versus expected weight females on total physical activity (medium effects). Table 13 summarizes the results for females.

Table 12

Effect Sizes for Pairwise Weight Status Comparisons for 9th Grade Males

Comparisons	Total	Vigorous	Moderate	Sedentary
Expected weight versus at-risk weight	0.30	0.37	0.29	0.06
At-risk weight versus overweight	-0.16	-0.17	-0.45	-0.09
Expected weight versus overweight	0.13	0.19	-0.18	-0.03

Table 13

Effect Sizes for Pairwise Weight Status Comparisons for 9th Grade Females

Comparisons	Total	Vigorous	Moderate	Sedentary
Expected weight versus at-risk weight	-0.62*	-0.41	0.10	0.28
At-risk weight versus overweight	0.57*	0.46	0.09	-0.44
Expected weight versus overweight	-0.15	-0.03	0.20	-0.18

Note. * = medium effect

Barriers to Engaging in Physical Activity

Tables 14 and 15 summarize the responses to the question regarding student-perceived barriers to engaging in daily physical activity. Overall, both 6th and 9th grade groups most commonly selected the response “I don’t have time” as a barrier to engaging in daily physical activity. Students were able to choose more than one response if appropriate. Students were only asked to respond to this item if they did not engage in daily physical activity. For the “Other” response, students were able to write in an answer that best described them. However, for the most part students wrote in answers that could have been classified in one of the provided categories. Some students indicated that the heat was a factor for not engaging in daily physical activity.

Table 14

6th Grade Participants' Perceived Barriers to Engaging in Daily Physical Activity

Group	I don't like it	I think it is boring	Other kids make fun of me	I'm not good at it	I don't have time	It makes me smell bad	I'm not coordinated	Other
6th Grade Students	14% (26)	10.2% (19)	5.9% (11)	14.5% (27)	27.4% (50)	5.9% (11)	5.9% (11)	16.2% (30)

Note. *n* = 185.

Table 15

9th Grade Participants' Perceived Barriers to Engaging in Daily Physical Activity

Group	I don't like it	I think it is boring	Other kids make fun of me	I'm not good at it	I don't have time	It makes me smell bad	I'm not coordinated	Other
9th Grade Students	16.5% (21)	9.4% (12)	5.5% (7)	7.1% (9)	30.7% (39)	3.9% (5)	7.1% (9)	19.7% (25)

Note. *n* = 127.

Summary

The findings of this study indicate that there are significant group differences for gender x ethnicity, weight status, and gender on dietary intake behaviors and for gender on physical activity behaviors among 6th grade students. No significant group differences were found for 9th grade students on dietary intake behaviors and an interaction effect was observed for gender x ethnicity on physical activity behaviors. With respect to dietary intake behaviors among 6th graders, an interaction was observed between gender and ethnicity (see Table 16). The follow-up univariate *F*-tests indicated group separation on the variable dairy. Means were fairly evenly distributed across ethnic groups and males typically had higher means than females except for the Black group, whereby females had a higher mean than males. Effect sizes were medium for Latinos and Whites, and small for Blacks (see Table 17).

Main effects were observed for weight status and gender (see Table 16). The follow-up univariate *F*-tests were significant for gender differences on meat/beans consumption (males had higher means than females), and for weight status differences on meat/beans consumption (expected weight had the highest mean followed by overweight and at-risk weight, respectively) and junk food consumption (expected weight had the highest mean followed by at-risk weight and overweight, respectively). Small effect sizes were reported for gender differences on meat/beans consumption and for weight status differences on meat/beans and junk food consumption (see Table 17).

Table 16

Univariate Effects for Dietary Intake Variables for 6th Grade Participants

Effects	F&V	Dairy	Meat/ beans	Breads	Junk food
Gender x ethnicity	-	.000	-	-	-
Weight status	-	-	.006	-	.003
Gender	-	-	.003	-	-

Note. Effects were significant at .01 level.

Table 17

Effect Sizes for Interactions and Main Effects on Dietary Intake Variables for 6th Grade Participants

Effects	F&V	Dairy	Meat/ beans	Breads	Junk food
Gender x ethnicity interaction					
Latinos (males versus females)	-	medium	-	-	-
Whites (males versus females)	-	medium	-	-	-
Blacks (males versus females)	-	small	-	-	-
Weight status main effect					
Expected weight versus at-risk weight	-	-	small	-	small
At-risk weight versus overweight	-	-	small	-	small
Expected weight versus overweight	-	-	small	-	small
Gender main effect (males versus females)	-	-	small	-	-

For physical activity behaviors among 6th grade students, main effects were observed for gender, but not for weight status or ethnicity. The follow-up univariate F-tests were significant for gender differences on total and vigorous activity behaviors (males had higher means than females). Small effect sizes were also observed on these pairwise comparisons. For physical activity behaviors among 9th grade students, an interaction was observed between gender and ethnicity; however, none of the follow-up univariate F-tests were significant. Overall, fewer significant results were obtained among the older participants (9th graders) as compared to the younger participants (6th graders).

Chapter 5

Discussion

The present study examined relationships among the independent variables weight status, gender, and ethnicity and the dietary intake behaviors and physical activity behaviors of 6th- and 9th-grade students. The following discussion addresses the findings of this study in relation to the research hypotheses. This discussion also considers the strengths and limitations of the present study followed by suggested directions for future research. The chapter will conclude with a discussion of the implications of the present study for the field of school psychology.

Percent Overweight

In this study, approximately 22% of the sample was overweight as classified by a BMI ≥ 95th percentile. This is consistent with previous research suggesting that between 20-24% of youth are overweight (Curtiss, 2004; Neumark-Sztainer & Hannan, 2000; Strauss & Pollack, 2001). In addition, about 19% of the sample met criteria for at-risk weight based on a BMI ≥ 85th percentile < 95th percentile. The remainder of the sample (~60%) fell in the expected weight range.

Dietary Intake

This section will address the two hypotheses that were generated with relation to the first research question on dietary intake behaviors.

It was hypothesized that overweight adolescents would consume more dairy products, meat/beans, and junk food and less fruit and vegetables (F&V) and grain products as compared to their expected weight peers.

Results of 6th graders. Overall, overweight adolescents in this study reported consuming similar servings of dietary intake variables as their at-risk weight and expected weight peers. For dairy consumption, overweight participants reported the highest servings per day, followed by at-risk weight and expected weight participants, respectively. The difference between overweight and expected weight participants was about ¼ serving, and all three groups reported meeting the daily recommendations of 2-3 servings per day. Consequently, the hypothesis that overweight participants would consume more dairy servings per day than expected weight peers was not supported.

There was a statistically significant difference between weight status groups on meat/beans consumption; however, expected weight, not overweight participants, reported consuming the most servings per day. On average, expected weight participants reported about .8 servings more than overweight and at-risk weight peers who reported very similar behaviors. Based on these findings, the hypothesis that overweight adolescents would consume increased servings of meat/beans per day as compared to expected weight peers was not supported. All three groups reported consuming about 2-3 servings more than the daily recommendation of 1 serving of meat/beans per day.

This result is not surprising in light of the fast-food culture of the United States. Chicken nuggets, fried chicken tenders, hamburgers, burritos, tacos, pizza with meat toppings, sausage and egg breakfast sandwiches, and hot dogs have become staples in the modern fast-food diet. It is easily conceivable that if an adolescent eats one of these items per meal, they would exceed the recommendation of one serving of meat per day. To date, there have been very few studies investigating adolescent consumption of meat/beans relative to the Pyramid recommendations, but some research suggests that adolescents are consuming inadequate servings of meat/bean products (Munoz et al., 1997). The results of the present study are inconsistent with previous findings and future research is warranted.

In terms of junk food consumption, there was a statistically significant difference between weight status groups, however, expected weight participants actually reported the highest consumption levels (5.18 servings per day), followed by overweight and at-risk weight peers (4.40 and 3.93, respectively). In general, it seems that all groups are consuming far too many servings of junk foods per day. There are no recommendations for maximum servings of junk food per day, rather it is recommended to consume them sparingly. Based on these findings, the hypothesis that overweight adolescents would consume more junk food than expected weight peers was not supported.

With regard to F&V, on average, at-risk weight students reported consuming slightly more servings per day than overweight and expected weight students, and expected weight students reported the fewest servings per day. The differences were very minimal (less than ½ serving) and thus, the hypothesis that overweight participants would consume fewer servings per day was not supported. On average, participants across weight groups reported 1 to 1 ½ servings more per day than the daily recommendation of 5 combined servings of F&V. This finding is contrary to some of the findings in the literature on inadequate consumption of fruit and vegetables among adolescents (Beech et al., 1999; Middleman, Vazquez & Durant, 1998; Munoz et al., 1997; Videon & Manning, 2003). It is possible that students over-reported F&V consumption to respond favorably. Despite attempts to provide very specific examples of serving sizes on the survey, it is also possible that students do not fully understand the concept of a "serving size" and how serving sizes vary across food groups (meat/beans versus grains), and within food groups (dried fruit versus fresh fruit). In addition, it is not clear whether or not youth are able to accurately classify all of the foods they eat into their correct food group category. These findings should be interpreted cautiously because of the possibility for response error in terms of quantity and quality of food choices.

Interestingly, participants across all three weight groups reported consuming an average of 3 to 3 ½ serving of bread/grain per day, which is below the Pyramid recommendation of six servings per day. This finding is consistent with the literature that adolescents, in general, do not meet the minimum daily recommendations for grains (Curtiss, 2004; Munoz et al., 1997).Consequently, the hypothesis that overweight adolescents would consume fewer bread/grain products per day than expected weight peers was not supported.

Results of 9th graders. Overall, overweight adolescents in this study reported consuming similar servings of dietary intake variables as their at-risk weight and expected weight peers. For dairy consumption, at-risk weight participants reported the highest servings per day, followed by expected weight and overweight participants, respectively. The difference between overweight and expected weight participants was about ¼ serving, and all three groups reported meeting the daily recommendations of 2-3 servings per day. Consequently, the hypothesis that overweight participants would consume more dairy servings per day than expected weight peers was not supported.

All three weight groups reported eating about 3.85 servings of meat/beans per day, exceeding the daily recommendation of 1 serving of meat/beans per day. Based on these findings, the hypothesis that overweight adolescents would consume increased servings of meat/beans per day as compared to expected weight peers was not supported. Again, as previously mentioned this result it is not surprising.

In terms of junk food consumption, at-risk weight participants reported the highest consumption levels (4.33 servings per day), followed by expected weight and overweight peers (4.05 and 3.16, respectively). Again, it seems that all groups are consuming far too many servings of junk foods per day. Based on this finding, the hypothesis that overweight adolescents would consume more junk food than expected weight peers was not supported.

With regard to F&V, on average, overweight students reported consuming slightly more servings per day than expected weight and at-risk weight students, and expected weight students reported the fewest servings per day. Similar to 6th grade participants, the differences were minimal (less than 1 serving) and thus, the hypothesis that overweight participants would consume fewer servings per day was not supported. On average, participants across weight groups reported 2 servings more per day than the daily recommendation of 5 combined servings of F&V. As stated previously, there are several factors that may influence this "over-reporting" and these findings should be interpreted cautiously.

Participants across all three weight status groups reported consuming an average of 3 to 4 servings of bread/grain per day, which is below the Pyramid recommendation of six servings per day. Consequently, the hypothesis that overweight adolescents would consume fewer bread/grain products per day than expected weight peers was not supported. Again, this finding is consistent with the literature that adolescents, in general, do not meet the minimum daily recommendations for grains (Curtiss, 2004; Munoz et al., 1997).

It was expected that there would be a relationship between gender and dairy food intake, with males more likely than females to consume the daily recommended servings of dairy products.

Results of 6th graders. Males reported consuming about .3 more servings of dairy products per day than females, but this difference was not significant. Thus, the research hypothesis was not supported. Contrary to previous studies indicating that males are more likely than females to meet the recommendations for daily dairy consumption, males were not more likely than females to meet the daily recommendations (i.e., 2-3 servings a day) in this study. In fact, both gender groups reported consuming, on average, between 2-3 servings of dairy products per day, which is inconsistent with the findings of Neumark-Sztainer et al. (2002). It is unclear as to why the findings of the present study were inconsistent with past research. One hypothesis is that the survey used in this study (NESS) provided comprehensive examples of items classified as dairy products, as well as specific serving examples and perhaps other studies did not provide participants with such examples. Thus, students may have been more accurate in categorizing items into this group.

Results of 9th graders. Similar to the results obtained with the 6th grade sample, males reported consuming about .4 more servings of dairy products than females. But males were not more likely than females to report consuming the daily recommended servings (i.e., 2-3 servings) of dairy products per day. Again, both gender groups reported consuming, on average, between 2-3 servings of dairy products per day, which is inconsistent with the findings of Neumark-Sztainer et al. (2002). This hypothesis was not supported based on the findings of the present study.

Barriers to Consuming Five Servings of F&V a Day

One hypothesis was generated with regard to the third research question on student-perceived barriers to consuming five combined servings of F&V a day. This section addresses the hypothesis.

It was hypothesized that the majority of participants would report "not liking the taste" and "not liking the ones served at school" as barriers to consuming five combined servings of F&V a day.

Results of 6th grade participants. Among 6th grade participants, the two most commonly cited barriers to consuming five combined servings of F&V a day were "I don't like the taste" and "I don't like the F&Vs served at my school," thus supporting the hypothesis. About 40% of the 6th grade participants responded to this question (n = 142), and of those about half cited "I don't like the F&Vs served at my school" as a barrier. The second (11%) most cited barrier was "I don't like their taste." These findings are consistent with previous findings from focus-group research conducted by Baranowski et al. (1993), Cullen et al. (1998), and Hearn et al. (1998). Follow-up focus groups with students are warranted to identify F&V that students would prefer to eat at school. If this truly is a barrier, it is one that could be easily addressed by involving student voices on F&V preferences.

Results of 9th grade participants. Among 9th grade participants, the two most commonly cited barriers to consuming 5 combined servings of F&V a day were "I don't like the F&Vs served at my school" and "F&V are not served in my house," thus supporting part of the hypothesis. About 50% of the 9th grade participants responded to this question (n = 83), and of those a little less than half cited "I don't like the F&Vs served at my school" as a barrier. The second (11%) most cited barrier was "F&V are not served in my house." It is interesting that students perceived that F&V were not readily available in their homes. This barrier could also be further explored via focus groups and results could be shared with parents during parent-teacher conferences or through a school-generated letter. Given that all of the study schools had a very high percentage of students eligible for free and reduced lunch it would be interesting to determine if students from more affluent high schools also perceived that F&V were not served in their homes. There is a body of research that suggests that F&V are more expensive and less fresh when purchased in grocery stores in lower-income neighborhoods, and thus, it may be an issue of availability at the community level (Topolski et al., 2003).

Physical Activity

Four hypotheses were generated with regard to the third research question on physical activity behaviors. This section will address each of these hypotheses.

It was hypothesized that overweight adolescents would engage in less physical activity (total, vigorous and moderate activity) than expected weight peers.

Results of 6th grade participants. Some studies (Boutelle et al., 2002; Fontvielle, Friska, & Ravussin, 1993; Maffeis, Zaffanello, & Schutz, 1997; Mayer, 1975) have found that overweight adolescents are less likely to participate in moderate or vigorous activity.

In contrast, the present study found overweight participants reported very similar behaviors to expected weight and at-risk weight peers across total, vigorous and moderate activity. The at-risk weight group reported the highest levels of physical activity followed by expected weight and overweight, respectively. In summary, this hypothesis was not supported for the 6th grade participants.

Results of 9th grade participants. Similar to the 6th grade sample, 9th grade participants reported engaging in very similar physical activity behaviors across weight groups. For total activity, all three weight groups reported about 3 ½ bouts of exercise per week. All weight groups reported about 3 bouts of total activity and between 2.5 (expected weight and overweight) and 3 (at-risk weight) bouts of moderate activity per week. Thus, this hypothesis was not supported for the 9th grade participants.

It was expected that there would be a relationship between gender and physical activity, with males more likely than females to meet the weekly recommendations.

Results of 6th grade participants. Consistent with previous findings (Andersen et al., 1998; Dowda et al., 2001; Gordon-Larsen, McMurray, & Popkin, 1999), males did report significantly higher levels of physical activity than females across total and vigorous activity. Males reported engaging in .4 more bouts of moderate activity per week than females. In terms of meeting the weekly recommendations, males, on average, fell slightly short of the total (daily exercise) and moderate activity (5 days a week) recommendations, but met the vigorous activity (3 days a week) recommendations. Females reported a similar trend of behaviors (met the vigorous activity guidelines but not the total and moderate activity guidelines), although some of their scores were significantly lower than the males. Based on the sample means for males and females engagement in physical activity, males were not more likely to meet the weekly recommendations than females.

Results of 9th grade participants. Males did report engaging in more physical activity than females among 9th grade participants, and on average, they engaged in one more bout per week across total, vigorous, and moderate activity. Similar to findings among 6th grade participants, 9th grade males, on average, fell slightly short of the total (daily exercise) and moderate activity (5 days a week) recommendations, but met the vigorous activity (3 days a week) recommendations. Females, on the other hand, did not meet recommendations across any of the activity guidelines. Thus, these cross-sectional data suggest that females become more at-risk for not engaging in adequate physical activity as they become older. Toward this end, it would be appropriate to evaluate if this trend is observed in longitudinal cohort studies, and if so, what factors contribute to these changes in physical activity behaviors, as well as the types of preventions that are necessary to sustain healthier choices.

The 9th-grade male participants, on average, reported fewer bouts per week of physical activity when compared to 6th-grade males, suggesting that they are also less active as they become older based on these cross-sectional data. It is possible that 9th grade students are less active because they are not required to enroll in PE during the entire school year as 6th grade students are required, or perhaps they have after-school jobs and are less able to play after school sports or engage in physical activities. As such, further research is warranted in this area. Based on the sample means for males' and females' engagement in physical activity, although males did report higher levels of physical activity, they were not more likely to meet the weekly recommendations than females.

It was expected that there would be a relationship between ethnicity and gender and physical activity (total, vigorous and moderate activity), with Black and Latino females less likely than White females to meet the weekly recommendations.

Results of 6th grade participants. When females were analyzed based on ethnic group, White and Black females, on average, just met the minimum recommendation of three days a week for vigorous activity. Latino females did not meet this recommendation, and on average, they were half a bout of exercise per week behind their peers. These results are consistent with the findings of Pate et al. (2000), whereby Latino females were least likely to meet physical activity recommendations. With regard to total and moderate physical activity, on average, females across all three ethnic groups were below the minimum recommendations. This hypothesis was not supported given there were no interaction effects. In summary, White and Black females reported similar behaviors on vigorous activity, and females across all three ethnic groups fell short of the recommendations for total and moderate activity.

Results of 9th grade participants. Although an interaction was observed for gender x ethnicity, follow-up univariate F tests were not significant. White females reported meeting the vigorous activity recommendations and Black and Latino females fell short of the recommendation of three days of vigorous activity per week. White females also had the highest mean scores for total and moderate activity, followed by Latino and Black females, respectively. However, consistent with results of the 6th grade sample, females across all three ethnic groups were below the minimum recommendations for total and moderate activity, although White females just missed the guidelines. This hypothesis was not supported given that females across ethnic groups reported similar behaviors in terms of meeting or falling short of for the majority of activity recommendations; however, Black and Latino girls do appear to be at higher risk for not engaging in physical activity and further research is warranted to identify the factors that contribute to this phenomenon.

It was expected that there would be a relationship between ethnicity and gender and physical activity (total, vigorous and moderate activity), with Latino males less likely than Black and White males to meet the weekly recommendations.

Results of 6th grade participants. This hypothesis was not supported for the dependent variables of physical activity because no interactions were observed. In fact, males across all three ethnic groups, on average, reported engaging in three or more bouts of vigorous physical activity per week, which meets the minimum weekly recommendations. These findings were inconsistent with national and state data from the Youth Risk Behavior Surveillance Survey (CDC, 2001), which indicate that White males are more likely than their Black and Latino peers to meet the weekly recommendations. A possible explanation for the inconsistency is that the 6th grade participants in the present study are not similar to those in other studies because they were enrolled in PE as part of state requirements. A hypothesis is that these students are already engaging in vigorous activities as part of their school requirements. With regard to total and moderate physical activity, all three ethnic groups, on average, were slightly below the weekly recommendations, thus, not supporting the hypothesis.

Results of 9th grade participants. As previously stated, an interaction was observed for gender x ethnicity, but follow-up univariate *F* tests were not significant; as such, this hypothesis was not supported. Again, in contrast to previous research that indicates that White males are more likely to meet physical activity recommendations, in this sample, the Black and Latino males met the vigorous activity recommendation but White males did not. These results should be interpreted with caution because the White male group had a very small sample size (n = 13) and thus, may not have been normally distributed. Latino males reported higher levels of total physical activity, followed by Black and White males, respectively; and Black males reported the highest levels of moderate activity followed by White and Latino males, respectively. In summary, inconsistent patterns were obtained for males of different ethnic groups on physical activity behaviors.

Sedentary Activity

Two hypotheses were generated with regard to the fourth research question on sedentary activity behaviors. This section will address each of these hypotheses.

It was hypothesized that overweight students would engage in more sedentary activity as compared to their expected weight peers.

Results of 6th grade participants. Many studies have found that overweight adolescents are more likely than their expected weight peers to engage in sedentary activities (Maffeis, Zaffanello, & Schutz, 1997; Mayer, 1975), however, in the present study the mean differences in sedentary activity were not statistically significant. A closer look at means differences revealed that, on average, overweight adolescents reported engaging in approximately the same number of hours of sedentary activity per day as expected weight and at-risk weight peers. Based on results of this study, all students are equally engaged in about 2-3 hours of sedentary activity per day. This hypothesis was not supported based on these findings.

Results of 9th grade participants. Again, students in the 9th grade were equally engaged in sedentary behavior across weight groups and it averaged between 2-3 hours per day. Thus, it appears that across grade levels, students are reporting fairly similar levels of physical inactivity. This hypothesis was not supported based on these findings.

It was expected that there would be a relationship between ethnicity and sedentary activity, with Black and Latino adolescents engaging in higher levels of sedentary activity than White students.

Results of 6th grade participants. No interaction effects were observed for gender x ethnicity. In this sample, Blacks, Latinos and White students reported almost identical levels for sedentary activity, a result that is inconsistent with the findings of many studies that suggest that students of color are more at-risk for high levels of sedentary activity (Andersen et al., 1998; CDC, 2001; Dowda et al., 2001; Pate et al., 1996; Troiano, 2002). This hypothesis was not supported based on these findings.

Results of 9th grade participants. Among 9th grade participants, differences in sedentary activity levels among Blacks, Latinos and White were not statistically significantly different. In this sample, White students reported the highest levels of inactivity, followed by Latino and Black students. However, there was less than one hour difference between these groups. This hypothesis was not supported based on these findings.

Barriers to Engaging in Daily Physical Activity

One hypothesis was generated with regard to the fifth research question on student-perceived barriers to engaging in daily physical activity. This section addresses the hypothesis.

It was hypothesized that students would select "I don't like it" and "I am not good at it" as barriers to engaging in daily physical activity.

Results of 6th grade participants. Among 6th grade participants, the two most commonly cited barriers to engaging in daily physical activity were "I don't have time" (13.8%) and "I don't like it" (7.5%), thus only partially supporting this hypothesis. About 50% of the 6th grade participants responded to this question (n = 185). Follow-up focus groups with students are warranted to identify why they perceive to lack time for physical activity, especially given that all 6th grade students are required to enroll in PE classes. It would be interesting to conduct a study that evaluates the amount of time students spend engaging in physical activity during PE.

Results of 9th grade participants. Among 9th grade participants, the two most commonly cited barriers to engaging in daily physical activity were "I don't have time" (22.5%) and "Other" (14.4%), thus not supporting the hypothesis. About 80% of the 9th grade participants responded to this question (n = 127). Again, follow-up focus groups with students are warranted to identify why they perceive to lack time for physical activity. In the state of Florida, high school students are only required to take one credit of physical education and health, resulting in one semester of PE and one semester of health. In addition, PE requirements can now be fulfilled on-line for high school students in Florida. Although the "Other" category had the second highest percentage of responses, many of the written-in responses could have been classified under one of the forced choices. For example, “I’m too busy,” “I have other things to do,” and “It’s not fun.”

Summary

In summary, the majority of the hypotheses were not supported based on the current data set. Further, when there were significant weight status group differences in dietary intake behaviors (e.g., in the 6th grade sample), the expected weight group often had the highest mean scores. Significant differences in dietary intake behaviors were not observed among 9th graders. Overall, students across both grade levels reported high consumption of F&V, meat/beans, and junk foods and inadequate consumption of grains. A number of barriers to consuming 5 servings of F&V a day were identified. For physical activity behaviors, statistically significant differences were observed for gender among 6th graders. No significant differences were observed among 9th graders. Students across both grade levels, on average, did not meet physical activity guidelines as set forth by the CDC. Further, students across all groups reported very high levels of sedentary activity. Finally, the most common cited barrier to engaging in physical activity was “I don’t have time.”

Strengths of the Present Study

The present study has several strengths that are worth mentioning before a discussion of the limitations is presented. First, this study was one of the first to compare the eating behaviors of adolescents in different weight categories, namely expected weight, at-risk weight, and overweight. To date, very few research studies have examined this issue. In fact, most studies look solely at the consumption levels of fruits/vegetables and dairy products for males versus females and across different ethnic groups and socio-economic statuses. The current investigator believes that it is important to look more closely at the eating behaviors of adolescents in different weight categories to provide a comprehensive picture of how these groups may be different. It is known that these groups differ significantly in terms of physical and sedentary activity, but much less is known about the eating patterns of these groups.

The ethnic diversity of the sample was also a strength of the present study. In fact, the study sample mirrored the ethnic diversity of all schools participating in the study in terms of proportions of minority groups represented. It is important to have an ethnically, proportionally representative sample when trying to fully understand behaviors as dynamic as eating behaviors and physical activity behaviors. Additionally, ethnic minorities (e.g., Blacks and Latinos) have been identified as subgroups at an increased risk for decreased engagement in physical activity and increased engagement in sedentary activity. Thus, it is notable that this study sample consisted of a large proportion of participants who were minorities.

Screening each participant in the study for body mass index (BMI) was a time-intensive process. A registered nurse conducted all of the weight and height measurements for each participant in the present study. This is considered a strength of the present study because obtaining a reliable and valid BMI is dependent on properly weighing and measuring each participant, and being sure to utilize the same procedures with each participant. For example, the nurses required that each participant remove their shoes and any heavy jackets, sweaters, sweatshirts, and heavy jewelry that might skew either of the measurements. The use of the BMI-percentiles to create weight categories is also a strength of the study given the cross-cultural research to support their use.

Finally, for dietary intake items in each food group, specific examples of a serving size were provided in textual and photographic formats. When reviewing the Nutrition and Exercise Survey for Students prior to the study, the issue of whether or not all adolescents were aware of the measurements associated with a serving size for each food group was considered. It was determined that an adolescent may not be familiar with the number of ounces in a cup, or how many ounces in a serving of meat. Thus, this researcher created, with the help of a pediatric nutritionist, concrete examples of what a serving size would be across each food group to help students better gauge how many servings from each food group they consume per day.

Limitations

There are several external and internal limitations to this study that warrant discussion. First, the participants were selected only from schools in a large district in southwest Florida. In terms of external validity, the population and ecological transferability (Tashakkori & Teddlie, 2003) of the research was minimized, and the results from the sample likely cannot be generalized beyond students in schools similar to the ones sampled. However, it should be noted that the present sample was very diverse in terms of ethnicity, grade level and/or age, and SES. Second, for the MANOVA analyses looking at group differences in 9th grade participants, inclusion criteria were met by only 173. Although there is not an established rule on a minimum number of participants, as was seen in the present study, once participants are divided into groups based on characteristics (i.e., gender, ethnicity, and weight status) it is difficult is to get groups that approximate a normal distribution on selected variables without a relatively large sample. Thus, in the present study, some of the groups had as few as three participants and this was too few to make meaningful comparisons that can be generalized beyond this sample. Third, a potential threat to the internal validity is that different amounts of time elapsed between BMI assessments and administration of the survey across the study sites. The time elapsed between sites ranged from 1 month at High School B to 5 months at Middle School C. Although it is unlikely that a student would move between weight categories in a 5-month period, it would be optimal to have a consistent data collection time frame across study sites.

Further, other threats to external validity include temporal validity and specificity of variables. With regard to temporal validity (Onwuegbuzie, 2003), it is possible that the research findings cannot be generalized across time. In the context of a developmental-systems perspective, an argument could be made that across time, the factors that influence dietary intake and physical activity are subject to varying degrees of change, and thus, may influence the behaviors in which adolescents engage.

In terms of identifying and constructing data collection instruments, difficulties in assessing dietary intake need to be considered. Specifically, when the Nutrition and Exercise Survey for Students was revised, examples of food items falling in each category were based on the cultural, ethnic, and professional experiences of the developers of the survey. The tenets of transformative theory (Mertens, 2003) suggest that a food frequency questionnaire would be better developed if the insights and experiences of members of ethnic and cultural minorities (what types of foods in each category that they commonly eat) were included. Therefore, exclusion of foods commonly eaten by different groups may result in misleading findings.

Another limitation to the use of a food frequency questionnaire is that the research on the reliability and validity of the scores they produce has been sparse, with further testing necessary. Baranowski et al. (2000) suggested that food frequency questionnaires tend to overestimate energy consumption and consumption of several nutrients when compared with a validation standard. However, Rockett et al. (1997) concluded that a "simple self-administered questionnaire completed by older children and adolescents can provide nutritional information about this age group" (p. 808). In order to address this potential limitation, the present investigator provided concrete examples of serving sizes as opposed to relying solely on metric measurements.

Finally, there is limited research to address the reliability and validity of scores obtained from self-report instruments for measurement of physical activity. Weston, Petosa, and Pate (1996) assessed the reliability and validity of scores obtained from a self-report instrument they developed that required youth in grades 7-12 to recall previous day physical activity. Correlations between self-report physical activity level and pedometer (a measure of footstrikes) and Caltrac counts (a measure of body movements) were .88 and .77, respectively. Interrater and test-retest reliability were .99 and .98, respectively. Further studies are necessary in order to determine the technical adequacy of self-report instruments for measurement of physical activity.

Directions for Future Research

To address the issue of population and ecological transferability, future studies could be designed in other school districts within the state, as well as studies outside of the state in various regions of the United States. These data would be useful for making within-state, between states, and regional comparisons of food and activity behaviors of children and adolescents. Although these data currently exist for several of the dependent variables, they do not exist for the variables meat/bean products, junk food, and grains.

With regard to small sample size, this was a major limitation in the present study for the 9th grade sample, especially when trying to make comparisons by weight status, gender, and ethnicity. As was pointed out in the present study, it was very difficult to obtain multivariate normality for some of the subgroups (i.e., overweight males across all three ethnic groups) due to the extremely small sample sizes. Once the data were broken down into 1 of 18 cells by weight status (3), by ethnicity (2), by gender (2), very small sample sizes were encountered. Future studies could investigate the differences in groups more closely if larger sample sizes were utilized. Future studies might be conducted in school districts where passive consent forms are accepted for student participation in order to increase the number of participants. Or, a more salient reward system for participants should be developed to increase the likelihood that students would participate.

With regard to identifying and constructing data collection instruments, future researchers might examine the types of foods that are commonly eaten among the cultural groups in their sample, especially in schools where there are large proportions of ethnic minority groups. Children and adolescents may not be familiar with the categories into which different food items are classified and thus, classify them incorrectly. There are many items that are marketed today as “fruit snacks,” but are no more closely related to a fruit than a can of soda. Future research may include a panel of diverse students from the study site to make suggestions on how to revise the survey items such that they are more culturally sensitive.

Given the lack of statistically significant differences in dietary intake and physical activity behaviors among groups, other factors must be considered. First, although the investigator believes that the research questions are appropriate, the method of collecting the data to answers these questions must be questioned. Specifically, asking youth to recall and accurately report the number of servings of items they eat from each food group is a very complex task. It requires one to recall what they eat over time, qualify it into a food group, and then quantify it within the food group. This is a difficult task that is probably difficult for most adult samples. Although examples of serving sizes were provided on the survey, it is questionable whether or not students can quantify food without adequate direct instruction. Thus, this may be an issue to consider when choosing and/or constructing a survey instrument for dietary recall.

Additionally, the present study found that, on average, participants across grade levels reported consuming more than the recommended one serving per day of meat/beans. In light of this fact, future research is warranted to determine if this finding can be replicated with other samples. Over consumption of meat is associated with negative health consequences (e.g., increased consumption of fat, decreases in calcium stores, increased consumption of cholesterol, etc.) and can lead to future health problems, especially if the meats being consumed are highly processed, injected with growth hormones and antibiotics, and high in fat (McDougall, 1983).

Future research should focus on student-perceived barriers to engaging in health promoting behaviors like healthy eating and physical activity. Many programs are targeted at increasing health among pediatric populations, but very few involve youth in the program development process. It is critical to hear student voices and include them in decision making that directly affects their behavior.

Implications for the Field of School Psychology

Pediatric overweight is increasingly becoming a major public health concern. As the proportion of children and adolescents who are overweight in this country increases, policy makers, public health personnel, and health professionals are trying to make known the negative health consequences associated with this serious epidemic. Some of the negative health consequences associated with pediatric overweight include: increased blood pressure, adverse lipoprotein profiles, non-insulin-dependent diabetes mellitus, early atherosclerotic lesions, asthma, and low body image (Pesa et al., 2000). Additionally, overweight children and adolescents miss more days from school than healthy children and adolescents, and the rates of absenteeism are similar to those found in children and adolescent with other chronic diseases (Vetiska et al., 2000).

In school systems, school psychologists serve a role of child advocate. They are not only concerned with each child's academic, social, and emotional well-being, but also with the physical and mental health of each and every child. The present study has implications for the field of school psychology. First, it is important for school psychologists to realize the increasing proportion of students who are overweight. Approximately 1 out of 5 students is overweight nationally (CDC, 2001), and in the present study 21.5% of the participants were overweight. This finding provides support that the sample in the present investigation was similar to those of other research studies in terms of percent of participants overweight.

Being aware that a problem exists is only the tip of the iceberg. Once a problem has manifested itself to the degree that pediatric overweight has, it is critical that intervention efforts be established at all levels of the continuum to prevent further escalation of the problem. In this approach, intervention and prevention are not mutually exclusive; but rather, different approaches are used at each level to achieve specific outcomes (e.g., primary, secondary, and tertiary forms of prevention) (Bradley-Klug, Grier, & Ax, 2006). Primary prevention interventions are those that are aimed at all students in a school at the same level of intensity (Bradley-Klug, Grier, & Ax, 2006). Their primary focus is to keep small problems from developing into greater problems and reduce the risk level for all students. In terms of pediatric overweight, primary prevention strategies should be aimed at increasing the opportunities for healthy food choices during school meals and increasing opportunities for children to engage in recess and/or physical education classes. Based on the results of the present study and the literature on early intervention, 6th grade students could be targeted for school-wide prevention programs to increase health-supporting food and activity behaviors. School psychologists could assist in prevention efforts by serving on a school-wide staff committee charged with developing a "healthy behaviors campaign" whereby opportunities for students to learn about health-promoting behaviors are implemented school-wide, in addition to opportunities to engage in such behaviors at school (i.e., eating F&V, and whole grains; increasing the number of minutes students engage in physical activity activities each week, etc.). In developing school-wide interventions to increase health-supporting behaviors, school psychologists are in an excellent position to conduct needs assessments to identify the student-perceived barriers to engagement in such behaviors. Within the framework of a problem-solving model, school psychologists have extensive training to serve the role of facilitator to staff committees in addressing issues that surround this epidemic.

School psychologists also could be involved with secondary prevention efforts which aim to provide more at-risk students with skill development, support, and mentoring (Walker & Shinn, 2002). These efforts are meant for those students who do not respond to the universal interventions implemented on a school-wide basis and are typically implemented in an individual or small group format. Examples of secondary prevention strategies include small group nutrition and exercise lessons, behavioral contracting (setting food intake and exercise goals), specialized counseling from a school nurse, and creating special exercise groups targeted at students most at-risk. Because some groups (e.g., females and ethnic minorities) are at higher risk for overweight, poor nutritional choices, and insufficient physical activity, secondary preventions strategies might target these sub-groups in particular. For example, nutrition and exercise education groups could be targeted toward females, and especially females of color, to educate them on healthy choices, help them to set behavioral goals, monitor their goals, and then finally, evaluate their progress. In addition, since students tend to become less active as they age, secondary prevention programs could target older adolescents (as opposed to older adolescents) who are at-risk for insufficient activity.

Finally, tertiary prevention is appropriate for students already identified as overweight. Knowing the physical and mental health consequences associated with pediatric overweight, school psychologists may be asked to serve these children by assisting in the development of accommodation plans for these children where necessary (i.e., creating a schedule and plan for class transitions, securing an appropriately-sized work place within classrooms and other facilities in the school, securing elevator passes in schools with multiple levels), linking these children to community resources that serve children who are overweight, and/or providing these children with individual or group therapy sessions to promote their social and emotional well-being.

Further, as professionals with extensive training in cognitive and behavioral theories, school psychologists could play an integral role in the development of physical activity interventions for students with pediatric overweight. First, in developing appropriate physical activity interventions, consultation with medical professionals will be critical. In many districts, school psychologists are already consulting with medical professionals to address other students' chronic-health needs. Second, school psychologists' have the training to collect data on student perceived barriers to engaging in physical activity and to identify what types of activities in which students would be more willing and interested to engage. Finally, they can also identify the types of reinforcement that would best motivate students to follow through on their plans.

A final area in which school psychologists can make tremendous contributions is in both formative and summative evaluation. School psychologists are well-trained in data collection and analysis, and can be utilized to conduct program evaluations to determine the efficacy of interventions. They have the analytical skills to recognize when an intervention is not supporting the development of students, and the ability to make adjustments where necessary.

Conclusion

Pediatric overweight is a preventable health problem that has its roots in a myriad of behaviors, some of which were examined in the present study (e.g., dietary intake and physical activity behaviors). Although many of the hypotheses of this study could not be strongly supported, there was evidence for some group differences across the dependent variables. For dietary intake variables, although group differences were observed for weight status, they were often in the opposite direction of the hypotheses (i.e., expected weight reported higher servings that overweight participants on meat/beans consumption and junk food consumption). For physical activity variables, although no differences were found between weight status groups, males consistently reported engaging in more physical activity than females. In addition, females of color were most at-risk for inadequate engagement in physical activity. Further, despite how the data were analyzed, all students, on average, reported high levels of sedentary activity. Given the exponential increase in pediatric overweight and its associated consequences, further investigations of eating and exercising patterns among youth are warranted. It is critical that future studies further examine student-perceived barriers to engaging in health-promoting eating and exercise behaviors in order to create school interventions that meet the needs of students.

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Appendices

Appendix A: Nutrition and Exercise Survey for Students

For School Use:

BMI:	Height:	Weight:

Student Information: Please provide the following information by circling one answer per question. Please answer the questions the best that you can. If you do not understand a question, ask an adult for help.

1. Sex	**3. What grade are you in?**
Male Female	6^{th} 7^{th} 8^{th} 9^{th} 10^{th} 11^{th} 12^{th}
2. Ethnicity: Do you think of yourself as…?	**4. How old are you?**
a. African American or Black, Non-Hispanic	11 16
b. Latino American or Hispanic American	12 17
c. Asian American or Pacific Islander	13 18
d. Native American or Alaskan Native	14 19
e. Caucasian American or White, Non-Hispanic	15 20
f. Other:_____________________________	

5. How many **days** during the **school week** (Monday-Friday) do you eat **breakfast?**

0   1   2   3   4   5

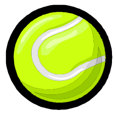
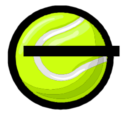
6. How many **days** during the **school week** (Monday- Friday) do you eat **lunch**?

0   1   2   3   4   5

7. Have you ever been on a diet to lose weight?	Yes	No
8. Do you think you do enough physical activity or exercise?	Yes	No
9. Do you think you eat a variety of foods from each food group?	Yes	No
10. Do you think you have too much stress in your life?	Yes	No

Part I. Nutrition: How many total **servings** from the following food groups do you think you eat or drink each day? (Please circle **one** number in the right-hand column)

Food Groups: Use the following pictures to help you estimate the number of servings you eat from each food group.

 Whole tennis ball	 ½ tennis ball	 Two Dice	 Golf ball
 1 Nutri-Grain bar	 1 slice of bread	 1 deck of cards	

Servings per Day

1) **Vegetables**

Uncooked- 1 serving = size of tennis ball
- Salad or lettuce
- Carrots
- Broccoli, cauliflower
- Celery, onions
- peppers
- tomatoes

Cooked- 1 serving = ½ size of tennis ball
- Potatoes, corn, vegetable soup
- Any canned vegetable
- Broccoli, cauliflower, carrots, squash
- Asparagus, collard greens
- Salsa, tomato sauce
- Yucca, plantains or any other vegetable

Servings per Day	
0	4
1	5
2	6
3	7

2) **Fruit and fruit juice**

Fresh/raw fruit- 1 serving = size of tennis ball
- apple, banana, peach, plum, pear, mango, tangerine, orange, grapes, papaya, cherries, raspberries, blueberries, watermelon, or any other fresh fruit

Canned fruit-1 serving = ½ size of tennis ball
- Applesauce, peaches, pears, pineapple, fruit cocktail

Dried fruit- 1 serving = size of golf ball
- apricots, prunes
- raisins, cranberries, Craisins

Fruit juice- 1 serving = ½ size of tennis ball
- 100% fruit juice (apple, grape, orange, tomato, grapefruit, mango, papaya, etc.)

**Does not include Hawaiian Fruit Punch, flavored Gatorade, lemonade, or Hi-C, Caprisun, Kool-Aid, fruit flavored soda (grape, orange, strawberry)- these are 'Other' items.*

Servings per Day	
0	4
1	5
2	6
3	7

3) **Milk/milk products**

Liquids- 1 serving = size of tennis ball
- milk, soy milk, (including chocolate milk, but **not** Yoo-Hoo)

Solids- 1 serving = ½ size of tennis ball
- yogurt
- cottage cheese

Cheese- 1 serving = 1 slice
- 1 Kraft single slice of cheese
- 1 string of cheese (size of index finger)

1 serving = size of golf ball
- crumbled/grated/shredded cheese

1 serving = size of 4 dice
- 1 cube of cheese

Servings per Day	
0	4
1	5
2	6
3	7

	Servings per Day
4) **Meat and beans** **Meats- 1 serving = 1 deck of cards** • hamburger patty, ground beef, steak • hot dog • chicken, including chicken nuggets • fish, tuna fish, or seafood • porkchop, ham • any deli meat or tofu/soy **Nuts- 1 serving = size of golf ball** • peanut butter • nuts **Beans- 1 serving = ½ size of tennis ball** • red, black, and white beans • pinto and lima beans **Eggs- 1 egg = 1 serving**	0 4 1 5 2 6 3 7
5) **Breads and grains** **Breads- 1 serving = size of slice of bread** • bread, frozen waffle or pancake, pizza crust **Cereals- 1 serving = size of tennis ball** • Cereal or oatmeal **Bagels- 1 serving = ½ bagel** **Breakfast bars- 1 serving = 1 bar** **Pastas/Rice- 1 serving = ½ size of tennis ball** **Crackers- 1 serving = size of tennis ball** **Popcorn- 1 serving = size of 3 tennis balls**	0 4 1 5 2 6 3 7
6) **Other foods** **1 serving = 1 of the following:** • 1 can of soda, 1 can size of the following: Hawaiian Fruit Punch, flavored Gatorade, lemonade, or Hi-C, Caprisun, Kool-Aid, fruit flavored soda (grape, orange, strawberry). • 1 candy bar **Potato/corn snacks- 1 serving = size of tennis ball** • French fries, tater tots, potato chips, corn chips **Candies- 1 serving = size of golf ball** • Twizzlers, Skittles, Gummy bears, hard candy, M & M's **Cookies/Ice cream- 1 serving = ½ size of tennis ball**	0 4 1 5 2 6 3 7

7) If you add your total servings of fruits and vegetables per day, is this number less than 5? If yes, why (you can check more than 1 box)? If you have 5 servings or more you can skip this question.

€I don't like their taste €I don't like the ones served at school

€We don't have them in my house €Other reason (please describe):_________

Appendix A: (Continued)

Part II. **Physical Activity: The following questions are about physical activity. Circle only** one **answer for each question.**

1. **On how many of the past 7** days **did you do any type of exercise/physical activity for** 20 minutes without stopping **or longer?**

0 days	1 day	2 days	3 days	4 days	5 days	6 days	7 days

2. **On how many of the past 7** days **did you exercise/participate in physical activities for at least** 20 minutes without stopping that made you breathe hard, **such as basketball, jogging, swimming laps, tennis, fast walking, fast bicycling or similar aerobic activities?**

0 days	1 day	2 days	3 days	4 days	5 days	6 days	7 days

3. On how many of the past 7 **days** did you participate in exercise/physical activity for at least **30 minutes without stopping that did not make you breathe hard**, such as brisk walking, slow bicycling, skating, pushing a lawn mower, or mopping floors?

0 days	1 day	2 days	3 days	4 days	5 days	6 days	7 days

4. On how many of the past 7 **days** did you participate in exercise/physical activity to strengthen or tone your muscles, such as push-ups, sit-ups, weight lifting, yoga, pilates, or martial arts?

0 days	1 day	2 days	3 days	4 days	5 days	6 days	7 days

5. In an average **week** when you are in school (Monday-Friday), on how many **days** do you go to physical education (PE) classes?

0 days	1 day	2 days	3 days	4 days	5 days

6. During an average physical education (PE) class, how many minutes do you spend actually exercising or playing sports?

I do not take PE	Less than 10 minutes	10 to 20 minutes	21 to 30 minutes	More than 30 minutes

7. In an average **school day** (Monday-Friday), how many **hours** do you spend doing any of the following activities: watching television/movies, playing video games, reading, homework, talking or text messaging on the phone, or on the computer/Internet?

0 (No time)	Less than **1** hour per day	More than **1 hour and less than 2** hours per day	More than **2 hours and less than 3** hours per day	More than **3 hours and less than 4** hours per day	More than **4 hours and less than 5** hours per day	**5** or more hours per day

8. If you do not do exercise/physical activity on a daily basis (7 days a week), what stops you (you can check more than 1 box)? If you do exercise/physical activity every day you can skip this question.

€ I don't like it
€ I think it is boring
€ Other kids make fun of me when I do it
€ I am not good at it
€ I don't have time
€ It makes me smell bad
€ I am not coordinated
€ Other:_______________________

Appendix B: Survey Revisions

Survey Revisions

In order to decrease response error and improve the reliability and validity of scores obtained from the Nutrition and Exercise Survey for Students, cognitive interviews were conducted in the fall of 2005 with an expert panel of six members. The panel consisted of two registered dietitians who specialize in pediatric nutrition and health, two middle-school physical education teachers, the supervisor of k-12 physical education and health in a local school district, and an associate professor of physical education, wellness, and sport studies from a metropolitan university. The think-aloud process was utilized whereby each panel member was asked to read the survey items one at a time and then talk out loud about his/her thoughts on the quality of the item (Willis, 1999). As a result of individual and small-group interviews with the panel, several revisions were made to the survey and will be discussed next. After the survey was revised, it was piloted on a group of 6th grade students at a school in southwest Florida.

Several changes were recommended on the student information section of the survey. First, it was recommended that item 7 be revised from “Have you ever been on a diet?” to state, “Have you ever been on a diet to lose weight?” The purpose of this revision was to rule out students who might answer ‘yes’ as a result of going on special diets for reasons other than to lose weight (e.g., allergies, ethical beliefs, etc.). Next, the word ‘exercise’ was added to item 8 (“Do you think you do enough physical activity or exercise?”). It was recommended that this word be added to make the item clearer for those students who may not know that physical activity and exercise are synonyms. Finally, it was recommended that the word ‘healthy’ be removed from item 9 because it is a subjective term (e.g., “Do you think you eat a healthy variety of foods from each food group?”). All of these recommendations were accepted and incorporated as revisions to the survey. Additional changes were made that were not a result of the cognitive interviews. These changes included adding grade levels 6, 7, and 8; ages 11, 12, 13, 14, and including the term Black as an ethnic group option alongside African American. These were changes the researcher made to improve the utility of the measure (Curtiss, 2004).

The registered dietitians on the panel suggested multiple revisions to the section of the survey that assessed dietary intake behaviors. These recommendations primarily consisted of changing the examples of serving sizes to be aligned with portion sizes accepted by national organizations such as the American Dietetic Association and the United States Department of Agriculture. In order to align portion sizes with accepted standards, additions such as examples of serving sizes for ‘Cooked’ versus ‘Uncooked’ vegetables were recommended because they are proportionally different (e.g., 1 serving of Uncooked vegetables = 2 servings of Cooked vegetables). Similar changes were recommended for the fruit and fruit juice group to distinguish serving size amounts between fresh/raw fruit, canned fruit, dried fruit, and fruit juice. All of these recommendations were accepted for purposes of revising the survey.

In addition, it was recommended that photographs be utilized to supplement the text examples of a serving size. Visual examples were added to the survey for each text example of a serving size. These examples included the following clip-art or Google images: (1) tennis ball = 1 serving uncooked vegetables; 1 serving fresh/raw fruit, 1 serving of dairy or soy milk, etc…; (2) ½ tennis ball = 1 serving of cooked vegetables; 1 serving of fruit juice; 1 serving of yogurt or cottage cheese, etc…; (3) four dice = 1 serving of a cube of cheese; (4) golf ball = 1 serving of dried fruit; 1 serving of crumbled, grated or shredded cheese; 1 serving of peanut butter or nuts (5) 1 slice of bread = 1 serving , (7) 1 deck of cards = 1 serving of meat; and (8) 1 Nutri-Grain bar = 1 serving. Substantial research has supported the use of visual stimuli to aid in working memory operations and memory recall (Foos & Goolkasian, 2005).

Another recommended change to the nutrition section of the survey included changing the word 'Junk' to 'Other' in the section 'Junk Foods'. This recommendation was accepted and the rationale behind this recommendation was that youth may be less likely to report the consumption of such foods if they are labeled by a word that has negative connotations (Junk) versus a more neutral word (Other). Additional recommendations included increasing the variety of food examples in each group to be more culturally representative of diverse groups of people, providing specific examples of reasons for not eating five combined servings of fruits and vegetables per day, and including food items that are commonly consumed by youth. Again, these recommendations were accepted and made to the survey.

The panel members with training in physical education suggested several revisions for the physical activity section of the survey. Most revisions related to changing the wording of the items so that comprehension levels of students might be increased. For example, it was recommended that the word 'continuously' be omitted from items 1 – 3 and be replaced with the words 'without stopping' in case some students are not clear on the definition of continuously as used in the context, “On how many of the past 7 days did you do any type of exercise or physical activity for 20 minutes continuously or longer?” This revision was made to items 1-3. Another recommendation was to include the words ‘exercise’ and ‘physical activity’ as synonyms in items 1, 2, 3, 4, 6, and 8 to eliminate any confusion students might have related to the definitions of these words. This recommendation was accepted, and both words were included in all of those items.

Two final recommendations were suggested and included in the final revision of the survey. First, it was suggested that item 7 include a statement that says, “If you do physical activity every day you can skip this question.” The physical education teachers at a local middle school made this suggestion based on their experiences administering it to their students. When the survey was piloted with 6th grade students, many of them asked their teachers if they had to answer the question if they did physical activity every day. In order to eliminate any confusion, this statement was added to the survey. Finally, it was recommended that examples of reasons for not doing physical activity be provided from which students could choose, in addition to a blank box in which they could fill in their own reason.

Results of pilot test. Forty-eight middle school students in the 6th grade participated in the pilot study of the present questionnaire. Table B1 presents a description of the pilot sample. The participants were fairly evenly distributed across two ethnic groups: ‘Latino or Hispanic American’ (n = 25) and ‘Caucasian American or White’ (n = 21), and there was only one student who self-identified as ‘African American or Black'. The majority of participants were female (62.5%), and participants ranged in age from 11 – 14 years.

Table B1

Sample Characteristics of Participants

Characteristic	Number (%) (N = 48)
Ethnicity	
African American	1 (2.1)
Caucasian	21 (43.8)
Latino	25 (52.1)
Gender	
Male	18 (37.5)
Female	30 (62.5)
Age	
11	18 (37.5)
12	20 (41.7)
13	9 (18.8)
14	1 (2.1)

After the demographic questions, participants were asked several questions related to dietary intake, physical activity, and perceived stress. Related to dietary intake, 37.5% of students reported eating breakfast and 60.4% reported eating lunch all five days of the school week. In addition, only 29.2% reported that they had been on a diet to lose weight, and 60.4% reported that they believed they ate a variety of foods from each food group. When asked if they believed they did enough physical activity or exercise, 72.9%

of students responded 'yes', and 66.7% of students believed that they had too much stress in their lives.

Descriptive statistics for dietary intake variables. The dependent variables were the amount of fruit, vegetables, milk/milk products, meat and beans, breads and grains, and junk foods that were consumed each day. Table B2 displays the minimum and maximum scores for each dietary intake variable, and the means and standard deviations for the total group across each dietary intake variable. Overall, students reported consuming an average of 2.56 vegetable servings per day, and 3.83 fruit/fruit juice servings. These numbers suggest that students are approximating the 1992 recommendation of five combined servings of fruits and vegetables per day set by the United States Department of Agriculture (USDA, 1992). To take a closer look at fruit and vegetable consumption, the vegetables and fruits/fruit juices variables were combined to create a total vegetables/fruits variable by summing the totals for each group. Approximately 75% of the sample reported consuming, on average, at least five servings of vegetables/fruits per day. This finding is not consistent with the results of a study by Munoz et al. (1997), where less than 36% of participants met the recommendation for five combined servings of fruits and vegetables. Gender differences were not significant for vegetable/fruit consumption, with approximately 77% of boys and 73% of girls reporting consuming, on average, five combined servings per day. The literature has not produced consistent results with regard to gender differences. Some studies have found inadequate fruit and vegetable consumption to be more prevalent among males

(Neumark-Sztainer et al., 2002) and others have found no differences between males and females (Beech et al., 1999).

Recently, the USDA changed the recommendations for the daily recommended amounts from each food group. At present, the guidelines for daily recommended amounts are calculated for each person individually based on three variables: 1) gender, 2) age, and 3) amount of exercise in which one engages per day. The recommended amounts are computed based on these variables. However, based on a number of computations on the USDA web-site by this examiner, with less than 30 minutes of exercise per day entered, a 12-year-old girl needs to consume 3.5 cups of combined fruits and vegetables per day and a 12-year-old boy needs to consume approximately 4 cups per day for adequate nutrition. A 16-year-old girl needs approximately 4 combined servings per day and a 16-year-old boy needs 5 servings per day. Thus, for students who are in middle school and are engaging in less than 30 minutes of physical activity, about 3.5 to 4 cups of vegetables/fruits is sufficient for adequate nutrition. However, if one enters 30 – 60 minutes of physical activity into the pyramid calculator, the recommended servings of fruits/vegetables increases to 4.5 for 12-year-old girls, 5 for 12-year-old boys, 4.5 for 16-year-old girls, and 6 for 16-year-old boys.

Table B2

Minimum, Maximum, Means, and Standard Deviations for all Variables

Variable	Minimum	Maximum	*M*	*SD*
Vegetables	0	7	2.56	1.79
Fruit and fruit juice	0	7	3.83	1.98
Milk/milk products	0	7	3.06	2.04
Meat and beans	0	7	3.19	2.08
Breads and grains	0	7	2.83	1.97
Other foods	0	7	5.08	2.15

Note. $N = 48$. Dependent variables were scaled from 0 to 7 servings per day.

In terms of milk/milk product consumption, the current USDA recommendations are three cups of milk for boys and girls between the ages 12 and 16, despite the amount of physical activity in which they engage per day (USDA, 2005). In the pilot sample, the total sample reported consuming an average of 3.06 ($SD = 2.04$) cups of milk per day. However, a look at gender differences revealed that 55% of males and 43% of females reported consuming the recommended three servings of milk products per day. Previous research has suggested that boys are more likely than girls to meet the dairy recommendations (Munoz et al., 1997). However, it is noted that in the pilot sample approximately 33.3% of females reported consuming an average of 2 servings of milk per day, just one serving short of the recommendation.

In the pilot sample, students reported consuming, on average, 5.08 ($SD = 2.15$) servings of foods from the "Other" category per day. Although there is no sizable body of literature on youth consumption of junk foods, Curtiss (2004) found that high school students ($N = 179$) reported consuming an average of 3.30 servings of "Other" foods per day. Based on USDA guidelines to consume fats, oils, and sweets sparingly, it would seem logical to assume that participants in the present study are not meeting this guideline.

Ethnic comparisons were not permitted in the pilot study due to small sample sizes in the sub-groups. Across ethnic groups, inconsistent patterns of food intake activity have been reported and typically the consumption of fruits, vegetables, and dairy are the only groups measured. Overall, the differences in dietary intake among ethnic groups are equivocal, and studies suggest that both geographic location and ethnicity may affect consumption of foods (Gower & Higgins, 2003).

Table B3 displays the minimum and maximum scores for each physical activity variable and the means and standard deviations for all items. On average, the total group reported engaging in any physical activity 5.67 (*SD* = 1.67) days per week. The average mean score for vigorous physical activity was 4.92 (*SD* = 1.98) days per week and the average mean score for moderate physical activity was 4.65 (*SD* = 2.43). The finding for moderate physical activity was somewhat surprising given that these students go to PE class five days a week, although it is conceivable that they rated their PE activity as vigorous.

Table B3

Minimum and Maximum Scores and Means and Standard Deviations for all Variables

	Minimum	Maximum	*M*	*SD*
Total physical activity[a]	0	7	5.67	1.67
Vigorous activity[a]	0	7	4.92	1.98
Moderate activity[a]	0	7	4.65	2.43
Toning exercise[a]	0	7	3.48	2.61
Go to PE[b]	5	5	5.00	0.00
Minutes exercising in PE[c]	2	5	4.50	.83
Sedentary activity[d]	1	7	4.65	1.93

Note. $N = 48$. [a]Activity variables were scaled from 0 to 7 days a week. [b]Go to P.E. was on a scale of 0 to 5 days a week. [c]Minutes exercising in P.E. was scaled 1 to 5 (see survey for scale definition). [d]Sedentary activity was scaled from 1 to 7 (see survey for scale definition).

A report from the Surgeon General (CDC, 2003) recommends that adolescents engage in at least three bouts of moderate to vigorous physical activity per week during which they sweat or breathe hard for 20 minutes or more on each occasion. Additionally, moderate physical activity is recommended on a daily basis, with a minimum of five bouts a week, and includes engaging in any of the following activities for at least 30 minutes: walking two miles, mowing the lawn or performing household chores (e.g., mopping), skipping rope, and riding a bike. Based on these recommendations, it appears that the present sample is meeting the physical activity guidelines when their scores are averaged for the total group.

In the pilot sample, approximately 87.5% of the total sample, 87% of females and 89% of males, reported engaging in a minimum of three bouts of vigorous activity per week. With regard to moderate activity, approximately 66% of the total sample, 53% of females and 61% of males reported meeting the recommendation of a minimum of five bouts of moderate activity per week. These findings were somewhat higher than what is cited in the literature for vigorous and moderate physical activity and may be due to the fact that the students take a daily PE class. Prevalence estimates of the number of bouts of vigorous physical activity per week for U.S. children (8-16 years) from NHANES III data indicate that overall, 80% of children reported engaging in vigorous physical activities that made them sweat or breathe hard three or more times per week (Andersen et al., 1998; Dowda et al., 2001). In the 1996 Add Health study, 33.2% (*N* = 13,157) of the adolescents reported that they participated in five or more episodes of moderate to vigorous physical activity per week (Gordon-Larsen, McMurray, & Popkin, 1999). Based on data from the National Health Interview Survey, the CDC reported that only 65% of adolescents engaged in the recommended amount of vigorous physical activity in 1999.

With regard to sedentary activity, the mean score for the total sample was 4.65 (*SD* = 1.93). This number translates to approximately three hours per day engaged in sedentary activities such as, watching television/movies, playing video games, reading, talking on a cell phone or sending text messages, doing homework, or on the computer/Internet. There are no guidelines for the maximum number of hours per day in which youth should engage in sedentary activity, however, the general consensus is that less time is better. Nationwide, approximately 26-30% of youth reported watching four or more hours of television per day (Andersen et al., 1998; Dowda et al., 2001). Gordon-Larsen et al. (1999) analyzed mean number of hours of television per week and mean composite inactivity hours per week (TV and video viewing, and computer and video game playing) and found that African Americans reported the highest levels of inactive engagement followed by Hispanics and Caucasians. African Americans reported 29.7 composite inactivity hours per week, followed by Hispanics (22.2 hours) and Caucasians (19.3 hours). Again, analyses of ethnic differences were not possible in the pilot study due to very small sample size and sub-sample sizes.

Item-to-total correlations and Cronbach's alpha were obtained for some of the items from the two sub-scales of the Nutrition and Physical Activity Questionnaire for Middle and High School Students. Table B4 displays the values of internal consistency computed for scores obtained from these items. For dietary intake, the variables vegetables and fruits/fruit juices were analyzed (2 items) and for physical activity, the variables total physical activity, vigorous activity, moderate activity, and toning activity were analyzed (4 items). Overall, the two sub-scale scores appear to have moderate internal consistency reliability scores with the Nutrition sub-scale scores being the least reliable.

Table B4

Values of Internal Consistency for Scores on Sub-Scales

Sub-Scale	Number of items	Cronbach's alpha (α)	Range of item-to-total correlation
Nutrition	2	.44	.29
Physical Activity	4	.64	.37-.47

Note. $N = 48$.

Item-to-total correlations for the two items on the Nutrition sub-scale and for the four items on the Physical Activity sub-scale are reported in Table B5, in addition to means and standard deviations. The correlations for each Nutrition item were .29. The correlations ranged from a minimum of .37 to a maximum of .47.

Table B5

Item-to-Total Correlations, Means and Standard Deviations for Nutrition and Physical Activity

	Corrected item to total correlation	*M*	*SD*
Vegetables	.29	2.56	1.79
Fruit/Fruit juices	.29	3.83	1.98
Total Physical Activity	.49	5.67	1.67
Vigorous Activity	.34	4.92	1.98
Moderate activity	.63	4.65	2.43
Toning Activity	.48	3.47	2.61

Note. $N = 48$.

Item-to-total correlations and Cronbach's alpha were also obtained for females and males separately on the two sub-scales. Table B6 displays the values of internal consistency computed for scores obtained from these items. For the Nutrition sub-scale, males' scores resulted in a higher Cronbach's alpha (.56) than females' (.40). For the

Physical Activity sub-scale, the reverse was true where females' scores resulted in a higher Cronbach's alpha (.69) than males' (.50). All alphas were moderate in size. Item-to-total correlations for the two items on the Nutrition sub-scale are reported in Table B7 for females and males, in addition to means and standard deviations. The correlations for males for each Nutrition item were .40 and for females they were .25. Table B8 contains item-to-total correlations, means, and standard deviations for the four items classified as Physical Activity for males and females. The correlations ranged from a minimum of .12 to a maximum of .47 for males and a minimum of .34 to a maximum of .67 for females.

Table B6

Internal Consistency for Scores on Sub-Scales for Females and Males

Sub-scale	Cronbach's alpha (α)
Nutrition	
Males	.56
Females	.40
Physical Activity	
Males	.50
Females	.69

Note. For males, n = 18. For females, n = 30.

Table B7

Item-to-Total Correlations, Means and Standard Deviations for Nutrition for Males and Females

	Corrected item to total correlation	*M*	*SD*
Males			
Vegetables	.40	2.33	1.71
Fruit/Fruit juices	.40	3.89	1.53
Females			
Vegetables	.25	2.70	1.84
Fruit/Fruit juices	.25	3.80	2.23

Note. For males, *n* = 18. For females, *n* = 30.

Table B8

Item-to-Total Correlations, Means and Standard Deviations for Physical Activity

	Corrected item to total correlation	*M*	*SD*
Males			
Total Physical Activity	.42	6.00	1.46
Vigorous Activity	.47	4.78	2.05
Moderate activity	.12	5.00	2.14
Toning Activity	.28	3.61	2.62
Females			
Total Physical Activity	.49	5.47	1.78
Vigorous Activity	.34	5.00	1.97
Moderate Activity	.63	4.43	2.60
Toning Activity	.48	3.40	2.65

Note. For males, *n* = 18. For females, *n* = 30.

Appendix C: Correlation Matrix for Dietary Intake Variables for 6th Grade Participants

Dependent variable	F&V	Milk	Meat	Bread	Junk food
			Participants (*n* = 354)		
F&V	-	.36	.47	.45	.17
Milk		-	.34	.36	.18
Meat			-	.49	.41
Bread				-	.18
Junk food					-

Note. F&V = Fruits and vegetables.

Appendix D: Correlation Matrix for Dietary Intake Variables for 9th Grade Participants

Dependent variable	F&V	Milk	Meat	Bread	Junk Food
			Participants (*n* = 164)		
F&V	-	.34	.45	.41	.14
Milk		-	.36	.34	.20
Meat			-	.52	.44
Bread				-	.37
Junk food					-

Note. F&V = Fruits and vegetables.

Appendix E: Correlation Matrix for Dietary Intake Variables for Total Sample

Dependent variable		Milk	Meat/beans	Breads	Junk food	F&V
Milk	Pearson correlation	1	.347(**)	.353(**)	.182(**)	.353(**)
	Sig. (2-tailed)		.000	.000	.000	.000
	N	523	522	521	520	522
Meat/beans	Pearson correlation	-	1	.500(**)	.413(**)	.465(**)
	Sig. (2-tailed)	-	-	.000	.000	.000
	N	-	523	522	521	522
Breads	Pearson correlation	-	-	1	.233(**)	.433(**)
	Sig. (2-tailed)	-	-		.000	.000
	N	-	-	522	520	521
Junk food	Pearson correlation	-	-	-	1	.162(**)
	Sig. (2-tailed)	-	-	-		.000
	N	-	-	-	521	520
F&V	Pearson correlation	-	-	-	-	1
	Sig. (2-tailed)	-	-	-	-	
	N	-	-	-	-	523

Note. **Correlation is significant at the 0.01 level (2-tailed).

Appendix F: Correlation Matrix for Physical Activity Variables for 6th Grade Participants

Dependent variable	Total	Vigorous	Moderate
		Participants (n = 344)	
Total	-	.55	.52
Vigorous	-	-	.47
Moderate		-	-

Appendix G: Correlation Matrix for Physical Activity Variables for 9th Grade Participants

Dependent variable	Total	Vigorous	Moderate
		Participants (n = 167)	
Total	-	.61	.47
Vigorous	-	-	.50
Moderate		-	-

Appendix H: Correlation for Physical Activity Variables for Total Sample

		Total	Vigorous	Moderate
Total	Pearson correlation	1	.576(**)	.511(**)
	Sig. (2-tailed)		.000	.000
	N	526	519	516
Vigorous	Pearson correlation	-	1	.477(**)
	Sig. (2-tailed)	-		.000
	N	-	520	512
Moderate	Pearson correlation	-	-	1
	Sig. (2-tailed)	-	-	
	N	-	-	517

Note. **Correlation is significant at the 0.01 level (2-tailed).

Appendix I: Correlation Matrix across Dietary Intake and Physical Activity Variables for 6th Grade Participants

		Total	Vigorous	Moderate	Milk	Meat/beans	Breads	Junk food	F&V
Total	Pearson correlation	1	.552(**)	.521(**)	.169(**)	.100	.075	.078	.191(**)
	Sig. (2-tailed)		.000	.000	.002	.060	.162	.147	.000
	N	356	350	348	349	350	349	350	350
Vigorous	Pearson correlation	-	1	.462(**)	.130(*)	.184(**)	.106	.155(**)	.267(**)
	Sig. (2-tailed)	-		.000	.016	.001	.050	.004	.000
	N	-	351	345	344	345	344	345	345
Moderate	Pearson correlation	-	-	1	.098	.217(**)	.144(**)	.132(*)	.187(**)
	Sig. (2-tailed)	-	-		.069	.000	.008	.015	.000
	N	-	-	349	342	343	342	343	343
Milk	Pearson correlation	-	-	-	1	.345(**)	.363(**)	.179(**)	.361(**)
	Sig. (2-tailed)	-	-	-		.000	.000	.001	.000
	N	-	-	-	355	355	354	355	355
Meat/beans	Pearson correlation	-	-	-	-	1	.491(**)	.417(**)	.471(**)
	Sig. (2-tailed)	-	-	-	-		.000	.000	.000
	N	-	-	-	-	356	355	356	356

Appendix I: (Continued)

		Total	Vigorous	Moderate	Milk	Meat/beans	Breads	Junk food	F&V
Breads	Pearson correlation	-	-	-	-	-	1	.179(**)	.446(**)
	Sig. (2-tailed)	-	-	-	-	-		.001	.000
	N	-	-	-	-	-	355	355	355
Junk food	Pearson correlation	-	-	-	-	-	-	1	.171(**)
	Sig. (2-tailed)	-	-	-	-	-	-		.001
	N	-	-	-	-	-	-	356	356
F&V	Pearson correlation	-	-	-	-	-	-	-	1
	Sig. (2-tailed)	-	-	-	-	-	-	-	
	N	-	-	-	-	-	-	-	356

Note. **Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed).

F&V = Fruits and vegetables.

Appendix J: Correlation Matrix across Dietary Intake and Physical Activity Variables for 9th Grade Participants

		Total	Vigorous	Moderate	Milk	Meat/beans	Breads	Junk food	F&V
Total	Pearson correlation	1	.620(**)	.472(**)	.132	.182(*)	.154(*)	.040	.214(**)
	Sig. (2-tailed)		.000	.000	.090	.019	.048	.608	.006
	N	170	169	168	166	165	165	163	165
Vigorous	Pearson correlation	-	1	.498(**)	.111	.075	.111	.023	.260(**)
	Sig. (2-tailed)	-		.000	.155	.337	.158	.771	.001
	N	-	169	167	165	164	164	162	164
Moderate	Pearson correlation	-	-	1	.049	.079	.081	.039	.178(*)
	Sig. (2-tailed)	-	-		.530	.316	.304	.620	.023
	N	-	-	168	164	163	163	161	163
Milk	Pearson correlation	-	-	-	1	.351(**)	.330(**)	.195(*)	.338(**)
	Sig. (2-tailed)	-	-	-		.000	.000	.012	.000
	N	-	-	-	168	167	167	165	167
Meat/beans	Pearson correlation	-	-	-	-	1	.520(**)	.432(**)	.454(**)
	Sig. (2-tailed)	-	-	-	-		.000	.000	.000

Appendix J: (Continued)

		Total	Vigorous	Moderate	Milk	Meat/beans	Breads	Junk food	F&V
	N	-	-	-	-	167	167	165	166
Breads	Pearson correlation	-	-	-	-	-	1	.364(**)	.408(**)
	Sig. (2-tailed)	-	-	-	-	-		.000	.000
	N	-	-	-	-	-	167	165	166
Junk food	Pearson correlation	-	-	-	-	-	-	1	.139
	Sig. (2-tailed)	-	-	-	-	-	-		.076
	N	-	-	-	-	-	-	165	164
F&V	Pearson correlation	-	-	-	-	-	-	-	1
	Sig. (2-tailed)	-	-	-	-	-	-	-	
	N	-	-	-	-	-	-	-	167

Note. **Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed). F&V = Fruits and vegetables.

Appendix K: Correlation Matrix across Dietary Intake and Physical Activity Variables for Total Sample

		Total	Vigorous	Moderate	Milk	Meat/beans	Breads	Junk food	F&V
Total	Pearson correlation	1	.576(**)	.511(**)	.157(**)	.125(**)	.098(*)	.080	.200(**)
	Sig. (2-tailed)		.000	.000	.000	.005	.026	.069	.000
	N	526	519	516	515	515	514	513	515
Vigorous	Pearson correlation	-	1	.477(**)	.125(**)	.149(**)	.106(*)	.122(**)	.265(**)
	Sig. (2-tailed)	-		.000	.005	.001	.017	.006	.000
	N	-	520	512	509	509	508	507	509
Moderate	Pearson correlation	-	-	1	.083	.170(**)	.122(**)	.116(**)	.186(**)
	Sig. (2-tailed)	-	-		.062	.000	.006	.009	.000
	N	-	-	517	506	506	505	504	506
Milk	Pearson correlation	-	-	-	1	.347(**)	.353(**)	.182(**)	.353(**)
	Sig. (2-tailed)	-	-	-		.000	.000	.000	.000
	N	-	-	-	523	522	521	520	522
Meat/beans	Pearson correlation	-	-	-	-	1	.500(**)	.413(**)	.465(**)
	Sig. (2-tailed)	-	-	-	-		.000	.000	.000

Appendix K: (Continued)

		Total	Vigorous	Moderate	Milk	Meat/beans	Breads	Junk food	F&V
	N	-	-	-	-	523	522	521	522
Breads	Pearson correlation	-	-	-	-	-	1	.233(**)	.433(**)
	Sig. (2-tailed)	-	-	-	-	-		.000	.000
	N	-	-	-	-	-	522	520	521
Junk food	Pearson correlation	-	-	-	-	-	-	1	.162(**)
	Sig. (2-tailed)	-	-	-	-	-	-		.000
	N	-	-	-	-	-	-	521	520
F&V	Pearson correlation	-	-	-	-	-	-	-	1
	Sig. (2-tailed)	-	-	-	-	-	-	-	
	N	-	-	-	-	-	-	-	523

Note. **Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed). F&V = Fruits and vegetables.

Appendix L: Multivariate Outliers, Skewness and Kurtosis Values for Dietary Intake for 6th Grade Students

Weight, race, gender	Dependent variable	*n*	No. of outliers	No. of extreme outliers	Skewness	Kurtosis
Expected Black Female	Milk	45	1	0	1.17	.75
Expected Black Female	Meat	45	0	0	.156	-1.17
Expected White Male	Meat	13	0	0	-.26	-1.87
Expected White Male	Bread	13	0	0	-.05	-1.75
Expected White Male	Junk Food	13	0	0	-1.30	1.94
Expected White Female	Bread	15	0	0	.99	1.19
Expected Latino Male	Junk Food	42	0	0	-.22	-1.41
Expected Latino Female	Bread	40	0	0	-.003	-1.13
At-risk weight Black Male	Milk	13	0	0	-.003	-1.76
At-risk weight Black Male	Bread	13	0	0	.59	-1.46
At-risk weight Black Male	Junk Food	13	0	0	.21	-1.46
At-risk weight Black Female	Milk	12	0	0	.24	-1.65
At-risk weight Black Female	Meat	12	0	1	1.07	-.56
At-risk weight Black Female	Junk Food	12	0	0	-.67	-1.23
At-risk weight Latino Male	Milk	14	0	0	.09	-1.19
At-risk weight Latino Male	F&V	14	0	0	.57	-1.36
At-risk weight Latino Female	Meat	12	0	0	1.09	-.09
At-risk weight White Male	Bread	3	0	0	-1.55	*
At-risk weight White Male	Other	3	0	0	1.73	*
At-risk weight White Female	Milk	4	0	0	-.86	-1.29
At-risk weight White Female	Meat	4	0	0	2.0	4.0

Appendix L: (Continued)

Weight, race, gender	Dependent variable	*n*	No. of outliers	No. of extreme outliers	Skewness	Kurtosis
At-risk weight White Female	Bread	4	0	0	.86	-1.29
At-risk weight White Female	Junk Food	4	0	0	1.72	3.27
At-risk weight White Female	F&V	4	0	0	-.86	-1.29
Overweight Black Male	Meat	17	0	0	1.09	2.35
Overweight Black Male	Bread	17	0	0	-.15	-1.31
Overweight Black Male	Junk Food	17	0	0	-.43	-1.12
Overweight Black Female	Milk	21	0	0	.30	-1.36
Overweight Black Female	Meat	21	0	0	.29	-1.04
Overweight Latino Male	Milk	20	0	0	-.05	-1.30
Overweight Latino Male	Junk Food	20	0	0	-.32	-1.20
Overweight Latino Female	Junk Food	15	0	0	.24	-1.73
Overweight White Male	Milk	6	0	0	1.34	1.88
Overweight White Male	Bread	6	0	0	0.8	-1.56
Overweight White Male	Junk Food	6	0	0	-.30	-1.42
Overweight White Male	F&V	6	0	0	.53	-1.88
Overweight White Female	Milk	3	0	0	-1.73	*
Overweight White Female	Bread	3	0	0	-1.73	*
Overweight White Female	F&V	3	0	0	-1.73	*

Note. *Value could not be computed due to small sample size.

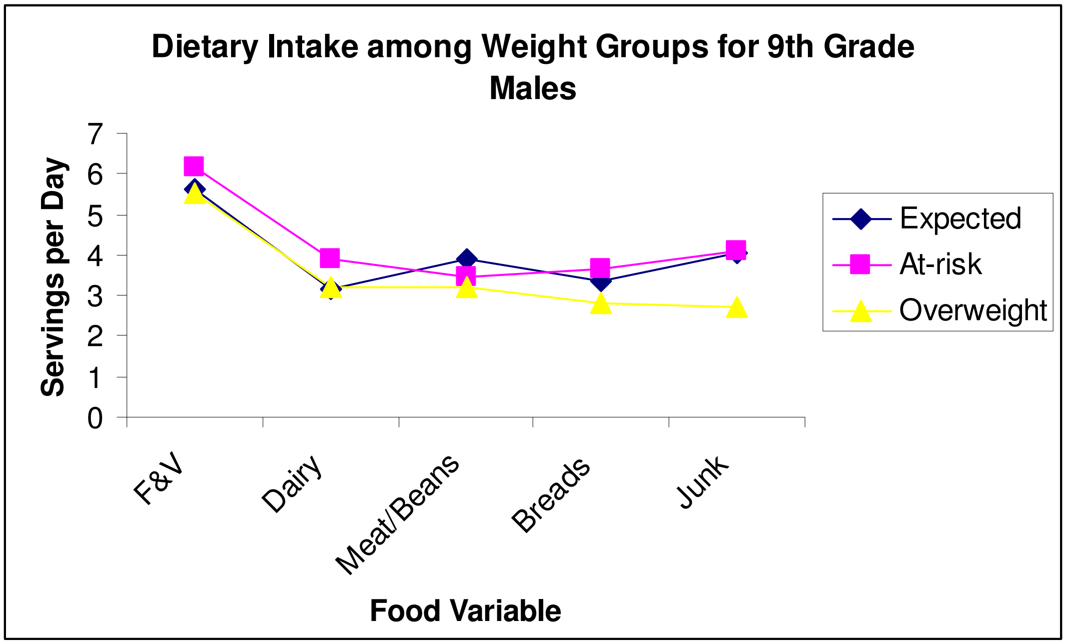
Appendix M: Multivariate Outliers, Skewness and Kurtosis Values for Dietary Intake for 9th Grade Students

Weight, race, gender	Dependent variable	*n*	No. of outliers	No. of extreme outliers	Skewness	Kurtosis
Expected Black Male	Junk Food	31	0	0	.31	-1.25
Expected Latino Male	Dairy	10	0	0	1.04	.31
Expected Latino Male	Junk Food	8	0	0	.42	-1.16
Expected Latino Female	Dairy	10	0	0	.50	-1.23
Expected Latino Female	Bread	10	0	0	.66	1.24
Expected Latino Female	Junk Food	10	0	0	.00	-1.84
Expected Latino Female	F&V	10	0	0	-.04	-1.18
Expected White Male	Meat	7	0	0	.36	-1.92
Expected White Male	Dairy	7	1	0	.77	.26
Expected White Male	Bread	7	0	0	-1.14	1.95
Expected White Male	Junk Food	7	0	0	-.38	-2.90
Expected White Male	F&V	7	0	0	1.17	1.30
Expected White Female	Dairy	7	0	0	-2.35	5.58
Expected White Female	Meat	7	0	0	1.07	.33
Expected White Female	Junk Food	7	1	0	1.65	2.35
At-risk weight Black Male	Junk Food	14	0	0	-.05	-1.06
At-risk weight Black Male	F&V	14	1	0	.64	2.04
At-risk weight Black Female	Dairy	11	0	0	.74	-1.06
At-risk weight Black Female	Meat	11	1	0	-.90	.30
At-risk weight Black Female	Bread	11	1	0	-.79	.19
At-risk weight Black Female	Junk Food	11	0	0	.007	-1.40
At-risk weight Latino Male	Meat	5	0	0	.47	-3.09

Appendix M: (Continued)

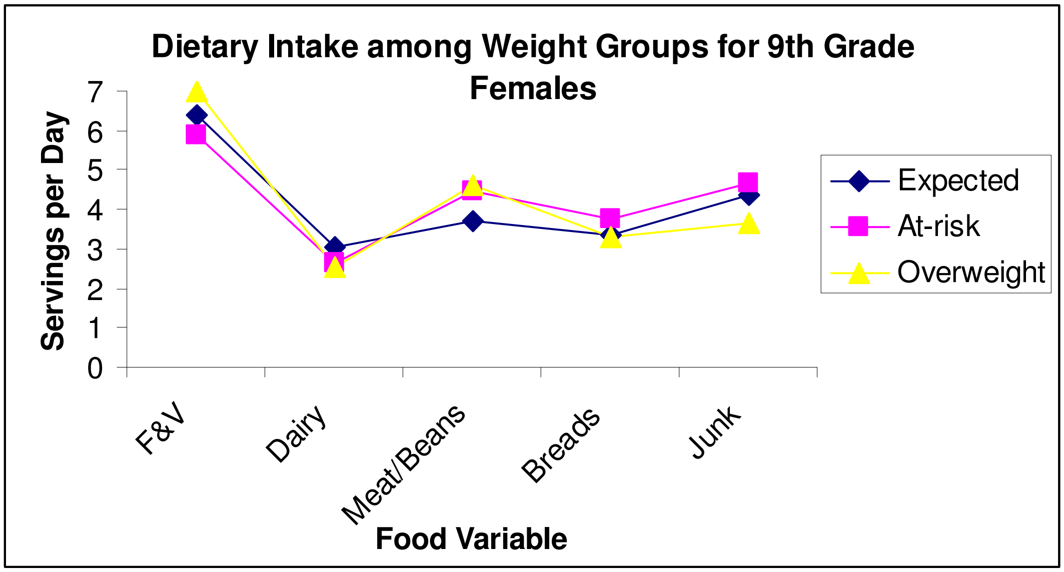
Weight, race, gender	Dependent variable	*n*	No. of outliers	No. of extreme outliers	Skewness	Kurtosis
At-risk weight Latino Male	Bread	5	0	0	.54	-1.49
At-risk weight Latino Male	Junk Food	5	1	0	1.15	2.00
At-risk weight Latino Male	F&V	5	0	0	.15	-2.08
At-risk weight Latino Female	Dairy	4	0	0	.00	-6.00
At-risk weight Latino Female	Meat	4	0	0	1.78	3.14
At-risk weight Latino Female	Bread	4	0	0	.37	-5.29
At-risk weight Latino Female	F&V	4	0	0	1.85	3.41
At-risk weight Latino Female	Junk Food	4	0	0	-.12	-5.29
At-risk weight White Male	Dairy	5	0	0	1.53	1.75
At-risk weight White Male	Meat	5	0	0	1.53	1.75
At-risk weight White Male	Bread	5	0	0	1.92	3.88
At-risk weight White Male	F&V	5	0	1	1.93	3.80
Overweight Black Male	Dairy	9	1	1	1.12	.27
Overweight Black Male	Bread	9	0	0	.12	-1.14
Overweight Black Male	F&V	9	0	0	1.16	1.49
Overweight Black Female	Dairy	11	1	0	-.45	.13
Overweight Black Female	Junk Food	11	0	0	.00	-1.72
Overweight Latino Male	Milk	6	0	0	1.24	.86
Overweight Latino Male	Bread	6	0	0	.46	-2.39
Overweight Latino Male	Junk Food	6	1	0	.89	1.34
Overweight Latino Female	Meat	3	0	0	-1.73	*
Overweight Latino Female	Bread	3	0	0	-1.46	*
Overweight Latino Female	Junk Food	3	0	0	1.60	*

Appendix N: Dietary Intake among Weight Groups for 9th Grade Males



Note. *n = 87. F&V = Fruit/vegetables.

Appendix O: Dietary Intake among Weight Groups for 9th Grade Females



Note. *n = 81. F&V = Fruit/vegetables.

Appendix P: Multivariate Outliers, Skewness and Kurtosis Values for Physical Activity for 6th Grade Students

Weight, race, gender	Dependent variable	*n*	No. of outliers	No. of extreme outliers	Skewness	Kurtosis
Expected Black Male	Vigorous	57	0	0	.08	-1.20
Expected Black Male	Sedentary	58	0	0	.11	-1.20
Expected Black Female	Total	44	0	0	.02	-1.37
Expected Black Female	Vigorous	44	0	0	.35	-1.23
Expected Black Female	Moderate	43	0	0	.27	-1.14
Expected Black Female	Sedentary	44	0	0	-.09	-1.54
Expected Latino Male	Vigorous	43	0	0	.12	-1.02
Expected Latino Male	Moderate	42	0	0	.39	-1.23
Expected Latino Male	Sedentary	41	0	0	-.20	-1.23
Expected Latino Female	Vigorous	40	0	0	.14	-1.05
Expected White Male	Total	13	1	0	-.81	1.17
Expected White Male	Vigorous	13	0	0	.11	-1.39
Expected White Male	Moderate	13	0	0	.001	-1.26
Expected White Female	Vigorous	16	1	0	.68	-.26
At-risk weight Black Male	Sedentary	12	0	0	.15	-1.78
At-risk weight Black Female	Total	12	0	0	-.51	-1.19
At-risk weight Black Female	Vigorous	12	0	0	-.44	-1.77
At-risk weight Black Female	Moderate	12	0	0	-.06	-1.55
At-risk weight Black Female	Sedentary	12	0	0	.18	-1.83
At-risk weight Latino Male	Total	15	0	0	-.19	-1.28
At-risk weight Latino Male	Sedentary	14	0	0	.67	-1.28
At-risk weight Latino Female	Moderate	12	0	0	1.27	.68

Appendix P: (Continued)

Weight, race, gender	Dependent variable	*n*	No. of outliers	No. of extreme outliers	Skewness	Kurtosis
At-risk weight Latino Female	Sedentary	12	0	0	-.03	-1.13
At-risk weight White Male	Total	3	0	0	-1.73	*
At-risk weight White Male	Vigorous	3	0	0	-.94	*
At-risk weight White Male	Moderate	3	0	0	-1.73	*
At-risk weight White Male	Sedentary	3	0	0	-1.73	*
At-risk weight White Female	Vigorous	5	0	0	-.31	-1.54
At-risk weight White Female	Moderate	5	0	0	-.27	1.07
At-risk weight White Female	Sedentary	5	2	0	-1.45	1.93
Overweight Black Male	Total	17	0	0	.05	-1.10
Overweight Black Male	Moderate	16	0	0	.25	-1.46
Overweight Black Male	Sedentary	16	0	0	.35	-1.63
Overweight Black Female	Moderate	21	0	0	.12	-1.45
Overweight Latino Male	Vigorous	20	0	0	-.15	-1.18
Overweight Latino Male	Moderate	20	0	0	.03	-1.20
Overweight Latino Male	Sedentary	20	0	0	.02	-1.26
Overweight Latino Female	Total	15	0	0	.20	-1.33
Overweight Latino Female	Moderate	15	0	0	.10	-1.43
Overweight Latino Female	Sedentary	15	0	0	-.28	-1.23
Overweight White Male	Moderate	6	1	0	1.51	2.89
Overweight White Male	Sedentary	6	0	0	1.54	1.43
Overweight White Female	Total	4	0	0	1.19	1.50
Overweight White Female	Vigorous	4	0	0	.00	-1.20
Overweight White Female	Moderate	4	0	0	.71	1.79

Appendix P: (Continued)

Weight, race, gender	Dependent variable	n	No. of outliers	No. of extreme outliers	Skewness	Kurtosis
Overweight White Female	Sedentary	4	0	0	-.12	-5.29

Appendix Q: Multivariate Outliers, Skewness and Kurtosis Values for Physical Activity for 9th Grade Students

Weight, race, gender	Dependent variable	*n*	No. of outliers	No. of extreme outliers	Skewness	Kurtosis
Expected Black Female	Milk	45	1	0	1.17	.75
Expected Black Female	Meat	45	0	0	.156	-1.17
Expected White Male	Meat	13	0	0	-.26	-1.87
Expected White Male	Bread	13	0	0	-.05	-1.75
Expected White Male	Junk Food	13	0	0	-1.30	1.94
Expected White Female	Bread	15	0	0	.99	1.19
Expected Latino Male	Junk Food	42	0	0	-.22	-1.41
Expected Latino Female	Bread	40	0	0	-.003	-1.13
At-risk weight Black Male	Milk	13	0	0	-.003	-1.76
At-risk weight Black Male	Bread	13	0	0	.59	-1.46
At-risk weight Black Male	Junk Food	13	0	0	.21	-1.46
At-risk weight Black Female	Milk	12	0	0	.24	-1.65
At-risk weight Black Female	Meat	12	0	1	1.07	-.56
At-risk weight Black Female	Junk Food	12	0	0	-.67	-1.23
At-risk weight Latino Male	Milk	14	0	0	.09	-1.19
At-risk weight Latino Male	F&V	14	0	0	.57	-1.36
At-risk weight Latino Female	Meat	12	0	0	1.09	-.09
At-risk weight White Male	Bread	3	0	0	-1.55	*
At-risk weight White Male	Other	3	0	0	1.73	*
At-risk weight White Female	Milk	4	0	0	-.86	-1.29
At-risk weight White Female	Meat	4	0	0	2.0	4.0
At-risk weight White Female	Bread	4	0	0	.86	-1.29

Appendix Q: (Continued)

Weight, race, gender	Dependent variable	*n*	No. of outliers	No. of extreme outliers	Skewness	Kurtosis
At-risk weight White Female	Junk Food	4	0	0	1.72	3.27
At-risk weight White Female	F&V	4	0	0	-.86	-1.29
Overweight Black Male	Meat	17	0	0	1.09	2.35
Overweight Black Male	Bread	17	0	0	-.15	-1.31
Overweight Black Male	Junk Food	17	0	0	-.43	-1.12
Overweight Black Female	Milk	21	0	0	.30	-1.36
Overweight Black Female	Meat	21	0	0	.29	-1.04
Overweight Latino Male	Milk	20	0	0	-.05	-1.30
Overweight Latino Male	Junk Food	20	0	0	-.32	-1.20
Overweight Latino Female	Junk Food	15	0	0	.24	-1.73
Overweight White Male	Milk	6	0	0	1.34	1.88
Overweight White Male	Bread	6	0	0	0.8	-1.56
Overweight White Male	Junk Food	6	0	0	-.30	-1.42
Overweight White Male	F&V	6	0	0	.53	-1.88
Overweight White Female	Milk	3	0	0	-1.73	*
Overweight White Female	Bread	3	0	0	-1.73	*
Overweight White Female	F&V	3	0	0	-1.73	*

Note. *Value could not be computed due to small sample size.

About the Author

Heather L. Curtiss received a Bachelor's Degree in International Studies from the University of South Florida in 1997 and an M.A. in School Psychology from the University of South Florida in 2003. She continued to pursue a Ph.D. in School Psychology with an emphasis in pediatric health issues.

While in the Ph.D. program at the University of South Florida, Ms. Curtiss was very active in the USF Kosove Society, which is a scholarship society for outstanding students committed to community service. She has also worked in the Department of Pediatrics, Division of Child Development as a school psychologist in training for 3 years.