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# What Is the Prevalence of Overweight and Obesity and its Relationship to Physical Activity in Children

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**Regis University**  
Rueckert-Hartman College for Health Professions  
**Final Project/Thesis**

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WHAT IS THE PREVALENCE OF OVERWEIGHT AND OBESITY  
AND ITS RELATIONSHIP TO PHYSICAL ACTIVITY IN CHILDREN

by

Cameron Grove DC

A Master's Thesis Presented in Partial Fulfillment  
Of the Requirements for the Degree  
Master of Science, Health Service Administration

Regis University

December 2008

FINAL APPROVAL OF MASTER'S PROJECT

**HSA696 MASTER'S THESIS**

I have **READ AND ACCEPTED**

the Master's Thesis by:

Cameron Grove

What is the Prevalence of Overweight and Obesity  
and its Relationship to Physical Activity in Children

Submitted in partial fulfillment of  
requirements for the  
Master of Science in Health Services Administration  
degree at  
Regis University

Primary Research Advisor: Michael Cahill MS

Date: December 2008

## Abstract

The purpose of this research project is to see if there is a relationship between the amount of physical activity a child gets during the week and their BMI. Previous studies have revealed an increase in the occurrence of childhood and adolescent overweight and obesity, and associations have been identified between physical activity, sedentary behaviors, dietary patterns and student's perceptions of overweight and obesity (Tremblay, 2003). This research study was a casual comparative validation study due to the secondary data that was collected by the Colorado Department of Public Health and Environment. Overweight and obesity are determined by the BMI that is calculated by using an individual's height and weight and yields a reliable manner of determining body fatness(U.S. Department, 2007).. Physical activity was measured in the number of hours per week, no physical activity, one to three hours, three to five, five to ten, and greater than ten hours per week. The methodology used the Chi-square test to determine if there is an association between BMI and the categorized amount of time. The analysis of the data indicated that a relationship exist between physical activity and BMI. The results show that the time children spend hourly in physical activity on a weekly basis is associated with their BMI of underweight, healthy-weight, overweight, or obese. The focus for Healthcare Service Administrators should be on future strategies of treatment and prevention and to educate physicians, parents, and their children about the direct and indirect effects of overweight and obesity.

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## Chapter 1: Introduction

### *Prevalence among children*

The prevalence of overweight and obesity in children has dramatically increased. In fact, according to the United States Department of Health and Human Services the occurrence of overweight and obesity has nearly tripled in the last twenty years (U.S. Department, 2007).

The purpose of this research project is to determine “what is the prevalence of overweight and obesity and its relationship to physical activity”.

This research is important as studies have revealed an increase in the occurrence of childhood and adolescent overweight and obesity, and connections have been identified between physical activity, sedentary behaviors, dietary patterns, students’ perceptions and overweight. In what has become an epidemic across the entire nation the issue of overweight and obesity has become a big concern for children (Tremblay, 2003).

This research study will investigate the question, “what is the prevalence of overweight and obesity and its relationship to physical activity”? When the study is finished it may yield an insight into the effects of physical exercise and overweight and its implications to public health.

### *BMI and Risk Factors*

Approximately 17.1 percent of U.S. school children and adolescents in 2003-04 were overweight (Dietz, Lee, 2007). In the discussion that follows, the term overweight and obesity will be used together. Overweight indicates a body mass index (BMI) of 25 to 30 and obesity is a BMI or 30 and above (U.S. Department of Health, 2007). BMI is a number that is calculated using by using an individual’s height and weight and gives a reliable method of determining

body fatness (U.S. Department of Health, 2007). However, BMI does not measure body fat directly but correlates closely to other direct measures of body fat.

The American Academy of Pediatrics uses the BMI to define a child as overweight for age and gender. Children that register a BMI between the 85<sup>th</sup> and 95<sup>th</sup> percentile are deemed to be at risk for being overweight (Harper, 2006). The problem of overweight children can be attributed to several factors. Genetics has been shown to play a role in overweight children however, ingesting more calories than is expended is the most common factor in overweight children (Krebs, Baker, 2003) Recognizing other factors is also important in developing ways to prevent overweight children. These factors include social, environmental and policy issues that have affected the physical activity and eating habits making it almost impossible for children to sustain an ideal body weight (Koplan, Liverman, 2005). Some overlooked social issues that contribute to overweight children are unsafe neighborhoods, both parents working and children living in poor socio-economic regions. With both parents working children may often not be allowed outdoors (U.S. Department of Health, 2004).

#### *Associated Disorders*

Children who are overweight are at risk for physical, mental, and social health disorders. While in childhood overweight children can suffer from diseases such as hypertension, hypercholesterolemia, type 2 diabetes, and coronary artery disease (US Department of Health and Human Services, 2005). Childhood overweight is also related to various adult diseases like cancer and osteoarthritis (New England Journal of Medicine, 1992). The Bogalusa Heart Study revealed that 60 percent of overweight children ages 5-10 showed at the minimum one additional risk factor for cardiovascular disease (high blood pressure, insulin, triglycerides or cholesterol), and 25 percent had two or more (Pediatrics, 1999). Compounding the physical symptoms,



overweight children are at risk for emotional health problems. Negative stereotyping, discrimination, bullying and teasing all contribute to a poor self-esteem and depression.

#### *Physical Activity and Sedentary Behavior*

Physical activity plays an important role in the growth, development, and physical health of children and the emotional aspect. Regular physical activity contributes to the growth and maintenance of the musculoskeletal system; helps keep a desirable body composition, and prevent high blood pressure (United States Department of Health and Human Services, 1996). Participation in physical activity also promotes social and mental development in young children and can reduce symptoms of depression and stress and improve concentration sleep quality, energy levels and self-confidence (K, K. 2007).

Some studies have shown a correlation between physical activity and sedentary behavior. Physical inactivity leads to sedentary behavior which in turn can increase the chances of overweight or obese children (Sallis, 2000). So the link to physical education begins with educating the general population about the need for physical activity in the schools. The Surgeon General and Institute of Medicine both have the same opinion that children and youth require at least 60 minutes of moderate to vigorous physical activity per day (Parks and Recreation, 2007). Most schools have phased out physical education in favor of a more rigorous academic environment. Elementary schools only give one or two days of physical education a week, while high schools mandate that students take one class of physical education a year.

#### *Health Service Administration Responsibilities*

The burden of overweight children must be a consideration to Health Services Administrators (HSA) if the trend is to be reversed. Current cost to the health care system of overweight children can be expected to increase. Health care administrators must be prepared to

deal with directly and indirectly the cost of overweight children. Since overweight children can grow up to become overweight adults this will represent significant business cost. Presently, direct and indirect costs of overweight in the United States are from \$69 billion to \$117 billion per year (US Department of Health and Human Services, 2005). In fact, overweight and obesity causes 4.3% to 9.1% of total health care costs in the United States (Harper, 2006).

Health Service Administrators might be affected by overweight or obese children by other means. As a member of health care management or health plans they may be in a position to support policies for population based wellness programs. They can support and promote clinical care by educating physicians, using evidence based guidelines in practice, and training the parents through better communication. There are a few health plans such as Blue Cross Blue Shield (BCBS) and Highmark that provide strategies and obesity tool kits to assess and manage overweight and obesity. Highmark, for example, distributes a tool kit that provides a guideline for the early identification and treatment of overweight in children. The kit includes a BMI calculator and growth charts as well as educational materials for nutrition and physical activity aimed at the parents. BCBS distributes a tool kit as well but supplements it with training and certification workshops for pediatric and primary care offices. The training and certification is designed to increase awareness of the growing overweight and obesity problem (Dietz, 2007).

In conclusion, it has become obvious that overweight and obesity and lack of physical exercise have become an epidemic problem within the United States. Clinicians as well as health service administrators face overweight and obese children, adolescents and their parents every day. Even though there is not a lot of empirical evidence for physical activity guidelines for children and adolescents it is obvious that a sedentary lifestyle is associated with overweight and obesity. However, the relationship between overweight school children and lack of physical

activity has been a focus of recent studies. Obviously targeting the overweight and obese children and adolescents is a start. Preventing those children from becoming overweight and obese adults as well as using dietary and physical activity intervention should be a focus of future wellness programs.

## Chapter 2: Literature Review

### *Overweight children and Physical Education*

Studies have shown an increase in the prevalence of childhood overweight and obesity and its relationship to physical activity, sedentary behaviors, dietary patterns and perceptions of being overweight or obese. This research study will investigate the prevalence of overweight and obesity in school children and its relationship to physical activity. The issue of concern is the lack of physical activity and the number of overweight and obese children.

### *Definition of Physical exercise*

The definition for physical activity for children can vary from state to state. In fact there are several different recommendations from varying organizations that provide physical activity guidelines. The Centers for Disease Control and Prevention recommend that children and adolescents participate in at least 60 minutes of moderate intensity physical activity most days of the week, preferably daily (U.S. Department 2007). National Association for Sport and Physical Education (NASPE) recommends four guidelines for physical activity in children. Guideline one recommends that children get at the minimum 60 minutes of moderate to vigorous physical activity that is intermittent in nature on almost every day of the week (National Association, 2004). Guideline two, states that children should get multiple episodes of physical activity in every day with each episode lasting about 15 minutes or more (National Association, 2004). In Guideline three children should take place in age appropriate exercise that involves a variety of activities (National Association, 2004). Guideline four deals with inactivity and that extended periods of inactivity are not recommended for children during the daytime (National Association, 2004).

### *Physical exercise requirements in schools*

The surgeon general recommends that children get at least 60 minutes of moderate physical activity on most days of the week (U.S. Department, 2007). In fact, like the NASPE, greater amounts of physical activity may be required for children in helping them to maintain normal weight, prevent weight gain and promote weight loss (U.S. Department, 2007).

Almost all studies on physical activity for children utilized supervised moderate to vigorous physical activity. One such study involved 35 to 45 minutes of exercise at least three to five days a week and believed that the higher the intensity of physical exercise the better the beneficial effects on not only general health but also on behavioral outcomes as well (Strong, 2005).

The second principle that emerged was the measurement of overweight and obesity in children. The most recognized method of calculating overweight and obesity is the Body Mass Index (BMI). According to The Centers for Disease Control and Prevention, the “BMI is a number calculated from a child’s weight and height” (U.S. Department, 2007). It is measured according to the following table. See Table 1.1

Table 1.1

Body Mass Index Scores with correlating weight categories

BMI	Weight Status
Below 18.5	Underweight
18.5 – 24.9	Normal
25.0 – 29.9	Overweight

The BMI gives a reliable method of determining body fatness. However, BMI does not measure body fat directly but correlates closely to other direct measures of body fat. As such it is used as an effective way to screen for the risk of potential health problems. But BMI is not a diagnostic tool, just for screening only. A person may have a high BMI but not a high body fat percentage. The American Academy of Family Physicians recommends universal screening using the BMI and growth curves to recognize overweight and obese children (Peterson, 2007). However, in adults measuring BMI can be used to define obesity while in children changes in their body weight are mystified by growth and puberty changes that can alter body composition in children (Rhodes, 2007).

#### *Factors to overweight/obesity*

There is a complex interaction of genetics, social, and environmental factors that contribute to the overweight and obesity epidemic among children. Besides the decrease in physical activity, many others have been reviewed in the literature. Genetics can be a decisive determinant in children who are overweight or obese. Current research is just in its infancy but a prevailing theme is the combination of genetics and the availability of food play a big role. Genetic conditions associated with obesity include Prader-Willi syndrome, Cohen syndrome, and the Bardet-Biedl syndrome (Krebs, 2003). It is well known that obesity runs in families and factors like high birth weight, maternal diabetes, and obesity in family members all play a pivotal role with multiple genes and the environment that can heavily influence body weight (Bouchard 1990, Rosenbaum 1997, Rosenbaum 1998, Stunkard 1990). The Human phylogenetic system was designed to deal with food shortages and to overeat when there was food available (Blass, 2003). This causes a release of opioids in the brain as a result of ingesting fat flavors or sweet

taste and coupled with a highly caloric food and an opportune social mechanism can diminish satiety signals in the brain (Dum, 1983).

The social environment of children's eating habits has changed dramatically. It is apparent that obesity has attacked children, especially those who spend a great deal of time in front of some type of screen. Children spend about four hours a day in front of a television, computer or video screen (The Robert Wood, 2004). Watching television and obesity has been shown to have a direct correlation from preschool children on up through adults (Dennison, 2002). Other societal factors such as unsafe neighborhoods and low socioeconomic regions, have forced children indoors and away from physical activity (Krebs, 2003). Nowadays either both parents or the single parent work so children spend after school time alone or with other children and therefore can be limited in their outdoor activity. Furthermore, neighborhoods are not designed to promote physical activity for school age children (AHRQ 2005). When children are overweight their social health can also suffer causing them to suffer from negative stereotyping, discrimination, teasing and bullying (Koplan, 2005). In fact so strong is the stereotyping of being overweight that it influences body image, perceptions, and weight concerns. Peer influence and modeling about weight related issues have been found to reinforce the perceived societal ideal among children (Paxton, 1999).

There is a plethora of current and past literature that study the effects of overweight and obesity in children. Physical symptoms associated with this epidemic are well documented as well as consequences. Children are being diagnosed with diseases that were previously found in adults. Such cardiovascular diseases as hypertension, hypercholesteremia, and dyslipidemia and endocrine diseases like hyperinsulinism, insulin resistance, and impaired glucose tolerance type 2 diabetes mellitus and menstrual irregularity and even mental health problems like depression

and low self esteem (Krebs, 2003). Girls as young as five years old who are overweight have been noted to suffer from poor self-esteem (Davison, 2001). The social health's of overweight and obese children also suffer. They are stigmatized in American society and often are the victims of negative stereotyping (Harper, 2006). Stigma can emerge in subtle forms, and it can be expressed overtly. Such stigma can include verbal teasing (e.g., name calling, being made fun of, derogatory comments), relational victimization (e.g., social exclusion, being ignored or avoidance, the victim of rumors), and physical intimidation (e.g., punching, kicking, pushing, shoving) encountered by overweight or obese children (Puhl, 2007). Their body image is constantly being evaluated by their parents, peers, and the media and body image is influenced by the culturally defined perfect body type for males and females (McCabe, 2005). The media seems to have a large impact by sending messages that can produce high levels of body dissatisfaction for adolescent boys and girls. In fact, the media is a powerful medium that promotes the slender ideal body, which can cause body dissatisfaction in females and also promotes the unnatural and unrealistic muscular male body (Pope, 1999).

### *Physical exercise in children*

Research identifying the physical contributing effects and factors are prevalent throughout the literature. Most studies delve into the physical pathologies of being an overweight or obese child. However, there is not as much information about the consequences of social and mental health problems relating to overweight and obesity. Ideally, schools are where the lack of physical exercise and epidemic of overweight and obesity meet head on with both seemingly going in opposite directions.

Schools can have a significant impact on the physical activity habits of children. Among these habits are key transition periods in childhood and adolescence where additional emphasis



can be placed on the importance of physical activity. These key periods make up the early childhood years, commencement of formal schooling, and the transitions from elementary school to high school and then from high school to higher education or the workforce (Sallis, 2000). Children should be able to establish good physical activity patterns from the time they are in elementary school on up to their late teens and these patterns should lead to an active lifestyle with good health benefits. Inadequate amounts of physical activity at any age during the school age years are major contributing factors to the childhood overweight and obesity epidemic (Hills, 2007). This leads to major challenges for the school systems to offer sufficient physical activity in the form of either physical education or recess (Harper, 2006). One challenge schools face is competing academic demands as a motive for eliminating physical education (Jago, 2004). Schools are under increasing pressure to improve the academic standards of their students and policies such as the “No Child Left Behind” by President Bush attest to this. Other challenges to schools are budget constraints and the lack of program evaluation by physical education instructors (Jago, 2004).

#### *Policies on physical fitness*

Out of these challenges, policies have emerged that are geared to combat not only overweight and obesity but also physical exercise. Both the healthcare and educational organizations have issued several position statements that have brought the childhood obesity epidemic to the forefront of local, state and national policy makers (Murray, 2004). This has resulted in legislative activity directed at the treatment and prevention of childhood obesity. For example, Congress has mandated the development of Local Wellness Policies (LWP) to promote physical activity, nutrition education and nutrition standards for food and beverages offered at school (Vinluan, 2006). LWP’s chief goal of the physical activity part is to give opportunities for

school age children to develop skills to participate in physical activity, sustain fitness and comprehend the role of physical activity in maintaining optimum health (Vinluan, 2006). Furthermore, the LWP's also set nutrition guidelines for all foods accessible to each school during the school day, with the goals of endorsing student health and reducing childhood obesity (Vinluan, 2006). In 2005 the Institute of Medicine (IOM) Committee for the Prevention of Childhood Obesity called for the urgency to control the epidemic of overweight and obese children and yet there are only a handful of evidence-based strategies that meet or exceed the criteria of the Guide to Clinical Preventive Services or Guide to Community Preventive Services (American Journal of Preventive Medicine, 2002). The IOM committee came to the conclusion that it was imperative to act on the best available evidence instead of waiting for the best possible evidence to come out (Institute of Medicine, 2005). In the pediatric population, the problem of overweight and obesity coupled with lack of physical exercise does not provide any simple solutions. The changes necessary to implement, maintain, and measure current and future strategies do not necessarily involve direct medical care per se.

#### *Health Services Administration*

The future strategies of treatment and prevention, Local Wellness Policies, nutrition guidelines for all foods and evidence-based plans will require Health Service Administrators (HSA) to take a critical and active role in addressing this epidemic. Two thirds of American children under the age of eighteen are covered either by private health plans and these plans also offer a sizeable part of public coverage via Medicare and Medicaid (U.S. Census Bureau, 2005). HSA may be able to influence the health plans, providers and anyone in the medical setting about policies affecting both the overweight and obesity and lack of physical exercise. Of particular interest are the health plans that provide most of the coverage to children. HSA can

through cooperation with local institutions, like departments of health; schools, employers, universities, and community organizations influence health plans and policies outside the hospital or clinic (Dietz, 2007). HSA can also support clinical care that parallels with scientific evidence by educating physicians, utilizing evidence based guidelines in clinical practice, and training that encourages effective communication with children and their patients (Dietz, 2007). In addition HSA can help conduct research to help demonstrate the relationship between physical activity, achievement test scores, and school grades (Harper, 2006). Perhaps they could also conduct research on overweight and obesity and the physical exercise requirements in schools. Keeping data on these relationships may help HSA to curtail the current epidemic of childhood obesity and also to control the cost to our society. Overweight and obese children may grow up to become overweight and obese adults and these adults use up more sick leave than employees of average or normal weight (Harper, 2006). In fact, the total cost of health problems related to obesity was estimated to be almost \$13 billion (U.S. Department, 2005). HSA oversee health care providers and medical systems that are important early responders to the epidemic. Therefore, they must play a vital role in educating, implementing policies, and communicating to schools, industry, communities, homes and clinical settings the prevalence and adverse effects of this epidemic. HSA are in the unique position of being able to help test policy and environmental approaches and to develop successful models for this epidemic (The Robert Wood, 2006).

Measuring BMI and defining standards of physical fitness are important in controlling the overweight and obesity epidemic. But overall the literature review seemed to focus on the factors that lead to overweight and obesity. Certainly the lack of physical exercise in our schools is important and the articles in the literature review made a minor connection with it and the other contributing factors. However, there is not much research on the actual time that is spent on

physical activity and its possible relationship with overweight and obesity. This study hopes to make a contribution to the overweight and obesity epidemic in children.

## Chapter 3: Methods

The purpose of this study is to decide if there is an association between the prevalence of overweight and obesity in children and physical activity. This study will explore “what is the relationship between overweight and obese children and physical activity”? This study is important as overweight and obesity is quickly becoming a contributing factor to the deteriorating health conditions in children.

### *Research Rationale*

A test of association research study design was appropriate for this study in that it intended to describe the relationship between the prevalence of overweight and obesity and its relationship to the lack of physical activity in schools. This research study was a causal comparative validation study due to the secondary data that was collected by the Colorado Department of Public Health and Environment (CDPHE, 2008).

### *Sampling Strategy*

The population for this study was K-12 school children in the surrounding counties including the Denver Metro area. The data for the number of overweight and obese children were presented in the form of secondary data from the Colorado Department of Public Health and Environment that was administered from the Child Health Survey. Sampling strategy utilized the data from the 2006 Child Health survey as determined by the BRFSS. The BRFSS is a state based continuously conducted, telephone administered health survey that measures risk behaviors related to chronic diseases, injuries and death. The raw data for this study was obtained from the Colorado Department of Public Health and Environment Health Statistics and was a convenience sample.

### *Variables*

The variables in the study were height and weight which is used to calculate the BMI of the respondent, the ages of the children which ranged from 5-14 years of age, and the amount of physical activity performed at school. There were many other variables such as the degree of physical inactivity and the time spent in front of some type of screen, single or two parent household, genetics and other socioeconomic factors. This study's main focus was on the BMI and amount of physical activity done at school. There were four categories for weight that were broken down into BMI percentiles that included the following: underweight, healthy weight, at risk of overweight, and overweight or obese. 'Underweight' contained respondents that were less than the 5<sup>th</sup> percentile, 'healthy weight' was between the 5<sup>th</sup> and 85<sup>th</sup> percentiles. The 'at risk of overweight respondents' were between the 85<sup>th</sup> and 94.9<sup>th</sup> percentile while 'overweight' group were greater than the 95<sup>th</sup> percent. The physical activity was divided into five categories that incorporated no physical activity, one to three hours of physical activity, three to five hours of physical activity, five to ten hours of physical activity, and greater than ten hours of physical activity in a week. In regards to the respondent's demographics, the categories were male and female, white/non-hispanic and other. The region of residence included not only the Denver metro area but also other metro and rural regions within Colorado.

### *Data Collection*

Institutional Review Board approval was not needed due to the fact that the data collected were de-identified secondary data. The data collected did not include private or protected health information and therefore obtaining informed consent was not needed. The raw data was obtained from 1,150 respondents who were placed into several different categories. Sampling strategy utilized the data from the 2006 Child Health Survey as determined by the Behavioral

Risk Factor Surveillance System (BRFSS). The BRFSS is a state based continuously conducted telephone administered health survey that measures risk behaviors.

### *Data Analysis*

The data collected were nominal data, meaning the data consisted of a small number of values with each corresponding to a specific category value or label. The variables included the number of healthy weight children, at risk of overweight children, overweight or obese children and the hours spent on some physical activity during the typical week. The Chi-square test was used to determine if there is an association between BMI and the categorized amount of time spent involved in physical activity.

### *Validity Issues*

Internal validity issues are always a threat when using secondary data for any study. Because internal validity is a truth about inferences regarding a cause-effect relationship it is only relevant in studies that try to establish a casual relationship such as in this specific study. Secondary data is only as accurate as the primary data that the researcher collected or the statistician who recorded the data. Single group threats can also jeopardize a study. This is where criticisms of the study happen because only a single group was involved or studied. The positive aspect to collecting secondary data is that response rate is usually high and it can be collected with less effort than primary data and it also allows for a large sample size which can raise the reliability and validity of the research results (Pearce, 2008).

Results from this study cannot be applied to any other population. The respondents of the study vary from other populations in ethnicity, socioeconomic status, and household factors when compared to other counties or states across the country. Contributing factors like metabolic

syndrome, juvenile onset diabetes, thyroid disorders, and eating disorders will be considered but not investigated.



## Chapter 4: Results

The populations utilized for this study included the Denver Metropolitan school district. The number of children, hours of physical activity, and Body Mass Index (BMI) were collected for this study for the year 2006. The data from this study were analyzed using the Statistical Package for Social Sciences. Statistical test performed involved Chi-square test to establish if there was an association between the variables. The following are the results from the analysis.

### *Descriptive statistics*

The number of total children in the school system for this study was 1,150. The ordinal data measured were the categorized amount in hours per week of physical activity and the BMI. Of the 1,150 children 886 were male (50.9%) and 853 were females (49.1%). Out of the total of 1,739 children 589, or 33.9% were not included for unknown reasons.

Figures 1 and 2 summarize the descriptive data.

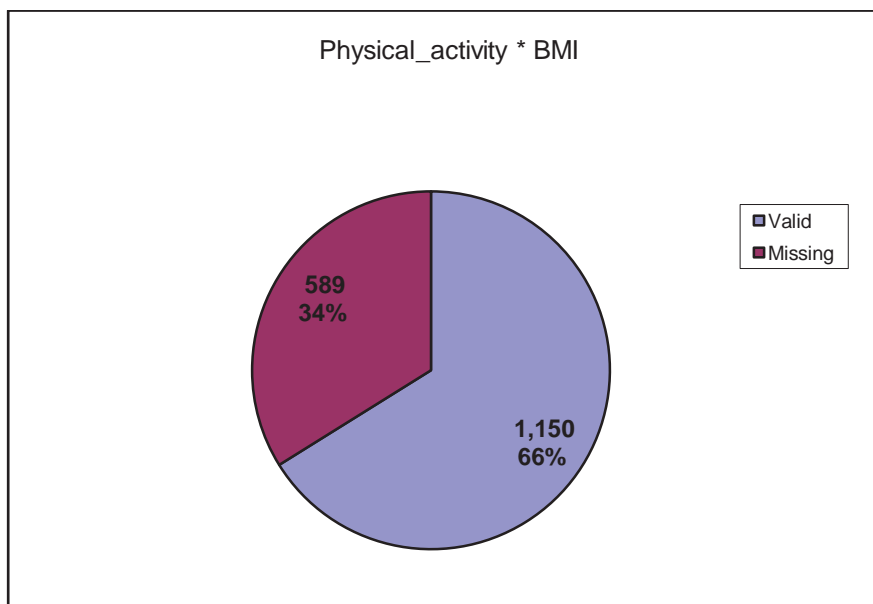


Figure 1  
Total Cases of Physical activity and BMI

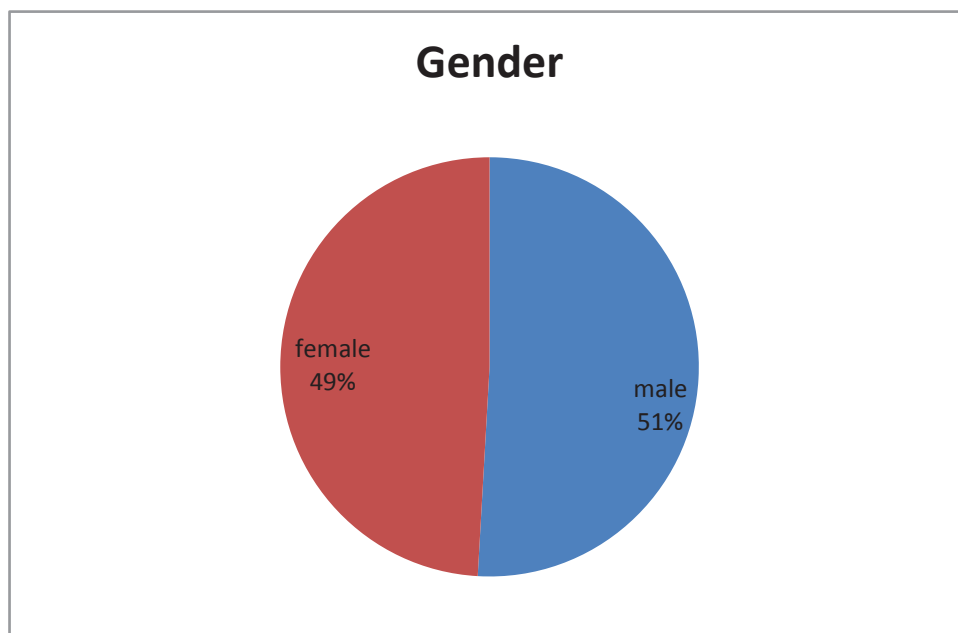


Figure 2  
Distribution of Gender Among Population

### *Associations*

The population of children with a measurable BMI and the amount of physical activity per week were tested using Chi-square analysis. The sample was tested to see if there was an association between BMI and physical activity using the Chi-square test. Physical activity was divided into no physical activity, one to three hours, three to five hours, five to ten hours and greater than ten hours of physical activity per week. BMI was divided into four categories: underweight, healthy- weight, overweight and obese. The chi-square test allows for categorical or numerical data to be compared with some theoretical expected distribution (Columbia University, 2003). Data were compared by chi-square test with a preset alpha of ( $\alpha = 0.05$ ) and the chi- square test was significant  $X^2(1, N = 1150) = 17.792, p = 0.042$ . Therefore the p-value is small enough to reject the null hypothesis that the variables are not associated and that

there is an association between physical activity and BMI. Chi-square revealed that there are statistical differences in the categorical variables of childrens' BMI and the amount of physical activity that they participated in on a weekly basis.

### *Descriptive Statistical Results*

For Figure 1, thirty-seven children that had no physical activity, 1.1 % or one child was underweight. Healthy-weight, overweight, and obese children were all close, within .5 % of each other.

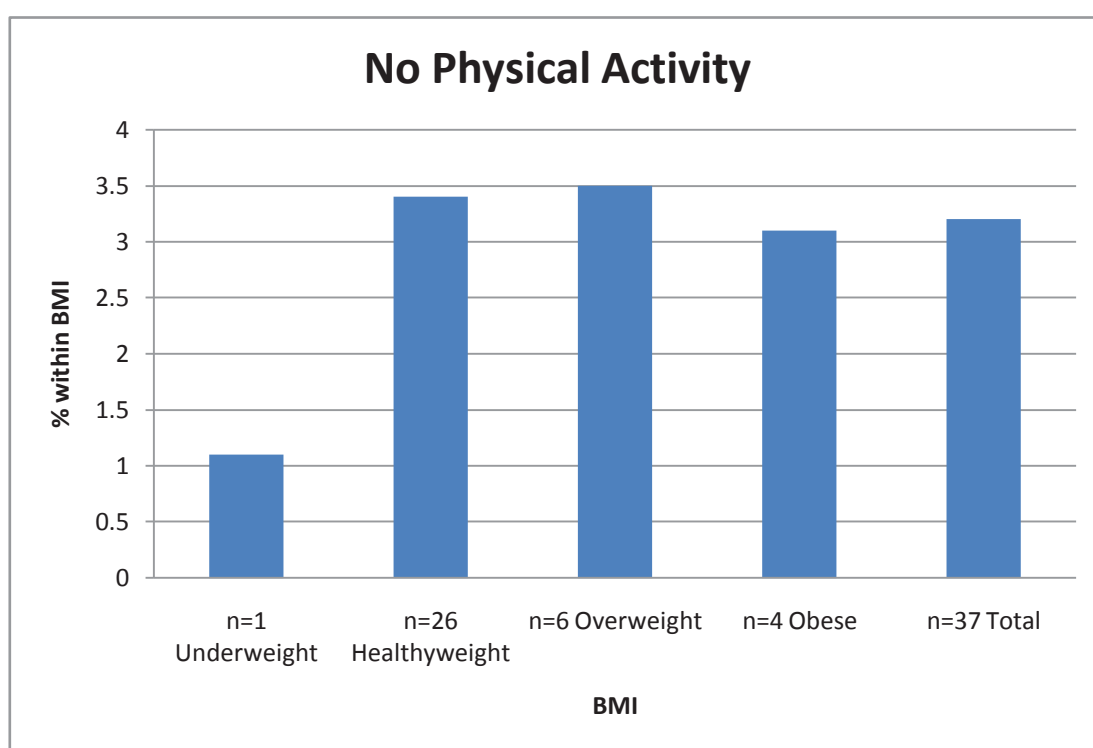


Figure 1  
No Physical Activity and BMI

As shown in Figure 2, a small percentage of healthy-weight children, 5.7 %, get one to three hours per week of physical activity. By looking closer at the graph, more obese children, 10.2 %, exercise between one and three hours which is greater than the 7.4 % seen among the total population.

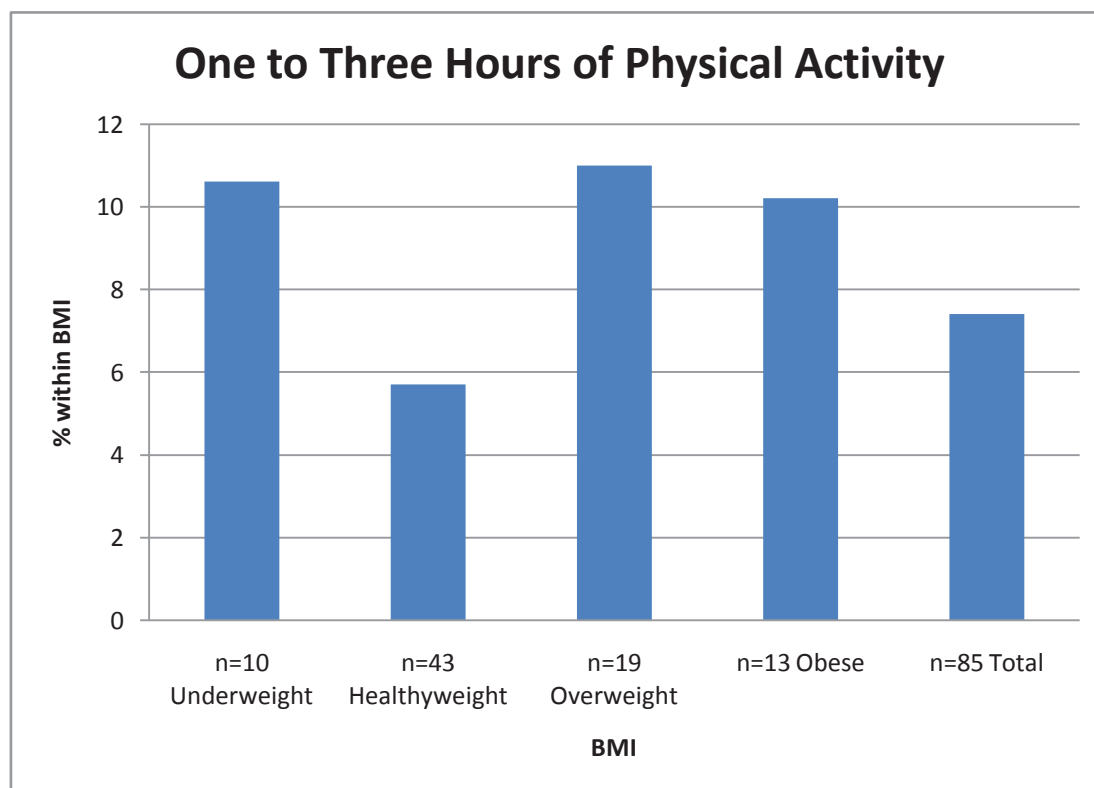


Figure 2  
1 to 3 Hours of Physical Activity and BMI

In Figure 3, obese children, 21.3 %, are getting one to three hours of physical activity per week versus 12.8 % for overweight, 16.9 % for healthy-weight, 14.9 for underweight children. However, there are almost five times more health-weight children who exercise three to five hours than there are overweight or obese children.

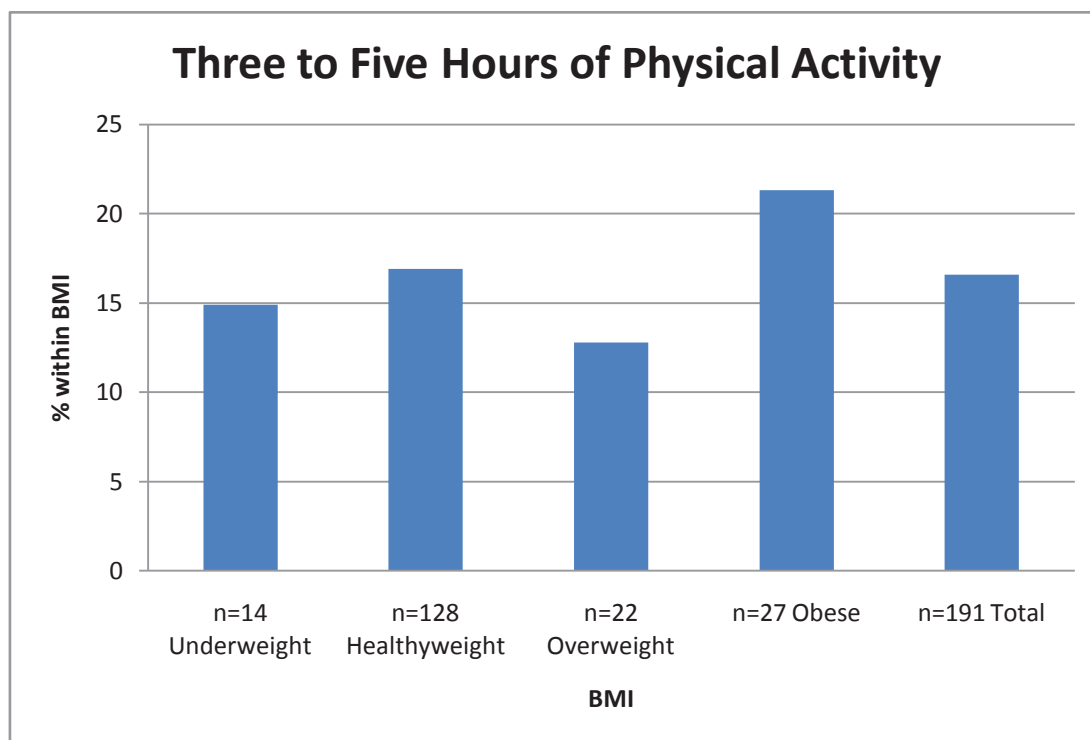


Figure 3  
3 to 5 Hours of Physical Activity and BMI

Figure 4 represents children who exercised between five and ten hours per week. As seen in the graph 269 children who exercised five to ten hours per week were of healthy-weight. This represents 66 % of the total number of children who exercised five to ten hours per week. Furthermore, sixty-eight overweight children and forty obese children got the same amount of exercise in a week. More overweight and obese children exercised less than five to ten hours a week than children who are of healthy-weight.

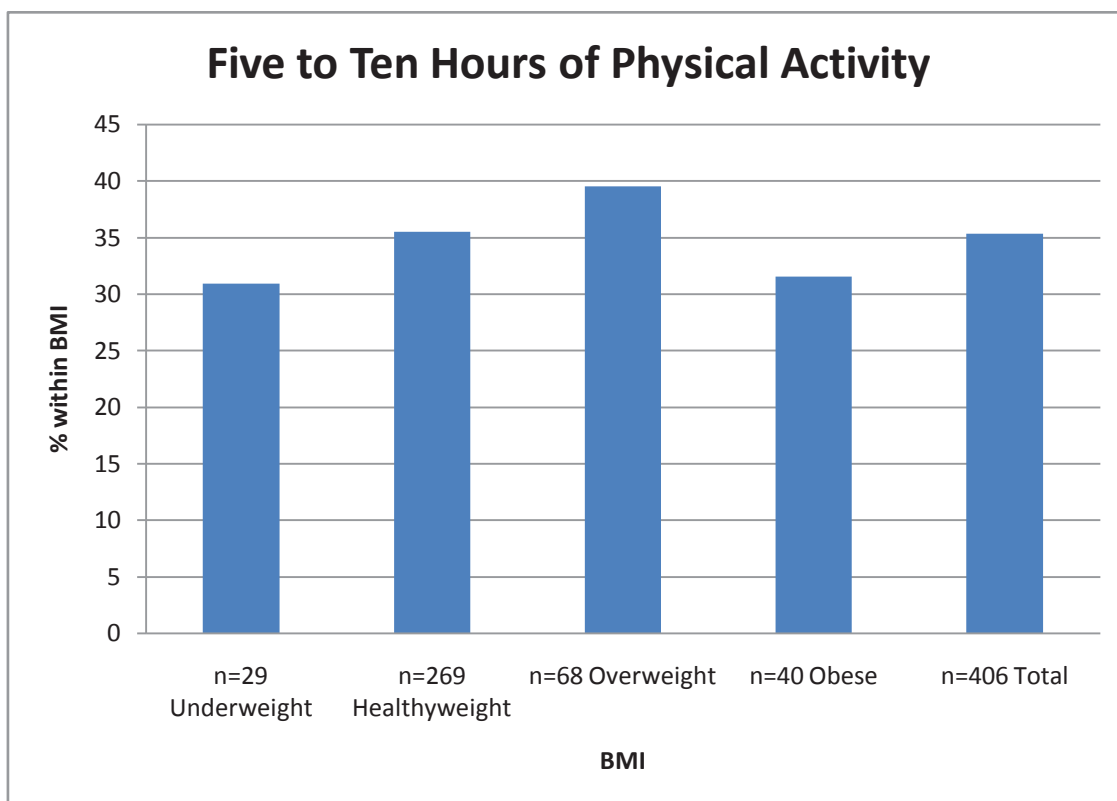


Figure 4  
5 to 10 Hours of Physical Activity and BMI

Figure 5 displays children who exercised greater than five hours of physical activity per week. As seen in the last graph a majority of children, 291 or 67.5 % were of healthy-weight and exercised more than ten hours in a week. Less obese children, 33.9 % exercised less than ten hours per week versus 37.5 % of the total. Only 33.1 % of overweight children exercised less than ten hours a week when compared to the 37.5 % of the total. Interestingly, 42.6 % of underweight children exercised more than ten hours in a week than 33.1 % of overweight and 33.9 % of obese children.

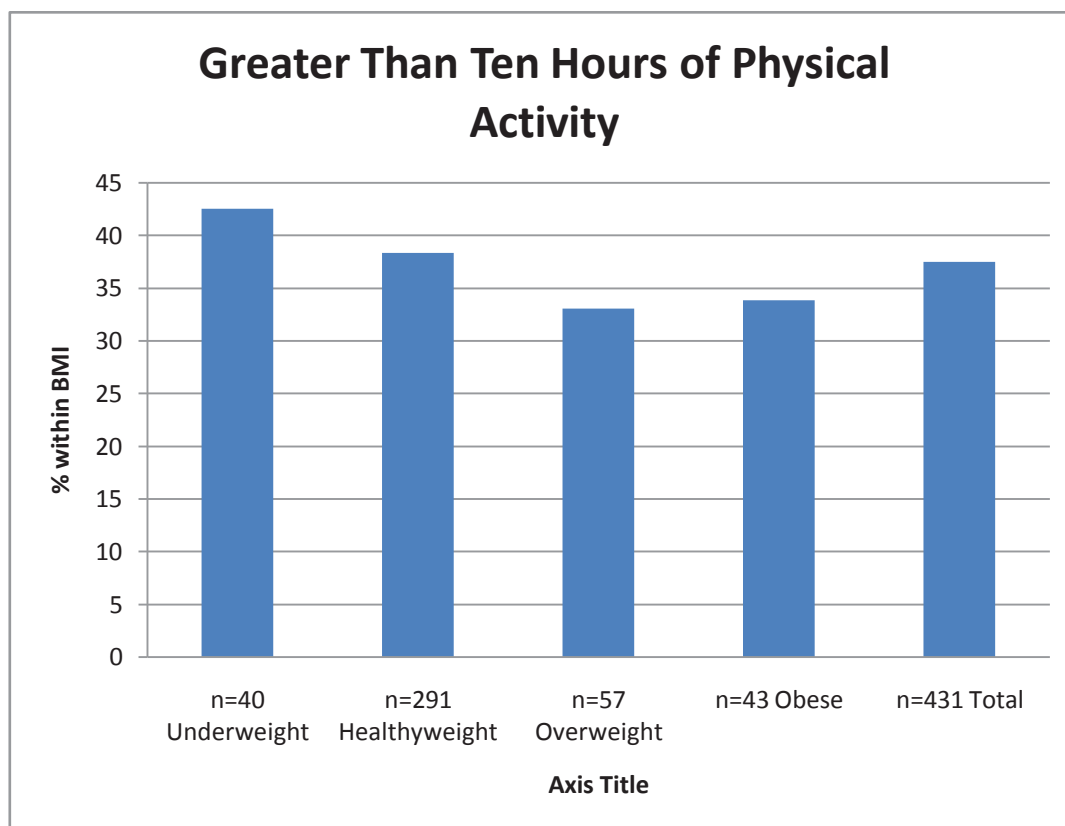


Figure 5  
Greater than 10 Hours of Physical Activity and BMI

For Figure 6, underweight children are measured in the number of hours of physical activity they participate in per week against percent within physical activity. The second bar in the graph shows that 11.8 % percent of underweight children exercise at least one to three hours a week whereas 9.3 % exercise more than ten hours in a week. Only 2.7 % of underweight children had no physical activity; however, there was only one child in that category.

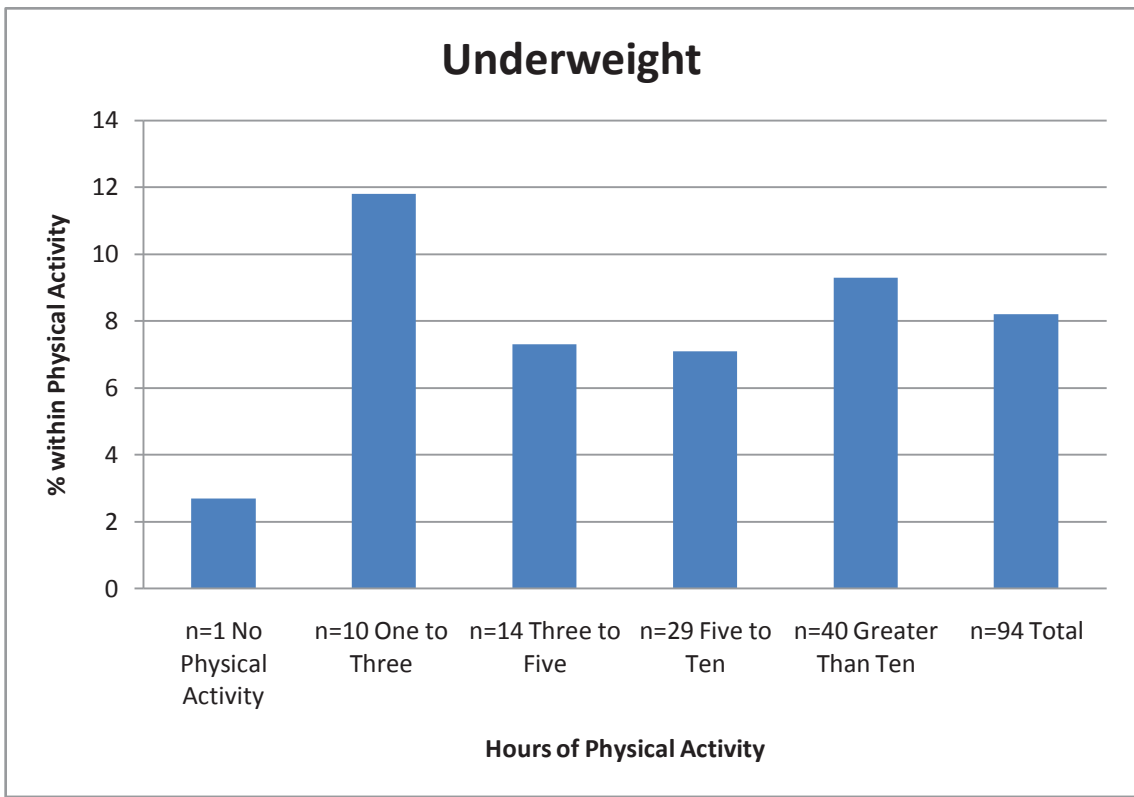


Figure 6  
Physical Activity and Underweight

In Figure 7, 70.3 % of healthy-weight children had no physical activity during the week while 50.6 % exercised between one and three hours. A majority of children exercised from three to five and more than ten hours a week. Therefore, 65.8 % of the total number of healthy-weight children received at least one hour of exercise up to greater than ten hours of exercise in a week.



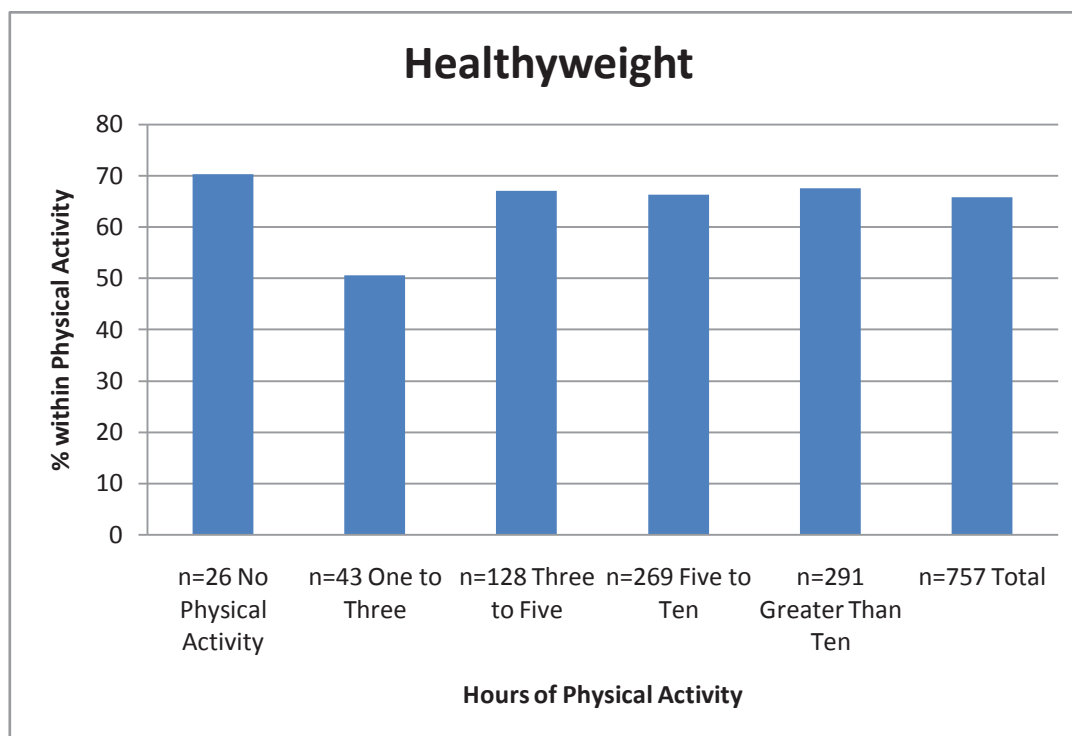


Figure 7  
Physical Activity and Healthy-weight

Figure 8 displays overweight children and how much physical activity they get during the week. 16.2 % of them had no physical activity while 22.4 % exercised between one and three hours a week. Only 11.5 % of overweight children exercised three to five hours compared to 16.7 % of children who got five to ten hours per week. 13.2 % of the total number of overweight children exercised when compared to the 16.2 % with no physical activity during the week.

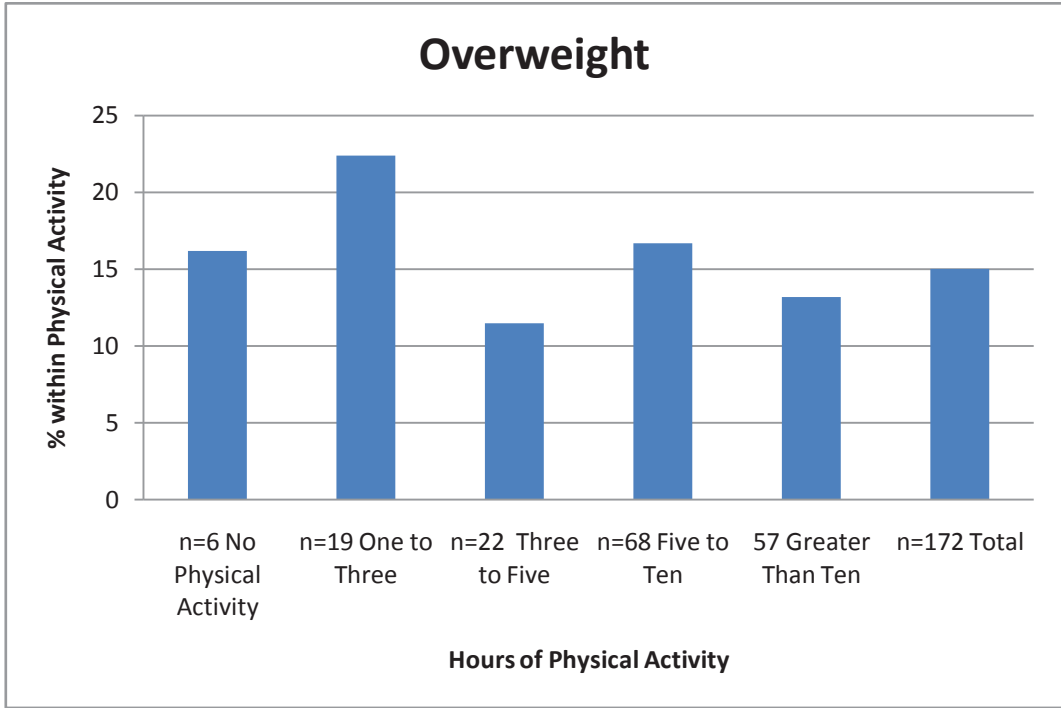


Figure 8  
Physical Activity and Overweight

Within Figure 9, the percentages of obese children who get more than five hours of physical activity in a week decrease. The highest percentage, 15.3 %, of obese children get one to three hours of exercise during the week. Only 9.9 % of obese children get five to ten hours a week and 10 % get greater than ten hours of exercise per week.

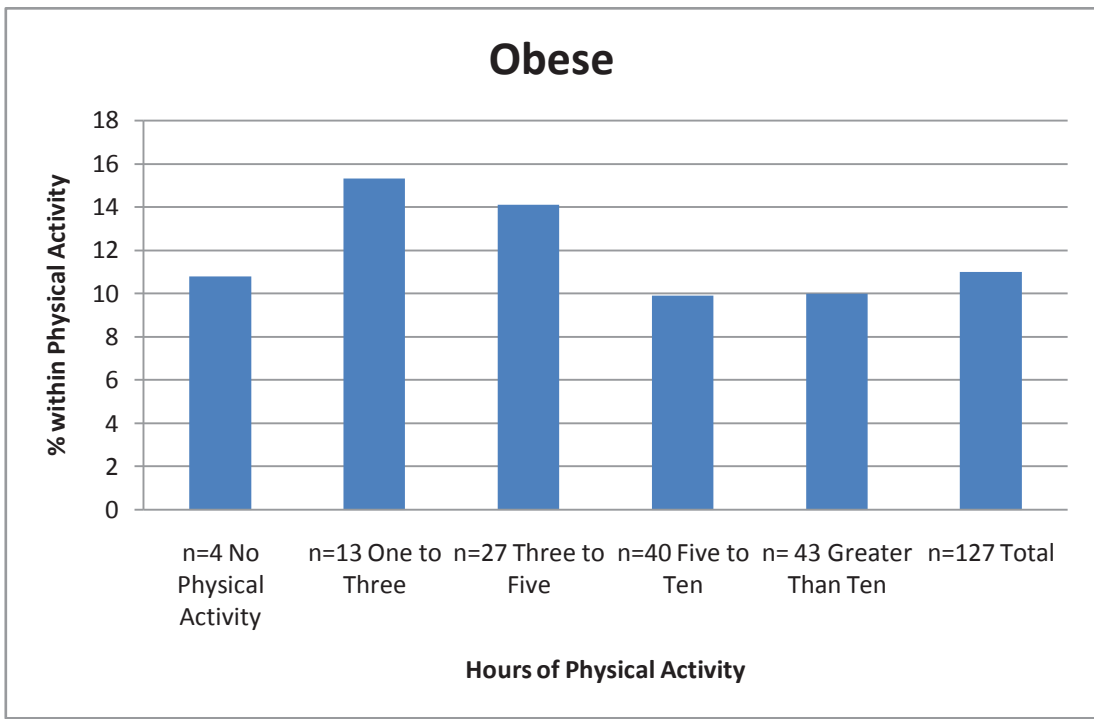


Figure 9  
Physical Activity and Obese

In summary, the data analyzed showed a significant association between BMI and physical activity in school age children of the Denver Metropolitan region. A relationship between the hours of physical activity per week and the BMI of children was supported by the analysis. Chi-square test was the only statistical analysis that was utilized to establish the association between physical activity and BMI.

## Chapter Five: Discussion

### *Purpose of Study*

The purpose of this research was to find out if there is a relationship between the amount of physical activity a child gets during the week and their BMI. Chapter five concentrates on the implication and results of the research study. The research question asked “what is the prevalence of overweight and obesity and its relationship to lack of physical activity in children”? The analysis of the data indicated that a relationship exist between physical activity and BMI. The results show that the time children spend hourly in physical activity on a weekly basis is associated with their BMI of underweight, healthy-weight, overweight, or obese.

### *Relationship to previous research*

The findings in this research study parallel the findings in other similar studies. However, it is important to consider that there are other variables that can vary widely across similar previous studies. This study showed that within the variables given that the amount of physical activity a child gets in a week is associated with their BMI.

The study indicated that a higher percentage of underweight and healthy-weight children exercised more than five to ten or greater than ten hours a week than overweight or obese children. The children in this study were all of school age and the data taken was from children who attended school in the Denver school system. One of the important factors in earlier studies is the key role that schools play in physical activity. There are timely transition periods that make up the early childhood years, commencement of formal schooling, and the transitions from elementary school to high school and then from high school to higher education or the workforce (Sallis, 2000). One previous research study showed that insufficient amounts of physical activity at any age during the school age years are important contributing factors to the childhood

overweight and obesity epidemic (Hills, 2007). Still other studies have shown that there are big challenges for schools to provide physical activity. Several factors such as increasing academic demands, budget constraints, and lack of program evaluation by physical education instructors all can limit the amount of physical activity that children get at school.

Other factors that relate the results of this study come from several previous studies. Not only does the amount of physical activity that children get play a role in their BMI, but factors such as genetics, social, and home environment contribute as well. One earlier study showed a direct correlation between watching television and obesity from preschool children on up to adults (Dennison, 2002). Overweight and obesity can be genetic in nature as factors like high birth weight, maternal diabetes, and family members with obesity along with the environment can heavily influence body weight (Bouchard 1990, Rosenbaum 1997, Rosenbaum 1998, Stunkard 1990).

#### *Study Limitations and Opportunities*

A key limitation to this study is the data available for analysis is secondary data. Even though the secondary data is easy to display and easy to access it can contain information that is either missing or inaccurate. CDPHE provided all the secondary data for this study had 589 missing cases which might have an effect on the results of the study. Secondary data can also be more general and vague and in this study does not include other factors. One of the biggest limitations is time constraint. Optimally, collecting data first hand and over a longer period of time would yield better results. The sample used to generate the data was fairly small and limited to the geographic region of the United States. Therefore, a larger sample size such as the entire state of Colorado would also yield better results. Further limiting the study was the association of

only two factors, BMI and physical activity. However, the research question by its very nature placed this limitation upon the study.

Although this study established an association between physical activity and BMI, there is an opportunity for more research to be done. Earlier studies have pointed to additional independent variables involved in contributing to overweight and obesity in children and therefore a need to look at other various aspects besides lack of physical activity. Current and future research should focus on socioeconomic interaction as well as genetic and environmental factors.

Another opportunity exists for research in analyzing parent and child education programs. Future research should focus on policies that have dual roles in the schools. One role would be to educate and combat the lack of physical activity in the school system itself by getting the school, children and parents involved. The other role is addressing the problem of overweight and obesity and the symptoms that accompany the disease. Similar to alcohol and tobacco programs the epidemic of overweight and obesity could be addressed through the media in the form of radio, television, and internet advertising and paid for by taxes from the fast food industry. Other research ideas might include looking for differences among various subgroups. For instance, some previous studies have demonstrated differences in ethnic, gender, and geographic overweight and obesity rates.

#### *Impact on Healthcare Administration*

It is vitally important for Health Service Administrators (HSA) to recognize the direct and indirect effects of overweight and obesity in children. HSA will be at the forefront in addressing this epidemic by taking an active role in future strategies and policies. HSA can also influence physicians and other healthcare providers through best practice guidelines and training.

They can encourage effective communication between healthcare providers, children and their parents. Some of these overweight and obese children may grow up into overweight and obese adults. This will put an ever increasing strain on the healthcare system and research studies like this one may help with future research that might resolve the problem.

### *Conclusion*

The purpose of this study is to determine “what is the prevalence of overweight and obesity and its relationship to lack of physical activity in children and adolescents”? This study found that there is an association between the BMI in children and the amount of physical activity they get in a week. The data clearly shows that as physical activity increases hourly per week the number of overweight and obese children increase. However, the data also shows that a higher percentage of obese children than the general population get one to three hours of exercise per week. Inferences can be made from previous studies that more overweight and obese children get less physical activity. Although this study confirmed this, there are several other factors involved. These factors such as ethnicity, sex, age, and definition of physical activity could not be asked in the research question and thus would be cause for further studies. This research study confirms that there is an association between overweight and obesity and physical activity in children and adolescents. However, a more encompassing study in this area might assist health care administrators in increasing education, strengthening legislation, and raising overall awareness to this epidemic.

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