

2018

# Adolescent Girls' Nutrition and Physical Activity Habits by Grade, Obesity, and Race/Ethnicity

NaTasha Nicks  
*Walden University*

Follow this and additional works at: <https://scholarworks.waldenu.edu/dissertations>

 Part of the [Education Commons](#)

---

This Dissertation is brought to you for free and open access by the Walden Dissertations and Doctoral Studies Collection at ScholarWorks. It has been accepted for inclusion in Walden Dissertations and Doctoral Studies by an authorized administrator of ScholarWorks. For more information, please contact [ScholarWorks@waldenu.edu](mailto:ScholarWorks@waldenu.edu).

# Walden University

College of Education

This is to certify that the doctoral study by

Natasha M. Harrell-Nicks

has been found to be complete and satisfactory in all respects,  
and that any and all revisions required by  
the review committee have been made.

Review Committee

Dr. Salina Shrofel, Committee Chairperson, Education Faculty

Dr. Antoinette Myers, Committee Member, Education Faculty

Dr. Mary Howe, University Reviewer, Education Faculty

Chief Academic Officer

Eric Riedel, Ph.D.

Walden University

2018

Abstract

Adolescent Girls' Nutrition and Physical Activity Habits by Grade, Obesity, and

Race/Ethnicity

by

Natasha Monique Harrell-Nicks

MA, University of Phoenix, 2008

BS, LeMoyne-Owen, 1999

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Education

Walden University

July 2018

## Abstract

An urban southern school district located in the United States identified adolescent obesity as a problem. District records showed that 37% of adolescent girls and 29% of adolescent boys were obese which exposed them to short-term and long-term health consequences. The purpose of this archival multivariate survey study was to gain an in-depth understanding of the problem by exploring the problem nutritional and physical activity habits of eighth and eleventh grade adolescent girls (n=3320) of various races/ethnicities and obesity levels to determine how their nutritional and physical activity habits differ. The research questions asked whether there were significant differences between the independent variables (grade level, self-reported obesity level, and race/ethnicity of adolescent girls) and the dependent variables (adolescent girls' nutrition habits and physical activity). The theoretical framework that grounded the study was the ecological system theory which identifies the child, parent, and community centered factors that predict the weight status of children. My findings revealed a statistically significant interaction effect of the combined grade and obesity levels and the combined grade and ethnicity categories on the combined nutrition habits and physical activity habits. I recommended increased collaboration between middle school and high school PE teachers and increased support from administrators and parents to elevate nutritional education and PA for adolescent girls. My study may contribute to positive social change by providing PE educators with new information and understanding that they can use to develop and justify educational programs that equip adolescent girls with the knowledge to make healthier food choices and increase their physical activity levels.

Adolescent Girls' Nutrition and Physical Activity Habits by Grade, Obesity, and  
Race/Ethnicity

by

Natasha Monique Harrell-Nicks

MA, University of Phoenix, 2008

BS, LeMoyne-Owen, 1999

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Education

Walden University

July 2018

## Dedication

I dedicated this dissertation to my son William Taylor, Jr. I know this has been a long journey for me. Your unwavering support, patience, and understanding is the reason why I was able to keep going and fulfill my dream. I love you!

## Acknowledgments

I would like to express my deepest gratitude to my family, friends, and committee members. I am grateful to all of you for your support and motivation. I would like to thank my husband Ronnie Nicks Jr. for your patience and encouraging me to finish. I would especially like to thank my parents Richard and Denise Davison. I would like to thank my siblings, Toriano Stokes, and Deloris Harrell.

To my friend, Cathy Davis, I want to thank you for listening when I needed to talk, praying for me and motivating me to continue even when I wanted to quit. I would like to extend my appreciation to Elaine Eisenbeisz and Dr. Katrina Oko-Odio for your support of various portions of my research and being available to answer my questions.

To my committee members, Dr. Salina Shrofel and Dr. Antoinette Myers as well as URR Dr. Mary Howe, thanks for the support and guidance during this passionate journey. Finally, a special thanks to Ronnie, DeAndre, Christopher, and William. I hope this inspires you all to make your dreams become a reality. Love you guys! I cannot leave out the family pet G’Nala.

## Table of Contents

List of Tables .....	iii
List of Figures .....	iv
Section 1: Introduction to the Study .....	1
Introduction.....	1
Problem Statement.....	3
Nature of the Study.....	4
Theoretical Framework.....	5
Operational Definitions.....	6
Assumptions.....	8
Scope and Limitations.....	8
Delimitations.....	9
Summary.....	10
Section 2: Literature Review .....	12
Introduction.....	12
Nutrition Habits of Adolescents and Adolescent Girls.....	13
Physical Activity Habits of Adolescent Girls .....	16
Physical Education for Adolescent Girls .....	18
Section 3: Research Method .....	22
Introduction.....	22
Research Design and Approach .....	23
Setting and Sample .....	24
Instrumentation and Materials .....	24



Data Collection .....	25
Data Analysis .....	26
Protection of Participants’ Rights .....	26
Researcher’s Role .....	27
Section 4: Results.....	28
Introduction.....	28
Inferential Analyses .....	36
Summary.....	49
Section 5: Discussion, Conclusions, and Recommendations.....	52
Introduction.....	52
Interpretation of the Findings.....	52
Implications for Social Change.....	59
Recommendations for Action .....	59
Recommendations for Future Research .....	63
Conclusion .....	64
References.....	66
Appendix A: School Physical Activity and Nutrition (SPAN) Survey .....	90
Appendix B: SPAN Nutrition and Physical Activity Scoring .....	94

## List of Tables

Table 1. Demographic and Sample Data .....	29
Table 2. Grade 8 and Grade 11 Obesity Levels, Frequencies, and Percentages.....	30
Table 3. Grade 8 and Grade 11 Adolescent Girls Race/Ethnicity Categories, Frequencies, and Percentages .....	30
Table 4. Summary of Grade 8 and Grade 11 Adolescent Girls Self-Reported Nutrition Habits and Physical Activity Habits .....	31
Table 5. Levene’s Test of Equality of Error Variances (Hypothesis 2) .....	39
Table 6. Levene’s Test of Equality of Error Variances (Hypothesis 3) .....	39
Table 7. Significant Differences Between Grade and Obesity Levels Regarding Nutrition Habits .....	42
Table 8. Significant Differences Between Grade and Obesity Levels Regarding Physical Activity Habits.....	43
Table 9. Significant Differences Between Grade and Race/Ethnicity Categories Regarding Nutrition Habits .....	47
Table 10. Significant Differences Between Grade and Race/Ethnicity Categories Regarding Physical Activity Habits.....	49

## List of Figures

Figure 1. Ecological model of childhood and adolescent obesity .....	6
--	---

## Section 1: Introduction to the Study

### **Introduction**

Obesity is a major problem in America because of its increasing prevalence and adverse health consequences (Reilly et al., 2003). Ogden, Carroll, Kit, & Flegal, (2012) argued stated that “Obesity continues to influence the lives of American adolescents” (p. 2). Obese adolescents may be at risk for both short and long-term health consequences (Freedman, Zuguo, Srinivasan, Berenson, & Dietz, 2007; Singh, Mulder, Twisk, van Mechelen, & Chuapari, 2008). The Centers for Disease Control and Prevention (2010) defined adolescence as individuals from ages 12 to 19. Obese adolescents are more likely to have health risk such as cardiovascular disease, high cholesterol, high blood pressure, and diabetes. Obesity is more evident among African American and Hispanic adolescent girls than Caucasian and Asian adolescent girls (Ogden et al., 2012; Ogden, Carroll, Kit, & Flegal, 2014).

Adolescence is a period during which adolescents decrease their physical activity (PA), especially adolescent girls (Currie et al., 2011). For example, Nader, Bradley, Houts, McRitchie, & O’Brien (2008) found that young people become less physically active as they transition from childhood to adolescence. Adolescent girls of all race/ethnicity groups demonstrate significantly lower levels of PA than adolescent boys of all race/ethnicity groups (Griffiths et al., 2013). Several researchers (see Bergier, Kapka-Skrzypczak, Bilinski, Paprzycki, & Wojtyla, 2012; Garcia, Pender, Antonakos, & Ronis, 1998; Gavarry, Giacomoni, Bernard, Seymat, & Falgairrette, 2003; Norman et al., 2006; Pearson, Atkin, Biddle, Gorely, & Edwardson, 2009; Sanchez et al., 2007) have

found that boys participated in more PA than girls. Colley et al., (2011) found that 80% of adolescent boys' and 67% of adolescent girls' participated in a moderate-to-vigorous PA at least 1, 3 or, 6 days a week. The prevalence of having been physically active at least 60 minutes per day on 5 or more days was higher among male high school students (59.9%) than among female high school students (38.5%) (CDC, 2012). Overall, the percentage of males who attended physical education (PE) classes (56.7%) was higher than females (46.7%), and the percentage of students who attended PE classes daily was higher among males (35.5%) than females (27.2%) (CDC, 2012).

Research shows that adolescent girls' nutrition habits (NH) are less healthy than those of adolescent boys. The CDC (2016) found that more adolescent boys ate breakfast each day (40.5%) than adolescent girls (32.1%) and more adolescent boys drank one or more glasses of milk each day (29.6%) than adolescent females (14.6%). There are two adolescent nutrition habits (NH), consumption of sugared beverages and skipping breakfast, which were found by Ambrosini (2014) to be associated with adolescent obesity. Leidy, Ortinau, Dauglas and Hoertel (2013) found that 70% of adolescent girls reported that they skipped breakfast for 7 days prior to participating in their study. Adolescent girls compensated for skipping breakfast by consuming high-calorie mid-morning snacks.

Morenga, Mallard, and Mann (2013) found that the consumption of sugared beverages was high among adolescent girls. Morenga et al. (2013) also found that adolescent girls who reported high sugared beverages intakes exhibited a significantly

increased risk of being overweight compared to those who reported low sugared beverages intakes.

According to the 2011-2014 National Health and Nutrition Health Surveys, obesity among adolescents 12-19 years of age was 20.5 for both males and females (Ogden, Carroll, Kit, & Flegal, 2015). However, obesity had a greater social and psychological effect on adolescent girls than boys. One study found that obese females adolescents reported that they were less satisfied with their bodies than were males and obese adolescent girls reported lower self-esteem than males (Mäkinen et al., 2012). Adolescent boys reported significantly more prevalent normal eating habits than adolescent girls (Mäkinen, Puukko-Vietomies, Lindberg, Siimes, & Aalberg 2012).

### **Problem Statement**

In 2011 and 2012, a southern urban school district identified adolescent obesity, especially adolescent girls' obesity as a problem that needed to be addressed: School district results from the Youth Risk Behavior survey (CDC, 2014) showed that 37% of enrolled adolescent girls and 29% of adolescent boys were obese. Because the research revealed that girls are less physically active and eat less healthily than boys, and that obesity has a more severe social effect on girls than boys, the problem I addressed in this study is adolescent girls' obesity in a southern urban school district. By focusing the study on girls, I do not intend to imply that adolescent female obesity is a more important problem than adolescent male obesity. Rather, I focused on girls because the problem of obesity is different for adolescent girls than it is for boys. The gap in practice that I addressed in this study is that school leaders and Physical Education (PE) teachers at the

local district lacked an in-depth and nuanced understanding of adolescent girls' nutritional habits and physical activity habits, whether these habits differ between eighth and eleventh grade adolescent girls, and how these habits are related to self-reported obesity and race/ethnicity.

### **Nature of the Study**

I employed a multivariate quantitative survey research design for this study. I analyzed archival survey data using descriptive statistics (frequencies, means, and standard deviations) to provide a broad description of the NH and PA of eighth and eleventh grade girls, disaggregated by race and obesity. To provide an in-depth understanding of adolescent girls' NH and PA, I used multiple analysis of variance (MANOVA) to determine whether there were significant differences between the independent variables (grade level, obesity, and race/ethnicity) and the dependent variables (adolescent girls' responses to survey questions about their NH and PA). The data for the study is archival and includes information about the independent variables and the survey responses to 18 questions about NH and PA for all eighth and eleventh grade girls enrolled in a southern urban school district who completed the School Physical Activity Nutrition (SPAN) survey in 2013. I addressed the following research questions:

*RQ1:* What are the self-reported NH and PA habits of eighth and eleventh grade girls of various race and ethnicity categories and obesity levels?

*RQ2:* Is there a significant difference between eighth and eleventh grade girls of varying levels of self-reported obesity regarding their NH and PA habits?

*H<sub>02</sub>:* There is no significant difference between the self-reported NH and PA of

eighth and eleventh grade girls of varying self-reported obesity levels.

*H<sub>a2</sub>*: There is a significant difference between the self-reported NH and PA of eighth and eleventh grade girls of varying self-reported obesity levels.

*RQ3*: Is there a significant difference between eighth and eleventh grade girls of varying race/ethnicity categories regarding their NH and PA habits?

*H<sub>03</sub>*: There is no statistically significant difference in NH and PA habits of G eighth and eleventh grade girls of varying race/ethnicity categories.

*H<sub>a3</sub>*: There is a statistically significant difference in NH and PA habits of eighth and eleventh grade girls of various race/ethnicity categories.

### **Purpose of the Study**

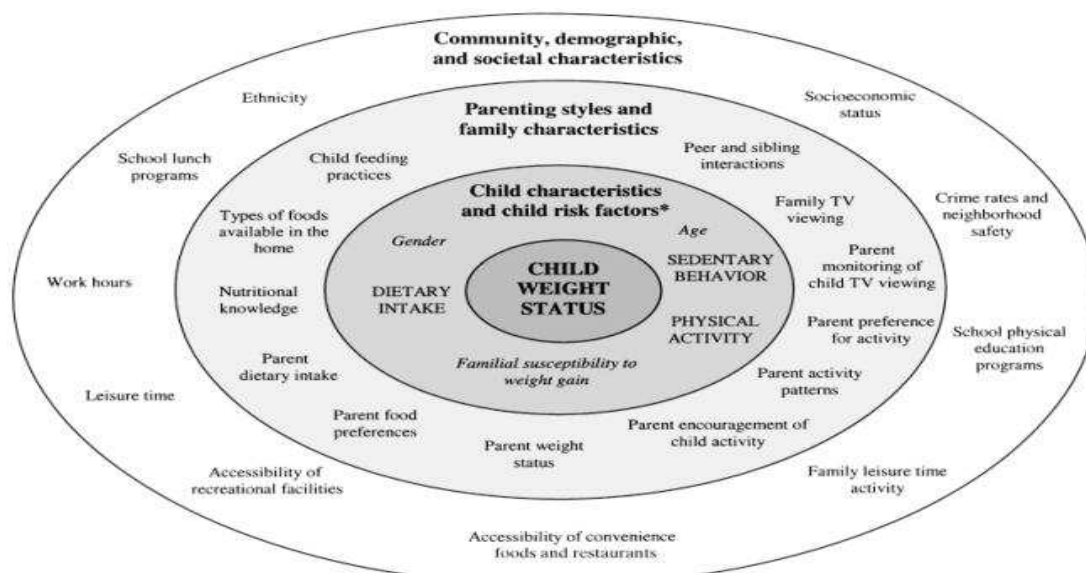
The purpose of this multivariate quantitative survey study was to gain an understanding of the NH and PA habits of eighth and eleventh grade girls and to determine whether NH and PA vary by obesity levels and race/ethnicity categories. Educating adolescent girls about the importance of healthy eating and PA may help prevent obesity. Promoting healthy eating and increasing PA is significant because it may decrease the risk of health conditions. The findings of this study provided the school district leaders with information to inform decision making regarding curricular interventions that may improve the health of adolescent girls.

### **Theoretical Framework**

Obesity is a complex condition influenced by biological, genetic, behavioral, social, cultural, and environmental factors. This research study was based on the ecological model of childhood and adolescent obesity developed by Davison and Birch



(2001). This model has 3 elements (child, family, and community). The ecological model suggests that NH and PA results is influence by these elements. The ecological model suggests that association between weight status and PA maybe depend on child characteristics such as gender and age and familial susceptibility to weight gain. The family characteristics including parent activity patterns may influence child NH and PA. The community characteristics such as socioeconomic status and neighborhood safety may influence child physical activity. My study was designed to explore some characteristics (grade level, NH, and PA) and how these characteristics are related to obesity. The ecological model framework allowed me to provide an in-depth understanding of the findings.



*Figure 1.* Ecological model of childhood and adolescent obesity, by K.K. Davison and L.L. Birch (2001, p. 19).

### Operational Definitions

The definitions of key terms, concepts and variables used in this study are as follows:

*Adolescence*: This term refers to the stage of life between childhood and adulthood between the ages of 12 and 19 (CDC, 2010). In my study, adolescence is defined as the period of development that occurs between the start of eighth grade and the end of eleventh grade.

*Body Mass Index (BMI)*: This term refers to a person's weight in kilograms divided by the square of height in centimeters (CDC, 2015). For example, an individual with a weight of 68 kg and a height of 165 cm would have a BMI of 24.98.

*Normal or Healthy Weight*: This term refers to having a BMI at the 5th percentile (CDC, 2015).

*Nutrition Habits (NH)*: In my study, this term is defined by the questions on the SPAN survey involving the frequency of eating fried foods and starchy vegetables, drinking soft drinks or soda, fruit juice, fruit-flavored drinks or sports drinks, eating breakfast regularly, and eating an evening meal regularly.

*Obesity*: This term refers to having BMI above the 95<sup>th</sup> percentile (CDC, 2015).

*Physical Activity (PA)*: This term refers to any body movement that is carried out by the skeletal muscles and requires energy (Fahey, Insel, & Roth, 2015). In my study this term is defined by the questions on the SPAN survey that refer to PA: strength training during the past 7 days, time spent on the computer, playing video games, and watching TV, participation in school or other organized team sports, and participation in organized physical activities such as martial arts or dance/gymnastics.

*Race/ethnicity*: In my study, race/ethnicity includes the following categories African-American, Asian, Hispanic, and White.

### **Assumptions**

I made the following assumptions as I conducted the study:

- I assumed that the students who completed the SPAN survey questions did so truthfully.
- I assumed that the survey administration was not affected by extraneous events at the various data collection sites.
- I assumed that the SPAN self-reported archival data provides an accurate measure of the adolescent girls' obesity levels.

### **Scope and Limitations**

Because the study was limited to adolescent girls in one urban school district, the sample may not be representative of all adolescent girls in the USA. As a result, the findings will not be generalizable beyond the local situation. Another limitation is the survey research methodology. The survey was directly administered to groups of students at various schools on different days during spring 2013. No record was kept of extraneous influences on the survey administrations. The survey questions were close-ended, which may have limited the responses of participants. Foddy (1993) stated that, "Close-ended questions limit the respondent to the set of alternatives being offered" (p. 127). The survey questions may not have provided the response that the participant wanted to choose. The NH survey questions asked the adolescent girls to report information about all foods and beverages consumed within a 24 hour period prior to survey administration. A single survey administration of a 24 hour recall is unable to account for day to day variation. The PA survey questions asked the adolescent girls to

report activities during the 7 days prior to the survey administration, which may have further limited the responses of participants. Adolescent girls may not have accurately recalled their PA habits.

### **Delimitations**

This study did not compare longitudinal data about NH and PA collected from eighth grade girls and then again when the same girls were enrolled in eleventh grade. Therefore, the results should only be understood as differences between eighth and eleventh grade girls rather than as changes that occur between eighth grade and eleventh grade girls. The survey was administered to eighth grade and eleventh grade students in the district. Because the research literature revealed that girls are less physically active and eat less healthily than boys, and obesity has a more severe social effect on girls than on boys, this study examines only the data about NH and PA habits of adolescent girls.

### **Significance of the Study**

This study will provide PE teachers and school district administrators with information regarding eighth grade and eleventh grade girls' NH and PA habits, whether these habits differ between them, and how these habits are related to their self-reported obesity and race/ethnicity. The school district may use this information to develop interventions such as school health curricula for students and information sessions for parents that positively affect adolescent girls' obesity and health. In this way, the findings from this study may provide local-based social change. Positive social change occurs when PE teachers and district leaders create an appropriate plan to increase adolescent girls' PA and achieve healthy NH and when the plan positively affects girls' weight

status. Also, this study will contribute to the literature about adolescent girls' obesity in general and differences between the NH and PA of eighth grade and eleventh grade girls by self-reported obesity levels and race/ethnicity categories.

### **Summary**

Section 1 provided an overview of a southern urban school district that identified adolescent girls' obesity as a problem that needed to be addressed. The purpose of this multivariate quantitative survey study was to gain an understanding of the NH and PA habits of eighth and eleventh grade girls and to determine whether NH and PA vary by obesity levels and race/ethnicity categories. The research questions and hypotheses of this study addressed whether there was a significant difference between the self-reported NH and PA of eighth and eleventh grade girls of varying self-reported obesity levels and race/ethnicity categories. The theoretical framework and nature of the study were described. Operational terms were defined, assumptions were provided, and the scope and limitations and delimitations of the study were detailed, along with the significance of the study.

Section 2 includes a review of literature about nutrition and PA as it relates to adolescent girls. Specifically, I review current research about factors and variables such as NH, PA, obesity levels and race/ethnicity that are related to obesity and health. In Section 3, I describe and justify the research design and methodology. I explain the context of the study and the sample. I discuss data collection procedures and instrumentation in detail. I present the research questions, hypotheses, and statistical analysis, followed by a discussion of the protection of participants' rights. The results of

the data analysis is presented in Section 4. Section 5 consists of an interpretation of findings, implications for positive social change, recommendations for action, recommendations for further study, and conclusions of the research study.

## Section 2: Literature Review

### **Introduction**

Adolescent obesity has increased considerably during the past 30 years. Approximately 25% of adolescents in developed nations are either overweight or obese (Lobstein & Frelut, 2003; Ogden et al., 2010). Biro and Wein (2010) stated that “obesity during the adolescent years is associated with many adverse health consequences and dietary habits as well as physical inactivity” (p. 1). Obesity increases during the transition from adolescence to young adulthood (Dietz, 1998; Dietz & Robinson, 2005), particularly among adolescent girls. Increases in excess body fat and weight gain of adolescent girls can be associated with lack of PA and failure to maintain a healthy diet (Kimm et al., 2005; Veugelers & Fitzgerald, 2005). In this review of the literature, I explored the NH, PA, and PE.

In order to locate relevant literature, I accessed Walden University’s electronic databases, including ProQuest Central, Thoreau, Medline, SAGE, EBSCOHost, Academic Search Complete, and EBSCO Education. I searched for current peer-reviewed research articles using the following search terms individually and in combinations: *adolescent girls’ obesity, adolescent girls’ PA, adolescent girls’ nutrition, adolescent girls’ PA race/ethnicity, adolescent girls’ nutrition race/ethnicity, PE class, puberty, gender and physical activity, and gender and NH*. With the information gleaned from journal articles it was possible for me to gain a better understanding of adolescent girls’ obesity and contributing factors.

### **Nutrition Habits of Adolescents and Adolescent Girls**

Adolescence is one of the most dynamic and complex transition periods in the lifespan (Story, Neumark-Sztainer, & French, 2002). During adolescence, food choice and dietary intake is less determined by parents or guardians and the responsibility shifts to the adolescent (Todd, Street, Ziviani, Byrne, & Hills, 2015). It is very typical that the nutritional choices made by adolescents do not adhere to dietary guidelines for Americans, as more often than not adolescents consume food that is quick, capable of giving quick energy, and tastes good (Story et al., 2002). It is recommended that adolescents consume a diet that consists of fruit, vegetables, whole grains, lean meat, and adequate sources of protein and dairy, with a minimum amount of sugary foods (U.S. Department of Agriculture, U.S. Department of Health and Human Services, 2010). It is also recommended for person ages 2 and older to consume a diet rich in fruits, vegetables, whole grains, and fat-free and low-fat dairy products (Dietary Guidelines Advisory Committee, 2010). The guidelines also recommend that adolescents limit intake of solid fats (major sources of saturated and trans fatty acids), cholesterol, sodium, added sugars, and refined grains (Dietary Guidelines Advisory Committee, 2010).

Unfortunately, most young people do not follow the recommendations set forth in the dietary guidelines for Americans (Briefel & Johnson, 2004; Forshee, Anderson, & Storey, 2006; Reedy & Krebs-Smith, 2010; U.S. Department of Agriculture, U.S. Department of Health and Human Services, 2010). Many adolescents do not take into account their dietary needs when selecting their meals (Krebs-Smith, Guentha, Kirkpatrick, & Dodd, 2010). Longitudinal studies (see Fiorito, Smicklas-Wright, &



Birch, 2006; Fisher, Mitchell, Smicklas-Wright, Manning, & Birch, 2004; Skinner & Carruth, 2001) that have focused on nutrition and dietary habits of adolescents have noted a severe decline in milk and fruit juice consumption from childhood into late adolescence.

Sugar-sweetened beverages (SSB) are soft drinks, fruit-flavored drinks (not 100% juice), tea, and sports drinks with added sugar (Duffey & Popkin, 2007; Popkin, 2010). Despite the overall availability of SSBs, it is typically adolescents who are the largest consumers (Bremer, Byrd, & Auinger, 2011). As the demand for such beverages has risen, the obesity rate in America has risen along with it (Lee et al., 2010). The overconsumption of SSBs in adolescence has increased in the last few decades (Lasater, Piernas, & Popkin, 2011; Nielsen & Popkin, 2004; Phillips et al., 2004).

Consumption of SSBs may cause weight gain (Ebbeling et al., 2012). Research reveals that adolescents experience greater energy intake and weight gain from the consumption of SSBs than they do from beverages containing artificial sweeteners (Tordoff & Alleva, 1990). Malik et al. (2010) showed positive associations between SSBs and the risk of obesity and related complications. SSBs have taken the place of nutritious beverages among adolescents (Fiorito et al., 2010).

The consumption SSBs has been associated with adolescent obesity and health issues (Morenga et al., 2013). SSBs can pose serious health concerns when consumed in great quantities (Duffey & Popkin, 2007; Popkin, 2010). Overconsumption of SSBs products can lead to debilitating health issues such as type 2 diabetes, hypertension, disruptive behaviors caused by a chemical imbalance, and poor mental health caused by a

severe lack of nutrition (see Malik et al., 2010; Montonen, Jarvinen, Knekt, Heliövaara, & Reunanen, 2007; Brown et al., 2011; Lien, Lien, Heyerdahl, Thoresen, & Bjertness, 2006; Shi, Taylor, Wittert, Goldney, & Gill, 2010). However, findings from the relatively few randomized controlled trials designed to examine the effects of SSBs on body weight have not been conclusive (Ebbeling et al., 2006; James, Thomas, Cavan, & Kerr, 2004; Sichieri, Trotte, deSouza, & Veiga, 2009). The use of public health measures to reduce the consumption of sugar-sweetened beverages remains controversial (Johnson et al., 2009).

Eating breakfast is widely considered to be important to maintain a healthy diet (Corder et al., 2014). Healthy eating is important for adolescents because there is rapid growth during adolescence. Meal skipping among adolescent girls is a major concern (Story et al., 2002). Over the past decades, breakfast consumption among adolescents has decreased (Lyerly, Huber, Warren-Findlow, Racine, & Dmochowski, 2013). Deshmukh-Taskar et al. (2010) indicated that 31% of adolescents' between the ages 14 and 18 years did not consume breakfast during a 24-hour recall period. Skipping breakfast was associated with higher BMI (Rampersaud, Pereria, Girard, Adams, & Metz, 2005; Szajewska & Ruszczyski, 2010).

Breakfast skipping may increase obesity levels and BMI among adolescents. Adolescent who skip breakfast may later have adult health issues. Smith et al (2010) conducted a longitudinal study and found that participants who skipped breakfast during both adolescence and adulthood had a large circumference, high fasting insulin, high total cholesterol, and low-density lipoproteins. Adolescent girls' make poor dietary choices

when they skip breakfast. They tend to consume large amounts of SSBs in place of a nutritious breakfast.

### **Physical Activity Habits of Adolescent Girls**

Habitual PA among human beings is vital to social and physical health (Eisenmann & Wickel, 2009). Research has shown that participation in PA declines during adolescence, more so for girls than boys (Dumith, Gigante, Domingues, & Kohl, 2011; Kwan, Cairney, Faulkner, & Pullenayegum, 2012). Parents and friends may influence the PA participation of adolescent girls (Green, Smith, & Roberts, 2005). Research has shown that social support from friends and family members are associated with higher levels of PA among adolescents (Sallis, Grossman, Pinski, Patterson, & Nader, 1987; Sharma, Sargent, & Stacy, 2005). Salvy et al. (2009) found that the presence of peers increases adolescent girls' engagements in PA. Researchers noted that support from parents and peers or friends are strong predictors of adolescent girls PA behavior (see de Vet, de Ridder, & de Wit, 2011; Janssen & LeBlanc, 2010; Lubans, Sylva, & Morgan 2007; Lytle et al., 2009; Moore et al., 2010; Neumark-Sztainer, Story, Hannan, Tharp, & Rex, 2003). Research found that support from parents and support from peers or friends are key factors that influence adolescence levels of PA (see Bauer, Nelson, Boutelle, Neumark-Sztainer, 2008; Hsu et al., 2011; Limstrand, 2008; Lubans, Sylva, & Morgan 2007; Sallis, Prochaska, & Taylor, 2000; Wright, Wilson, Griffin, & Evans, 2010).

The decline in PA is an important issue in adolescence as the body requires exercise to function properly just as much as it requires nutrition to function at all

(Troiano et al., 2008). Research has revealed that PA decline during adolescence (Corbin, Pangrazi, & LeMasurie, 2004; Currie et al., 2008). The CDC (2012a) recommended that adolescents engage in at least 60 minutes of PA daily. According to the recommendations of health experts, “all secondary school adolescents should accumulate at least 60 minutes of moderate-to-vigorous intensity physical activity daily” (World Health Organization, 2012, p. 1). Adolescent girls tend not to meet the recommended PA requirement (CDC, 2012b). A study in England found that adolescent girls were not meeting government recommendation of PA per day, and in fact were becoming more sedentary and less healthy with each passing year (Joint Health Surveys Unit, 2013). A study conducted in the United States showed that only 35% of adolescent girls meet the PA recommended levels (CDC, 2008; Troiano et al, 2008). Most studies of PA in adolescents found that adolescent girls are less physically active than adolescent boys (see Anderson & Economas, 2008; Chung, Skinner, Steiner, & Perrin, 2012; Fakhouri, Hughes, Brody, Kit, & Ogden, 2013; Sallis, Prochaska, & Taylor, 2000; Troiano, et al., 2008).

There is evidence that PA of adolescent girls varies by race/ethnicity. National reports by the CDC found that African American and Hispanic adolescent girls did not meet the recommended PA level (CDC, 2002, 2003, 2005). Findings using self-report measures of PA of U.S. samples showed African American adolescent girls were the least physically active race/ethnic group (Anderson, Economos, & Must, 2008). Based on objectively measured levels of PA, African American and Hispanic adolescent girls were the least active race/ethnic group (Belcher et al 2010). Taylor and Lou (2011) noted that

African American and Latinos adolescent girls self-reported PA indicated that they participated less in PA than White adolescents.

### **Physical Education for Adolescent Girls**

Since the early 20<sup>th</sup> Century, PE has been incorporated into the American school curriculum (Wuest & Bucher, 1999). PE is one of the main agents to promote PA among adolescents (Fairclough & Stratton, 2005). PE acts as a means through which many children and adolescents participate in a range of physical activities. Prior to 1972, public school separated PE classes by gender (Hannon & Williams, 2008). However, schools were obligated to provide equal opportunity for both genders to attend PE classes (Hannon & Williams, 2008) and gender segregation in PE largely disappeared in the USA. Pate, Dowda, O'Neill, and Ward (2007) argued that PE fill an important role in increasing both the knowledge and application of PA for adolescents.

The main purpose of PE is to teach the students the basic elements of exercise that will lead to a healthy lifestyle (see Bocarro, Kanters, Casper, & Forrester, 2008; Garn, Cothran, & Jenkins, 2011). PE is one of the main agents to promote PA among adolescents (Fairclough & Stratton, 2005). PE is an important source of PA for many adolescents, especially for adolescent girls' who do not engage in PA regularly outside of school (Cañadas et al., 2015). Longitudinal research has consistently showed that PA levels declined steeply during adolescence (see Aaron, Storti, Robertson, Kriska, & La Porte, 2002; Inchley, Kirby, & Currie, 2011) especially among girls (Kimm et al., 2005; Whitehead & Biddle, 2008). Research has shown that many girls do not participate in PE (Mitchell, Inchley, Fleming, & Currie, 2015). Adolescent girls have reported a decline in

PA participation, low sports participation, and low participation in PE (Eaton et al., 2010). The decline in PA of girls begins in fifth grade and continues through high school (Hannon, Ratliffe, & Thorn, 2005). By the time these girls reach seventh and eighth grade, the number of girls reporting sedentary activities is alarming with each passing year (Hannon et al., 2005). Research showed that adolescent girls' demonstrated lower levels of perceived competence and lower levels of enjoyment in PE (see Cairney et al., 2012; Carroll & Loumidis, 2007; Inchley, Kirby, & Currie, 2011; Lyu & Gill, 2011; Kalaja et al, 2010; Prochaska, Sallis, Slymen, & McKenzie 2003).

Adolescent girls present many reasons to explain why they do not participate in PA during PE classes. One reason is their concern about their appearance and body image. Many adolescent girls have voiced a dislike for the unflattering PE uniforms that some schools make them wear (Cockburn & Clarke, 2002; Slater & Tiggeman, 2010). Adolescent girls' also have expressed a dislike for PA as it causes their makeup to run, messes up their hair, and causes them to sweat after physical exertion (Slater & Tiggeman, 2010) making them less presentable during classes that follow PE (Cockburn & Clarke, 2002; Grieser et al, 2006). Another reason is their discomfort of being physically active in front of boys in PE classes (Cockburn et al, 2002; Loman, 2008; Emie, Payne, Casey, & Harvey, 2010; Slater & Tiggeman, 2010; & Knowles, Niven, & Fawkner, 2013). Adolescent girls expressed that they looked far less lady-like while being active. Feelings of discomfort also affected many adolescent girls as they found themselves becoming sexually objectified by the boys in their PE classes (Cockburn et al, 2002; Dwyer, Allison, Goldenberg, Fein, Yoshida, et al., 2006; & van Daalen, 2009).

Hannon et al. (2005) reported that adolescent girls have more opportunity to participate and receive more verbal interaction from their PE teacher when engaged in single gender games. One method of improving the level of PA in which adolescent girls engage might be to reinstitute the single gender class structure (Bracey, 2006). The majority of adolescent girls indicated that they would prefer single-sex PE courses (Cockburn et al., 2002; Jackson & Warin, 2010; Mitchell, Gray & Inchley, 2013). Lyu, Minjeong, & Gill (2011) found that “adolescent girls in single-gender classes scored higher in perceived physical competence, effort, and enjoyment, than adolescent girls in coeducational settings, possibly because girls are less likely to interrupt classmates and more likely to help each other” (p. 250). Girls do not enjoy mixed-gender PE when boys are extremely competitive or when the learning environment seem unsafe to participate in PA (Constantinou, Manson, & Silverman, 2009). Constantinou et al. (2009) reported that some adolescent girls benefited from mixed-gender PE classes when they are forced to work harder in games. Some girls stated that they like having boys in the PE classes because it made the games enjoyable and it allowed them to interact with boys in low intensity games, such as volleyball, flexibility, and gymnastics (Hannon, Ratliffe, Holt, & Thorn, 2005).

### **Summary**

In the literature review, I discussed a variety of issues related to adolescent and adolescent girls’ nutrition and PA habits and how NH and PA vary by race/ethnicity. The literature revealed that adolescent girls did not meet the dietary food choices because they tended to skip breakfast and consume large amounts of SSBs. They did not consume the

recommended amount of fruit, vegetables, whole grain, meats and dairy products recommendations. PA among adolescent girls was influenced by parents and peers. The literature also revealed that adolescent girls were not meeting the 60 minutes PA recommendation by the (CDC, 2012). African American and Hispanic adolescent girls tend to be less active than White adolescent girls. Adolescent girls tend not to participate in PE class because of their body image, dislike of PE uniform, and discomfort of being physical in front of adolescent boys. Some adolescent girls prefer single gender or mixed gender PE class.

In Section 3, I describe the research design and methodology including the population and sample, data collection procedures, and data analysis. Lastly, I discuss the ethical issues that are related to the study.



### Section 3: Research Method

#### **Introduction**

The purpose of this multivariate quantitative survey study was to gain an understanding of the NH and PA habits of eighth and eleventh grade girls and to determine whether NH and PA vary by obesity levels and race/ethnicity categories. This section contains the methodological approach used to answer research questions and test the hypotheses discussed in Section 1. The research design, population and sample, research instrumentation, data collection, data analysis procedures, and ethical considerations will be described. The research questions and hypotheses are:

*RQ1:* What are the self-reported NH and PA habits of eighth and eleventh grade girls of various race and ethnicity categories and obesity levels?

*RQ2:* Is there a significant difference between eighth and eleventh grade girls of varying levels of self-reported obesity regarding their NH and PA habits?

*H<sub>02</sub>:* There is no significant difference between the self-reported NH and PA of eighth and eleventh grade girls of varying self-reported obesity levels.

*H<sub>a2</sub>:* There is a significant difference between the self-reported NH and PA of eighth and eleventh grade girls of varying self-reported obesity levels.

*RQ3:* Is there a significant difference between eighth and eleventh grade girls of varying race/ethnicity categories regarding their NH and PA habits?

*H<sub>03</sub>:* There is no statistically significant difference in NH and PA habits of G eighth and eleventh grade girls of varying race/ethnicity categories.

*H<sub>a3</sub>*: There is a statistically significant difference in NH and PA habits of eighth and eleventh grade girls of various race/ethnicity categories.

### **Research Design and Approach**

I employed a quantitative multivariate survey design for this study. This was the most appropriate design to describe characteristics of a specific population and explore and explain relationships between subsets of the population (independent variables) and the data (Creswell, 2009). Using archival survey data, I described the NH and PA of a population of eighth and eleventh grade girls of various levels of obesity and race/ethnicity, determined the relationships between NH and PA and grade level, obesity, and race/ethnicity, and described the differences between the subsets of the sample. Because I wanted to describe characteristics of a population and achieve an in-depth understanding of the population, other quantitative designs would not be appropriate. A causal-comparative design attempts to determine the cause of differences that already exist between groups. Because the differences between the groups in my study have not been determined, a causal-comparative design would not be appropriate. Once the differences are determined, a causal-comparative study would be an interesting follow-up study. I also considered an experimental research design. An experimental study is designed to manipulate a variable to explore the effects of the manipulation on a dependent variable. In my study, I explored independent variables which will not be manipulated (NH and PA of adolescent girls). Thus, an experimental design was not appropriate for my study.

### **Setting and Sample**

The population for this study was adolescent girls in a southern urban school district. The student population of this urban southern school district is made up of 77% African-American, 12% Hispanic, 7.5%, Caucasian, 1.9% Multi-ethnic, and 1.56% Asian. The target population is adolescent girls ages 13-14 and 16-18 who were enrolled in eighth and eleventh grades in 2013. In 2013, the sample data were collected from 765 eighth grade adolescent girls' and 2555 eleventh grade adolescent girls.

To assure confidence in the findings, I determined an appropriate sample size. I used a size effect calculator by Coe (2002). I determined that a minimum of 157 participants will achieve an 80% power confidence, and an alpha size  $\alpha = .05$ . The total sample size for my research study was 3,320 adolescent girls, more than enough to satisfy requirements for sufficient power.

### **Instrumentation and Materials**

The district collected data by administering the SPAN survey. The overall goal of SPAN was to establish a surveillance system to monitor overweight/obesity levels in school-aged children (Smith & Walker, 2000). The SPAN identifies factors that may underlie obesity including dietary behaviors, nutrition knowledge, and PA behavior (Smith & Walker 2000). The SPAN was designed to evaluate the nutritional and PA knowledge and habits of individuals in fourth, eighth, and eleventh grade. The SPAN also collected demographic data (gender, age, and race/ethnicity) allowing for cross-sectional analysis. The SPAN survey is both reliable and valid (Hoelscher, Day, Kelder, & Ward, 2009; Thiagarajah et al., 2008)

The SPAN survey questions are structured using a Likert scale to collect participants' self-reports about recent past NH and PA: "Yesterday, how many times did you...?" The PA portion asked questions about "During the past 7 days..." or "During the past 12 months..." The NH questions asked students to rate statements about their habits on a scale ranging from none to five or more times. The PA questions asked students to rate the length of their activities from zero to six or more hours and from zero days to seven days (see Appendix A).

### **Data Collection**

I used archival data that were collected by the district in 2013. I did not participate in the collection of the data for this study. Coordinated School Health (CSH), is a department in the district conducted the data collection. The students that participated in this survey were enrolled in PE classes during the spring semester of 2013. The CSH members sent a passive parent permission letter. Students were excluded from the survey only when a parent returned a signed form denying permission. The CSH members asked the students to return the form within 3 days after receiving it. The CSH members returned to the schools to collect the permission forms. I could not obtain information about whether any parents refused permission. The CHS members returned to the school one week later to conduct the survey. The PE teachers at each school provided classrooms for the CSH members to administer the survey. Shortly after the survey was administered, the school district underwent a reorganization and the survey data was never analyzed. In order to access the data, I called the CSH department and requested the adolescent girls' SPAN data. I was referred to an individual who no longer works for

the district. I called this person and we discussed my plans to obtain the SPAN archival data for adolescent girls. This individual allowed me to pick up the de-identified data in Excel format saved on a CD-ROM.

### **Data Analysis**

To prepare the data for statistical analysis, I entered the data into Excel columns by variables: Student Grade, Student Race/Ethnicity, Student Obesity level, Nutrition Habits, and Physical Activity Habits. To analyze the raw data, I transfer the Excel sheet to The Statistical Package for the Social Sciences (SPSS) Version 22. To answer Question 1, I computed the frequency, mean, and standard deviation for each of the NH and PA questions of eighth and eleventh grade girls disaggregated by obesity level and race/ethnicity (18 groups). To answer Question 2, a Two-way MANOVA determined whether there was a significant difference ( $p=.001$ ) between eighth and eleventh grade girls disaggregated by obesity and the means of their responses to each of the NH and PA questions. To answer Question 3, a Two-way MANOVA analysis determined whether there was a significant difference ( $p=.001$ ) between eighth and eleventh grade girls disaggregated by race/ethnicity and the means of their responses to each of the NH and PA questions.

### **Protection of Participants' Rights**

De-identified archival data were used in this study to minimize risk and ensure anonymity for participants. After I received permission from the school district, I sought approval from Walden University Institutional Review Board (IRB) prior to analyzing the archival data. The IRB approval number for this study is 03-21-17-0144605.

The raw and analyzed data will be stored in a password protected file on my personal computer. A copy of the data was stored on a flash drive which will be stored in a locked safe in my home office for five years. The data file and flash drive will be permanently deleted from my computer and flash drive after five years.

### **Researcher's Role**

I was a PE educator at an urban middle school located in the study district. My role as a teacher in the school did not affect data collection. All the data for the study were archival and I did not participate in its collection. I knew that the data had been collected because data was collected by CSH at the school where I was employed. When I requested access to the raw data from the district, I was informed that the district did not own the data. I approached the owner of the data as a researcher, not as an employee of the district. The owner of the data required that I complete a Data Usage Agreement form from Walden University.

## Section 4: Results

### Introduction

The purpose of this multivariate quantitative survey study was to gain an in-depth understanding of NH and PA habits of eighth and eleventh grade girls of various races/ethnicities and obesity levels to achieve a further understanding of adolescent obesity. The following research questions and hypotheses were addressed:

*RQ1:* What are the self-reported NH and PA habits of eighth and eleventh grade girls of various race and ethnicity categories and obesity levels?

*RQ2:* Is there a significant difference between eighth and eleventh grade girls of varying levels of self-reported obesity regarding their NH and PA habits?

*H<sub>02</sub>:* There is no significant difference between the self-reported NH and PA of eighth and eleventh grade girls of varying self-reported obesity levels.

*H<sub>a2</sub>:* There is a significant difference between the self-reported NH and PA of eighth and eleventh grade girls of varying self-reported obesity levels.

*RQ3:* Is there a significant difference between eighth and eleventh grade girls of varying race/ethnicity categories regarding their NH and PA habits?

*H<sub>03</sub>:* There is no statistically significant difference in NH and PA habits of eighth and eleventh grade girls of varying race/ethnicity categories.

*H<sub>a3</sub>:* There is a statistically significant difference in NH and PA habits of eighth and eleventh grade girls of various race/ethnicity categories.

### Data Collection

Archived data from the 2013 SPAN was used for this study. The data described

NH and PA habits of eighth and eleventh grade girls of various levels of obesity and race/ethnicity categories. The students who participated in this survey were adolescent girls enrolled in PE classes during the spring semester of 2013. The girls were between 13-14 and 16-18 of age and enrolled in eighth and eleventh grades, respectively. Data were organized for analyses by entering the scores for the dependent variables (eighth and eleventh grade, NH, and PA) and level categories of the independent variables for each participant on the Version 22 SPSS data entry sheet. It is important to note that the higher the score for each NH item, the less healthy was the response indicated and the higher the score for PA items, the healthier were the choices made by participants (see Appendix B).

### **Descriptive Statistics**

Participants were eighth and eleventh grade girls. The frequency analysis showed that 23% ( $n=765$ ) of the students who completed survey questions were in eighth grade and 77% ( $n=2,555$ ) of the students were in eleventh grade. Tables 1-3 display the frequency disaggregation for the independent variables which are further disaggregated by obesity levels and race/ethnicity categories.

The three obesity levels were normal weight, overweight, and obese. The four race/ethnicity categories were African American, Asian, Hispanic, and White.

Table 1

#### *Demographic and Sample Data (n = 3320)*

Grade	Sample (n)	Percentage of Sample
8 <sup>th</sup>	765	23.04%
11 <sup>th</sup>	2555	76.96%



Table 2

## Grade 8 and Grade 11 Obesity Levels, Frequencies, and Percentages

	Grade 8	Grade 11
Normal Weight Frequency	462	1081
Percentage of Normal Weight	60.39%	42.31%
Overweight Frequency	216	732
Percentage of Overweight	28.24%	28.65%
Obese Frequency	87	742
Percentage of Obese	11.37%	29.04%

Table 3

*Grade 8 and Grade 11 Adolescent Girls Race/Ethnicity Categories, Frequencies, and Percentage*

	African American	Asian	Hispanic	White
<b>Grade 8</b>				
Normal	231	27	33	171
Percentage	61.27%	93.10%	63.47%	55.70%
Overweight	117	2	11	86
Percentage	31.03	6.90%	25.15%	28.01%
Obese	29	0	8	50
Percentage	7.69%	0.00%	15.38%	16.29%
<b>Grade 11</b>				
Normal	177	79	513	312
Percentage	30.25%	86.81%	55.63%	32.60%
Overweight	180	10	291	251
Percentage	30.76%	10.99%	31.57%	26.22%
Obese	228	2	118	394
Percentage	38.99%	2.20%	12.80%	41.18%

To organize the data, I needed to summarize it. To summarize the data, I determined the

frequency, mean, and standard deviation for each relationship between the dependent and independent variables. Table 4 displays the summary.

Table 4

*Summary Description of Grade 8 and Grade 11 Adolescent Girls Self-Reported Nutrition Habits and Physical Activity Habits*

	Grade 8 Normal	Grade 11 Normal	Grade 8 Overweight	Grade 11 Overweight	Grade 8 Obese	Grade 11 Obese
<b>African American</b>						
Frequencies (n)	231	177	117	180	29	228
NH Mean	12.67	13.27	14.30	17.65	12.82	25.96
NH <i>SD</i>	9.80	7.65	7.27	4.52	2.02	4.89
PA Mean	12.15	9.02	18.08	9.47	14.55	15.10
PA <i>SD</i>	11.37	5.09	7.63	1.80	3.22	5.22
<b>Asian</b>						
Frequencies (n)	27	79	2	10	0	2
NH Mean	11.40	13.39	21.37	23.40	0.00	22.50
NH <i>SD</i>	6.02	3.05	8.75	.70	0.00	.71
PA Mean	14.14	11.55	25.50	23.33	0.00	17.74
PA <i>SD</i>	5.86	3.42	2.12	1.94	0.00	1.83
<b>Hispanic</b>						
Frequencies (n)	33	513	11	291	8	118
NH Mean	12.93	15.99	19.36	13.22	25.50	13.55
NH <i>SD</i>	6.88	8.11	4.06	.70	5.68	5.73
PA Mean	12.93	10.24	21.72	9.68	27.50	9.13
PA <i>SD</i>	9.07	4.43	3.98	1.94	5.53	1.52
<b>White</b>						
Frequencies (n)	171	312	86	251	50	394
NH Mean	3.66	17.81	11.33	15.11	15.30	17.93
NH <i>SD</i>	2.54	2.19	4.97	5.60	5.99	4.55
PA Mean	10.94	8.03	23.10	7.12	28.04	10.19
PA <i>SD</i>	4.87	4.47	7.25	7.60	7.80	7.75

### RQ 1

RQ1 asked: What are the self-reported NH and PA habits of eighth and eleventh grade girls of various race and ethnicity categories and obesity levels?

## **Findings of the Descriptive Analysis**

### **Grade 8 Nutrition Habits Disaggregated by Obesity Levels and Race/Ethnicity**

- A comparison of the normal weight Grade 8 girls NH means of the four race/ethnicity categories shows that White Grade 8 girls indicated healthier NH (3.66) than did the African American girls (12.68), Asian girls (11.41), and Hispanic girls (12.94).
- A comparison of the overweight Grade 8 girls NH means of the four race/ethnicity categories shows that White Grade 8 girls indicated healthier NH (11.34) than did the African American girls (14.30) Hispanic girls (19.36), and Asian girls (21.38).
- A comparison of the obese Grade 8 girls NH means of the four race/ethnicity categories shows that Grade 8 African American girls indicated healthier NH (12.83) than did the White girls (15.30), and Hispanic girls (25.50).

### **Grade 11 Nutrition Habits Disaggregated by Obesity Levels and Race/Ethnicity**

- A comparison of the normal weight Grade 11 girls NH means of the four race/ethnicity categories shows that normal weight Grade 11 girls of all the race/ethnicity categories indicated relatively unhealthy NH means: African American (13.27), Asian (13.39), Hispanic (15.10), and White (17.81) with White Grade 11 girls indicating the unhealthiest NH.
- A comparison of the overweight Grade 11 girls NH means of the four race/ethnicity categories showed that Grade 11 girls of all the categories indicated relatively unhealthy NH means: Hispanic (13.23), White (15.11), African

American (17.66), and Asian (23.40) with Asian Grade 11 girls indicating the unhealthiest NH.

- A comparison of the obese Grade 11 girls NH means of the four race/ethnicity categories showed that Grade 11 girls of all the categories indicated relatively unhealthy NH means: Hispanic (13.56), White (17.94), Asian (22.50), and African American (25.96) with African American Grade 11 girls indicating the unhealthiest NH.

### **Grade 8 Physical Activity Habits Disaggregated by Obesity Levels and Race/Ethnicity**

- A comparison of the normal weight Grade 8 girls PH means of the four race/ethnicity categories showed that Grade 8 White girls indicated healthier PH means (10.94) than did the African American girls (12.15), Hispanic girls (12.93), and Asian girls (14.14).
- A comparison of the overweight Grade 8 girls PH means of the four race/ethnicity categories shows that Grade 8 African American girls indicated healthier PH means (18.08) than did the Hispanic girls (21.72), White girls (23.10), and Asian girls (25.50).
- A comparison of the obese Grade 8 girls PH means of the four race/ethnicity categories showed that Grade 8 African American girls indicated healthier PH means (14.55) than did the Hispanic girls (27.50), and White girls (28.04).

### **Grade 11 Physical Activity Habits Disaggregated by Obesity Levels and Race/Ethnicity**

- A comparison of the normal weight Grade 11 girls PH means of the four race/ethnicity categories showed that Grade 11 White girls indicated healthier PH means (8.02) than did the African American girls (9.02), Hispanic girls (10.24), and Asian girls (11.55).
- A comparison of the overweight Grade 11 PH means of the four race/ethnicity categories showed that Grade 11 White girls indicated healthier PH means (7.12) than did the African American girls (9.47), Hispanic girls (9.68), and Asian girls (23.33).
- A comparison of the obese Grade 11 PH means of the four race/ethnicity categories showed that grade 11 Hispanic girls indicated healthier PH means (9.13) than did the White girls (10.19), African American girls (15.10), and Asian girls (17.74).

### **Grade 8 and Grade 11 Nutrition Habits Disaggregated by Obesity Levels and Race/Ethnicity**

- The differences between normal weight Grade 8 and Grade 11 NH means were relatively small for African American girls (.59), Asian girls (1.98), and Hispanic girls (3.06). The difference between the means of Grade 8 and Grade 11 NH for White girls was much larger (14.17) indicating that the NH for normal weight Grade 11 White girls was less healthy than that of Grade 8 White girls.
- The differences between overweight Grade 8 and Grade 11 girls NH means were relatively small for African American girls' (3.36), Asian girls (2.02) and White

girls (3.77). The Grade 11 Hispanic girls' responses indicated healthier responses than did Grade 8 Hispanic girls. The difference between the means was 6.13.

- The difference between obese Grade 8 and Grade 11 girls NH mean was relatively large for African American girls (13.13) and relatively small for Grade 8 and Grade 11 White girls (2.63). The Grade 11 Hispanic girls' responses indicated healthier responses than Grade 8 girls. The difference between the means was 11.95.
- The differences between normal weight Grade 8 and Grade 11 girls PH means were relatively small for Asian girls (2.59), Hispanic girls (2.70), White girls (2.91), and African American girls (3.14).
- The differences between overweight Grade 8 and Grade 11 girls PH means were relatively small for Asian girls (2.17), Hispanic girls (8.51), and African American girls (8.62). The difference between the means of Grade 8 and Grade 11 girls PH means for White girls was much larger (16.02) indicating that Grade 11 White girls were less physically active than Grade 8 White girls.
- The differences between obese Grade 8 and Grade 11 girls PH means is relatively large for Hispanic girls (18.37), White girls (17.85), and relatively small for Grade 8 and Grade 11 African American girls (.54).

### **Comparison of Grade 8 and Grade 11 Nutrition Habits and Physical Activity Habits**

#### **Disaggregated by Obesity Levels and Race/Ethnicity**

- In all obesity categories, Grade 8 African American, White, and Asian girls indicated healthier NH (13.37) means than did the Grade 11 African American,

White and Asian girls (15.61).

- In only one obesity category (overweight) did the Grade 8 Hispanic girls indicate healthier NH means (21.72) than did the Grade 11 Hispanic girls (9.68). In all obesity categories, Grade 8 African American, White, and Asian girls indicated healthier PA means (16.28) than did the Grade 11 African American, White and Asian girls (12.39) (for which data was available).
- In two obesity categories (normal and obese), Grade 8 Hispanic girls (normal 12.03; obese 27.50) indicated healthier PA means than did the Grade 11 Hispanic girls (normal 10.24; obese 9.13).

### **Inferential Analyses**

In order to analyze my data to address research questions 2 and 3, I determined what statistical test would be appropriate for my study. Two-way multivariate analysis of variance (MANOVA) is the appropriate statistical test to address the two null hypotheses. The two-way MANOVA statistical test is used in nonexperimental research situations when there is more than one dependent variable and when one is comparing differences between the means of several outcome variables for naturally occurring groups (Warner, 2013). My study is non-experimental. In my study, the dependent variables are Grade 8 and Grade 11 responses to the NH and PA. I compared the dependent variables and each of the categories of the independent variables (obesity levels and race/ethnicity categories) to determine whether there is a difference between the independent variables and dependent variables (Grade 8 and Grade 11 summary responses to the NH and PA). In order to proceed with the two-way MANOVA analysis, I ensured that my data can be

analyzed using this statistical procedure. The two-way MANOVA has 10 assumptions that must be considered (Laerd Statistics, 2015).

**Assumption 1.** Assumption one requires that the two or more dependent variables be continuous in nature. In my study, the dependent variables were continuous in that they are Likert-scale-like responses which are a set of ordered categories. Whether Likert-scale-like responses are a set of ordered categories is a continuing debate among statisticians. However, using parametric tests on Likert-scale-like scores is common. Grace-Martin (2017) recommended that when analyzing Likert-scale scores using parametric tests, a-stringent alpha level such as .01 or .005 be used. I have used .001 as the alpha level in this study.

**Assumption 2.** Assumption two requires that each of the independent variables consist of two or more categorical, independent groups. In my study, each hypothesis concerns one independent variable. Each of the independent variables in my study consist of two or more categorical, independent groups: obesity level (three groups) and race/ethnicity categories (four groups).

**Assumption 3.** Assumption three requires independence of observation in that there are no relationships between the participants of any of the groups. The groups in my study are independent in that participants belong to one of the three obesity levels and to one of the race/ethnicity categories.

**Assumption 4.** Assumption four requires that the data contain no univariate or multivariate outliers. The data used in my study contains univariate outliers as shown by a review of box plots. The data used in my study contains multivariate outliers as



assessed by Mahalanobis distance (min: .056. max: 18.09 mean 1.99, SD: 2.46). Because the sample sizes in my study are relatively large, it is unlikely that the univariate and multivariate outliers have a large influence on the test results (Laerd Statistics, 2015).

**Assumption 5.** Assumption five requires that the data exhibit multivariate normality. To determine whether the data exhibited multivariate normality, I used the Shapiro-Wilk test of normality. I conducted as many Shapiro-Wilk tests as there were groups of the independent variable multiplied by the number of dependent variables. In all, I conducted 3320 tests. The tests indicated that multivariate normality was not present. Because the two-way MANOVA is robust enough to accommodate deviations from normality, I decided to conduct the test and report the deviation from normality.

**Assumption 6.** Assumption six requires that the data exhibit no multicollinearity. To determine multicollinearity, I used Pearson correlation coefficients between the dependent variables. The analysis determined that multicollinearity was not present ( $r=.621, p=.0005$ ).

**Assumption 7.** Assumption seven requires that there should be a linear relationship between the dependent variables for each group of the independent variable. To assess whether there was a linear relationship, I examined the scatterplots of each of the groups. I determined that the relationships approximately followed a straight line, indicating a linear relationship between the dependent variables for each group of the independent variable.

**Assumption 8.** Assumption eight requires that the data exhibit an adequate sample size. To meet this requirement, there should be as many cases in each group of the

independent variable as there is number of dependent variables. Table 5 shows that the number of cases per group verifies this assumption.

**Assumption 9.** Assumption nine requires that the data exhibit similar variances and covariance. To test for this assumption, I conducted Box's Test of Equality of Covariance Matrices. The result showed that for Hypotheses 2 and 3, the assumption was violated. To compensate for this violation, I will use Pillai's Trace instead of Wilks-Lambda as the multivariate test (Laerd Statistics, 2015).

**Assumption 10.** Assumption ten requires that there be equal variances between the groups of the independent variable. To determine whether the data meets this assumption, I conducted Levene's Test of Equality of Error Variances. The data for my study indicates that the assumption of equal variances was not met (see Tables 5 and 6).

Table 5

*Levene's Test of Equality of Error Variances (Hypothesis 2)*

	F	df1	df2	Sig.
SUM_NH	12.03	5	3403	.000
SUM_PA	89.63	5	3403	.000

Table 6

*Levene's Test of Equality of Error Variances (Hypothesis 3)*

	F	df1	df2	Sig.
SUM_NH	99.12	7	3403	.000
SUM_PA	81.53	7	3403	.000

When the assumption of equal variances is not met, the two-way MANOVA test can be used but the level of statistical significance should be more stringent: .01 or even .005

(Laerd Statistics, 2015). I made the decision to use the test and set the level of the statistical level at  $p = <.001$ .

## RQ 2

To begin the analysis, I first determined whether there was a statistically significant interaction effect between the combined independent variables (grade levels and obesity levels) on the combined dependent variables (NH and PA). There was a significant interaction effect  $F(4, 6806.00) = 82.240, p < .001$ , Pillai's Trace = .092, partial  $\eta^2 = .046$ . Thus, I rejected the null hypothesis and concluded that the combined NH and PA was not the same for eighth and eleventh girls.

Because of this statistically significant interaction effect, I examined the interaction effect for each dependent variable separately and found that there was a statistically significant interaction effect between grade and obesity for NH  $F(2, 3403) = 29.258, p < .001$ , partial  $\eta^2 = .017$  and for PA  $F(2, 3403) = 118.835, p < .001$ , partial  $\eta^2 = .084$ .

Next, I analyzed the data to determine whether there was a statistically significant difference between eighth and eleventh girls for NH and PA. There was a statistically significant difference between eighth and eleventh girls for NH  $F(1, 3403) = 146.551, p = .001$ , partial  $\eta^2 = .041$  and for PA  $F(1, 3403) = 654.457, p = .001$ , partial  $\eta^2 = .161$ . The NH summary means for eighth grade girls was 4.08 lower than that for eleventh girls, (95% CI, -4.726- 3.409,  $p < .001$ ) indicating that eighth grade girls NH were, on average, healthier than for eleventh grade, on average. The PA summary means for eighth grade girls' was 8.258 higher than that for eleventh grade girls (95% CI, 7.626-8.892,  $p < .001$ )

indicating that eighth grade girls' PA was, on average, healthier than that for eleventh grade girls on average.

Next, I determined whether there was a statistically significant difference between the obesity levels (normal weight, overweight, obese) regarding NH and PA. There was a statistically significant difference for NH  $F(2, 3403) = 65.592, p < .001, \text{partial } \eta^2 = .037$  and PA  $F(2, 3403) = 156.133, p < .001, \text{partial } \eta^2 = .054$ . The NH summary means for overweight girls was 1.65 higher than for normal weight girls indicating that normal weight girls, on average, had healthier NH than overweight girls, on average (95% CI, -2.434-- .873,  $p < .001$ ). The NH summary means for obese girls was 4.82 higher than for normal weight girls, indicating that normal weight girls had, on average, healthier NH than did obese girls (95% CI, 3.788-5.843,  $p < .001$ ). The NH summary means for obese girls was 3.16 higher than for overweight girls, indicating that overweight girls, on average, had healthier NH than did obese girls, on average (95% CI, 2.044-4.280,  $p < .001$ ). The PA summary means for overweight girls' was 3.35 higher than that for normal weight girls' (95% CI, 2.600-4.099,  $p < .001$ ), indicating that normal weight girls', on average, had healthier PA than did overweight girls', on average. The PA summary means for obese girls was 6.74 higher than for normal weight girls (95% CI, 5.748-7.722,  $p < .001$ ), indicating that normal weight girls, on average, had healthier PA than did obese girls, on average. The PA summary mean for obese girls was 3.39 higher than for overweight girls (95% CI, 2.311-4.460,  $p < .001$ ), indicating that overweight girls, on average, had healthier PA than did obese girls, on average.

To gain further insight about the differences between the independent variables, I compared the means of each pair of independent variables using the Bonferroni post hoc test which is the appropriate post hoc test to use when comparing many variables and where the assumptions of the statistical analysis were not met. Table 7 shows the Bonferroni significant post hoc test results for NH summary means, grade and obesity level. Note that only the pairs of variables that were significantly different are listed in Table 7.

*Significant Differences between Grade and Obesity Levels Regarding Nutrition Habits*

Independent variable	Independent variable	Mean difference	Implications
Grade 8 normal weight	Grade 8 obese	-10.63	Grade 8 normal weight girls demonstrate healthier NH
Grade 8 normal Weight	Grade 11 obese	-4.67	Grade 8 normal weight girls demonstrate healthier NH
Grade 11 normal	Grade 8 obese	-9.82	Grade 11 normal weight girls demonstrate healthier NH
Grade 11 normal weight	Grade 11 obese	-3.86	Grade 11 normal weight girls demonstrate healthier
Grade 8 overweight	Grade 8 obese	-8.86	Grade 8 overweight girls demonstrate healthier NH
Grade 8 overweight	Grade 11 obese	-2.90	Grade 8 overweight girls demonstrate healthier NH
Grade 11 overweight	Grade 8 obese	-9.20	Grade 11 girls demonstrate healthier NH
Grade 11 overweight	Grade 11 obese	-3.24	Grade 11 girls demonstrate healthier NH
Grade 11 obese	Grade 8 obese	-5.96	Grade 11 girls demonstrate healthier NH

The Bonferroni post hoc results revealed the following generalizations:

- Grade 8 and Grade 11 girls of normal weight have healthier NH than Grade 8 and Grade 11 girls who are obese.
- There is no significant difference between the NH of Grade 8 normal weight girls and Grade 11 normal weight girls' and there is no significant difference between the NH of Grade 8 overweight girls and Grade 11 overweight girls.
- There is a significant difference between Grade 8 and Grade 11 overweight girls with Grade 11 overweight girls demonstrating healthier NH.

Table 8 shows the Bonferroni significant post hoc test results for PA summary means, grade, and obesity levels. Note that only the pairs of variables that were significantly different are listed in Table 8

Table 8

*Significant Differences between Grade and Obesity Levels Regarding Physical Activity Habits*

Independent variable	Independent variable	Mean difference	Implications
Grade 8 normal weight	Grade 11 overweight	-2.72	Grade 8 normal weight girls demonstrate healthier PA
Grade 8 normal weight	Grade 8 obese	-7.52	Grade 8 normal weight girls demonstrate healthier PA
Grade 11 normal weight	Grade 8 overweight	-2.51	Grade 11 normal weight girls demonstrate healthier PA
Grade 11 normal weight	Grade 8 obese	-7.31	Grade 11 normal weight girls demonstrate healthier PA

*(table continue)*

Grade 8 overweight	Grade 11 normal	-1.78	Grade 8 overweight girls demonstrate healthier PA
Grade 8 overweight	Grade 11 overweight	-4.29	Grade 8 overweight girls demonstrate healthier PA
Grade 8 overweight	Grade 8 obese	-9.09	Grade 8 overweight demonstrate healthier PA
Grade 8 overweight	Grade 11 obese	-2.65	Grade 8 overweight girls demonstrate healthier PA
Grade 11 overweight	Grade 8 obese	-4.80	Grade 11 obese girls demonstrate healthier PA
Grade 11 obese	Grade 11 overweight	-1.64	Grade 11 obese girls demonstrate healthier PA
Grade 11 obese	Grade 8 obese	-6.44	Grade 11 obese girls demonstrate healthier PA

### RQ 3

To begin the analysis, I first determined whether there was a statistically significant interaction effect between the combined independent variables (grade levels and race/ethnicity categories) on the combined dependent variables (NH and PA). There was a statistically significant effect with grade and race/ethnicity on the combined dependent variables, NH and PA:  $F(3, 7008) = 169.583, p < .001$ , Pillai's Trace = .254, partial  $\eta^2 = .127$ . Thus, I rejected the null hypothesis and concluded that the combined NH and PA was not the same for eighth and eleventh girls of various race/ethnicities.

Because there was a significant interaction effect, I examined the interaction effects for each dependent variable separately. There was a statistically significant interaction effect between grade and race for NH  $F(3, 3504) = 45.650, p < .001$ , partial  $\eta^2 = .036$  and for PA  $F(3, 3504) = 32.339, p < .001$ , partial  $\eta^2 = .027$ . There was a

statistically significant difference between eighth and eleventh grade girls' for NH  $F(1, 3504) = 90.409, p = <.001$ , partial  $\eta^2 = .025$  and for PA,  $F(1, 3504) = 105.928, p = <.001$ , partial  $\eta^2 = .029$ . There was a significant difference between eighth and eleventh grade girls of varying race/ethnicity regarding NH,  $F(3, 3504) = 46.372, p = <.001$ , partial  $\eta^2 = .038$ . But, there was no significant difference regarding PA,  $F(3, 3504) = 2.927, p = <.033$ , partial  $\eta^2 = .002$ .

The NH summary means for eighth grade Hispanic girls was 3.04 higher than for African American eighth grade girls and 4.00 higher than for eighth grade Asian girls and 8.52 higher than for White eighth grade girls. At eighth grade, White girls had, on average, healthier eating habits than Asian, African American, and Hispanic girls. Asian girls, on average, had healthier eating habits than African American, and Hispanic girls. African American girls' had healthier eating habits than Hispanic girls.

The NH summary means for eleventh grade African American girls was 1.648 higher than for White eleventh grade girls, 4.563 higher than for eleventh grade Hispanic girls and 4.761 higher than for eleventh grade Asian girls. At the eleventh grade level, Asian girls, on average, had healthier eating habits than Hispanic, White, and African American girls. Hispanic girls, on average, had healthier eating habits than White and African American girls. White girls, on average, had healthier eating habits than African American girls.

The NH summary means for eleventh grade White girls was 9.998 higher than that of eighth grade White girls. The NH summary means for eleventh grade Asian girls was 2.79 higher than that of eighth grade Asian girls. The NH summary means for



eleventh grade African American girls was 6.15 higher than that of eighth grade African American girls. The NH summary means for eighth grade Hispanic girls was higher than that of eleventh grade Hispanic girls. Except for the Hispanic girls, eighth grade Asian, African American, and White girls, on average, had healthier NH than eleventh grade girls of the same races.

The PA summary means for eighth grade White girls was .076 higher than for eighth grade Hispanic girls, 2.20 higher than for eighth grade Asian girls, and 3.36 higher than for African American eighth grade girls. At eighth grade, White girls had, on average, healthier PA habits than eighth grade girls of the other race/ethnicity categories. Hispanic girls had, on average, healthier PA than Asian and African American girls. Asian girls had, on average, healthier PA than African American girls.

The PA summary means for eleventh grade Asian girls was, on average, 3.50 higher than that for White eleventh grade girls, 2.84 higher than that for Hispanic girls, and 1.49 higher than that for African American eleventh grade girls. Asian eleventh grade girls had healthier PA than White, Hispanic, and African American eleventh grade girls. Eleventh grade African American girls had, on average, healthier PA than Hispanic and White girls. Hispanic eleventh grade girls had, on average, healthier PA than eleventh grade White girls.

The PA summary means for eighth grade White girls was 7.87 higher than that for eleventh grade White girls. The PA summary means for eighth grade Asian girls was 9.96 higher than that for eleventh grade Asian girls. The PA summary means for Hispanic eighth grade girls was 7.11 higher than that for eleventh grade Hispanic girls. The PA

summary means for African American eighth grade girls was 2.02 higher than that of eleventh grade African American girls. For each race/ethnicity category, eighth grade girls, on average, reported healthier PA than did Grade eleventh grade girls. At eighth grade, White girls had, on average, the healthiest PA of the all the eighth grade girls race/ethnicity groups. At eleventh grade, on average, White girls had the least healthy PA of all the eleventh grade girls' race/ethnicity groups.

To gain further insight about the differences between the independent variables, I compared the means of each pair of independent variables using the Bonferroni post hoc test which is the appropriate post hoc test to use when comparing many variables and where the assumptions of the statistical analysis were not met. Table 9 shows the Bonferroni post hoc test results for NH summary. Table 9 shows only those pairs of variables that were significantly different.

Table 9

*Significant Differences Between Grade and Race/Ethnicity Categories Regarding Nutrition Habits*

Independent variable	Independent variable	Mean difference	Implications
Grade 11 African American	Grade 8 White	-3.34	Grade 11 African American girls demonstrate healthier NH
Grade 11 African American	Grade 11 White	-1.60	Grade 11 African American girls demonstrate healthier NH
Grade 11 African American	Grade 8 Hispanic	-4.43	Grade 11 African American girls demonstrate healthier NH
Grade 11 African American	Grade 8 African American	-2.66	Grade 11 African American girls demonstrate healthier NH

*(table continues)*

Grade 11 Asian	Grade 8 White	-4.91	Grade 11 Asian girls demonstrate healthier NH
Grade 11 Asian	Grade 8 African American	-4.24	Grade 11 Asian girls demonstrate healthier NH
Grade 11 Hispanic	Grade 8 White	-3.97	Grade 11 Hispanic girls demonstrate healthier NH
Grade 11 Hispanic	Grade 11 White	-2.23	Grade 11 Hispanic girls demonstrate healthier NH
Grade 11 Hispanic	Grade 8 Hispanic	-5.06	Grade 11 Hispanic girls demonstrate healthier NH
Grade 11 Hispanic	Grade 8 African American	-3.30	Grade 11 Hispanic girls demonstrate healthier NH

The Bonferroni post hoc results revealed the following generalizations:

- There were no significant differences between Asian Grade 8 girls and any other grade, race/ethnicity categories regarding NH.
- At the Grade 8 level, there were no significant differences between the race/ethnicity categories regarding NH.
- At the Grade 11 levels, there were significant differences between the following: Grade 11 White and Grade 11 Hispanic, Grade 11 White and Grade 11 African American girls.
- At the Grade 11 levels, there were no significant differences between Asian girls and all other Grade 11 race/ethnicity categories.

Table 10 shows The Bonferroni post hoc test results for PA summary means for grade and race/ethnicity categories. Note that Table 10 shows only those pairs of variables that were significantly different.

Table 10

*Significant Differences Between Grade and Race/Ethnicity Categories Regarding Physical Activity Habits*

Independent variable	Independent variable	Mean difference	Implications
Grade 8 African American	Grade 11 Asian	-3.96	Grade 8 African American girls demonstrate healthier PA
Grade 11 African American	Grade 11 Asian	-4.16	Grade 11 African American girls demonstrate healthier PA
Grade 11 Hispanic	Grade 11 Asian	-4.74	Grade 11 Hispanic girls demonstrate healthier PA
Grade 8 White	Grade 11 Asian	-3.78	Grade 8 White girls demonstrate healthier PA
Grade 11 White	Grade 11 Asian	-5.03	Grade 11 White girls demonstrate healthier PA

The Bonferroni post hoc results revealed the following generalizations:

- Grade 8 and Grade 11 White girls and Grade 8 Hispanic girls demonstrate healthier PA than Grade 11 Asian girls.
- Grade 8 and 11 African American girls' demonstrate healthier PA than Grade 11 Asian girls.

### Summary

I conducted this multivariate quantitative survey study to gain an understanding of the NH and PA habits of eighth and eleventh grade girls' of various races/ethnicities and obesity, and whether there are significant differences between eighth and eleventh grade girls of various races/ethnicities and obesity categories regarding their NH and PA habits.

Archived data collected in 2013 were analyzed to answer the research questions and accept or reject the hypotheses.

RQ1 asked, What are the self-reported NH and PA habits of eighth and eleventh grade girls of various race/ethnicity categories and obesity levels? The findings revealed that there was difference between NH and PA habits by various race/ethnicity categories and obesity levels. I determined that 60% of eighth grade girls were normal weight, 28% were overweight, and 11% were obese, while 42% of eleventh grade girls were normal weight, 28% were overweight, and 29% were obese. Normal healthy weight were most commonly in eighth and eleventh grade Asian girls. Overweight were most commonly in eighth grade African American girls and eleventh grade Hispanic girls. Obese were most commonly in eighth and eleventh grade White girls. Adolescent girls with normal weights reported the healthiest NH and PA levels, while overweight girls reported healthier NH and PA habits levels than obese girls.

RQ2 asked, Is there a significant difference between eighth and eleventh grade girls' of varying levels of self-reported obesity regarding their NH and PA habits? There was a statistically significant difference between eighth and eleventh grade girls' of varying obesity levels regarding their NH and PH scores. I rejected the null hypothesis because the NH and PA habits of eighth and eleventh grade girls of varying obesity levels (normal healthy weight, overweight, and obese) were not the same.

RQ 3 asked, Is there a significant difference between eighth and eleventh grade girls of varying race/ethnicity categories regarding their NH and PA habits? I found that there was a significant difference between eighth and eleventh grade girls of varying

race/ethnicity regarding NH. But, there was no significant difference regarding PA habits of eighth and eleventh grade girls of varying race/ethnicity categories. I rejected the null hypothesis because my results showed that the combined NH and PA habits was not the same for eighth and eleventh grade girls of various race/ethnicity categories (African American, Asian, Hispanic, and White). There was a significant difference in eighth and eleventh grade eighth and eleventh grade PA levels among the race/ethnicity categories. I found that eighth grade White girls had the healthiest PA habits of all the races/ethnicities, but eleventh grade White girls had the least healthy PA habits. Section 5 provided an interpretation of findings, implications for social change, recommendations for action, recommendations for future research, and conclusion.

## Section 5: Discussion, Conclusions, and Recommendations

### **Introduction**

The purpose of this study was to determine whether there was a difference between eighth and eleventh grade girls' self-reported NH and PA habits. To accomplish this, I conducted a multivariate quantitative survey study using archival SPAN data which was collected during spring 2013. I employed a two-way MANOVA to analyze SPAN data from 3320 girls. This analysis allowed me to provide detailed information about the relationship between the independent variables (grade level, obesity levels, and race/ethnicity categories) and the dependent variables (adolescent girls' NH and PA habits). The findings revealed that there was a significant difference regarding NH and PA habits. In this section, I present an interpretation of the findings, implications for social change, recommendation for actions, recommendations for further study, and the conclusion.

### **Interpretation of the Findings**

Adolescent obesity has increased in recent decades. Nearly a 25% of adolescents in developed nations qualify as overweight or obese (Lobstein & Frelut, 2003; Ogden et al., 2010). This trend is concerning because adolescent obesity is associated with poor dietary choices and decreased PA levels which can have negative long-term impacts on health (Biro & Wein, 2010). These trends are particularly strong for adolescent girls; a group which has been shown to have decreased PA, NH, and increased weight gain as adolescents age into adulthood (Kimm et al., 2000; Veugelers & Fitzgerald, 2005). In addition, there is also evidence that PA levels of adolescent girls vary in terms of

race/ethnicity. African American and Hispanic adolescent girls participate in PA less than their White counterparts (Anderson et al., 2008; Belcher et al., 2010; Taylor & Lou, 2011). Such a disparity in PA levels may point to greater risk of adolescent obesity among certain races/ethnicities.

To investigate the potential differences in NH, PA, and obesity, I analyzed archival survey data collected from eighth and eleventh grade girls'. I addressed the following research questions in my analyses:

*RQ1:* What are the self-reported NH and PA habits of eighth and eleventh grade girls of various race/ethnicity categories and obesity levels?

*RQ2:* Is there a significant difference between eighth and eleventh grade girls of varying levels of self-reported obesity regarding their NH and PA habits?

*RQ3:* Is there a significant difference between eighth and eleventh grade girls of varying race/ethnicity categories regarding their NH and PA habits?

## **RQ 1**

The NH and PA of adolescents are closely linked to levels of obesity. The CDC (2002; 2003; 2005) found differences in the PA activity habits of adolescent girls by race/ethnicity. Several researchers have concluded that participation in PA decreased among African American and Hispanic adolescent girls compared to White adolescent girls (Anderson et al., 2008; Belcher et al., 2010; Taylor & Lou, 2011). Based on current research, I posed the following question: What are the self-reported NH and PA habits of eighth and eleventh grade girls of various race/ethnicity categories and obesity levels? To answer this question, I statistically analyzed the nutritional and PA habits of eighth and



eleventh grade girls of various obesity levels and race/ethnicity categories enrolled in an urban southern school district, to create a distribution of obesity levels.

I determined that 60.39% of eighth grade girls were normal weight, 28.24% were overweight, and 11.37% were obese, while 42.31% of eleventh grade girls were normal weight, 28.65% were overweight, and 29.04% were obese. Other research of adolescent girls aged 12-19 reported that 61.9% were normal weight, 14.0% were overweight, and 20.5% were obese (U. S. Department of Health and Human Services; Centers for Disease Control and Prevention, 2015). The results of my study aligned with the results of U. S. Department of Health and Human Services and Centers for Disease Control and Prevention (2015) of normal weight for eighth girls. The rest of my results differed from these previously reported numbers, with higher levels of overweight (eighth and eleventh grade) and obese (eleventh grade) girls. I also found that eighth grade girls were healthier than eleventh grade with lower levels of obesity. It is important to note that my analysis considered the results for eighth and eleventh grade girls separately, while the previously reported numbers combined those age groups. This could have contributed to the observed difference in reported obesity distributions in my analysis compared to previous reports, and suggests that my results may provide a more nuanced understanding of variable obesity risks within the broad 12 to 19-year-old age group.

Furthermore, I found that the obesity levels of girls in my study did, in fact, vary by race/ethnicity. For eighth grade, the descriptive statistics from my study showed the following:

- Normal weight girls were most commonly Asian (93.10%), followed by Hispanic (63.47%), African American (61.27%), and White (55.70%).
- Overweight girls were most commonly African American (31.03%), followed by White (28.01%), Hispanic (25.15%), and Asian (6.90%).
- Obese girls were most commonly White (16.29%), followed by Hispanic (15.38%), and African American (7.69%).

Differences in obesity levels by race/ethnicity were also found in eleventh grade girls, with the following results:

- Normal weight girls were most commonly Asian (86.81%), followed by Hispanic (55.63%), White (32.60%), and African American (30.25%).
- Overweight girls were most commonly Hispanic (30.76%), followed by African American (31.55%), White (26.22%), and Asian (10.99%).
- Obese girls were most commonly White (41.18%), followed by African American (38.99%), Hispanic (12.80%), and Asian (2.20%).

Although other studies have also found obesity levels in adolescent girls to vary by race/ethnicity (see Huh et al., 2012; Ogden et al., 2014), the specific results of my study are different. Huh et al. (2012) found that 22% of Hispanic, 17% of African American, and 15% of White adolescent girls were overweight, while 29% of African American, 18% of Hispanic, and 15% of White adolescent girls between the ages of 12 and 19 were obese. In addition to this divergence in the data from previous research, a key difference between my findings and previous results is that I did not find White girls to have the lowest obesity levels. In my study, White girls had the highest levels of

obesity in both eighth and eleventh grade (16.29% and 41.18%, respectively). Based on my findings, White girls are most at risk for obesity. It is possible that there is a change taking place among White girls' NH and PA habits.

Because I did not focus on the ages of girls in this study, I combined eighth grade overweight and obese categories with eleventh grade overweight and obese categories to determine overall obesity levels by race/ethnicity. I determined that 38.72% of African American, 6.90% of Asian, 40.53% of Hispanic, and 44.30% of White girls were overweight. I also found that 69.75% of African American, 13.19% of Asian, 44.37% of Hispanic, and 67.40% of White girls were obese. Ogden et al. (2014) conducted a study of African American, Asian, Hispanic, and White adolescent girls aged 12 to 19 years. Ogden et al. (2014) found that 42.5% of African American, 15% of Asian, 36.5% of Hispanic, and 31.0% of White girls were overweight. Ogden et al. (2014) also found that 22.7% of African American, 7.3% of Asian, 21.3% of Hispanic, and 20.9% of White girls were obese. These findings are different from my own study findings regarding girls' obesity levels in the various race/ethnicity categories. The percentage of overweight African American and Asian girls in my study was lower than that reported in Ogden et al. (2014); however, Ogden et al. (2014) reported lower percentage of obese for all race/ethnicity categories. Therefore the findings have determined that Ogden et al. (2014) found a lower percentage of obese adolescent girls. This could mean that the Ogden et al. (2014) participants' obese adolescent girl had a healthier NH or participated in more PA.

## **RQ 2**

PA levels have been found to decrease during adolescence, particularly for girls (Kimm et al., 2005; Whitehead & Biddle, 2008), which is concerning because PA is vital to social and physical health (Eisenmann & Wickel, 2009). Poor NH, such as the consumption of sugary beverages and skipping breakfast, have been linked to adolescent obesity (Morenga et al., 2013) and higher BMI (Rampersaud et al., 2005; Szajewska & Ruszczyski 2010). With this information in mind, I asked the following: Is there a significant difference between eighth and eleventh grade girls of varying levels of self-reported obesity regarding their PA and NH habits?

I rejected the null hypothesis because there was a significant difference between the PA and NH of eighth and eleventh grade girls of varying obesity levels (normal weight, overweight, and obese). Since there was a significant difference between grade and combined PA and NH, I analyzed the data separately to fully grasp the difference between NH and PA of girls in eighth and eleventh grade. Within their separate grade levels, obesity aligned with expected NH and PA levels. In other words, girls with normal weights reported the healthiest NH and PA levels, while overweight girls reported healthier NH and PA levels than obese girls. This could potentially indicate that girls at any age should make healthier food choices and participate more in PA to lower the obesity levels.

### **RQ 3**

Previously published studies have found decreased levels of activity among African American (Anderson et al., 2008) and Hispanic (Belcher et al., 2010; Taylor & Lou, 2011) adolescent girls compared to other races/ethnicities. To determine whether

this held true for the eighth and eleventh grade girls in this study, and to identify potential differences in NH in addition to PA habits, I asked the following question: Is there a significant difference between eighth and eleventh grade girls of varying race/ethnicity regarding their NH and PA habits?

I rejected the null hypothesis because my results showed that the combined NH and PA was not the same for eighth and eleventh grade girls of varying race/ethnicity categories. There was a significant difference in eighth and eleventh grade PA levels among the race/ethnicity categories. I found that eighth grade White girls had the healthiest PA of all the races/ethnicities, but eleventh grade White girls had the least healthy PA. This finding pointed to a dramatic decrease in activity level among White girls between eighth and eleventh, which may make this age and ethnicity group a key target demographic for educational efforts to increase activity levels. This directly contradicted a study by Taylor and Lou (2011), which examined the PA levels of African American, Latino, and White adolescent girls, and found that White adolescents participated in PA more than African American and Latino adolescents. My results showed that eleventh African American and Hispanic girls participated in PA more than White girls; and, that African American girls were the most physically active among the races/ethnicities. My findings were more in line with the results of Belcher et al. (2010), which also found that White adolescents were the least active race/ethnic group and African American the most active. The disparities among literature results on this topic and my own findings suggest that this is an area that needs additional investigation. My results represent the most recent data on this topic and, thus, may indicate a change

currently taking place among the PA levels of girls in different race/ethnicity categories. While African American and Hispanic girls appear to be participating in PA more frequently, the activity levels of White girls appear to be in decline. My findings have identified that there is a difference in PA among race/ethnicity categories. There are so many things that might be influencing my findings that I cannot say for sure what is behind the results relating to girls NH and PA of various race/ethnicity.

### **Implications for Social Change**

This study was conducted to compare NH and PA habits of eighth and eleventh grade girls of various races/ethnicities and obesity levels to achieve a further understanding of obesity. The findings can contribute to positive social change by providing new information and understanding to PE educators about the difference between middle school and high school adolescent girls' NH and PA. PE educators can use this information and understanding to develop and justify educational programs that equip girls with the knowledge to make healthier food choices and increase their physical activity levels. Administrators and district leaders can improve existing wellness programs for girls' and find methods to increase the knowledge of NH and PA in PE classes and implement this information into other content subject areas.

### **Recommendations for Action**

Based on my findings, I have several recommendations that are intended to combat obesity by increasing the nutritional health and PA of girls. These include increased nutritional education and opportunities for activity in schools, as well as continuing education and support for teachers and parents on these topics.

**Increase Collaboration among Physical Education Teachers**

I recommend that PE educators who instruct Grades 6–8 and 9–12 collaborate within their district to discuss the current research on health, nutrition, and activity levels of adolescent girls. This collaboration would provide deeper insight into effective teaching strategies that encourage better NH and improved PA among adolescent girls, with the goal to design an effective PE and health program for each school district. PE educators should use professional development sessions to develop methods for recording current nutritional habits and PA levels that include age, grade, obesity levels, and race/ethnicity categories. Establishing such a database would inform educators about changing NH and PA levels as girls' age from middle to high school and would function as a critical resource for educators designing strategies and educational programs targeted to adolescents at different ages and race/ethnicity categories.

**Elevate Nutritional Education**

According to my results, eighth grade adolescent girls had healthier nutritional habits than girls in eleventh grade. This is evidence that older girls may make less healthy food choices and suggests that a comprehensive nutrition program could have a positive impact on older adolescents. Such a program should inform adolescent girls about good nutritional habits and also help them to understand the importance of healthy eating. I recommend that PE educators incorporate the SPARK program, a research-based program that promotes lifelong wellness with an emphasis on nutrition, into their current curricula. The SPARK program strives to improve the health of children and

adolescent by disseminating evidence-based initiatives to students in Pre-K through Grade 12. One example of a SPARK research program is the Healthy Kids Challenge®. The Healthy Kids Challenge® (HKC) is an evidence-based resource for school nutrition education, food education, and food literacy that is nationally recognized with oversight from a team of registered and licensed dietitians. Healthy Kids Challenge® provides resources that include nutrition curricula and activities for teachers. According to James (2014), in 20 school districts in Florida that implemented HKC, they found:

- 64% of the schools started, enhanced, or expanded a wellness program;
- 71% started or expanded healthy eating options in the classroom, at vending machines, in the school store, etc.;
- 86% started or increased nutrition education.

Incorporating SPARK-type initiatives into school districts is one way to encourage adolescent girls to continue to make healthy food choices as they age.

### **Encourage PA**

I found that eighth grade girls had healthier PA habits than girls in eleventh grade, which is further evidence that older adolescent girls participate less in physical activity. To address this finding, I recommend that school districts design physical activity or wellness programs aimed at older adolescent girls of various obesity levels and race/ethnicity categories. Such programs should inform adolescent girls about the many physical activities available to them and also help them understand the importance of remaining physically active. An existing program that does this is the SPARK Physical Education (PE) program. The SPARK PE program has two components that encourage



physical activity in middle and high school students. The Middle School Physical Activity and Nutrition (M-SPAN) program and the SPARK High School Physical Education (HSPE) program both assist PE educators via training in current teaching methodologies and strategies to help adolescent girls meet PA requirements. These program encourage adolescent girls to engage in at least 60 minutes of PA every day and provide PE educators with differentiated instruction, strategies, and teaching styles to improve the PA level of adolescent girls from middle to high school.

### **Administrative and Parental Support for Nutrition and PA**

To implement effective nutrition and activity programs to benefit adolescent girls, school administrators must provide adequate support for their PE educators and students. School administrators must ensure that adolescent girls are comfortable participating in PE classes by providing a safe environment for them. School administrators must also lobby for healthier food options during lunch and athletic events so that students have the opportunity to make healthy choices throughout the day. Finally, school administrators must prioritize student health as a necessary element of student education and support programs and policies that encourage lifelong nutrition and PA for their students.

Parental involvement is key to maintaining healthy lifestyle choices among adolescents. Schools should provide appropriate educational programs on nutritional habits and PA for parents. Parents need to be educated on the importance of nutrition and PA and the benefits of these two elements for their adolescent daughters. Through workshops and educational materials, PE educators can inform parents about appropriate nutritional guidelines and physical activity requirements for their children. Having this

information in hand will make it easier for parents of adolescent girls to help their children make healthy food and activity choices.

### **Recommendations for Future Research**

My recommendations for future research are based on some of the inherent limitations of this study. One limitation of this survey was that the participants recalled only what they had eaten within a 24-hour period and the PA they had participated in during the 7 days prior to the survey. In future studies, researchers should collect data on NH for a longer time period than just the previous 24 hours. It would be beneficial for researchers to have adolescent girls record what they have eaten for the last 7 days in order to establish a better picture of their NH.

Another limitation was my study design, which was not longitudinal in nature. The eighth and eleventh grade adolescents were not the same group of girls, but rather separate groups surveyed at the same time. Therefore, I could not investigate or discuss the possible changes in NH and PA over time as the girls transitioned from eighth and eleventh grade. I recommend that future researchers conduct longitudinal research that follows a single group of students from middle school to high school to track changes in their NH, PA, and obesity levels as they age.

Another limitation of my study was that the survey used only close-ended questions that did not allow for nuanced data. Such questions did not permit me to obtain the girls' perspectives on their NH and PA habits. To address this limitation, I recommend that future research use a mixed method research design that incorporates both qualitative and quantitative data to generate a deeper understanding of the research

questions and responses (Creswell, 2012). The qualitative portion of such a study would give future researchers the opportunity to interview adolescent girls using open-ended questions to observe their NH, while the quantitative portion would employ a behavioral survey to yield a broader understanding of adolescent girls' NH, PA, and attitudes towards both aspects.

### **Conclusion**

Researchers have identified changes in weight gain, eating and PA behaviors during adolescence period (Alberga, Sigal, Goldfiled, Prud'homme, & Kenny, 2012; Hills & Byrne, 2010; Neumark-Sztainer et al., 1999). During this period, adolescent girls experience changes in body size, shape, and composition as a result of puberty. These changes may trigger body dissatisfaction as well as unhealthy eating and weight control practices, such as skipping meals, eating sugar-sweetened beverages, and decreasing PA (Sonnevile et al., 2012; Vander Wal, 2012). Good nutrition and PA is important for all adolescent girls, especially during the transition from middle to high school, to avoid behaviors that lead to obesity and its associated negative impacts on health.

The purpose of this multivariate quantitative survey study was to gain an understanding of the NH and PA of eighth and eleventh grade girls of various obesity levels and races/ethnicities. The archival data used were from a survey of 3320 adolescent girls. I found that there was no significant difference between NH and PA for eighth and eleventh grade girls of varying levels of obesity. However, there was a significant difference between PA of eighth and eleventh grade adolescent girls of various race/ethnicity categories (African American, Asian, Hispanic, and White). Based

on these findings, I recommended multiple strategies to further investigate these differences among adolescent girls of different ethnicities and methods to encourage better NH and PA habits to reduce obesity levels in this population.

## References

- Aaron, D.J., Storti, K.L., Robertson, R.J., Kriska, A.M., & La Porte, R. E. (2002). Longitudinal study of the number and choice of leisure time physical activities from mid to late adolescence. *Archives of Pediatrics & Adolescent Medicine, 156*, 1075-1080.
- Alberga, A.S., Sigal, R.J., Goldfield, G., Prud'homme, D., & Kenny, G. P. (2012). Overweight and obese teenagers: Why is adolescence a critical period? *Pediatric Obesity, 7*(4), 261–273. doi:10.1111/j.2047-6310.2011.00046.x
- Ambrosini, G.L. (2014). Childhood dietary pattern and later obesity: A review of the evidence. *Proceeding of the Nutrition Society, 73*,137-164. doi: 10.1017/S0029665113003765
- Anderson, S.E., Economas, C.D., & Must, A. (2008). Active play and screen time in US children aged 4 to 11 years in relation to sociodemographic and weight status characteristics: A nationally representative cross-sectional analysis. *BioMed Central Public Health, 8*, 366. doi.org/10.1186/1471-2458-8-366
- Bauer, K.W., Nelson, M.C., Boutelle, K.N., & Neumark-Sztainer, D. (2008). Parental influences on adolescents physical activity and sedentary behavior: Longitudinal findings from Project EAT-II. *International Journal of Behavioral Nutrition Physical Activity, 5*(12), 1-7. doi: 10.1186/1479-5868-5-12
- Belcher, B.R., Berrigan, D., Dodd, K.W., Emken, B.A., Chou, C.P., & Spuijt, D. (2010). Physical activity in US youth: Impact of race/ethnicity, age, gender, & weight

status. *Medicine & Science in Sports & Exercise*, 42(12), 2211-2221.

doi:10.1249/MSS.0b013e3181e1fba9

Bergier J., Kapka-Skrzypczak L., Bilinski, P., Paprzycki, P., & Wojtyla A. (2012).

Physical activity of Polish adolescents and young adults according to IPAQ: A population-based study. *Annals of Agricultural and Environmental Medicine*, 19(1), 109–15.

Biro, F.M., & Wein, M. (2010). Childhood obesity and adult morbidities. *American*

*Journal of Clinical Nutrition*, 91(5), 1499-1505. doi:10.3945/ajcn.2010.28701B

Bocarro, J., Kanters, M. A., Casper, J., & Forrester, E. (2008). School physical education,

extracurricular sports, and lifelong active living. *Journal of Teaching in Physical Education*, 27, 155–166.

Bracey, G. W. (2006). Separate but superior? A review of issues and data bearing on

single-sex education. Retrieved from <http://epicpolicy.org/files/EPSSL-0611-221-EPRU.pdf>.

Bremer, A.A., Byrd, R.S., & Auinger, P. (2011). Racial trends in sugar-sweetened

beverage consumption among US adolescents: 1988-2004. *International Journal of Adolescence Medicine Health*, 23(3), 279-286. doi: 10.1515/IJAMH.2011.056

Briefel, R. R., & Johnson, C. L. (2004). Secular trends in dietary intake in the United

States. *Annual Review of Nutrition*, 24, 401-431.

Brown, I.J., Stamler, J., Van Horn, L., Robertson, C.E., Chan, Q., Dyer, A.,

Chiang-Ching, H., Rodriguez, B. L., Zhao, L., Daviglus, M. L., Ueshima, H., & Elliott, P. (2011). Sugar-sweetened beverage, sugar intake of individuals, and

their blood pressure. *Hypertension*, 57, 695–701. doi:

10.1161/HYPERTENSIONAHA.110.165456

Cairney J., Kwan M.V., Velduizen S., Hay J., Bray S.R., & Faught B.E. (2012). Gender

perceived competence and the enjoyment of physical education in children: A

longitudinal examination. *International Journal of Behavioral Nutrition and*

*Physical Activity*, 9, 1-8. doi.org/10.1186/1479-5868-9-26

Cañadas, L., Esteban-Comejo, I., Ortega, F., Gómez-Martínez, S., Casajús, J., Cabero,

M., Calle, M., Marcos, A., Veiga, Óscar, L., Martínez-Gómez, D., Esteban-

Comejo, I., Gomez-Martinez, S., Calle, M., Veiga, Oscar L; &Martinez-Gomez,

D. (2015). Straight-A students dislike physical education in adolescence: myth or

truth? The AVENA, AFINOS and UP&DOWN studies. *Nutricion Hospitalaria*,

32, (1), 318-323.

Carroll, B., & Loumidis J. (2007). Children's perceived competence and enjoyment of

physical education and physical activity outside of school. *European Physical*

*Education Review*, 7, 24-43.

Centers for Disease Control and Prevention. (2002). *Youth Risk Behavior Surveillance*

*System*. Retrieved from

<http://www.cdc.gov/mmwr/preview/mmwrhtml/ss5104a1.htm>.

Centers for Disease Control and Prevention. (2003). *Youth Risk Behavior Surveillance*

*System*. Retrieved from

<http://www.cdc.gov/mmwr/preview/mmwrhtml/ss5302a1.htm>

- Centers for Disease Control and Prevention. (2005). *Youth Risk Behavior Surveillance System*. Retrieved from <http://www.cdc.gov/mmwr/PDF/SS/SS5505.pdf>
- Centers for Disease Control and Prevention (2010). *Childhood Overweight and Obesity*. Retrieved from <http://www.cdc.gov/obesity/childhood/index.html>
- Centers for Disease Control and Prevention. (2012a). *Physical Activity Guidelines for Americans*. Retrieved from <http://www.cdc.gov/physicalactivity/basics/index.htm>
- Centers for Disease Control and Prevention. (2012b). Youth Risk Behavior Surveillance United States, 2011. *Morbidity and Mortality Weekly Report*, 61(4), 1-165.
- Centers for Disease Control and Prevention. (2014). Youth Risk Behavior Surveillance United States, 2013. Retrieved from <https://www.cdc.gov/mmwr/preview/mmwrhtml/ss6104a1.htm>
- Centers for Disease Control and Prevention (2015). *Defining Childhood Obesity*. Retrieved from <http://www.cdc.gov/obesity/childhood/defining.html>
- Centers for Disease and Control Prevention (2016). *Youth Risk Behavior Surveillance-United States 2015*. Retrieved from <http://www.cdc.gov/healthyyouth/data/yrbs/results.htm>
- Chung, A.E., Skinner, A.C., Steiner, M.J., & Perrin, E. M. (2012). Physical activity and BMI in a nationally representative sample of children and adolescents. *Clinical Pediatrics*, 51(2), 122-129. doi: 10.1177/0009922811417291.
- Cockburn, C., & Clark, G. (2002). "Everybody's looking at you!" Girls negotiating the "femininity deficit" they incur in physical education. *Women's Studies International Forum*, 25(6), 651-665. doi.org/10.1016/S0277-5395(02)00351-5



- Coe, R. (2012). Effect size. *Research Methods and Methodologies in Education*, 368-377.
- Colley, R. C., Garriguet, D., Janssen, I., Craig, C.L., Clarke, J., & Tremblay, M. S. (2011). Physical activity of Canadian children and youth: Accelerometer results from the 2007 to 2009 Canadian Health Measures Survey. *Statistic Canada Health Report*, 22(1), 15-23.
- Constantinou, P., Manson, M., & Silverman, S. (2009). Female students' perceptions about gender-role stereotypes and their influence on attitude toward physical education. *Physical Educator*, 66, 85-96.
- Corbin, C. B., Pangrazi, R. P., & Le-Masurier, G.C. (2004). Physical activity for children: Current patterns and guidelines. *The President's Council on Physical Fitness and Sports Research Digest*, 52, 1-8.
- Corder, K., van Sluijs, E. M., Ridgway, C. L., Steele, R. M., Prynne, C. J., Stephen, A. M., Bamber, D. J., Dunn, V. J., Goodyer, I., & Ekelund, U. (2014). Breakfast consumption and physical activity in adolescents: Daily associations and hourly patterns. *American Journal of Clinical Nutrition*, 99, 361–368. doi: 10.3945/ajcn.111.027607
- Creswell, J. W. (2009) Research design: *Qualitative, quantitative, and mixed methods approaches*. Thousand Oaks, CA: SAGE.
- Creswell, J. W. (2012). Educational research: *Planning, conducting, and evaluating quantitative and qualitative research*. Laureate Education, Inc.

- Currie, C., Gabhainn, S., Godeau, E., Roberts, C., Smith, R., Picket, W., & Barnekow, V. (2008). *Inequalities in young people's health. Health behavior in school-aged children international report from the 2005/2006 survey*. Retrieved from <http://www.euro.who.int/en/publications/abstracts/inequalities-in-young-peoples-health.-hbsc-international-report-from-the-20052006-survey>
- Currie, C., Levin K., Kirby J., Currie D., Van Der Sluijs, W., & Inchley J. (2011). Health behavior in school-aged children. National report. Findings from the 2010 HBSE survey in Scotland. Retrieved from <http://www.cahru.org/research/hbsc-scotland>
- Davison, K. K., & Birch, L.L. (2001). Childhood overweight: a contextual model and recommendations for future research. *Obesity Review*, 2(3), 159–171.
- Deshmukh-Taskar, P., Nicklas, T., O'Neil, Keast, D., Radcliffe, J., & Cho, S. (2010). The relationship of breakfast skipping and type of breakfast consumption with nutrient intake and weight status in children and adolescents: The National Health and Nutrition Examination survey 1999-2006. *Journal of the American Dietetic Association*, 869-876. doi:10.1016/j.jada.2010.03.023.
- de Vet, E., de Ridder, D. T., & de Wit, J. B. (2011). Environmental correlates of physical activity and dietary behaviors among young people: A systematic review of reviews. *Obesity Review*, 12(5), 130-142. doi:10.1111/j.1467-789X.2010.00784.x.
- Dietary Guidelines Advisory Committee (2010). *Report of the dietary guidelines advisory committee on the dietary guidelines for Americans*. Washington, DC.
- Dietz, W. H. (1998). Health consequences of obesity in youth: Childhood predictors of adult disease. *Pediatrics*, 101 (2), 518-525.

- Dietz, W. H., & Robinson, T. N. (2005). Overweight children and adolescents. *New England Journal of Medicine*, 352, 2100-2109. doi: 10.1056/NEJMcp043052
- Dubois, L., Girard, M., & Kent, M. P. (2006). Breakfast eating and overweight in a pre-school population: Is there a link? *Public Health Nutrition*, 9, 436–442.
- Duffey, K. J., & Popkin, B. M. (2007). Shifts in patterns and consumption of beverages between 1965 and 2002. *Obesity (Silver Spring)*, 15, 2739–2747.  
doi:10.1038/oby.2007.326
- Dumith S. C., Gigante D. P., Domingues M. R., & Kohl, H. W. (2011). Physical activity change during adolescence: A systematic review and a pooled analysis. *International Journal Epidemiology*, 40(3), 685-698. doi:10.1093/ije/dyq272
- Dwyer, J. M., Allison, K. R., Goldenberg, E., Fein, A., Yoshida, K. K., & Boutilier, M. (2006). Adolescent girls' perceived barriers to participation in PA. *Adolescence*, 41, 75-89.
- Dwyer, J. T., Evans, M., Stone, E. J., Feldman, H. A., Lytle, L., Hoelscher, D., Johnson, C., Zive, M., & Yang, M. (2001). Adolescents' eating patterns influence their nutrient intakes. *Journal the Academy of Nutrition and Dietetics*, 101, (7) 798–802.
- Eaton, D. E., Kann, L., Kinchen S., Shanklin, S., Ross, J., Hawkins, J., Harris, W. A., Lowry, R., McManus, T., Chyen, D., Lim, C., Whittle, L., Brener, N. D., & Wechsler, H. (2010). Youth risk behavior surveillances-United States, 2009. *Morbidity and Mortality Weekly Report*, 59, 5.

- Ebbeling, C. B., Feldman, H. A., Chomitz, V. R., Tracy, A. A., Antonelli, M. P., Steven L. Gortmaker, S., Stavroula, K., Osganian, S. K., & David, L. S. (2012). A randomized trial of sugar-sweetened beverages and adolescent body weight. *New England Journal of Medicine*, *367*, 1407-1416. doi:10.1056/NEJMoa1203388
- Ebbeling, C. B., Feldman, H. A., Osganian, S. K., Chomitz, V. R., Ellenbogen, S. J., & Ludwig, D. S. (2006). Effects of decreasing sugar-sweetened beverage consumption on body weight in adolescents: A randomized, controlled pilot study. *Pediatrics*, *117*, 673–680.
- Eime R. M., Payne, W. R., Casey M. M., & Harvey J. T. (2010). Transition in participation in sport and unstructured physical activity for rural living adolescent girls. *Health Education Research*, *25*(2), 282–293. doi.org/10.1093/her/cyn060
- Eisenmann, J. C., & Wickel, E. E. (2009). The biological basis of physical activity in children: Revisited. *Pediatric Exercise Science*, *21*, 257-272.
- Fahey, T.D., Insel, P.M., & Roth, W.T. (2015). *Fit & Well: Core concepts and labs in physical fitness and wellness*. McGraw-Hill Education, New York, NY.
- Fairclough, S., & Stratton G. (2005). “Physical education makes you fit and healthy”. Physical education’s contribution to young people’s physical activity levels. *Health Education Research*, *20*, 14-23.
- Fakhouri, T.H., Hughes, J. P., Brody, D. J., Kit, B. B., & Ogden, C. L. (2013). Physical activity and screen-time viewing among elementary school aged children in the United States from 2009 to 2010. *Journal of America Medical Association Pediatrics*, *167*(3), 223-229. doi:10.1001/2013.jamapediatrics.122

- Fiorito, L. M., Marini, M., Mitchell, D. C., Smiciklas-Wright, H., & Birch, L. L. (2010). Girls' early sweetened carbonated beverage intake predicts different patterns of beverage and nutrient intake across childhood and adolescence. *Journal of the American Dietetic Association, 110*(4), 543–550.  
doi.org/10.1016/j.jada.2009.12.027
- Fiorito, L. M., Smiciklas-Wright, H., Mitchel, D. C., & Birch, L. L. (2006). Dairy and dairy-related nutrient intake during middle childhood. *Journal of the American Dietetic Association, 106*, 534-542. doi:10.1016/j.jada.2006.01.005
- Fisher, J. O., Mitchell, D. C., Smiciklas-Wright, H., Mannino, M. L., & Birch, L.L. (2004). Meeting calcium recommendations during middle childhood reflects mother-daughter beverage choices and predicts bone mineral status. *America Journal of Clinical Nutrition, 79*, 698-706.  
doi.org/10.1080/07315724.2006.10719520
- Foddy, W. (1993). *Constructing questions for Interviews and questionnaires: Theory and practice in social research*. Cambridge: Cambridge University Press.
- Forshee, R. A., Anderson, P. A., & Storey, M. L. (2008). Sugar-sweetened beverages and body mass index in children and adolescent: A meta-analysis. *The American Journal of Clinical Nutrition, 87*(1), 1662-1671.  
doi.org/10.1093/ajcn/87.6.1662
- Freedman, D. S., Mei, Z., Srinivasan, S. R., Berenson, G. S., & Dietz, W. H. (2007). Cardiovascular risk factors and excess adiposity among overweight children and adolescents: The Bogalusa heart study. *Journal of Pediatrics, 150*(1), 12-17.

- Garcia, A. W., Pender, N.J., Antonakos, C. L., & Ronis, D. L. (1998). Changes in physical activity beliefs and behaviors of boys and girls across the transition to junior high school. *Journal of Adolescent Health, 22*(5), 394–402.
- Garn, A. C., Cothran, D. J., & Jenkins, J. M. (2011). A qualitative analysis of individual interest in middle school physical education: Perspectives of early adolescents. *Physical Education & Sports Pedagogy, 16*, 223–236.  
doi.org/10.1080/17408989.2010.532783
- Gavarry, O., Giacomoni, M., Bernard T., Seymat, M., & Falgairette, G. (2003). Habitual physical activity in children and adolescents during school and free days. *Medicine & Science in Sports & Exercise, 35*(3), 525–31.
- Grace-Martin, K. (2017). Can likert scale data ever be continuous? Retrieved from <https://www.theanalysisfactor.com/can-likert-scale-data-ever-be-continuous/>
- Green, K, Smith, Andy and Roberts, K. (2005). Social class, young people, sport and physical education. In K. Green & K. Hardman (Eds.), *Physical education: Essential issues* (pp. 180-196). London, England: Sage
- Grieser, M., Vu, M. B., Bedimo-Rung, A. L., Neumark-Sztainer, D., Moody, J., Young, D. R., & Moe, S. G. (2006). Physical activity attitudes, preferences, and practices in African American, Hispanic, and Caucasian girls. *Health Education & Behavior, 33*, 40-51.
- Griffiths L. J., Cortina-Borja M., Sera F., Pouliou, T., Geraci, M., Rich, C., Cole, T. J., Law, C., Joshi, H., Ness, A. R., Jebb, S. A., & Dezaux, C. (2013). How active

- are our children? Findings from the millennium cohort study. *British Medical Journal Open* 3:e002893, 1-10. doi: 10.1136/bmjopen-2013- 002893
- Hannon, J. C., & Ratliffe, T. (2005). Physical activity levels in coeducational and single-gender high school physical education settings. *Journal of Teaching in Physical Education*, 24, 149-164. doi.org/10.1123/jtpe.24.2.149
- Hannon, J., Ratliffe, T., Holt, B., & Thorn, J. (2005). Activity levels and female students' views of a high school physical education flag football unit: Coeducational and single gender settings. *International Council for Health, Physical Education, Recreation, Sport & Dance*, 41, 16-21.
- Hannon, J., & Williams, S. M. (2008). Should secondary physical education be coeducational or single-sex? *Journal of Physical Education, Recreation, & Dance*, 79(2), 6-56. doi.org/10.1080/07303084.2008.10598126
- Hills, A. P. & Byrne, N. M. (2010). An overview of physical growth and maturation. *Medicine & Science in Sports & Exercise*, 55, 1–13.
- Hoelscher, D. M., Barroso, C., Springer, A., Castrucci, B., & Kelder, S. H. (2009). Prevalence of self-reported activity and sedentary behaviors among 4th-, 8th-, and 11th-grade Texas public school children: The school physical activity and nutrition study. *Journal of Physical Activity Health*, 6(5), 535-47. doi.org/10.1123/jpah.6.5.535
- Hsu, Y. W., Chou, C. P., Nguyen-Rodriguez, S. T., McClain, A. D., Belcher, B. R., & Spruijt-Metz, D. (2011). Influences of social support, perceived barriers, and negative meanings of physical activity on physical activity in middle school

students. *Journal of Physical Activity Health*, 8, 210-219.

<https://doi.org/10.1123/jpah.8.2.210>

Huh, D., Shaw, H., & Boutelle, K. (2012). Female overweight and obesity in adolescence: developmental trends and ethnic differences in prevalence, incidence, and remission. *Journal of Youth Adolescents*, 41(1), 76-85.

doi: 10.1007/s10964-011-9664-4

Inchley, J., Kirby J., & Currie, C. (2011). Longitudinal changes in physical self-perceptions & associations with physical activity during adolescence. *Pediatric Exercise Science*, 23(2), 237-249.

Jackson, C. & Warin, J. (2010). The importance of gender as an aspect of identity at key transition points in compulsory education. *British Education Research Journal*, 26(3), 375-391. doi.org/10.1080/713651558

James, J., Thomas, P., Cavan, D., & Kerr, D. (2004). Preventing childhood obesity by reducing consumption of carbonated drinks: Cluster randomized controlled trial. *British Medical Journal*, 328(1237) 1-6. doi.org/10.1136/bmj.38077.458438.EE

Janssen, I., & LeBlanc A. G. (2010). A systematic review of the health benefits of physical activity and fitness in school-aged children and youth. *International Journal of Behavioral Nutrition Physical Activity*, 7(1) 40-10.

[doi.org/10.1186/1479-5868-7-40](https://doi.org/10.1186/1479-5868-7-40)

Johnson, R. K., Appel, L. J., Brands, M., Howard, B., Lefeyre, M., Lusting, R. H., Sacks, F., Steffen, L. M., & Wylie-Rosett, J. (2009). Dietary sugars intake and cardiovascular health: A scientific statement from the American Heart



Association. *Circulation*, *120*, 1011-20.

[doi.org/10.1161/CIRCULATIONAHA.109.192627](https://doi.org/10.1161/CIRCULATIONAHA.109.192627)

Joint Health Surveys Unit. (2013). *Health survey for England 2012: Health, social care, and lifestyle*. Retrieved from

<http://www.digital.nhs.uk/catalogue/PUB13218/HSE2012-Sum-bklet.pdf>

Kalaja S., Jaakkola T., Watt A., Liukkonen, J., & Ommundsen, Y. (2010). The associations between seventh-grade Finnish students' motivational climate, perceived competence, self-determined motivation, and fundamental movement skills. *European Physical Education Review*, *15*(3), 315–335.

<https://doi.org/10.1177/1356336X09364714>

Kimm, S. Y., Glynn, N. W., Obarzanek, E., Kriska, A. M., Daniels, S. R., Barton, B. A., & Liu, K. (2005). Relation between the changes in physical activity and body-mass index during adolescence: A multicenter longitudinal study. *The Lancet*, *366*(9482), 301-307.

Knowles A. M., Niven A., & Fawkner S. (2013). 'Once upon a time, I used to be active': Adopting a narrative approach to understanding physical activity behavior in adolescent girls. *Qualitative Research in Sport, Exercise, and Health*, *6*(1), 62-76.

[doi.org/10.1080/2159676X.2013.766816](https://doi.org/10.1080/2159676X.2013.766816)

Krebs-Smith, S. M., Guenther, P. M., Subar, A. F., Kirkpatrick, S. I., & Dodd, K. W. (2010). American do not meet federal dietary recommendations. *The Journal of Nutrition*, *140*, 1832–1838. doi: 10.3945/jn.110.124826

- Kwan M. Y., Cairney J., Faulkner G. E., & Pullenayegum E. E. (2012). Physical activity and other health-risk behaviors during the transition into early adulthood: A longitudinal cohort study. *American Journal of Preventive Medicine*, *42*(1), 14-20. doi:10.1016/j.amepre.2011.08.026.
- Laerd Statistics (2015). Statistical tutorials and software guides. Retrieved from <https://statistics.laerd.com/>
- Lasater G., Piernas C., & Popkin, B. M. (2011). Beverage patterns and trends among school-aged children in the US, 1989-2008. *Nutrition Journal*, *10*, 103. doi: 10.1186/1475-2891-10-103.
- Lee, J. M., Pilli, S., Gebremariam, A., Keirns, C. C., Davis, M. M., Vijan, S., Freed, G. L., Herman, W. H., & Gurney, J. G. (2010). Getting heavier, younger: Trajectories of obesity over the life course. *International Journal of Obesity* (London), *34*, 614-623. doi:10.1038/ijo.2009.235
- Leidy, H. J., Ortinau, L. C., Douglas, S. M., & Hoertel, H. A. (2013). Beneficial effects of a higher-protein breakfast on the appetitive, hormonal, and neural signals controlling energy intake regulation in overweight/obese, “breakfast-skipping,” late-adolescent girls. *American Journal Clinical Nutrition*, *97*(4), 67-688. doi:10.3945/ajcn.112.053116
- Lien, L., Lien, N., Heyerdahl, S., Thoresen, M., & Bjertness, E. (2006). Consumption of soft drinks and hyperactivity, mental distress, and conduct problems among adolescents in Oslo, Norway. *American Journal Public Health*, *96*, 1815–1820. doi:10.2105/AJPH.2004.059477

- Limstrand, T. (2008). Environmental characteristics relevant to young people's use of sports facilities: A review. *Scandinavian Journal of Medicine & Science in Sports, 18*, 275-287. doi:10.1111/j.1600-0838.2007.00742
- Loman, D. (2008). Promoting physical activity in teen girls: Insight from focus groups. *American Journal of Maternal Child Nursing, 33*, 294-299. doi:10.1097/01.NMC.0000334896.91720.86
- Lobstein., T., & Frelut, M. L. (2003). Prevalence of overweight among children in Europe. *Obesity Reviews, 4*, 195–200. doi:10.1046/j.1467-789X.2003.00116.x
- Lubans D. R., Sylva K., & Morgan, P. J. (2007). Factors associated with physical activity in a sample of British secondary school students. *Australian Journal of Educational & Developmental Psychology, 7*, 22-30.
- Lyerly, J. E., Huber, L. R., Findlow, J., Racine, E. F., & Dmochowski, J. (2013). Is breakfast skipping associated with physical activity among US adolescents? A cross-sectional study of adolescents aged 12–19 years, National Health and Nutrition Examination Survey (NHANES). *Public Health Nutrition, 17*(4), 896–905. doi: 10.1017/S1368980013000700
- Lytle, L. A., Murray, D. M., Evenson, K. J., Moody, J., Pratt, C., Metcalfe, L., & Parra-Medina D. (2009). Mediators affecting girls' levels of physical activity outside of school: Findings from the trial of activity in adolescent girls. *Annals Behavioral Medicine 38*, 124-136. doi: 10.1007/s12160-009-9127-2

- Lyu M., Minjeong, L., & Gill, D. L. (2011). Perceived physical competence, enjoyment, and effort in same-sex and coeducational physical education classes. *Educational Psychology, 31*(2), 247–260. doi.org/10.1080/01443410.2010.545105
- Malik, V. S., Popkin, B. M., Bray, G. A., Despres, J., Willett, W. C., & Hu, F. B. (2010). Sugar- sweetened beverages and risk of metabolic syndrome and type 2 diabetes: A meta-analysis. *Diabetes Care, 33*, 2477–2483. doi.org/10.2337/dc10-1079
- Mäkinen, M., Puukko-Viertomies, L. R., Lindberg, N., Siimes, M. A., & Aalberg, V. (2012). Body dissatisfaction and body mass in girls and boys transitioning from early to mid-adolescence: Additional role of self-esteem and eating habits. *Biomed Central Psychiatry, 12*(35) 1-8. doi: 10.1186/1471-244X-12-35
- Mitchell F., Gray S., & Inchley J. (2013). ‘This choice thing really works ...’ Changes in experiences and engagement of adolescent girls in physical education classes, during a school-based physical activity programme. *Physical Education and Sport Pedagogy, 18*(1), 593-611. doi.org/10.1080/17408989.2013.837433
- Mitchell, F., Inchley, J., Fleming, J., & Currie, C. (2015). A socio-ecological approach to understanding adolescent girls’ engagement and experiences in the PE environment: A case study design. *Graduate Journal of Sport, Exercise & Physical Education Research, 3*, 44-62.
- Montonen, J., Jarvinen, R., Knekt P., Heliovaara, M., & Reunanen, A. (2007). Consumption of sweetened beverages and intakes of fructose and glucose predict type 2 diabetes occurrence. *Journal of Nutrition, 137*, 1447–54.

- Moore, J. B., Jilcott, S. B., Shores, K. A., Evenson, K. R., Brownson, R. C., & Novick, L. F. (2010). A qualitative examination of perceived barriers and facilitators of physical activity for urban and rural youth. *Health Education Research, 13*. 355-367. doi:10.1093/her/cyq004
- Morenga L. T., Mallard, S., & Mann J. (2013). Dietary sugars and body weight: Systematic review and meta-analyses of randomized controlled trials and cohort studies. *British Medical Journal, 346*, 1-25. doi.org/10.1136/bmj.e7492
- Nader, P. R., Bradley, R H., Houts, R., McRitchie, S. L., & O'Brien, M. (2008). Moderate-to-vigorous physical activity from ages 9 to 15 years. *Journal of the American Medical Association, 300*, 295–305. doi:10.1001/jama.300.3.295
- Neumark-Sztainer, D., Story, M., Hannan, P. J., Tharp, T., & Rex, J. (2003). Factors associated with changes in physical activity: A cohort study of inactive adolescent girls. *Archives of Pediatrics Adolescent Medicine, 157*, 803-810.
- Neumark-Sztainer, D., Story, M., Perry, C., & Casey, M. A. (1999). Factors influencing food choices of adolescents: Findings from focus-group discussions with adolescents. *Journal of the American Dietetic Association, 99*, 929–937.
- Nielsen, S. J., & Popkin, B. M. (2004). Changes in beverage intake between 1977 and 2001. *American Journal of Preventive Medicine, 27*(3), 205–10.
- Norman, G. J., Nutter, S. K., Ryan, S., Sallis, J. F., Calfas K. J., & Patrick, K. (2006). Community design and access to recreational facilities as correlates of adolescent physical activity and body-mass index. *Journal of Physical Activity & Health, 3*(1), 118-128.

- Ogden, C. L., Carroll, M. D., Curtin, L. R., Lamb, M. M., & Flegal, K. M. (2010). Prevalence of high BMI in US children and adolescents, 2007-2008. *Journal of the American Medical Association*, *303*(3), 242-249. doi:10.1001/jama.2009.2012
- Ogden, C. L., Carroll, M. D., Kit, B. K., & Flegal, K. M. (2012). *Prevalence of obesity in the United States, 2009–2010. NCHS data brief*, no 82. Hyattsville, MD: National Center for Health Statistics.
- Ogden, C. L., Carroll, M. D., Kit, B. K., & Flegal, K. M. (2014). Prevalence of childhood and adult obesity in the United States, 2011-2012. *The Journal of the American Medical Association*, *311*(8), 806-814. doi:10.1001/jama.2014.732.
- Ogden, C. L., Carroll, M. D., Kit, B. K., & Flegal, K. M. (2015). *Prevalence of obesity among adults and youth: United States, 2011–2014. NCHS data brief*, no 219. National Center for Health Statistics.
- Pate, R. R., Dowda, M., O'Neill, J. R., & Ward, D. S. (2007). Change in physical activity participation among adolescent girls from 8th to 12th grade. *Journal of Physical Activity and Health*, *4*(1), 3.
- Pearson, N., Atkin, A. J., Biddle, S. J., Gorely, T., & Edwardson, C. (2009). Patterns of adolescent physical activity and dietary behaviors. *International Journal of Behavioral Nutrition Physical Activity*, *6*(1), 45.  
<https://doi.org/10.1186/1479-5868-6-45>
- Phillips, S. M., Bandini, L. G., Naumova, E. N., Cyr, H., Colclough, S., Dietz, W. H., & Must, A. (2004). Energy-dense snack food intake in adolescence: Longitudinal

relationship to weight and fatness. *Obesity Research*, 12(3), 461–72.

doi:10.1038/oby.2004.52

Popkin, B. M. (2010). Patterns of beverage use across the lifecycle. *Physiology Behavior*, 100, 4–9. doi.org/10.1016/j.physbeh.2009.12.022

Prochaska, J. J., Sallis, J. F., Slymen, D., & McKenzie, T. L. (2003) A longitudinal study of children's enjoyment of physical education. *Pediatric Exercise Science*, 15,170-178.

Rampersaud, G. C., Pereira, M. A., Girard, B. L., Adams, J., & Metz, J. D. (2005). Breakfast habits, nutritional status, body weight, and academic performance in children and adolescents. *Journal of the American Dietetic Association*, 105, 743–760.

doi:10.1016/j.jada.2005.02.007

Reedy, J., & Krebs-Smith S. M. (2010). Dietary sources of energy, solid fats, and added sugars among children and adolescents in the United States. *Journal of the American Dietetic Association*, 110(10), 1477–1484.

Reilly, E., Methven, E., McDowell, Z. C., Hacking, B., Alexander, D., Stewart, D. & Kelnar, C. (2003). Health consequences of obesity. *Archives of Disease in Childhood*, 88, 748–752.

Sallis J. F., Grossman R. M., Pinski R. B., Patterson T. L., & Nader P. R. (1987). The development of scales to measure social support for diet and exercise behaviors. *Preventive Medicine*, 16, 825–836. doi.org/10.1016/0091-7435(87)90022-3

- Sallis, J. F., Prochaska, J. J., & Taylor, W. C. (2000). A review of correlates of physical activity in children and adolescents. *Medicine & Science in Sports & Exercise*, 32, 963–975.
- Salvy S. J., Roemmich J. N., Bowker J. C., Romero N. D., Stadler P. J., & Epstein, L. H. (2009). Effect of peers and friends on youth physical activity and motivation to be physically active. *Journal of Pediatric Psychology*, 34, 217–225.  
doi:10.1093/jpepsy/jsn071
- Sanchez, A., Norman, G. J., Sallis, J. F., Calfas, K. J., Cella, J., & Patrick, K. (2007). Patterns and correlates of physical activity and nutrition behaviors in adolescents. *American Journal of Preventive Medicine*, 32(2), 124–30.  
doi.org/10.1016/j.amepre.2006.10.012
- Sharma, M., Sargent, L., & Stacy, R. (2005). Predictors of leisure-time physical activity among African American women. *American Journal of Health Behavior*, 29(21), 352–359.
- Shi, Z., Taylor, A. W., Wittert, G., Goldney, R., & Gill, T. K. (2010). Soft drink consumption and mental health problems among adults in Australia. *Public Health Nutrition*, 13, 1073–9. doi: 10.1017/S1368980009993132
- Sichieri, R., Trotte, P. A., de Souza, R. A., & Veiga, G. V. (2009). School randomized trial on prevention of excessive weight gain by discouraging students from drinking sodas. *Public Health Nutrition*, 12, 197-202. doi:  
10.1017/S1368980008002644



- Singh, A. S., Mulder C., Twisk, J. W., van Mechelen, W., & Chuapari, M. J. (2008). Tracking of childhood overweight into adulthood: A systematic review of the literature. *Obesity Reviews*, *9*, 474-488. doi:10.1111/j.1467-789X.2008.00475.x
- Sisk, C. L. & Zehr, J. L. (2005). Pubertal hormones organize the adolescent brain and behavior. *Front Neuroendocrinol*, *26*, 163-174. doi:10.1016/j.yfrne.2005.10.003
- Skinner, J. D., & Carruth, B. R. (2001). A longitudinal study of children's juice intake and growth: The juice controversy revisited. *Journal of the American Dietetic Association*, *101*, 432-437. doi: 10.1016/S0002-8223(01)00111-0
- Slater, A., & Tiggemann, M. (2010). "Uncool to do sport": A focus group study of adolescent girls' reasons for withdrawing from physical activity. *Psychology of Sport and Exercise*, *11*(6), 619-626. doi.org/10.1016/j.psychsport.2010.07.006
- Smith, C., & Walker, J. (2000). School Physical Activity and Nutrition Survey Retrieved from <https://sph.uth.edu/research/centers/dell/project.htm?project=3037edaa-201e-492a-b42f-f0208ccf8b29>
- Smith, K. J., Gall S. L., McNaughton, S. B., Blizzard, L., Dwyer, T., & Venn, A. J. (2010). Skipping breakfast: Longitudinal associations with cardiometabolic risk factors in the childhood determinants of adult health study. *American Journal of Clinical Nutrition*, *92*(6), 1316-1325. doi.org/10.3945/ajcn.2010.30101
- Sonneville, K. R., Calzo, J. P., Horton, N. J., Haines, J., Austin, S. B., & Field, A. F. (2012). Body satisfaction, weight gain and binge eating among overweight adolescent girls. *International Journal of Obesity*, *36*(7), 944-949. doi: 10.1038/ijo.2012.68

- Story, M., Neumark-Sztainer, D. & French, S. (2002). Individual and environmental influences on adolescent eating behaviors. *Journal of the American Dietetic Association, 102*(3), 40–51. doi.org/10.1016/S0002-8223(02)90421-9
- Szajewska, H., & Ruszczyński, M. (2010). Systematic review demonstrating that breakfast consumption influences body weight outcomes in children and adolescents in Europe. *Critical Reviews in Food Science and Nutrition, 50*(2), 113–9. doi: 10.1080/10408390903467514
- Taylor, W., & Lou, D. (2011). Do all children have places to be active? Disparities in physical activity environments in racial and ethnic minority and lower-income communities. *Research Synthesis*. Retrieved from <http://www.activelivingresearch.org>.
- Thiagarajah, K., Fly, A.D., Hoelscher, D. M., Bai, Y., Leone, A., & Shertzer, J.A. (2008). Validating the food behavior questions from the elementary school SPAN questionnaire. *Journal of Nutrition Education and Behavior, 40*(5), 305-310.
- Todd, A. S., Street, S. J., Ziviani, J., Byrne, N. M., & Hills, A. P. (2015). Overweight and obese adolescent girls: The importance of promoting sensible eating and activity behavior from the start of the adolescent period. *International Journal of Environmental Research and Public Health, 12*, 2306-2329. doi: 10.3390/ijerph120202306
- Tordoff, M. G., & Alleva, A. M. (1990). Effect of drinking soda sweetened with aspartame or high-fructose corn syrup on food intake and body weight. *American Journal of Clinical Nutrition, 51*(6), 963-969.

- Troiano, R. P., Berrigan, D., Dodd, K. W., Masses, L. C., Tilbert, T., & McDowell, M. (2008). Physical activity in the United States measured by accelerometer. *Medicine & Science in Sports in Exercise, 40*, 181-188.  
doi:10.1249/mss.0b013e31815a51b3
- U.S. Department of Agriculture, U.S. Department of Health and Human Services. (2010). Dietary Guidelines for Americans, 2010. 7th Edition. Washington, DC, US Government Printing Office.
- U. S. Department of Health and Human Services & Centers for Disease Control and Prevention. (2015). *Adolescent Overweight and Obesity*. Retrieved from <https://mchb.hrsa.gov/chusa14/health-status-behaviors/adolescents/adolescent-overweight-obesity.html>
- van Daalen, C. (2009). Girls' experiences in physical education: competition, evaluation & degradation. *Journal of School Nursing, 21*, 115-121.  
doi: 10.1177/10598405050210020901
- Vander Wal, J. S. (2012). Unhealthy weight control behaviors among adolescents. *Journal of Health Psychology, 17*(1), 110–120.  
<https://doi.org/10.1177/1359105311409787>
- Veugelers, P. J., & Fitzgerald, A. L. (2005). Effectiveness of school programs in preventing childhood obesity: A multilevel comparison. *American Journal of Public Health, 95*(3), 432-435. doi: 10.1177/10598405050210020901
- Warner, R. M. (2013). *Applied statistics from bivariate through multivariate techniques*. Thousand Oaks, CA: SAGE Publications Inc.

- Whitehead S. & Biddle S. (2008). Adolescent girls' perceptions of physical activity: A focus group study. *European Physical Education Review, 14*(2), 243-262.
- Wuest D. & Bucher C. (1999). Historical foundations of physical education and sport. In D. Wuest & C. Bucher (Eds). *Foundations of Physical Education and Sport*. (pp. 146-193). Boston, Mass: WCB/McGraw-Hill.
- World Health Organization (2012). *Physical activity and young people*. Retrieved from [http://www.who.int/dietphysicalactivity/factsheet\\_young\\_people/en/](http://www.who.int/dietphysicalactivity/factsheet_young_people/en/)
- Wright, M. S., Wilson, D. K., Griffin, S., & Evans A. (2010). A qualitative study of parental modeling and social support for physical activity in underserved adolescents. *Health Education Research, 25*(2), 224-232. doi:10.1093/her/cyn043

## Appendix A: School Physical Activity and Nutrition (SPAN) Survey

The following questions are about what students your age eat, what they know about nutrition, and their physical activity (exercise). Your answers will help us learn about students in Texas and will be used to design better health programs. Read each question carefully and pick the answer that is true for you. Mark that answer on your survey as shown in the example below. ***This is not a test, and there is no right or wrong answers. Remember, your answers will be kept private***

### STUDENT INFORMATION

1. What school do you go to? \_\_\_\_\_

2. Today's date \_\_\_\_\_

3. Bubble in your grade.       8<sup>th</sup>       11<sup>th</sup>

4. Bubble in your sex.       Male       Female

5. Date of Birth. \_\_\_\_\_

6. Bubble your age

- 11
- 12
- 13
- 14
- 15
- 16
- 17
- 18
- 19
- 20

7. How do you describe yourself?

(Fill in only one)

- Black or African American
- Mexican- American, Latino, or Hispanic
- White, Caucasian, or Anglo
- Vietnamese
- Chinese
- Indian or Pakistani
- Other Asian
- American Indian or Alaska Native
- Native Hawaiian or Other Pacific Islander
- Other \_\_\_\_\_

**(Write in other)**

Yesterday, how many times did you...

1. ... eat fried chicken, chicken nuggets, chicken fried-steak, fired pork chops, fried fish, or fish sticks?
 

<input type="radio"/> 0 None	<input type="radio"/> 2 Times	<input type="radio"/> 4 Times
<input type="radio"/> 1 Time	<input type="radio"/> 3 Times	<input type="radio"/> 5 or More Times
  
2. ....eat starchy vegetable like potatoes, corn, or peas (DO NOT COUNT French fries or chips)?
 

<input type="radio"/> 0 None	<input type="radio"/> 2 Times	<input type="radio"/> 4 Times
<input type="radio"/> 1 Time	<input type="radio"/> 3 Times	<input type="radio"/> 5 or More Times
  
3. ...drink fruit juice? Fruit juice is 100% juice of orange juice, apple juice, or grape juice. (DO NOT COUNT punch, Kool-Aid®, sports drinks, and other fruit-flavored drinks)?
 

<input type="radio"/> 0 None	<input type="radio"/> 2 Times	<input type="radio"/> 4 Times
<input type="radio"/> 1 Time	<input type="radio"/> 3 Times	<input type="radio"/> 5 or More Times
  
4. ...drink any punch, Kool Aid®, sports drinks, or other fruit-flavored drinks? (DO NOT COUNT 100% fruit juice).
 

<input type="radio"/> 0 None	<input type="radio"/> 2 Times	<input type="radio"/> 4 Times
<input type="radio"/> 1 Time	<input type="radio"/> 3 Times	<input type="radio"/> 5 or More Times
  
5. ...drink any regular (NOT diet) sodas or soft drinks?
 

<input type="radio"/> 0 None	<input type="radio"/> 2 Times	<input type="radio"/> 4 Times
<input type="radio"/> 1 Time	<input type="radio"/> 3 Times	<input type="radio"/> 5 or More Times
  
6. ...drink any diet sodas or soft drinks?
 

<input type="radio"/> 0 None	<input type="radio"/> 2 Times	<input type="radio"/> 4 Times
<input type="radio"/> 1 Time	<input type="radio"/> 3 Times	<input type="radio"/> 5 or More Times
  
7. ...drink a bottle or glass of water? (INCLUDE sparkling or any other water that has 0 calories).
 

<input type="radio"/> 0 None	<input type="radio"/> 2 Times	<input type="radio"/> 4 Times
<input type="radio"/> 1 Time	<input type="radio"/> 3 Times	<input type="radio"/> 5 or More Times
  
8. Do you usually eat or drink something for breakfast?
 

Yes, all the time    Yes, most of the time    Yes, some of the time    Never
  
9. Do you usually eat evening meal?
 

Yes, I usually eat an evening that is homemade

Yes, I usually eat an evening meal at home that is not homemade (frozen pizza, microwave meal, etc.)

Yes, I usually eat an evening meal from a fast food restaurant

Yes, I usually eat an evening meal from a sit-down restaurant or pizza place

Yes, I usually eat an evening meal from a place other than home or restaurant

No, I don't usually eat and evening meal

10. During the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day? (Add up all the time you spent in any kind of PA that increased your heart rate and made you breathe hard some of the time.)

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

11. On how many of the past 7 days did you exercise or take part in PA that made your heart beat fast and made you breathe hard for at least 20 minutes? (For example: basketball, soccer, running or jogging, fast dancing, swimming laps, tennis, fast bicycling, or similar aerobic activities).

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

12. On how many of the past 7 days did you do exercises to strengthen or tone your muscles, such as push-ups, sit-ups, or weight-lifting.

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

13. During the past 12 months, on how many sports teams run by your school did you play (DO NOT INCLUDE PE classes)? Sports teams include soccer, basketball, baseball, swimming, gymnastics, wrestling, track, football, tennis, and volleyball teams.

- 0 teams                       1 team                       2 teams                       3 teams or more

14. During the past 12 months, on how many sports teams run by organizations outside of your school (like the recreation department, club sports, summer leagues, YMCA, or church teams) did you play? Sports teams include soccer, basketball, baseball, swimming, gymnastics, wrestling, track, football, tennis, and volleyball teams.

- 0 teams                       1 team                       2 teams                       3 teams or more

15. Do you currently participate in any other organized physical activities or take lessons, such as martial arts, dance, gymnastics, or tennis?

- Yes                               No

16. How many hours per day do you usually watch TV, DVDs, or movies away from school?

- I don't watch TV, DVDs, or movies     Less than 1 hour     1 hours                       2 hours  
 3 hours                          4 hours                       5 hours                       6 hours or more

17. How many hours per day do you usually spend on a computer away from school? (Time on the computer includes time spent surfing the Internet, instant messaging, and playing online video or computer games.)

- I don't use a computer    Less than 1 hour    1 hour    2 hours  
 3 hours    4 hours    5 hours    6 hours or more

**18.** How many hours per day do you usually spend video games like Nintendo®, Wii or DS, Sega®, PlayStation®, Xbox®, Gameboy®, or arcade games away from school?

- I don't play video games    Less than 1 hour    1 hour    2 hours  
 3 hours    4 hours    5 hours    6 hours or more

The Coordinated School Health members met with each student after she completed the survey to measure their height. The CSH group the students into 3 levels of obesity (normal weight, overweight, and obese).



## Appendix B: SPAN Nutrition and Physical Activity Scoring

1. Yesterday, how many times did you eat fried chicken, chicken nuggets, chicken fried-steak, fried pork chops, fried fish, or fish sticks?
  - None = 0
  - 1 time = 1
  - 2 times = 2
  - 3 times = 3
  - 4 times = 4
  - 5 or more times = 5
  
2. Yesterday, how many times did you eat starchy vegetable like potatoes, corn, or peas (DO NOT COUNT French fries or chips)?
  - None = 0
  - 1 time = 1
  - 2 times = 2
  - 3 times = 3
  - 4 times = 4
  - 5 or more times = 5
  
3. Yesterday, how many times did you drink fruit juice? Fruit juice is 100% juice of orange juice, apple juice, or grape juice. (DO NOT COUNT punch, Kool-Aid®, sports drinks, and other fruit-flavored drinks).
  - None = 0
  - 1 time = 1
  - 2 times = 2
  - 3 times = 3
  - 4 times = 4
  - 5 or more times = 5
  
4. Yesterday, how many times did you drink any punch, Kool Aid®, sports drinks, or other fruit-flavored drinks? (DO NOT COUNT 100% fruit juice).
  - None = 0
  - 1 time = 1
  - 2 times = 2
  - 3 times = 3
  - 4 times = 4
  - 5 or more times = 5
  
5. Yesterday, how many times did you drink any regular (NOT diet) sodas or soft drinks?
  - None = 0
  - 1 time = 1
  - 2 times = 2

3 times = 3  
4 times = 4  
5 or more times = 5

6. Yesterday, how many times did you drink any diet sodas or soft drinks?

None = 0  
1 time = 1  
2 times = 2  
3 times = 3  
4 times = 4  
5 or more times = 5

7. Yesterday, how many times did you drink a bottle or glass of water? (INCLUDE sparkling or any other water that has 0 calories).

None = 5  
1 time = 4  
2 times = 3  
3 times = 2  
4 times = 1  
5 or more times = 0

8. Do you usually eat or drink something for breakfast?

Yes= 0  
No= 1

9. Do you usually eat evening meal?

Yes= 0  
No= 1

10. During the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day? (Add up all the time you spent in any kind of PA that increased your heart rate and made you breathe hard some of the time.

None = 0  
1 days = 1  
2 days = 2  
3 days = 3  
4 days = 4  
5 days = 5  
6 days = 6  
7 days = 7

11. On how many of the past 7 days did you exercise or take part in PA that made your heart beat fast and made you breathe hard for at least 20 minutes? (For example:

basketball, soccer, running or jogging, fast dancing, swimming laps, tennis, fast bicycling, or similar aerobic activities).

None = 0

1 days = 1

2 days = 2

3 days = 3

4 days = 4

5 days = 5

6 days = 6

7 days = 7

12. On how many of the past 7 days did you do exercises to strengthen or tone your muscles, such as push-ups, sit-ups, or weight-lifting?

None = 0

1 days = 1

2 days = 2

3 days = 3

4 days = 4

5 days = 5

6 days = 6

7 days = 7

13. During the past 12 months, on how many sports teams run by your school did you play (DO NOT INCLUDE PE classes)? Sports teams include soccer, basketball, baseball, swimming, gymnastics, wrestling, track, football, tennis, and volleyball teams.

0 teams=0

1 teams=1

2 teams=2

3 teams or more= 3

14. During the past 12 months, on how many sports teams run by organizations outside of your school (like the recreation department, club sports, summer leagues, YMCA, or church teams) did you play? Sports teams include soccer, basketball, baseball, swimming, gymnastics, wrestling, track, football, tennis, and volleyball teams.

0 teams=0

1 teams=1

2 teams=2

3 teams or more= 3

15. Do you currently participate in any other organized physical activities or take lessons, such as martial arts, dance, gymnastics, or tennis?

Yes= 1

No= 0

16. How many hours per day do you usually watch TV, DVDs, or movies away from school?
- 0 to less than 1 hours=6
  - 1 hour=5
  - 2 hours=4
  - 3 hours=3
  - 4 hours=2
  - 5 hours=1
  - 6 hours or more=0
17. How many hours per day do you usually spend on a computer away from school? (Time on the computer includes time spent surfing the Internet, instant messaging, and playing online video or computer games).
- 0 to less than 1 hours=6
  - 1 hour=5
  - 2 hours=4
  - 3 hours=3
  - 4 hours=2
  - 5 hours=1
  - 6 hours or more=0
18. How many hours per day do you usually spend video games like Nintendo®, Wii or DS, Sega®, PlayStation®, Xbox®, Gameboy®, or arcade games away from school?
- 0 to less than 1 hours=6
  - 1 hour=5
  - 2 hours=4
  - 3 hours=3
  - 4 hours=2
  - 5 hours=1
  - 6 hours or more=0