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The Causes and Correlates of Childhood Obesity: A Study of Children between 10 and 14 Years of Age

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THE CAUSES AND CORRELATES OF CHILDHOOD OBESITY:
A STUDY OF CHILDREN BETWEEN
10 AND 14 YEARS OF AGE

A Thesis
Presented to
the Graduate School of
Clemson University

In Partial Fulfillment
of the Requirements for the Degree
Master of Applied Sociology

by
Rajani Shakya
December 2006

Accepted by:
Dr. Catherine Mobley, Committee Chair
Dr. Kinly Sturkie
Dr. Veronica Parker

ABSTRACT

Obesity is an alarming public health problem among people of all age groups in nearly every society. The increasing obesity rates are especially serious in the United States. The main purpose of this thesis is to explore the causes and correlates of obesity among American children between the ages of 10 and 14 using National Longitudinal Survey of Youth Child Data (NLSY79-CA).

This thesis hypothesized three major causal factors for the likelihood of children between the ages of 10 and 14 to be overweight or obese: socio-demographic groups, activities that children prefer to participate in, and the associated health conditions. A binary logistic regression was conducted to examine the likelihood of being overweight or obese of children between the ages of 10 and 14 and each of the above mentioned social factors.

The findings suggest that race and mothers who attained college graduate and higher, were significant predictors of the likelihood of overweight and obesity. However, the maternal education was no longer significant predictor when controlled for socio-demographic variables. Among the children's preferred activities included in the study, only listening to music and playing outside variables were significant. None of the health condition variables were found significant.

Therefore, the overall finding suggests that the influence of socio-demographic factors is higher for the likelihood of children and adolescents being overweight or obese compared to other social factors. Based on this finding, this thesis suggests that attention should be given more to the strategy directed toward the socio-demographic factors.

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INTRODUCTION

Obesity is one of the most pressing and serious public health problems of the 21st century. Although the patterns of obesity differ between developing and developed countries, obesity rates are increasing worldwide. According to Speiser, Rudolf, Anhalt, Camacho-Hubner, Chiarelli, Eliakim et al. (2005), as many as 250 million people, or about 7% of the world's current population, are obese.

In the United States, more than 300,000 adult deaths are caused by obesity-related diseases. Research indicates that obesity incurs more than \$100 billion in health care costs annually (Allison, Fontaine, Manson, Stevens & VanItallie, 1999; Must, Spadano, Coakley, Field, Colditz & Dietz, 1999; Blumenthal, 2001; American Academy of Pediatrics, 2002). The Institute of Medicine of the National Academies (2005) estimated that “after adjusting for inflation and converting estimates to 2004 dollars, the national direct and indirect health-care costs related to overweight and obesity ranged from \$98 billion to \$129 billion” (p. 70).

The health and economic impacts of escalating overweight and obesity rates are found not only among adults but also among children and adolescents. That is, overweight and obesity rates among children and adolescents are increasing in many countries. For example, a study of German preschoolers showed that between 1982 and 1997 the obesity increased from 1.8% to 2.8% (Kalies, Lenz & Kries, 2002; Lissau, Overpeck, Ruan, Due, Holstein & Hediger, 2004). The occurrence of being overweight and obese among children aged seven to eleven in England, however, increased by more than 20% for girls and more than 15 % for boys between mid-1970 and 1998 (Lobstein,

James & Cole, 2003; Lissau et al., 2004). Although obesity rates fell in rural areas of China during a period from 1989 to 1997, obesity among children aged two to six increased from 1.5% to 12.6% in the urban areas of the country within the same period of time (Luo & Hu, 2002).

The literature indicates that obesity rates in the United States are among the highest in the world for people of all age groups (Anderson & Butcher, 2006). A cross-sectional comparison of adolescents in 13 European countries, Israel, and the United States in 1997 and 1998 (Table 1) showed that the prevalence of obesity rates for adolescents has especially been alarming. This trend was most serious in the United States (Lissau et al., 2004).

Table 1. Prevalence of Overweight and Obesity for 13 Year Old Adolescents

Country	13-Year-Old Boys (%)		13-Year-Old Girls (%)	
	BMI ≥ 85th Percentile	BMI ≥ 95th Percentile	BMI ≥ 85th Percentile	BMI ≥ 95th Percentile
Austria	15.2	5.5	14.4	6.1
Belgium	11.1	4.2	13.0	3.4
Czech Republic	12.1	4.5	10.3	2.7
Denmark	9.8	1.8	12.2	2.6
Finland	19.4	6.9	22.6	5.8
France	11.4	3.4	13.6	4.2
Germany	13.7	3.5	12.3	4.3
Greece	28.7	8.9	18.9	5.0
Ireland	24.7	7.0	21.4	6.6
Israel	13.9	3.5	12.3	4.8
Lithuania	7.5	1.8	9.0	2.6
Portugal	12.5	3.5	22.8	8.3
Slovakia	14.1	4.1	13.2	3.6
Sweden	11.5	3.8	14.4	4.8
United States	25.5	12.6	26.6	10.8

Source: Lissau et al., 2004. (p. 30)

In 2005, there were nearly 25 million overweight children and adolescents in the United States, which represented approximately “a threefold increase in the prevalence of obesity in the last 40 years” (Bouchard & Rankinen, 2005, p. 100). Studies using National Health and Nutrition Examination Survey (NHANES) reveal that the proportion of American children who are overweight and between the ages of 6 and 11 doubled and the proportion among those who are overweight and between the ages of 12 and 17 tripled between NHANES II (1976-1980) and NHANES 1999-2000 (Ogden, Flegal, Carroll & Johnson, 2002). A similar trend was also directed by Gordon-Larsen, Adair, Nelson and Popkin (2004) who used the data from National Longitudinal Survey of Youth (NLSY) and Add Health.

Previously, when a child was found to be overweight or obese, he or she would be considered a healthy child. In those days, food treats were viewed more as a cultural index of parental caring rather than as a health risk. More recently, however, obesity among children and adolescents is considered a disease associated with significant health problems. It is also looked upon as an important risk factor for morbidity and mortality of children and adolescents. Indeed, obesity among children and adolescents is even associated with an increase in economic costs. It is estimated that the hospital costs for obesity-related disease among children and adolescents increased from \$35 million in 1979-1981 to \$127 million in 1997-1999, which represents more than three times the costs of 20 years ago (Wang & Dietz, 2002).

Numerous obesity-related health complications such as high cholesterol, high blood pressure, type II diabetes mellitus, coronary plaque formation, and serious psychosocial implications, are also affecting children and adolescents (Freedman &

Stern, 2004; Pinhas-Hamiel, Dolan, Daniels, Standiford, Khoury & Zeitler, 1996; Ludwig & Ebbeling, 2001; Dietz, 1998; American Academy of Pediatrics, 2002). Since the increase in such health problems has generally paralleled that of the obesity epidemic, Anderson and Butcher (2006) remarked that there should be an association between these health problems and childhood obesity.

Guo, Wu, Chumlea & Roche (2002) indicated that overweight children often become overweight adolescents and adults. This notion only adds to the seriousness of childhood obesity. Indeed, the National Institute of Health (1998) identified that obesity is a serious health risk among children and adolescents of all age groups.

If particular causes of obesity could be known, then health experts, policymakers and others could design programs to reduce overweight and obesity among younger age groups. Therefore, it would be very helpful if a research based understanding regarding what social aspects encourages childhood obesity could be developed. This thesis intends to generate a knowledge base that could contribute to such an overall understanding.

Bearing this intention, this thesis aims to find out whether there are relationships between the likelihood of being overweight or obese among children and adolescents and the social factors. The literature suggests that the prevalence of overweight or obesity differs based on different social factors. For example, the literature suggests an inverse relationship between physical activities and the prevalence of overweight or obesity. The relationships, however, change when the prevalence of overweight or obesity is associated with other social factors like television watching, listening to music and playing computer games. In particular, this thesis focuses on three main factors which

are associated with overweight or obesity among children and adolescents: socio-demographic factors, preference for certain activities, and health conditions. To test the existence of the relationships between these factors and the prevalence of overweight and obesity among children and adolescents, the thesis proposes three hypotheses. Under each hypothesis, the researcher examines the influence of the one of the three groups of social factors on the prevalence of overweight or obesity among children and adolescents.

In order to test these hypotheses, this thesis used the data available from the National Longitudinal Survey of Youth Child Data (NLSY79-CA), with a goal as of predicting the likelihood of overweight or obesity among children and adolescents who are between the ages of 10 and 14.

The overview of this thesis will begin with a literature review which describes the causes and correlates of overweight and obesity among children and adolescents. The discussion will then be followed by the descriptions of the research methods that were used in this study. Results of the analysis will then be presented, which will be followed by a discussion of the results, limitations of the study and overall conclusions.

LITERATURE REVIEW

The literature review begins with a definition of obesity in general, as well as for children and adolescents. The discussion then focuses on the causes of childhood obesity, where the researcher has presented various predictors that could influence obesity among American children. The predictors of interest that were discussed in this thesis include socio-demographic characteristics; activities that influence children and adolescents to be overweight and obese; and associated health conditions that impact the likelihood of children and adolescents being overweight or obese.

Definition of Obesity

Typically, obesity and overweight in adults are defined in terms of body mass index (BMI), which in turn is defined as weight in kilograms divided by height in meters squared (kg/m^2) (Centers for Disease Control and Prevention (CDC), 2000). Guidelines issued by the National Institutes of Health (1998) consider an adult underweight if his or her BMI is less than 18.5, overweight if BMI is 25 or more, and obese if BMI is 30 or more. These guidelines also indicate that the standard BMI for a healthy body is between 18.5–25 kg/m^2 .

BMI is also used to identify children who are overweight or at a risk of becoming overweight. The cutoff criteria, however, are mostly based on the age-and-sex-specific BMI growth charts for the United States produced by Centers for Disease Control and Prevention (CDC) in 2000 (Bouchard & Rankinen, 2005). CDC experts recommend that

children with BMI values at the 85th percentile and at or above the 95th percentile of the age-and-sex-specific BMI growth charts be categorized as overweight and obese, respectively (National Center for Health Statistics, 2005).

Logically, the increase in childhood obesity is associated with the increase in adult obesity. That is, children who are overweight and obese during their childhood are more likely than normal weight children to remain and become overweight and obese during adolescence and adulthood (Anderson & Butcher, 2006). Whitaker and his colleagues (1997) found that 52% of children who were obese when they were at the ages of three to six remained obese at the age of twenty-five, compared to only 12% of children who were normal and underweight when they were at the ages of three to six becoming obese at the age of twenty-five. Thus, this thesis will look at the predictors of overweight and obesity among children and adolescents together.

The Causes and the Correlates of Obesity

The medical and sociological literatures suggest various factors associated with the obesity epidemic. Different researchers, however, have different views regarding the causes of obesity. Some researchers focus on the physical structures of communities. Suburban sprawl, absence of sidewalks, reliance on automobile are, thus, seen to be major causes of obesity (Bouchard & Rankinen, 2005; Corless & Ohland, 2005; Russonello & Stewart Research and Communications, 2003; Fertig, Glomm & Tchernis, 2005). Other investigators view the changes in the food market, the increase in advertising targeted toward children and adolescents, and the adaptation of fast foods by children and adolescents as major factors behind the causes of obesity (Paxson, Donahue,

Oreleans & Grisso, 2006; Anderson & Butcher, 2006; American Academy of Pediatrics, 2004; Jeffery & Utter, 2003).

The literature also supports the idea that there have been many changes in the school environment today, particularly in the availability of fast foods and beverages in schools and the decline in physical education. Generally, most children and adolescents rely on vending machines for food during school time, which allow for the purchase of high-calorie foods like sodas, chips and candy (Anderson & Butcher, 2006; Anderson, Butcher & Levine, 2003). Logically, a greater consumption of high-calorie foods causes children and adolescents to be overweight and obese. Therefore, the greater reliance on vending machines food by children and adolescents is thought to be associated with increasing obesity or overweight rates. The lack of opportunities for exercise has also been associated with this trend of overweight or obesity among children and adolescents. Koplan, Liverman and Kraak (2005) remarked that many American schools have reduced their commitment to provide students with regular and adequate physical activities. This reduction has been attributed to budget cuts and the pressure to increase academic course offerings in order for schools to maintain standards and remain competitive with other schools.

The change in parental care in the American society is also believed to have played an important role in the obesity epidemic among children and adolescents. The economic necessities and the expanded job opportunities for women are believed to have led more mothers to enter the work force today than in the past (Koplan et al., 2005). In these families, since both parents are often actively participating in the work force, researchers anticipated that the lack of proper supervision of the food behavior and

overall activities of children might have led to children and adolescent to become overweight and obese (Fertig et al., 2005).

Literature also indicates that shared genes and other environmental factors within families also affect children and adolescents to be overweight and obese (Whitaker, Wright, Pepe, Seidel & Dietz, 1997). Bouchard and Rankinen (2005) indicated that “the risk of obesity is about two to three times higher for an individual with family history of obesity” (p. 102).

As this overview suggests, a number of broader trends are related to obesity and overweight among children and adolescents. This brief review is provided to give a glimpse of the complex factors associated with overweight and obesity among children and adolescents. This thesis, however, focuses only on three sets of variables to explain overweight or obesity among children and adolescents: socio-demographic characteristics, the activities that children prefer to engage in, and the health conditions that influence obesity and overweight among children and adolescents. The following section reviews each of those sets of factors that are associated with obesity and overweight among children and adolescents.

Socio-demographic Variables

Although most studies on the causes of childhood obesity emphasize the diets and behaviors of children and adolescents, many studies also reveal that the extent of obesity or overweight might vary depending on one’s socio-demographic background. The literature review below will focus on those socio-demographic correlates that are investigated in this thesis. These include race, gender and maternal education.

Race

A variety of studies show a significant relationship between race/ethnicity and obesity. Strauss and Pollack (2001) reported that between 1986 and 1998, the prevalence of overweight or obesity rates increased faster among Non-Hispanic black children and Hispanic children than in other racial groups. A similar trend is also reported by the results from National Health and Nutrition Examination Survey (NHANES). NHANES report indicated that between 1988 and 2004, the overweight or obesity rates among children between the ages of 6 and 17 increased from 14.0% to 21.7% for Non-Hispanic black children, from 15.4% to 19.6% for Hispanic children, and from 10.5% to 17.3% for Non-Hispanic white children (Ogden et al., 2006). Hill (2006) also noted that obesity rates have increased in all ethnic groups. Particularly, he indicated that the overall obesity rate among blacks increased from 39.8% to 49.5% between 1999 and 2004.

The prevalence of higher obesity rates among children and adolescents has been associated with the cultural influences that impact individuals differently (Baughcum, Chamberlin, Deeks, Powers & Whitaker, 2000; Beauboeuf-Lafontant, 2003; Sherwood, Story & Obarzanek, 2004). Overall, many studies indicate that overweight and obesity rates among Non-Hispanic white children and adolescents is relatively lower than the rates for Non-Hispanic blacks and Hispanics (Freedman & Stern, 2004; American Heart Association, 2004; Strauss & Knight, 1999). Stanton and Hills (2004) remarked that lower overweight and obesity rates in Non-Hispanic white children and adolescents, compared to other racial groups, is due to the cultural sensitivities toward ideal body size and the relative social pressure in these groups to remain slim (Sherwood et al., 2004). Research indicates that Non-Hispanic white children and adolescents are more likely to

feel socially rejected at very high levels of adiposity as compared to young people from other racial groups (Kimm & Glynn, 2006).

These cultural attitudes toward body size may, however, operate differently for minorities. For example, Non-Hispanic blacks, especially women, are more likely to accept larger body size, regardless of their level of education, than are members of other racial groups (Baughcum et al., 2000; Gordon-Larsen et al., 2004; Whitaker & Orzol, 2006). Beauboeuf-Lafontant (2003) indicated that in Non-Hispanic black communities, a larger body size represents an image of power, especially for Non-Hispanic black women. Therefore, obese mothers of Non-Hispanic black children are somewhat less likely to feel that their children, especially daughters, are overweight than obese mothers of Non-Hispanic white and Hispanic children (Kimm & Glynn, 2006).

However, further research indicates an opposite trend in the prevalence of obesity for Non-Hispanic black males. According to Taylor, Viner, Booy, Head, Tate, Brentnall et al., (2005) Non-Hispanic black males are less likely to be obese than their Non-Hispanic white and Hispanic male counterparts. These researchers remarked that the difference in the prevalence of obesity among Non-Hispanic black males and males in other racial groups might be due to the differences in the height and the body mass index. That is, Non-Hispanic black males are more likely to be tall and thus, their mean BMI is more likely to be lower than males from other racial groups.

Other investigations have found that obesity rates are significantly higher among Hispanic children and adolescents, especially males, than in other racial groups (American Heart Association, 2004; Ogden et al, 2002; Ogden et al, 2006; Whitaker & Orzol, 2006). Research suggests that the higher prevalence of obesity rates among

Hispanic boys may be due to the value placed on sons, compared to daughters, in Hispanic families (Freedman & Stern, 2004). Since food treats were predominantly accepted as a symbol for parental caring among Hispanic families, Hispanic boys are more likely to be offered larger portion sizes of food which might have increased the adiposity among Hispanic boys (Freedman & Stern, 2004).

Despite these indications of racial differences in overweight or obesity of children and adolescents, some investigators dispute the presence of such racial differences. For example, Whitaker and Orzol (2006) indicated that the prevalence of childhood obesity is not significantly different between Non-Hispanic black and Non-Hispanic white children and adolescents. This thesis hopes to clarify the relationships between race and overweight or obesity among children and adolescents.

Gender

Research indicates that there are gender differences in the likelihood of overweight and obesity among children and adolescents. Ogden and his colleagues (2006) reported that there is a significant relationship between the trend of overweight or obesity among male and female children and adolescents. They indicated that the prevalence of obesity in female children and adolescents increased from 13.8% in 1999-2000 to 16.0% in 2003-2004, whereas the prevalence of obesity in male children and adolescents increased from 14.0% to 18.2% over the same time period. Other studies have indicated that female children and adolescents are more likely to be overweight or obese than male children and adolescents (Wang, 2002; Hill & Lissau, 2002; Gordon-Larsen et al., 2004; Stanton & Hills, 2004; Hills, 2006). It should be, however, noted that several investigations indicate that the likelihood of overweight and obesity between

male and female children and adolescents vary according to their racial background (Freedman & Stern, 2004; Taylor et al., 2005; American Heart Association, 2004).

Moreover, studies indicated two main reasons for these gender differences in the prevalence of overweight and obesity between boys and girls: sexual maturity and differences in the perception of body image (Stanton & Hills, 2004; Hill & Lissau, 2002; Wang, 2002). Generally, puberty affects girls and boys differently. Girls are thought to physically mature faster than boys (Stanton & Hills, 2004). During puberty, boys who become sexually mature early are more likely to be thinner than boys who mature later. On the other hand, girls who reach puberty earlier are more likely to be fat compared to those girls who mature at a later age (Wang, 2002). The difference in body size, and ultimately, BMI, could also possibly be attributed to the height of girls. Since body mass index (BMI) is determined by height and weight of an individual, the differences in height between boys and girls influences the likelihood of being overweight and obese. Girls tend to increase in height slowly when they reach puberty and thus, they become overweight, whereas the height of boys tends to increase faster when they reach puberty, thus resulting in a lower BMI.

Gender differences in perceptions of body image may be another likely cause of gender differences in overweight and obesity (Rosenblum & Lewis, 1999). Stanton and Hills, 2004 remarked that “both boys and girls think that girls must be thin to be acceptable” and boys must be “tall and muscular” (p. 69). Due to these stereotypical perceptions among adolescents, girls who are overweight are more likely to be depressed than boys who are overweight (Granberg, Simons, Gibbons & Melby, n.d.). Girls are also more likely to develop other psychological problems (Falkner, Neumark-Sztainer,

Story, Jeffery, Beuhring & Resnick, 2001) which could lead them to develop eating disorders (Stanton & Hills, 2004), and ultimately, cause them to become or remain overweight or obese. Other research indicates that both boys and girls who are overweight during their childhood and adolescence are equally likely to develop psychological problems regarding their body image (Stanton & Hills, 2004). Therefore, both boys and girls are equally likely to adapt unhealthy food behavior which influences them to be overweight or obese.

Research also pointed out that the differences in the prevalence of obesity among boys and girls might be due to the differences in the levels of physical activity. Boys are more likely to engage in outdoor games than girls, which might be due to the influence of a stereotypical notion that boys are strong and girls are delicate (Stanton & Hills, 2004). Often, due to this stereotypical perception, boys are more likely to be encouraged by parents, teachers and others to do vigorous activities, whereas girls are discouraged from engaging in such activities (Adkins, Sherwood, Story & Davis, 2004). However, other research indicates that girls who belong to families with higher education level and higher socioeconomic status are more likely to engage in various physical activities (Kimm & Glynn, 2006). Research also indicates that parental perception and parental support for physical activities plays a more important role in girls' participation in physical activities than for boys' participation in physical activities (Adkins, Sherwood, Story & Davis, 2004). However, Rushovich, Voorhees, Davis, Neumark-Sztainer, Pfeiffer, Elder, Going & Marino (2006) found that girls who are not supervised by their parents are more likely to be active than those girls who get continuous parental supervision for physical activities. Probably, those girls who are supervised for the

physical activities might have certain guidelines for other activities as well, such as, doing homework, time spent on watching television and other food behaviors. Such guidelines by the parents might have resulted in the decreasing activity level of the girls who were supervised.

It is important to note, however, that a few studies remarked that there are no significant difference in the overall prevalence of obesity between male and female children and adolescents, while controlling other related socio-demographic characteristics (Whitaker et al., 2006; Freedman & Stern, 2004). This thesis aims to investigate the relationship further between gender and overweight and obesity.

Maternal Education

Maternal education is also considered to be an important factor behind childhood obesity (Fertig et al., 2005). There are several reasons for this association. Children, generally, show more intimate relationship with mothers compared to their fathers. Therefore, the behaviors of children such as food behavior are more likely to be shaped by the extent of perception and knowledge of their mothers (Boardman, Hummer, Padilla & Powers, 2002). This thesis attempts to determine how maternal education might influence overweight or obesity among children and adolescents.

Research indicates that those children with mothers with low educational attainment, and who are also more likely to be overweight or obese, may be at a greater risk for later obesity. Huerta and his colleagues (2006) reported a similar kind of relationship between childhood obesity and parental education. Their research indicated that children whose parents have low level of education are at a higher risk for overweight or obese than children whose parents both attended college. One of the

reasons for the differences in the prevalence of overweight or obesity among children due to the differences in the educational level of parents might be because of the relative differences in the overall socio-economic status of parents. Mothers with less education are thought to be less likely to recognize if their children are overweight or obese (Baughcum et al., 2000). Another reason for this difference might be because of “the differences in cultural and social norms between parents with higher and lower levels of education” (Huerta, Bibi, Haviv, Scharf & Gdalevich, 2006, p. 4). For example, parents with higher education and higher socioeconomic status are more likely to practice dieting and weight control activities, like reducing high-calorie foods in their daily meal and engaging in more physical exercise. However, these activities might not be as important for those parents who have lower education and lower socioeconomic status.

Research, however, has also produced evidence for the prevalence of obesity among children whose mothers are highly educated and actively participating in the labor market. Fertig and his colleagues (2005) remarked that mothers who are highly educated and participating in the labor market are less likely to have enough time to spend on preparing healthy meals for their families or to supervise their children’s other behaviors. Thus, their children may have more freedom in their food choices and thus may eventually choose unhealthy meals. This thesis aims to clarify this contradiction in the research about the impact of maternal education on overweight or obesity in children and adolescents

Activities that Influences Childhood Obesity

In the past several decades, the development of various technologies has resulted in vast changes in the activities that children and adolescents engage in during their free time. The U.S. Department of Health and Human Services (1991) recommends that all children ages 5 years or older should engage in at least 30 minutes of daily physical activity at a moderate intensity, and at least 30 minutes for at least 3 days per week at a vigorous intensity. However, children and adolescents are now spending more of their time engaging in sedentary or inactive behaviors, such as watching television, playing computer games and listening to music than on playing outside with other children or other physical activities (Dietz & Gortmaker, 1985; Norman, Schmid, Sallis, Calfas & Patrick, 2005; Kids health, 2006; Dowda, Ainsworth, Addy, Saunders & Riner, 2001; Hofferth & Sandberg, 2000).

Nie and Hillygus (2002) argued that “time is largely a zero-sum phenomenon and it is much like a liquid rather than a gas as it can be reshaped but not expanded” (p. 2). Obviously, therefore, the time spent on one activity often involves a trade off in the time spent on other activities. Thus, it is plausible that if children and adolescents spend more time in sedentary activities, they are less likely to spend their time in physical activities, because there are only 24 hours in a day.

Sedentary activities, particularly watching television and playing computer games, are considered to be very important contributors to the prevalence of obesity among children and adolescents (Dietz & Gortmaker, 1985; Kids health, 2006). Time spent on homework, listening to music and reading for fun are also considered to have impacted the prevalence of obesity, as these activities ultimately displace the physical

activities of children and adolescents (Norman et al., 2006; Sturm, 2005; Hofferth & Sandberg, 2000).

In the past, children used to engage in physical activity as a part of their daily routine activities. They used to get all of their needed exercise simply by playing outside and interacting with friends. That is, exercise was not something that they set out consciously to do. Since the late 1970's, however, there has been a 25% decrease in the time spent by children in play and another 50% decrease in other outdoor activities (MacPherson, 2002). Norman and his colleagues (2005) found that children in the United States spend an estimated 75% of the day being inactive. One of the major reasons for the decrease in playing outside or participating in other outdoor activities among children is due to the lack of vacant land for recreational purposes (Stanton & Hills, 2004). As indicated earlier, suburban sprawl is viewed as a contributing factor to the decrease in levels of exercise by children and adolescents (Fertig et al., 2005). Children are also more likely to spend more time playing indoors than playing outdoors because playing outdoors might be dangerous due to traffic or other safety concerns. Thus, for some parents who are concerned about the safety of their children, television and computer has become a substitute babysitter for their children (Fertig et al., 2005; Stanton & Hills, 2004).

Another reason for the decrease in physical activity among children is the increase in the vehicles miles driven per person, thus, resulting in fewer children walking to school or to other locations (Corless & Ohland, 2005). A nationally representative survey conducted in 2002 found that 53% of children were driven to school by their parents, 38% children went to school by bus and only 17% of children walked to school,

while 5% of children rode their bikes (Russonello & Stewart Research and Communications, 2003). This increase in car trips has resulted in substantially fewer trips by foot or bicycle, which is also attributed to the complex physical structure of the communities such as greater sub-urbanization and absence of sidewalks, as mentioned earlier.

Ultimately, fewer children and adolescents are actively participating in one or other type of physical activities. Of course, lower rates of physical activity are more likely to enhance adiposity among children and adolescents. Because of lower rates of physical activity, children and adolescents are not burning off enough of the calories that they consume and these calories are eventually deposited in their body in the form of excessive fats.

Parental perceptions and support for physical activity among children and adolescents are also believed to play a crucial role in the active participation in physical activities (Adkins et al., 2004). As indicated earlier, girls are not encouraged to become involved in vigorous activities compared to boys. However, this may vary according to the socio-economic status background of the parents. Parent who are highly educated and of higher socio-economic status are more likely to encourage their daughters to engage in various kinds of activities including vigorous activities (Kimm & Glynn, 2006). Often, parents who are highly educated are more aware of the advantages of physical activities and become sensitive to the health concerns of their children. However, those parents who have completed less than high school are less likely to recognize that physical activities help children reduce the likelihood of being overweight or obese, as mentioned earlier.

Additional factors that are associated with lesser time spent on physical activities are lack of time, lack of interest, fatigue involved in physical activities and homework (Kimm, Glynn, McMahon, Voorhees, Striegel-Moore & Daniels, 2006; Allison, Dwyer, Goldenberg, Fein, Yoshida & Boutilier, 2005).

This thesis investigates the role of various sedentary activities in overweight or obesity among children and adolescents. Particularly, the current study examined the relationship of sedentary activities, like television watching, playing computer games, preference for doing homework, preference for listening to music and preference for reading, with childhood overweight and obesity. The following section examines the correlation between childhood overweight and obesity and these specific activities in more detail.

Television Watching and Childhood Obesity

Television watching is associated with a variety of negative consequences, including aggressive behavior, poor academic performance, exposures to sexuality, and use of drugs and alcohol (Reagor, Ferguson, Salinas, Gilchrist & Jacob, 2006). This thesis explores the role of television in yet another negative consequence: overweight and obesity among children and adolescents. Several studies estimated that children and adolescents spend an average of five-and-a-half hours a day using media like television and the Internet (Dalton, 2004; Rideout, 2004). The prevalence of obesity is found to be lowest among children and adolescents who watch television one hour or less daily, and highest among those who watch television more than four hours per day (Kids Health, 2006; Dalton, 2004). A study done by Dietz and Gortmaker (1985) found that the likelihood of obesity increases by 2 % with each additional hour of watching television

per day. This evidence has also been supported by various recent studies (Anderson & Butcher, 2006; Curtin & Hofferth, 2004; Dalton, 2004; Rideout, 2004; Robinson, 2001) which indicated that watching television might have influential impacts on the weight of children and adolescents in several ways. Some of the important impacts are as follows:

1. Television watching may displace other healthier physical activities (Dietz & Gortmaker, 1985);
2. Watching television may reduce the resting metabolism among children and adolescents (Robinson, 2001, Bouchard & Rankinen, 2005);
3. Television advertisements may increase children's and adolescents' desire for, and ultimately their consumption of, high-calorie snack foods (Dietz & Gotmaker, 1985);
4. Watching television may go hand in hand with snacking, leading to higher portion size of foods and beverages among children and adolescents who watch television (Dietz & Gotmaker, 1985, Robinson, 2001);
5. Watching television may also lead children to attempt to influence the food purchasing behavior of their parents (Dietz & Strasburger, 1991).

Additionally, pediatricians, child development experts and media researchers have hypothesized that it is not only the attractive advertisement of food products, but also the cross-promotions between food products and popular movie characters which is encouraging these vulnerable children and adolescents to buy and eat more high-calorie foods and beverages (Rideout, 2004).

Robinson (1999) found a weak inverse association between number of hours watching television and physical activity among children in elementary schools. Since this result is based on the study done among the children who were in elementary schools, it would be unreasonable to predict these same results for adolescents. This is because the number of hours that children watch television might differ from the amount of television watched by adolescents. Overall, researchers seem to conclude that watching television does contribute to childhood obesity. This thesis will, therefore, examine the odds of being overweight or obese among children of ages between 10 and 14 when they watch television both on per weekdays or on weekend days.

Computer Games and Childhood Obesity

Research indicates that time spent on one activity usually involves a trade off in the time spent on other activities, because there is only 24 hours a day (Nie & Hillygus, 2002). That is, children and adolescents who spend their time surfing the Internet might not have enough time to spend on physical activities. The literature suggests that children and adolescents are substituting other forms of media, including video games and Internet, for television watching, and thus, ultimately substituting these activities for exercise. Rideout (2004), in his study found that aside from spending 19.3 hours watching television a week, children spend an average of 2.5 hours in front of the computer and another 2.3 hours playing video games per week.

Research found that online Internet surfing, in particular, is becoming popular among children and adolescents. Due to the growing demand of individuals surfing Internet websites, various companies are launching new programs that not only market a

wide variety of products on-line, but also provide a significant amount of information on a variety of topics.

Studies indicate that marketing to children and adolescents is moving from television to the Internet, where food and beverage companies target their websites toward this age group, with games, prizes and other activities as incentives to visit the sites (Dalton, 2004; Rideout 2004, Media Awareness Network, 2006). Some of the companies that have websites geared towards children and adolescents include candystand.com, Hershey's kidztown.com and Ronald McDonald's Happy Meal site (Rideout, 2004).

Recently, marketing professionals have created and targeted a new demographic group "tweens"- young children between the ages of 8 and 12. Critics suggest that this strategic marketing to this age group has negative consequences. Children between the ages of 8 and 12 are considered to be more vulnerable than adolescents, as they rely heavily on others to understand the norms and values of the world, and to place themselves in it. In one of the special issues of Media Awareness Network (2006), the authors commented that marketers who are addressing messages toward "tweens" have been very successful in removing the parents from the whole picture, leaving this age group vulnerable to their messages in various topics like food behavior, fashion, body image, sexuality, relationships and violence.

This thesis, however, looked at only the use of computer by children and adolescents at home in general, thus do not include the activities like Internet surfing, email and so on. However, the researcher examined the use of computer by children and adolescents to play games and how this impacts childhood obesity.

Homework and Childhood Obesity

Research indicates that the amount of free time available to children and adolescents has decreased substantially over the time period. This is thought to be due to the pressures of spending more time away from home, particularly in schools and at after school programs. As mentioned earlier, schools in the United States are providing less time for physical education in order to offer more courses so that they can be competitive with other schools. As a result, children and adolescents spend much of their time in schools studying, and doing homework after school. Hofferth and Sandberg (2001) found that the overall average study time spent by children and adolescents including doing homework increased by 20% between 1981 and 1997.

A study done on the reasons and the barriers for participating in physical activity among male adolescents between ages 15 and 16 year old revealed that the homework load was the major barrier for participating in physical activities, aside from household chores and part-time jobs (Allison, Dwyer, Goldenberg, Fein, Yoshida & Boutilier, 2005). This indicates that the time spent on homework is displacing physical activities among children and adolescents, which might be one of the possible causes for overweight or obesity in this age group. Sturm (2005) also indicated that it is indeed the increased homework loads which are associated with the obesity epidemic among children and adolescents. This thesis looked at the relationship between time spent on homework and overweight and obesity among children and adolescents in more detail.

Listening to Music and Reading and Childhood Obesity

There is little in the literature on the role of listening to music and reading for fun and their associations with overweight and obesity among American children and

adolescents. Some literature, however, supports the idea that children and adolescents are more likely to spend their free time listening to music and reading for fun as their age increases, thus displacing time for physical activities. Curtin and Hofferth (2004), however, noted that 3% of the total time that children and adolescents spent on various sedentary activities is used in listening to music. It is also suggested that there might be gender differences in this regard. As age increases, the time spent on activities like playing outdoor and indoor games for girls might decrease compared to boys (Hofferth & Sandberg, 2000). Adolescent girls are, therefore, more likely to spend their free time sitting and listening to music or reading for fun, whereas adolescent boys are more likely to spend their free time playing computer games (Norman et al., 2006).

As indicated earlier, there is a little in literature on this topic. Since listening to music and reading for fun also play a role in displacing the physical activities of children and adolescents, this thesis explored the relationship between these activities and childhood obesity, thus helping to fill the gap in the literature on childhood obesity.

Associated Health Conditions

With the obesity epidemic, children are also facing a variety of health problems including type II diabetes, cardiovascular disease, hypertension, asthma, depression, and other relevant health disparities. Research suggests that since the trend of these health problems matches the increasing trend of obesity among children and adolescents, there is a high possibility for an association between those health problems and childhood obesity. Swallen, Reither, Haas and Meier (2005) found that children and adolescents

who are either overweight or obese are more apt to report poor health conditions than children and adolescents with normal weight.

Among the various associated health disparities, this thesis examined whether the likelihood of being overweight or obese for those children and adolescents who have asthma related symptoms, especially when asthma and obesity are considered to develop together as a health problem among children and adolescents. While considering the prevention, rather than causes of obesity among people of all ages, literature suggests that the odds of being obese or overweight are less for children and adolescents who were breastfed during their infant stage. Therefore, this thesis also examined whether there is a relationship between breastfeeding and childhood obesity, as described below.

Asthma and Childhood Obesity

One important complication that is associated with obesity is asthma (Gidding, Bao, Srinivasan & Berenson, 1995; Wang, 2002; Must, Jacques, Dallal, Bajema & Dietz, 1992; American Academy of Pediatrics, 2002; Silvestri, Weese-Mayer, Bass, Kenny, Hauptman & Pearsall, 1993; Freedman & Stern, 2004). Research indicates that, in the last three decades, the prevalence of both obesity and asthma has shown a steady increase (Elamin, 2004). A study done at Cleveland's Case School of Medicine found that obesity raises the risk of asthma by 1.8 times (Hitti, 2005). The BBC News on Oct. 18, 2001, also indicated that the obese children and adolescents are 77% more likely to have asthma symptoms than their non-obese peers. Currently, it is estimated that 5.3% of US adults, who are overweight or obese, are affected by asthma (Flegal, Carroll, Kuezmarski & Johnson, 1998; Elamin, 2004).

One of the most pervasive issues that the researcher found in the relation of obesity and asthma is the relation between airway hyperresponsiveness (AHP) and changes in BMI (Elamin, 2004). Research suggested that increased weight might lead to inflammation in the respiratory tract, which could be the key factor in inducing asthma (BBC News, Oct. 18, 2001).

Although many studies supported the possible causal association between obesity and asthma, there is still a debate among scholars in the link between obesity and asthma (Elamin, 2004; BBC News, Oct. 18, 2001). Research suggests that the mechanism by which asthma may cause obesity could be that asthmatic children may not be physically capable of regular exercise. However, the New York Times on November 28, 2006 commented that the adiposity among asthmatic children are not simply because they cannot exercise rather it could be possible that weight gain among these children come first (Grady, 2006).

Much of the research on obesity and asthma focuses on how obesity may cause asthma. This thesis looked at the reverse situation, if asthma is associated with obesity. That is, this thesis looked at whether or not the odds of being overweight or obese are higher for asthmatic children than for non-asthmatic children. This thesis, therefore, hopes to add to this literature regarding the association between obesity and asthma.

Breastfeeding and Childhood Obesity

Breastfeeding is considered as an important determinant of child survival. Breast milk provides all the nutrients an infant needs during the first few months of life. It provides immunological agents that protect children against disease (VanLandingham, Trussell & Grummer-Strawn, 1991). Immunologic benefits include reduction in risk for

many acute and chronic diseases like diarrhea, lower respiratory tract infections, urinary tract infections and asthma. A reduction in these and other health conditions is associated with exclusive breastfeeding for the first four months of life (Oddy, Holt, Sly, Read, Landau, Stanley et al., 1999; Hediger, Overpeck, Kuczmarski & Ruan, 2001).

Several studies also indicated that breastfeeding may provide protective effects against the development of obesity (Goldfield, Paluch, Keniray, Hadjiyannakis, Lamb & Adamo, 2006; Hediger et al., 2001; Armstrong, Reilly & the Child Health Information Team, 2002; VanLandingham et al., 1991). Researchers found that breastfed children showed greater reductions in body mass index compared to their non-breastfed peers (Goldfield et al, 2006; Nelson, Gordon-Larsen & Adair, 2005). They also suggest that the exclusive breastfeeding during the first 4 to 6 months is most consistently associated with a reduced risk of being overweight among children and adolescents. Additionally, the increased duration of any breastfeeding (up to 12 months) is found to be associated with decreasing risk of overweight among children (New York State Department of Health, 2004).

Goldfield and his colleagues (2006) described several mechanisms to explain how breastfeeding may reduce obesity risk. They indicated that mothers who breastfeed their children do not have visual cues available to guide feeding, and to provide information about the amount of milk consumed, in the way is provided during formula feeding. Therefore, infants may learn to regulate intake by responding to sensations of hunger and satiety, rather than outside cues, while they are breastfed. They also indicated that breastfed infants are more likely to learn to control their meal size according to their

caloric needs when they are young and therefore, are better able to regulate the food intake behavior when they get older.

However, research also suggests that parents with a higher educational level tend to breastfeed their children more than parents with a lower educational level, perhaps because they are knowledgeable about the advantages of breastfeeding (Huerta et al., 2006). Therefore, it is not only breastfeeding alone which may help to reduce risk of childhood obesity; other social factors, such as education, may contribute to this effect.

This thesis examined whether breastfeeding impacts the prevalence of overweight or obesity among children between the ages 10 and 14, after controlling for the socio-demographic variables and the activities variables.

In summary, the prevalence of overweight or obesity among children and adolescents is associated with various factors which include diet behavior of children and adolescents, family history of obesity-related disease and lack of opportunities for physical activities due to suburban sprawl, lack of recreational vacant land, and the increasing trips in vehicles. However, this thesis examined the prevalence of overweight or obesity due to three different groups of social factors that have been described in this literature review. These include socio-demographic factors such as race, gender and maternal education; activities that children preferred to participate in, such as watching television, playing computer games, preference for doing homework, preference for listening to music, preference for reading and preference for playing outside; and the health conditions of asthma symptoms and breastfeeding.

METHODOLOGY

The main purpose of this thesis is to better understand the relationships between childhood obesity and the extent of influences laid by social and cultural indicators. This section will discuss the methods used in the current study to achieve the research objective. The discussion will begin with the description of the sources of data that the current study used. It will then be followed by the description of the dependent variables and independent variables used for the study. The statistical analyses and the methods will then be presented. Finally, this section will describe the hypotheses that were investigated in this study, based on the literature reviewed in the previous section.

Sources of Data

This thesis used public data files from the National Longitudinal Survey of Youth Child Data (NLSY79-CA). The NLSY79-CA was developed from the original National Longitudinal Survey of Youth (NLSY79), a nationally representative sample of 12,686 adolescents of ages between 14 and 21 in 1979. The data set contains detailed longitudinal information on health development outcomes from birth throughout the teen years for children of mothers from the original cohort (NLS Handbook, 2005; Boardman et al., 2005). The survey is conducted under contract with the Center for Human Resource Research (CHRR) at The Ohio State University and the National Opinion Research Center (NORC) at the University of Chicago, and sponsored and directed by the

Bureau of Labor Statistics (BLS) of the U.S. Department of Labor (National Longitudinal Survey (NLS) Handbook, 2005).

NLSY79-CA data on the children of female NLSY respondents were collected biennially since 1986. In order to administer the interviews of these children, the mother's consent for each child was obtained. Children ages 4 to 14 were given a variety of questions depending on their age. Children below 4 years of age were, however, excluded from the assessment. Additionally, a series of questions were asked directly to children ages 10 to 14 through a self-administered CAPI (Computer assisted personal interviewing) questionnaire on a variety of topics such as their schooling, family, peer-related and other attitudes and behavior (NLSY79 Child and Young Adult User's Guide, 2004). A verbal consent was obtained from these participants after obtaining permission of their mother (NLS Handbook, 2005).

Concerning weights, "each set of cross-sectional child sampling weights, earlier, was computed by multiplying the mother's 1979 sampling weight by a factor that is reciprocal of the rate at which children in particular age/sample-type/sex cells were assessed or interviewed" (NLSY79-CA User's Guide, 2004, page 22). However, with the beginning of 2002, a revisited algorithm was used to compute all child and young adult sampling weights. Therefore, children who were not assessed and young adults who were not interviewed in a given year were assigned a weight of zero for that year (NLSY79-CA User's Guide, 2004).

The Data Research Center of National Longitudinal Survey indicated that the total sample size in 2004 was 11,428 (McClaskie, 2006). Since the children of all age groups who were interviewed in the National Longitudinal Survey (NLSY79-CA) in 2004 were

not asked all the obesity-related questions that were used in this thesis, the researcher chose only those children who answered the questions included in the study. As children of ages between 10 and 14 answered all the obesity-related questions that were included in this thesis, the researcher chose this age group for the study.

Therefore the total sample size included 1359 respondents who answered the obesity-related questions included in this thesis and who met the CDC criteria of overweight or obese. However, all of them were not able to answer all the questions that were included for the study. Therefore, there were some missing values which included those respondents who did not answer some of the obesity-related questions. Only 891 respondents answered all of the obesity-related questions used in this thesis.

Dependent Variables

The standard definition of obesity is different across all cultures, races or genders (Neff, Sargent, McKeown, Jackson & Valois, 1997). However, it is essential for a researcher to have a standard unit of measurement that is generally accepted. Since most of the literature reviewed indicated the extensive use of Body Mass Index as a measure for defining obesity, this thesis also used BMI to follow the standard used by those researchers, thus, allowing for comparisons between the current study and other studies.

In order to examine the causes and correlates of obesity among children, this thesis used the Body Mass Index (BMI) of children between the ages of 10 and 14 as a dependent variable for the study.

As described earlier, body mass index (BMI) is defined as weight in kilograms divided by height in meters squared (kg/m^2) for metric conversions. For non-metric

conversion the weight in pounds is divided by height in inches squared and the product is multiplied by 703 (CDC, 2000). For this investigation, a new variable BMI was created using two of the questions from the NLSY79-CA dataset. The new variable was arrived at by taking the question, “Child’s weight in pounds” and dividing it by the answer to the question, “Child’s height in inches” squared and then multiplying that product by 703.

As described earlier, the National Center for Health Statistics/Centers for Disease Control and Prevention (2000) recommends BMI cutoff criteria of 85th percentile for overweight, and BMI at or above 95th percentile for obese children and adolescents. Since overweight children are more likely to be obese in the future, this thesis also incorporated overweight children into the dependent variable. Thus, the cutoff criteria of BMI as the dependent variable were the 85th percentile for the study. However, while manipulating the cutoff criteria of BMI approximately the 85th percentile, the analysis included a small number of normal weight children who were older than 12 years old and excluded a small number of overweight children who were of the ages 10 and 11. However, the number of normal weight children who were included and the number of overweight children who were excluded was very small.

Since the researcher used BMI at 85th percentile ($BMI \geq 21$) as the dependent variable, those children whose BMI is at 85th percentile of the reference curve produced by Centers for Disease Control and Prevention (2000) were recoded as ‘1’ and those with a BMI less than 85th percentile of the reference curve were recoded as ‘0’.

Independent Variables

The independent variables have been analyzed using three different logistic regression models (as shown in Figure 1 on page 43). The first model included the socio-demographic variables of race, gender and maternal education. The second model included the following activities, controlling for socio-demographic factors: preference for playing outside, television watching, playing computer games, preference for doing homework, preference for listening to music and preference for reading. The third model also controlled for socio-demographic factors and included the obesity-related health conditions of asthma symptoms and breastfeeding. The researcher, therefore, examined the possible correlates of obesity in terms of these three models.

Table 2 illustrates the dependent and independent variables that were used in the analysis of this thesis. The variables, as shown in the table, were added in blocks by category for each outcome so that the sequential effects of each group of predictors in each model could be analyzed. The coding scheme for the variables is described below.

Demographic Variables

The literature reviewed suggested ranges of variation in childhood obesity based on socio-demographic characteristics. The researcher, therefore, included some basic socio-demographic variables that might impact the relationship between childhood overweight and obesity and development outcomes of children and adolescents in the first model.

The most significant demographic predictor that is consistently shown in the literature as impacting obesity is race. The study limited the analyses to three

racial/ethnic groups: a) Hispanic; b) Non-Hispanic Black; and c) Non-Hispanic White. A dummy variable was created for both Non-Hispanic black children and Hispanic children with Non-Hispanic white as a reference group in both categories. Thus, those children and adolescents who were Non-Hispanic black and those who were Hispanic were coded as '1' and those individuals who were Non-Hispanic white were coded as '0'.

Gender was a dummy variable, where male children were coded as '1' and female children were coded as '0'. A dummy variable was created in which those mothers who completed less than high school were categorized as the reference group. Each level of maternal education – high school graduate, some college, and college degree and higher – was then compared separately with the reference category. Therefore, the reference category was coded as '0' and all other categories were each separately coded as '1'.

Activities that Influence Childhood Obesity

As described above, the literature suggests that various activities influence the weight level of a child. Although activities are comprised of broad categories that could affect childhood obesity, this study examined a few basic categories.

In this model, the researcher examined respondents' preferences for certain physical activities and sedentary activities, including playing outside, watching television, doing homework, reading, listening to music, and playing computer games. In order to analyze the preferences that children and adolescents indicated to spend their free time on playing outside, listening to music, reading and doing homework, the researcher used the questions which asked children and adolescents "What do you like to do after school?" and they were able to select, or not select, the relevant activities like

play outside, do homework, read and listen to music. Through this analysis, the researcher examined the preferences for participating in each of the above mentioned activities. A dummy variable for each of these activities was, thus, created which showed that those children who indicated the preference of each certain activities after school were coded as '1' and those who indicated that they do not prefer to participate in each of the above mentioned activities after school were coded as '0'.

To analyze the amount of time spent on watching television both on week days and weekend days, the researcher used the question that asked the children "How much time - either in your home or elsewhere – does (child name) spend watching television on a typical weekday?" and "How much time – either in your home or elsewhere – does (child name) spend watching television on a typical weekend day (Saturday and Sunday)?" respectively. Children were given six different answer choices in both cases: less than 1 hour, 1-4 hours, 5-9 hours, 10-14 hours, 15-19 hours, and more than 20 hours respectively. Due to the small sample size for the last three categories, the researcher collapsed the three latter answer choices and created a new answer choice reflecting those respondents who indicated they spend more than 10 hours per day and per weekend day. A dummy variable was created in which those children who watch less than one hour were categorized as the reference group. Each other category of TV-watching – 1-4 hours, 5-9 hours, and more than 10 hours – was then compared separately with the reference category. Therefore, the reference category was coded as '0' and each above mentioned categories of children watching TV were coded as '1' separately. The researcher then examined how the television watching behavior corresponds to the increasing obesity rates of children between the ages of 10 and 14.

Similarly, to analyze the time spent on playing computer games, the researcher included the question which asked the children “How often do you use computer to play games?” They were then able to choose any of the four given answer choices: ‘Never’, ‘Less than once a week’, ‘About once a week’, ‘Several times a week’, ‘Every day or almost every day’. A dummy variable was, thus, created in which those children who ‘never’ use computer to play games was considered as a reference category and was compared separately with other categories such as use of the computer to play games ‘about once a week’, ‘several times a week’ and ‘everyday or almost every day’.

The analysis of the time spent on homework by children and adolescents was accomplished using the question which asked “What do you like to do after school?” However, there was another question on homework in the data set which asked “Which of these is closer to the amount of time you usually spend on homework outside of school each week?” They were given four answer choices: 1-4 hours, 5-9 hours, 10-14 hours, and 20 or more hours respectively. The researcher, however, did not use this question to analyze the homework variable because the number of children who answered this question was not sufficient for the final analysis.

Associated Health Conditions

Research suggests that obesity is one of the major causes of health problems in children and adolescents. Although the literature reviewed suggests various kind of health disparities related to obesity among children, the third model of this thesis focused only on the likelihood of being overweight or obese of children and adolescents who have asthma. Since the NLSY-CA dataset do not have a relevant data that describes the

number of children affected by asthma, this thesis used the data that describes the number of children affected by asthma symptoms. A new variable called Asthma_symp is created which is the combination of all the symptoms that a child indicated they had in the month prior to the survey. Children and adolescents were asked: “In the past month how often did you feel any of these things, without a cold or flu?” They were given five answer categories: cough, wheezing, shortness of breath, tightness in your chest, and extra phlegm. A dummy variable was, thus, created which considered those children who mentioned any of the above asthma symptoms as ‘1’ and those who indicated that they do not have any of the above mentioned asthma symptoms as ‘0’.

Breastfeeding is considered as one of the important predictors for preventing obesity among children. Therefore, the second health-related variable examined the likelihood of being overweight or obese of children and adolescents who have been breastfed. Mothers of children were asked a question: Child breastfed? They were then able to answer “Yes” and “No” depending upon whether the child was breastfed or not. A dummy variable was, thus, created which considered those children who indicated they have been breast-fed as ‘1’ and those who indicated that they have not been breast-fed as ‘0’.

Table 2. Variables Used in the Analysis of Overweight and Obesity

DEPENDENT VARIABLE	
Body Mass Index (BMI)	
Overweight and Obesity among Children between the Ages of 10 and 14	<p>BMI is calculated by taking the question, “Child’s weight in pounds” and dividing it by the answer to the question, “Child’s height in inches” squared and then multiplying that product by 703.</p> <p>A recoded variable called ‘Obese’ is created: children whose BMI are less than 85th percentile is coded as ‘0’ and BMI at 85th percentile and at or above 95th percentile is coded as ‘1’.</p>
INDEPENDENT VARIABLES	
Demographic Variables	
Race of Child	<p>A dummy variable representing the race of the children: For Hispanic populations: those who are Non-Hispanic, Non Black = 0, those who are Hispanic = 1, For Black populations: those who are Non-Hispanic, Non Black = 0 and those who are Black = 1.</p>
Sex of Child	<p>A dummy variable representing children’s gender: those who are Female = 0, those who are Male = 1.</p>
Maternal Education (What is the highest grade completed by mother?)	<p>A dummy variable representing the education level of the children’s mother: Those who completed less than high school = 0, those who completed high school graduate = 1; Those who completed less than high school = 0, those who completed some college = 1; Those who completed less than high school = 0, those who completed college and higher = 1.</p>

Table 2. Variables Used in the Analysis of Overweight and Obesity (Continued)

INDEPENDENT VARIABLE	
Activity: Physical Activities Vs. Sedentary Activities	
<p>How much time – either in your home or elsewhere – do you spend watching television on a typical weekday?</p>	<p>A dummy variable representing children’s television watching per day: those who watch less than 1 hour = 0, those who watch 1-4 hours = 1; those who watch less than 1 hour = 0, those who watch 5-9 hours = 1; those who watch less than 1 hour = 0, those who watch 10-14 hours = 1; those who watch less than 1 hour = 0, and those who watch more than 15 hours = 1.</p>
<p>How much time – either in your home or elsewhere – do you spend watching television on a typical weekend day?</p>	<p>A dummy variable representing children’s television watching per weekend day: those who watch less than 1 hour = 0, those who watch 1-4 hours = 1; those who watch less than 1 hour = 0, those who watch 5-9 hours = 1; those who watch less than 1 hour = 0, and those who watch 10-14 hours = 1; those who watch less than 1 hour = 0, and those who watch more than 15 hours = 1.</p>
<p>How often do you use the computer to play games?</p>	<p>A dummy variable representing children’s computer use to play games: those who ‘never’ use computer to play games = 0, those who use computer ‘less than once a week’ to play games = 1; those who never use computer to play games = 0, those who use computer ‘about once a week’ to play games = 1; those who never use computer to play games = 0, those who use computer ‘several times a week’ to play games = 1; those who never use computer to play games = 0, and those who use computer ‘everyday or almost every day’ to play games = 1.</p>

Table 2. Variables Used in the Analysis of Obesity (Continued)

INDEPENDENT VARIABLE	
Activity: Physical Activities Vs. Sedentary Activities	
<p>What do you like to do after school? Children who answered “do homework”.</p>	<p>A dummy variable representing child’s preference for doing homework after school: those who did not indicate that they preferred to do homework after school = 0, those who indicated that they prefer to do homework after school = 1.</p>
<p>What do you like to do after school? Children who answered “reading”.</p>	<p>A dummy variable representing child’s preference for reading after school: those who did not indicate that they preferred to read after school = 0, those who indicated that they prefer to read after school = 1.</p>
<p>What do you like to do after school? Children who answered “listen to music”.</p>	<p>A dummy variable representing child’s preference for listening to music after school: those who did not indicate that they preferred to listen to music after school = 0, those who indicated that they prefer to listen to music after school = 1.</p>
<p>What do you like to do after school? Children who answered “playing outside”.</p>	<p>A dummy variable representing child’s preference for playing outside: those who did not indicate that they preferred to play outside after school = 0 and those who indicated that they prefer to play outside after school = 1.</p>
INDEPENDENT VARIABLES	
Associated Health Condition	
<p>In the past month how often did you feel any of these things without a cold or flu? (cough, wheezing, short of breath, chest tight and extra phlegm)</p>	<p>A new variable called Asthma_symp was created which combined all the symptoms of asthma. So $Asthma_symp = Cough + Wheezing + Short\ of\ Breath + Chest\ tight + Extra\ Phlegm$ A dummy variable representing asthma symptoms: those who have any kind of asthma symptoms = 1, those who do not have any kind of asthma symptoms = 0.</p>
<p>Child breastfed?</p>	<p>A dummy variable representing whether child was breastfed: those who have been breastfed =1, those who indicated they were not breastfed = 0</p>

Statistical Analyses

Statistical estimates in this study were computed using Statistical Package for the Social Sciences (SPSS) version 14.0. With SPSS, the researcher, at first, generated frequencies for each of the variables mentioned above in Table 2. Secondly, the researcher used cross-tabulations to explore how obesity among children between the ages of 10 and 14 differs by demographic factors: race, age, gender, maternal education; physical activities and sedentary activities; and the associated health conditions. Finally, a binary logistic regression was then used to test how well the predictor variables (independent variables) predicted or explained overweight or obesity among children and adolescents between the ages of 10 and 14. Logistic regression not only tests models to predict categorical outcomes (e.g. win/lose; fail/pass; obese/not obese, yes/no) with two or more categories but also measures continuous variables in which a high value indicates the higher likelihood of a particular variable of interest (Tabachnik & Fidell, 2001; Vittinghoff, Glidden, Shiboski & McCulloch, 2005; Pallant, 2005). In logistic regression, the value that is being predicted represents a probability, which helps to determine the likelihood of the effect of each predictor (George & Mallery, 2006). Thus, logistic regression emphasizes the odds ratio for each predictor in the model (Tabachnik & Fidell, 2001). The researcher therefore created three models to use logistic regression to better estimate the effect of the predictors of childhood obesity.

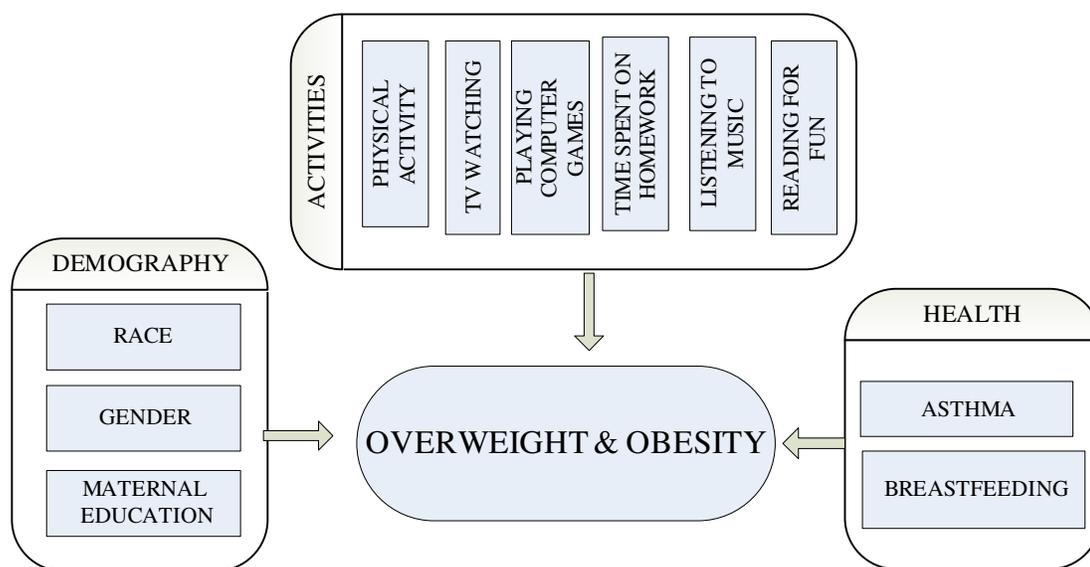


Figure 1. Models for Analysis of Childhood Overweight and Obesity

Research Hypotheses

As mentioned in the introduction to this thesis, numerous studies indicate that being overweight or obese of children and adolescents are a matter of serious concern in the United States and worldwide. Researchers have argued that a number of social variables are contributing factors to the prevalence of this disease among children and adolescents. Among such variables, some seemed more prominent based on the number of resources that discussed them or included them in their data related to overweight and obesity. The following section will discuss the research hypotheses that were used for the study, based on the literature review.

Socio-demographic characteristics

The literature has suggested that a variety of socio-demographic characteristics influence the likelihood of overweight or obesity among children and adolescents. The researcher, however, looked at only three of those socio-demographic characteristics: race, gender and maternal education, thus excluding all other, perhaps important, socio-demographic groups. Based on the literature reviewed, the researcher hypothesized the following research questions in the first model to examine the odds of being overweight or obese of children and adolescents.

Hypothesis 1: The likelihood of being overweight and obese is related to socio-demographic characteristics like race, gender, and maternal education.

Hypothesis 1a: The odds of being overweight and obese are greater for Non-Hispanic black children than for Non-Hispanic white children.

Hypothesis 1b: The odds of being overweight and obese are greater for Hispanic children than for Non-Hispanic white children.

Hypothesis 1c: The odds of being overweight and obese are greater for female children than for male children.

Hypothesis 1d: The odds of being overweight and obese are greater for children whose mothers have less than a high school education than for those children whose mothers completed college graduate or higher levels of education.

Activities that Influence Overweight or Obesity

As described in the literature review, the obesity epidemic among children and adolescents is due to lower levels of engagement in certain physical activities and higher levels of participation in sedentary behaviors. It is believed that it is not only the hours spent on watching television and playing computer games but also hours spent on homework, and listening to music and reading for fun which displaces physical activities of children and adolescents. Based on the literature reviewed, the researcher, therefore, proposed the following research questions in the second model.

Hypothesis 2: The likelihood of being overweight and obese is related to children's participation in or preference for certain activities at school and home.

Hypothesis 2a: The odds of being overweight and obese are greater for children and adolescents who watch television more than 1 hour per day and per weekend day compared to those who watch less than an hour of television per day and per weekend day (after controlling for socio-demographic variables).

Hypothesis 2b: The odds of being overweight and obese are greater for children and adolescents who indicate that they use the computer to play games at least everyday compared with those who indicate that they never use the computer to play games.

Hypothesis 2c: The odds of being overweight and obese are greater for children and adolescents who indicate a preference for doing homework than for those who do not indicate such a preference for spending their free time after school.

Hypothesis 2d: The odds of being overweight and obese are greater among children and adolescents who indicate a preference for listening to music and reading than those who do not indicate such a preference for spending their free time after school.

Hypothesis 2e: The odds of being overweight and obese are lower among children and adolescents who indicate a preference for playing outside compared to those who do not indicate such a preference for spending their free time after school.

Associated Health Conditions

Obesity is also believed to be associated with various health disparities among children and adolescents, as described earlier. Studies have indicated that asthma, cardiovascular diseases, type 2 diabetes, cancers, hypertension, gastrointestinal diseases, and arthritis are the major medical problems that are related to overweight and obesity (Speiser et al., 2005; WHO, 1997; Freedman & Stern, 2004). Based on the literature reviewed, the researcher hypothesized the following research questions for the third logistic regression model. Through the following research hypotheses, the researcher examined the likelihood of being overweight or obese of children and adolescents who

have asthma related symptoms and the likelihood of being overweight or obese who indicated they were breastfed.

Hypothesis 3: The likelihood of being overweight and obese is related to certain health conditions.

Hypothesis 3a: The odds of being overweight and obese are greater for children and adolescents who have asthma symptoms than for those who do not have asthma symptoms.

Hypothesis 3b: The odds of being overweight and obese are lower among children and adolescents who indicated they had been breastfed compared to those who indicated they were not breastfed.

RESULTS

The main purpose of this thesis, as mentioned earlier, is to better understand the possible social influences, such as influence by socio-demographic factors, preferred activities of children and adolescents and associated health conditions, laid on the prevalence of overweight or obesity among children and adolescents. In order to achieve the above mentioned purpose, the researcher first conducted a univariate analysis, providing frequencies for each variable. Then a bivariate analysis was done, using cross-tabulation between obesity and the variables of interest. Finally, the researcher conducted a multivariate analysis using logistic regression to examine the likelihood of the overweight or obesity explained by each of the independent variables. The results of these analyses are discussed below.

Descriptive Characteristics of Sample

The total sample size for this thesis was 1,359. This represents the number of respondents who were between the ages of 10 and 14, and who were interviewed in 2004. The descriptive characteristics for this sample are presented in Table 3. Of these individuals, only 891 responded to all the obesity-related questions included in this study. Thus, the sample size for logistic regression was only 891.

As indicated in Table 3, the data suggests that 44.1% of children between the ages of 10 and 14 were overweight or obese whereas 55.9% of the children were not overweight or obese. The sample was composed of 19.6% Hispanic children, 26% Non-

Hispanic blacks and 54.4% Non-Hispanic white children. There were 50.6% male children and 49.4% female children in the sample group. The data indicated that 14.3% of children had mothers who had less than a high school education, 31.4% of children had mothers who completed high school education, 26.8% of the children had mothers who completed some college and 27.5% of the children had mothers who attained a college degree or higher.

Children's preferences for certain leisure activities are considered important predictors for overweight or obesity. As indicated in Table 3, approximately 4.6% of children indicated that they watch television less than an hour per week day, 81.3% of the sample indicated that they watch television 1-4 hours per week days, and just 3.1% of children indicated that they watch television for 10 or more hours per weekday. Approximately, 4.3% of children indicated that they watch television less than an hour per weekend days, and 71.7% of children indicated that they watch television 1-4 hours per weekend days. Only 2.8% of children indicated that they watch television for 10 or more hours per weekend day.

Approximately 13.3% of children indicated that they never play computer games, whereas 21.3% of children indicated that they use the computer to play games everyday or almost everyday. The highest proportion of respondents (28.2%) indicated that they did so several times a week. Similarly, only 42.2% of children indicated that they prefer doing homework after school, and about 57.8% of children did not indicate that they prefer doing homework after school. The data also suggests that about 45.8% of children indicated that they prefer listening to music after school, and about 54.2% of children did not indicate such a preference. About 28.5% of children indicated that they prefer

reading after school whereas 71.5% did not indicate that they prefer reading after school. Similarly, about 66.6% of children indicated that they prefer playing outside, whereas only 33.4% of children did not indicate such a preference.

While considering the associated health conditions, the data suggests that about 44.3% of children indicated that they have one or more asthma symptoms, and about 55.7% of children indicated that they do not have any asthma symptoms. About 56% of children indicated that they had been breastfed, and 44% of children indicated that they were not breastfed.

Table 3. Frequencies of Dependent and Independent Variables

Variables	Total Percentage (%)	Total Number (n)
DEPENDENT VARIABLES		
	100.0 %	1,359
Overweight or Obese	44.1%	599
Non-overweight or obese	55.9 %	760
INDEPENDENT VARIABLES		
Race	100.0 %	1,359
Hispanic	19.6 %	267
Non-Hispanic Black	26.0 %	354
Non-Hispanic White	54.4 %	738
Gender	100.0 %	1,359
Male	50.6 %	688
Female	49.4 %	671
Maternal Education	100.0 %	1,355
Less than high school	14.3 %	194
High School Graduate	31.4 %	425
Some College	26.8 %	363
College graduate and higher	27.5 %	373
Television watching per weekday	100.0 %	1,336
Less than 1 hour	4.6 %	61
1-4 hours	81.3 %	1,086
5-9 hours	11.0 %	147
More than 10 hours	3.1%	42
Television watching per weekend day	100.0 %	1,339
Less than 1 hour	4.3 %	57
1-4 hours	71.7 %	960
5-9 hours	21.3 %	285
More than 10 hours	2.8 %	37

Table 3. Frequencies of Dependent and Independent Variables (Continued)

Independent Variables	Total Percentage (%)	Total Number (n)
Play computer games	100.0 %	1,137
Never	13.3 %	151
Less than once a week	17.9 %	204
About once a week	19.3 %	219
Several times a week	28.2 %	321
Every day or almost every day	21.3 %	242
Prefer to do homework	100.0 %	1,286
Yes	42.2 %	543
No	57.8 %	743
Prefer to listen to music	100.0 %	1,286
Yes	45.8 %	589
No	54.2 %	697
Prefer to read	100.0 %	1,286
Yes	28.5 %	366
No	71.5 %	920
Prefer to play outside	100.0 %	1,286
Yes	66.6 %	857
No	33.4 %	429
Asthma symptoms	100.0 %	1,281
Yes	44.3 %	568
No	55.7 %	713
Breastfed	100.0 %	1,120
Yes	56.0 %	627
No	44.0 %	493

Bivariate Relationships between Dependent and Independent Variables

Bivariate analyses, in the form of cross-tabulations, were conducted to determine if there was a relationship between the dependent variable (being overweight or obese) and some key independent variables. The result of the bivariate analyses indicated a statistically significant relationship between race and obesity ($\chi^2 = 46.636$, $p < 0.001$) (Table 4). Non-Hispanic black children between the ages of 10 and 14 were more likely than Hispanic and Non-Hispanic whites to be overweight or obese. Approximately 58.2% of Non-Hispanic blacks and 46.4% of Hispanics were overweight or obese as compared to just 36.4% of Non-Hispanic whites. However, the data suggests no statistically significant gender difference in the prevalence of obesity or overweight. Male children were equally likely as female children to be overweight or obese ($\chi^2 = 0.717$, $p > 0.05$). Approximately 42.9% of males were overweight or obese as compared to 45.3% of female children and adolescents.

The data indicated a statistically significant relationship between maternal education and overweight or obesity ($\chi^2 = 0.717$, $p < 0.01$). Approximately 47% of children whose mothers attended high school education, 46% of children whose mothers completed some college, and approximately 36% of children whose mothers attended a college graduate or higher were overweight or obese as compared to 50% of children whose mothers had less than high school education. As indicated in Table 4, the results, therefore, suggest that the prevalence of obesity or overweight decreased with increasing levels of maternal education.

Table 4. Cross-tabulation: Demographic Variables and Overweight or Obesity

Variables	Overweight /Obese (%)	Non- Overweight/ Non-Obese (%)	Total Number (n)	Chi- square (χ^2)	P-Value
Race				46.636	0.000***
Non-Hispanic White	36.4 %	63.6 %	738		
Non-Hispanic Black	58.2 %	41.8 %	354		
Hispanic	46.4 %	53.6 %	267		
			1359		
Gender				0.717	0.397
Male	42.9 %	57.1%	688		
Female	45.3 %	54.7%	671		
			1359		
Maternal Education				14.667	0.002**
Less than High School	50.0 %	50.0%	194		
High School Graduate	46.8 %	53.2 %	425		
Some College	46.0 %	54.0 %	363		
College Graduate and Higher	35.9 %	64.1 %	373		
			1355		

* $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$.

The data indicated a statistically significant relationship between some activity variables and overweight or obesity (Table 5). The result suggests that approximately 43% of children who indicated that they watch television 1-4 hours per weekdays, 53.1% of children who indicated that they watch television 5-9 hours per weekdays, and approximately 55% of children who indicated that they watch television more than 10 hours per weekdays were overweight or obese as compared to only 39.3% of children who indicated that they watch television less than 1 hour per week day. Similarly, 41.6% of children who indicated that they watch television 1-4 hours per weekend days, 53% of

children who indicated that they watch television 5-9 hours per weekend days, and 51.4% of children who indicated that they watch television more than 10 hours per weekend days were overweight or obese as compared to only 40.4% of children who indicated that they watch television less than 1 hour per weekend days. Moreover, the result indicates that there was a significant relationship between television watching both per week days ($\chi^2 = 17.894$, $p = 0.048$) and per weekend days ($\chi^2 = 12.729$, $p = 0.005$), and the prevalence of overweight or obesity among children between ages 10 and 14. Therefore, it suggests that children who watch television more than an hour both per weekdays and per weekend days are more likely to be overweight or obese as compared to those children who watch television less than an hour.

However, there was not a statistically significant relationship between time spent on playing computer games, children's preference for spending their free time reading, and children's preference for spending their free time doing homework, and overweight or obesity. However, there was a barely significant relationship between children's preference for spending their free time listening to music and overweight or obesity ($\chi^2 = 3.725$, $p = 0.054$) although there was not much difference between the proportion of the sample who were overweight or obese and who reported that they prefer listening to music (47.7%), and those children who were overweight or obese and who do not prefer listening to music (42.2%). The data suggest a statistically significant relationship between children's preference for playing outside, and overweight or obesity ($\chi^2 = 9.334$, $p = 0.002$). About 41.7% of children who indicated a preference for playing outside were overweight or obese, compared to 50.8% of overweight or obese children who indicated that they do not prefer playing outside.

Table 5. Cross-tabulation: Activities and Overweight or Obesity

Variables	Overweight /Obese (%)	Non- Overweight/ Non-Obese (%)	Total Number (n)	Chi- square (χ^2)	P-Value
<hr/>					
Television Watching Per Week day				7.894	0.048*
Less than 1 hour	39.3 %	60.7 %	61		
1-4 hours	42.9 %	57.1 %	1086		
5-9 hours	53.1 %	46.9 %	147		
More than 10 hours	54.8 %	45.2 %	42		
			<hr/> 1336		
Television Watching Per Weekend Day				12.729	0.005**
Less than 1 hour	40.4 %	59.6 %	57		
1-4 hours	41.6 %	58.4 %	960		
5-9 hours	53.0 %	47.0 %	285		
More than 10 hours	51.4 %	48.6 %	37		
			<hr/> 1339		
Playing Computer Games				3.254	0.516
Never	41.7 %	58.3 %	151		
Less than once a week	40.7 %	59.3 %	204		
About once a week	44.7 %	55.3 %	219		
Several times a week	47.7 %	52.3 %	321		
Everyday or almost everyday	46.3 %	53.7 %	242		
			<hr/> 1137		
Homework				1.769	0.184
Yes	47.0 %	53.0 %	543		
No	43.1 %	56.9 %	743		
			<hr/> 1286		
Listen to Music				3.725	0.054*
Yes	47.7 %	52.3 %	589		
No	42.2 %	57.8 %	697		
			<hr/> 1286		
Read for Fun				3.092	0.079
Yes	40.7 %	59.3 %	366		
No	46.3 %	53.7 %	920		
			<hr/> 1286		

* $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$.

Table 5. Cross-tabulation: Activities and Overweight or Obesity (Contd.)

Variables	Overweight/ Obese (%)	Non- Overweight/ Non-Obese (%)	Total Number(n)	Chi-square (χ^2)	P-Value
Play Outside					
Yes	41.7 %	58.3 %	857	9.334	0.002**
No	50.8 %	49.2 %	429		
			1286		

* $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$.

For the health-related variables (Table 6), the data indicated an insignificant relationship between asthma symptoms and the prevalence of obesity or overweight among children between the ages of 10 and 14. However, there was a statistically significant relationship between breastfeeding and the prevalence of obesity or overweight ($\chi^2 = 11.288$, $p=0.001$). Nearly 40% of overweight or obese children said they had been breastfed, compared to 50.1% of overweight or obese children who indicated they were not breastfed.

Table 6. Cross-tabulation: Health Conditions and Overweight or Obesity

Variables	Overweight/ Obese (%)	Non- Overweight/ Non-Obese (%)	Total Number (n)	Chi-square (χ^2)	P-Value
Asthma Symptoms				0.264	0.608
Yes	45.1 %	54.9 %	568		
No	43.5 %	56.5 %	713		
			1281		
Child Breastfed					
Yes	39.9 %	60.1 %	627	11.288	0.001***
No	50.1 %	49.9 %	493		
			1120		

* $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$.

In summary, the bivariate analyses indicated that there were statistically significant relationships between overweight or obesity and television watching (both per weekdays and weekend days), children's preference for listening to music, children's preference for playing outside and having been breastfed. Since the main purpose of this thesis is to determine the likelihood of the prevalence of overweight or obesity among children between ages of 10 and 14, based on socio-demographic groups of race, gender, and maternal education; preference for the activities that children participate in after school; and the associated health conditions of asthma symptoms and breastfeeding, merely cross-tabulations of the data was not sufficient. In order to fulfill the above mentioned objective of the study, a multivariate analysis was conducted using logistic regression to test the research hypotheses.

Logistic Regression and Test of Hypothesis

The following section explores the influence of the independent variables: socio-demographic variables such as race, gender and maternal education; activities of children and adolescents such as television watching, playing computer games, preference for doing homework, preference for listening to music, preference for reading, and preference for playing outside; and the associated health condition such as asthma symptoms and breastfeeding, on the prevalence of overweight or obesity among children of the ages between 10 and 14. Logistic regression was used to determine the influence of each independent variable on the dichotomous dependent variable (i.e. the likelihood of being overweight or obese). This section of the results will discuss each research hypothesis separately. The results of the logistic regression are presented in Table 7 on pages 68-70.

It is also important to note that the sample size of the study during bivariate analysis was 1,359. However, it decreased to 891 during multivariate analysis. Therefore, the number and characteristics of respondents who were excluded from the sample and the number and characteristics of respondents who remained in the sample might have also influenced the result of the study.

Hypothesis 1: The likelihood of being overweight and obese is related to socio-demographic characteristics like race, gender, and maternal education.

The first model presented in Table 7 explored the influences of socio-demographic variables such as race, gender and maternal education on the likelihood of being overweight or obese of children and adolescents between ages 10 and 14. In order

to be more specific, the researcher developed sub-hypotheses for each of these socio-demographic variables, the results of which are described as below.

The results presented in Table 7 indicated that the odds of being overweight or obese were 2.39 times as large for Non-Hispanic black children as they are for Non-Hispanic white children (odds ratio = 2.392, $p < 0.001$). Similarly, the odds of being overweight or obese were 1.6 times as large for Hispanic children as they were for Non-Hispanic white children (odds ratio = 1.618, $p \leq 0.01$). Based on this analysis, the current study strongly supports the hypotheses (hypothesis 1a and 1b) that *the odds of being overweight and obese are greater for Non-Hispanic black children compared to Non-Hispanic white children, and the odds of being overweight and obese are greater for Hispanic children compared to Non-Hispanic white children.*

The results regarding gender indicated that the odds of being overweight or obese were 18.1% lower for male children than they were for female children. However, this was not a statistically significant relationship. Thus, the hypothesis (hypothesis 1c) that *the odds of being overweight and obese are greater for female children compared to male children* is rejected.

As depicted in Table 7, children whose mothers had less than high school education were more likely to be overweight or obese, compared to those children whose mothers completed a college graduate or higher level of education. The odds of being overweight or obese were 38.6% lower for children whose mother was a college graduate or higher (odds ratio = 0.614, $p \leq 0.05$), than they were for children whose mothers had less than a high school education. Based on this result, the current study supports the hypothesis (hypothesis 1d) that *the odds of being overweight and obese are greater for*

children having mothers with less than high school education compared to those children having mothers with a college graduate or higher levels of education. However, it should be noted that the relationship between the odds of being overweight or obese and those children whose mothers completed high school graduate and some college was not statistically significant.

As indicated in Table 7, the R^2 of Model 1 suggests that 6.7% of the variability in the odds of being overweight or obese was explained by the set of variables included in Model 1. It also suggests that chi-square of the Model 1 was statistically significant and therefore, the set of predictors included in Model 1 was reliable for predicting the odds of being overweight or obese among adolescents and children.

Hypothesis 2: The likelihood of being overweight and obese is related to children's participation or preferences for certain activities.

The second model explored the influences of the preference for certain activities of children between the ages of 10 and 14 on the odds of being overweight or obese. The researcher again developed sub-hypotheses to analyze specific activities such as television watching, playing computer games, preference for doing homework, preference for listening to music, preference for reading and preference for playing outside.

As indicated in Table 7, the data suggested that the odds of being overweight or obese were higher for children and adolescents who watch television more than an hour, as they were for children who watch television less than an hour, both per week days and per weekend days. Although the relationship between watching television both per

weekdays and weekend days, and the prevalence of overweight or obesity, after controlling for socio-demographic characteristics, was positive, the relationship was not statistically significant. Based on this result, the current study rejects the hypothesis (hypothesis 2a) that *the odds of being overweight and obese are greater for children and adolescents who watch television more hours per week days and per weekend days, compared to those who watch less than an hour of television per weekday and per weekend day.*

The data indicated that the odds of being overweight or obese were higher for those children who played computer games than for those children who never played computer games. Although the relationship between playing computer games and the prevalence of being overweight or obese among children and adolescents was positive and in the expected direction, it was not statistically significant. Based on this result, the hypothesis (hypothesis 2b) is rejected which states that *the odds of being overweight and obese are greater for children and adolescents who indicate the use of computer to play games, compared to those who indicate that they never use the computer to play games.*

Similarly, the data indicated that the odds of being overweight or obese for children who prefer doing homework were approximately 1.16 times higher than those children who indicated that they do not prefer doing homework during their free time. Thus, the result was in the expected direction. However, the relationship was not statistically significant. Based on this result, the hypothesis (hypothesis 2c) that *the odds of being overweight and obese are greater for children and adolescents who spend their free time doing homework than those who do not spend their time doing homework* is rejected.

Interestingly, the data indicated that the odds of being overweight or obese for children who prefer listening to music were 1.43 times higher than those children who indicated that they do not prefer listening to music during their free time (odds ratio = 1.428, $p=0.017$). Moreover, the relationship was statistically significant. Therefore, the current study supports the hypothesis (hypothesis 2d) that *the odds of being overweight and obese are greater among children and adolescents who spend their free time listening to music than those who do not indicate such a preference.*

The data, however, suggested that the odds of being overweight or obese were 23.2% lower for children who prefer reading than those who indicated that they do not prefer reading during their free time. Although the relationship between children's preference for reading and the likelihood of being overweight or obese was negative, the relationship was not statistically significant. Therefore, the current study rejects the hypothesis that *the odds of being overweight and obese are greater among children and adolescents who prefer to spend their time reading, compared to those who do not indicate such a preference.*

There was a statistically significant inverse relationship between the preference for playing outside and the likelihood of being overweight or obese among children and adolescents (odds ratio = 0.681, $p=0.014$). As indicated in Table 7, the data indicated that the odds of being overweight or obese were nearly 32% lower for children who preferred to play outside after school than for those children who did not indicate such a preference. Based on this result, the current study supports the hypothesis (hypothesis 2e) that *the odds of being overweight and obese are lower among children and*

adolescents who indicate the preference for playing outside, compared to those who do not indicate such a preference.

As indicated in Table 7, Model 2 indicated that the addition of the activities variables slightly mediated the relationship between socio-demographic variables and the likelihood of overweight or obesity. The odds of being overweight or obese for Non-Hispanic black children slightly decreased from 2.392 to 2.386 times with the addition of the activity variables. There was also a slight decrease in the odds of being overweight or obese for Hispanic children between Model 1 and Model 2. Although the addition of activity variables did not change the significance level of the relationship between gender and the prevalence of overweight or obesity, there was a slight increase in the odds of being overweight or obese for male children in Model 2.

However, the addition of the activity variables resulted in a negative impact on the significance level of the relationship between maternal education and prevalence of being overweight or obese among children and adolescents. Although the data indicated that the odds of being overweight or obese for children whose mothers completed a college graduate or higher were 38.2% lower than for those children whose mothers had less than high school education, the relationship was no longer statistically significant in Model 2 (odds ratio = 0.618, $p = 0.58$). In other words, the addition of activity variables signified that the maternal education variable was no longer a significant predictor for the likelihood of being overweight or obese of children and adolescents. Thus, it suggests that children's preferences for certain activities might be a more important determinant of overweight and obesity than the educational levels of their mothers.

The R^2 of Model 2 suggest that 9.8% of the variability in the odds of being overweight or obese was explained by the set of variables included in Model 2 as compared to 6.7% in Model 1. This represents about a 46.2% increase in the explanation of the variability when the activity variables were added. But still the overall variability in the dependent variable explained in Model 2 was low. However, the decrease in the value of -2 log likelihood from Model 1 to Model 2 (1177.715 to 1155.811) suggested an improvement in goodness of fit in Model 2.

Hypothesis 3: The likelihood of being overweight and obese is related to certain health conditions.

The third model in Table 7 explored the likelihood of being overweight or obese of children and adolescents who have asthma symptoms and who indicated that they were breastfed.

The data indicated that the odds of being overweight or obese were 1.08 times higher for children and adolescents who indicated one or more asthma symptoms than for those children who did not have any asthma symptoms. The relationship was in the expected direction. However, the relationship between asthma symptoms and the odds of being overweight or obese was not statistically significant. Based on this result, the current study rejects the hypothesis (hypothesis 3a) that *the odds of being overweight and obese are greater for children and adolescents who have asthma symptoms than for those children who do not have asthma symptoms.*

The data also indicated that the odds of being overweight or obese were 13.2% lower for children who had been breastfed than for those children who indicated that they

were not breastfed. Surprisingly, the relationship between breastfeeding and the odds of being overweight or obese was not statistically significant although it was in the expected direction. Thus, the strong association between breastfeeding and overweight or obesity that showed up in the bivariate analysis was not supported in the multivariate analyses. Based on this result, the current study rejects the hypothesis (hypothesis 3b) that *the odds of being overweight and obese are lower among children and adolescents who have been breastfed compared to those who indicated they were not breastfed.*

Model 3, as indicated in Table 7, also suggested that the addition of associated health conditions variables mediated the relationships between the likelihood of being overweight or obese and socio-demographic variables, and the likelihood of being overweight or obese and activities variables. The odds of being overweight or obese for Non-Hispanic black children decreased (from 2.385 to 2.262) from Model 2 to Model 3, with the addition of health conditions variables. However, there was not much change in the odds of being overweight or obese for Hispanic children between Model 2 and Model 3 (from 1.616 in Model 2 to 1.611 in Model 3).

Although the addition of health conditions variables resulted in an increase in the odds of being overweight or obese for those children whose mothers completed a college graduate or higher, the relationship between maternal education and the likelihood of being overweight or obese was not significant. In other words, the addition of health conditions variables did not improve the significance level of the maternal education variable, and thus, maternal education was no longer a good predictor for the likelihood of being overweight or obese of children and adolescents, as how it was in the case with Model 2.

The data also indicated that the odds of being overweight or obese for children's preference for listening to music decreased slightly with the addition of the health condition variables (from 1.428 in Model 2 to 1.415 in Model 3). However, children's preference for listening to music still remained significant in Model 3. A similar trend was found in the relationship between children's preference for playing outside and the likelihood of being overweight or obese. Although there was not a difference in the significance level of the relationship between children's preference for playing outside and the likelihood of being overweight or obese in Model 3, there was a slight decrease in the odds of being overweight or obese among children who prefer to play outside from 0.681 in Model 2 to 0.676 in Model 3.

The R^2 of Model 3 suggest that 9.9% of the variability in the odds of being overweight or obese was explained by the set of variables included in Model 3, a very slight increase from Model 2. However, the decrease in the value of -2 log likelihood in Model 3 (1154.748), compared to Model 2 (1155.811) suggested that there was a slight improvement in goodness of fit in Model 3 after adding the health conditions variables. Overall, the addition of the health variables did not add significantly to the explanation of the prevalence of overweight or obesity among children between ages of 10 and 14. Thus, it suggests that the likelihood of being overweight or obesity among children and adolescents is not as much influenced by their health conditions, as it was by socio-demographic characteristics.

Table 7. Logistic Regression: The Likelihood of Overweight or Obesity (Model 1-3)

Independent Variable	Model 1 “Demographic” (standard error) (sample size = 891)	Model 2 “Activities” (standard error) (sample size= 891)	Model 3 “Health” (standard error) (sample size = 891)
Race (Reference =Non-Hispanic White)			
Hispanic	1.618** (0.188)	1.616** (0.194)	1.611** (0.194)
Non-Hispanic Black	2.392*** (0.171)	2.386*** (0.182)	2.262*** (0.190)
Gender (Reference = Female)			
	0.819 (0.139)	0.827 (0.150)	0.822 (0.150)
Maternal Education (Reference =Less than high school education)			
High School Graduate	0.937 (0.232)	0.916 (0.237)	0.921 (0.237)
Some College	0.961 (0.238)	0.963 (0.243)	0.998 (0.246)
College graduate and higher	0.614* (0.246)	0.618 (0.253)	0.648 (0.259)
Television watching per weekdays (Reference = Less than 1 hour)			
1-4 hours		1.097 (0.369)	1.069 (0.370)
5-9 hours		1.140 (0.423)	1.113 (0.424)
More than 10 hours		1.604 (0.520)	1.575 (0.521)

Table 7. Logistic Regression: The Likelihood of Obesity Rates (Model 1-3) (Contd.)

Independent Variable	Model 1 “Demographic” (standard error) (sample size = 891)	Model 2 “Activities” (standard error) (sample size = 891)	Model 3 “Health” (standard error) (sample size = 891)
Television watching per weekend day (Reference = Less than 1 hour)			
1-4 hours		1.992 (0.374)	1.991 (0.375)
5-9 hours		1.939 (0.395)	1.914 (0.397)
More than 10 hours		1.286 (0.560)	1.287 (0.562)
Play Computer Games (Reference = Never)			
Less than once a week		1.147 (0.255)	1.148 (0.255)
About once a week		1.355 (0.254)	1.354 (0.255)
Several times a week		1.386 (0.236)	1.394 (0.236)
Every day or almost every day		1.401 (0.249)	1.401 (0.249)
Prefer to do homework (Reference = do not prefer to do homework)		1.156 (0.148)	1.159 (0.148)
Prefer to listen to music (Reference = do not prefer to listen to music)		1.428* (0.149)	1.415* (0.150)
Prefer to read (Reference = do not prefer to read)		0.768 (0.169)	0.780 (0.170)
Prefer to play outside (Reference = do not prefer to play outside)		0.681** (0.156)	0.676** (0.156)

Table 7. Logistic Regression: The Likelihood of Obesity Rates (Model 1-3) (Contd.)

Independent Variable	Model 1 “Demographic” (standard error) (sample size = 891)	Model 2 “Activities” (standard error) (sample size = 891)	Model 3 “Health” (standard error) (sample size = 891)
Asthma symptoms (Reference = No asthma symptoms)			1.080 (0.144)
Breastfed (Reference = not breastfed)			0.868 (0.157)
Constant	0.755	0.306*	0.327*
-2 Log Likelihood	1177.715	1155.811	1154.748
Nagelkerke R Square (R ²)	0.067	0.098	0.099
Chi-square (χ^2)	45.540***	67.444***	68.506***

* $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$.

In summary, three different models were designed to predict the prevalence of overweight or obesity among children between the ages 10 and 14. Although many of the independent variables were found to be insignificant in predicting the dependent variable, the comparison of constant only model with the full model chi-square is highly significant ($p < 0.001$), thus indicating the reliability of predictors (a set of variables in each model used as predictors) in predicting the likelihood of overweight or obesity. The decrease in -2 log likelihood from Model 1 to Model 2, and from Model 2 to Model 3 suggests that there was an improvement in the goodness of fit in models, after adding the activities and the associated health conditions variables, respectively. However, the R-square value suggests that the amount of variation in the odds of being overweight or

obese explained by the set of variables is lower in the constant only model than in full model. Based on this result, the current study found that the socio-demographic characteristics have greater influence on the likelihood of being overweight or obese of children and adolescents than other social factors.

DISCUSSION

The main goal of this research study, as mentioned earlier, was to investigate the social causes and the correlates of overweight or obesity among children and adolescents of ages 10 and 14. In order to achieve this goal, this thesis examined the likelihood of being overweight or obese among children and adolescents based on socio-demographic variables such as race, gender and maternal education; activities that children and adolescents involved during their free time such as television watching, playing computer games and children's preference for doing homework, listening to music, reading for fun and playing outside; and associated health conditions such as asthma symptoms and breastfeeding. This section summarizes the discussions and conclusions drawn from the work done in this research study which contributed to the above mentioned goals, followed by some recommendations for future work.

Findings and Discussion

There is a lot of evidence in the literature that indicates socio-demographic variables, various activities, and some associated health conditions as the major factors for the prevalence of overweight or obesity. The findings from this thesis has supported some of these investigations while at the same time, other findings from this study did not support previous research.

Socio-demographic variables

Socio-demographic variables such as race, gender and maternal education are considered as important predictors for the prevalence of overweight or obesity among children and adolescents. Most of the literature reviewed showed that there is an increasing trend of overweight or obesity among Non-Hispanic blacks. The current study found that both Non-Hispanic black and Hispanic children are more likely to be overweight or obese in comparison to Non-Hispanic white children. However, the relationship was stronger for Non-Hispanic blacks than for Hispanic children. The current study also indicated that the prevalence of overweight or obesity among children and adolescents were not influenced by their preferred or participated activities, however, their health conditions impacted slightly on the likelihood of their being overweight or obese.

The literature indicates that gender is a significant predictor for the prevalence of overweight or obesity among children and adolescents. The greater importance given to boys rather than girls in Hispanic families and the cultural perceptions of body image for girls in African American families were indicated as major factor for these gender differences. However, the current study did not show a significant relationship between gender and the likelihood of being overweight or obese of children and adolescents. Moreover, the relationship between gender and the likelihood of being overweight or obese was not influenced by the preferred or participated activities of children and adolescents and their health conditions. Therefore, this study supports the finding by Whitaker and his colleagues (2006) that gender is not an important factor in predicting overweight or obesity among children and adolescents.

According to the literature reviewed, children whose mothers completed less than high school are less likely to consider ‘obesity’ as a disease and thus, are less likely to recognize that their children are overweight or obese. Therefore, children whose mothers completed less than high school are more likely to be overweight or obese than those children whose mothers attained higher levels of education. The current study also found that the odds of being overweight or obese for those children whose mothers were college graduate or higher are lower than for those children whose mothers completed less than high school education. This thesis, therefore, suggests that those mothers who attained higher levels of education are more likely to be aware of the health problems of their children. Thus, these mothers are more likely to provide a good nutrient food and help their children to maintain a healthy body by encouraging them for physical activities. Therefore, the current study agrees with the findings by Baughcum and his colleagues (2000) and Boardman and his colleagues (2002), and supports their contention that maternal education is an important factor for predicting the likelihood of overweight or obesity of children and adolescents.

However, this thesis indicates that maternal education was no longer a significant predictor when the activity variables and the health condition variables were added in the model. That is, the activity variables mediated the relationship between maternal education and overweight or obesity of children and adolescents to the extent that maternal education was no longer significant in Model 2 and Model 3.

Activities that Influences Childhood Obesity

Experts suggest that physical activities and sedentary activities of children and adolescents play a significant role in the prevalence of overweight or obesity (Dietz & Gortmaker, 1985; Hofferth & Sandberg, 2000; Norman et al., 2005; Rideout, 2004; Kids Health, 2006). Several studies indicate that sedentary activities such as watching television, playing computer games, doing homework, listening to music and reading, which is more popular among children and adolescents, displaces the activities that make them physically healthy. It is obvious that the amount of time spent on one activity involves a trade off in the amount of time spent on other activities.

Although the literature review indicated a positive relationship between the amount of time spent on watching television and the likelihood of overweight or obesity among children and adolescents, the results of the current study show that this relationship was not statistically significant for the children between the ages of 10 and 14. This study also shows that the relationships between the likelihood of being overweight or obese of children and adolescents and the amount of time spent on playing computer games, preference for doing homework and preference for reading were not significant, a finding which also contradicts to the literature. Therefore, it could be anticipated that there might be other factors which go hand in hand with these activities which might have triggered obesity among children between ages of 10 and 14. Some of the factors that the literature mentioned are the food behavior of children, family history of overweight or obesity and the cultural values of the families.

Previous investigations indicate that the amount of time spent on listening to music displaces physical activities among children and adolescents (Norman et al., 2006;

Curtin & Hofferth, 2004). Therefore, this variable is an equally important factor for predicting childhood and adolescence obesity. The current study strongly supports this fact and indicates that children's preference for listening to music during their free time increases the likelihood of their being overweight or obese. However, there has been little research on the mechanisms through which listening to music impacts on weight and other outcomes of children and adolescents, as indicated in the literature review. Norman et al. (2006) found that as children become older, often boys tend to spend their free time playing computer games and girls tend to spend their time listening to music. Both of these activities are considered as an inactive behavior that displaces other more physically active endeavors, which ultimately increases the likelihood of being overweight or obese.

Physical activities of children and adolescents should also be taken into account while studying childhood and adolescence obesity. Previous studies indicate that there is an inverse relationship between physical activities and prevalence of overweight or obesity (Corless & Ohland, 2005; Stanton & Hills, 2004; Adkins et al., 2004). The current study strongly supports this fact and indicates that there is a statistically significant inverse relationship between the likelihood of being overweight or obese and the children's preference for playing outside. The connection is quite obvious because engaging in physical activity allows children and adolescents to burn calories and increase metabolic rates which help them maintain a healthy body.

In summary, among the various activities that were studied in this thesis, the current study showed only a significant relationship between the likelihood of overweight or obesity and the children's preference for listening to music and preference for playing

outside. Therefore, it could be anticipated that listening to music might be associated with other factors that help increase the prevalence of being overweight or obese. This may include the intake of higher portion sizes while listening to music, or the content of the music itself, especially when music is considered as an important factor for stress relief. This study, however, did not find statistically significant relationship between watching television, playing computer games, children's preference for doing homework and preference for reading which contradicts to the literature reviewed.

Associated Health Conditions

The literature suggests a relationship between the increase in certain health conditions and the rise on overweight or obesity rates (Swallen et al., 2005). An important health problem among children and adolescents that is associated with obesity is asthma (Gidding et al., 1995; Wang, 2002; Must et al., 1992; Freedman & Stern, 2004; Hitti, 2005). Although the likelihood of being overweight or obese is higher for children who have asthma symptoms than those children who indicated they do not have asthma symptoms, the study found an insignificant relationship between these variables. Therefore, the current study suggests that asthma symptoms are not a good predictor of obesity for this sample of 10 to 14 years old children. Probably the data included in this study might have confounded the result since the study did not include a variable which actually asked children if they had asthma. Rather, the study included a variable that asked children if they had one or more symptoms that are associated with asthma. Thus, the current study might have overestimated actual prevalence of asthma for the sample of 10 to 14 years old children.

Breastfeeding is considered to be an important determinant for the health of children (VanLandingham et al., 1991). It is considered that those children who have been breastfed are more likely to regulate their intake by responding to sensations of hunger and satiety and, therefore breastfeeding have a long term effect in a human body (Goldfield et al., 2006). Literature suggests that those children who have been breastfed are less likely to be overweight or obese compared to those who indicated that they were not breastfed (Goldfield et al., 2006; Hediger et al., 2001; Armstrong et al., 2002; VanLandingham et al., 1991). The current study, however, does not support this fact. Although the findings indicate that those who have been breastfed were less likely to be overweight or obese than those who indicated they were not, there was not a statistically significant relationship between these variables.

It is also important to note that during bivariate analysis, there was a strong and statistically significant relationship between breastfeeding and overweight or obesity (see page 58). However, while conducting logistic regression analysis, this relationship went away (see page70). That is, breastfeeding was no longer a significant predictor of the likelihood of overweight and obesity among children and adolescents. This could possibly because of the decrease in the sample size between the bivariate analysis and the multivariate analysis. Also, the introduction of the other control variables (socio-demographic and activity variables) likely impacted the outcomes for breastfeeding.

Goldfield and his colleagues (2006) referred the environment, which exposes children and adolescents to unhealthy food products and provides them with fewer opportunities to burn off enough calories, as the obesogenic environment. Therefore, the current study supports the contention by Goldfield and his colleagues, and suggests that

there could be these additional factors that might have manipulated the advantages of breast milk that children and adolescents had during their infant stage, ultimately, increasing the likelihood of overweight or obesity among children and adolescents.

Limitations of the Study

The major limitation of this study is that the current study did not look at the changes in overweight or obesity among children and adolescents over time. Rather the study was a cross-sectional investigation of the causes and correlates of overweight and obesity among children and adolescents. Additionally, the current study examined the prevalence of overweight or obesity only for children and adolescents between the ages of 10 and 14 who were interviewed in 2004 and met the CDC criteria for overweight or obese (BMI at or above 85th percentile for age and gender). Therefore, it excluded all other age groups of children and adolescents who might be either overweight or obese. Moreover, while adjusting the cutoff criteria for children who were both overweight and obese, the BMI cutoff used in this study excluded a small number of 10 and 11 year olds children who might have been overweight and included a small number of 13 and 14 year olds children who might have normal weight. Although the number of children and adolescents in these categories was small, it might have influenced the result of the study.

Furthermore, the current study examined the prevalence of overweight or obesity using certain socio-demographic characteristics like race, gender, and maternal education, and might have excluded some of the important socio-demographic variables such as family or household income, parental occupation and father's education. The literature suggests that socio-economic status of children's family also impacts on the prevalence

of overweight or obesity among children and adolescents (Kimm & Glynn, 2006). This thesis, however, did not include socio-economic status of children's family in the study. Therefore, it could be assumed that the result might change if the socio-economic status of children's family is included. The family history of obesity (father's and mother's obesity level) and diet history of children, which are considered as important factors in contributing to childhood obesity, are also excluded from the current study.

There were also some limitations in the measurement of certain activity variables. Among the activities variables, only television variable and playing computer games variable indicate children's actual participation for the activities. The other variables such as homework, reading, listening to music and playing outside indicate only children's preference for such activities. Although physical activities include various activities like bicycling, walking, and other vigorous outdoor activities, this study examined children's preference for playing outside, to reflect the physical activities among children and adolescents. Therefore, the current study did not include any variables related to the frequency, intensity, and duration of physical activities of children. This may explain the lack of statistical significance for these variables.

The literature suggests that obesity is associated with various health conditions. This study, however, only included the asthma symptoms related to obesity, thus, excluded other possible health conditions like cardiovascular diseases, diabetes, and cancer. The study also covered whether the children in the sample group have been breastfed. However, it did not provide any information about the frequency, intensity, and duration of breastfeeding.

Importantly, out of 1,359 respondents included in this thesis, only 891 respondents answered all of the obesity-related questions that were included in this thesis. Therefore, the decrease in the sample size in logistic regression analysis due to the missing values might have influenced the overall result of the study. Moreover, the children who ended up in the final sample might have also impacted the results of variables such as television watching, computer games, homework, asthma symptoms, and breastfeeding. As indicated earlier, the relationships between the dependent variable and each of these variables were statistically insignificant although they were in the expected directions. Therefore, the children who were included in the sample might have specific characteristics that impacted the results of the study.

Future Research

Childhood obesity is obviously a very real social problem. There are lots of ongoing investigations which are covering the various major issues associated with obesity. However, based on the findings of the current study, there are several things that still need to be explored.

The current study used BMI cutoff value at 85th percentile, thus included all the children who were overweight or obese in the sample size. This might have influenced in the result of the current study. Therefore, future research could investigate each of these categories separately to examine the factors associated with this age group.

Time spent on activities such as watching television, playing computer games, doing homework, and reading are considered to have displaced the physical activities of children and adolescents. Although several investigations also supported this fact, the

relationship between the likelihood of being overweight or obese and the time spent on watching television is not supported by the findings of this study. The sample size of this study might have influenced the result of the study. Therefore, additional investigations with different and more thorough measures, including larger samples size of children and adolescents between the ages of 10 and 14, might be useful.

Although there are numerous study conducted on children's inactive behavior like watching television and playing computer games, very few investigations exist on the association between overweight or obesity and children's activities such as, time spent on doing homework, reading, and listening to music. The current study found an insignificant relationship between the likelihood of overweight or obesity and the children's preference for doing homework and reading. However, children's preference for listening to music is found to be a significant predictor. The connection is obvious because the increasing popularity of various musical instruments and downloadable music websites have geared children and adolescents toward this activity which displaces their other physically healthy activities. However, more investigations of these variables might be useful, which explore the influences of other important factors on these variables that have manipulated in the likelihood of being overweight or obese among children and adolescents.

The current study found that the odds of being overweight or obese among children and adolescents are higher for those who have asthma symptoms. However, the relationship was not significant. Although the literature indicates that there is a relationship between obesity and asthma, most of the literature reviewed suggests that obesity increases the likelihood of asthma rather than the reverse – asthma causing

obesity. Therefore, it would be useful to attempt a similar study using another medium of survey instruments and compare the findings so that the relationship between these two variables becomes clearer.

Similarly, the current study indicates an insignificant relationship with breastfeeding. Although the finding shows that the odds of being overweight or obese is higher among children and adolescents who have been breastfed than those who indicated that they were not breastfed, the relationship was insignificant. Breast milk is considered as an immunological agent that help children prevent from diseases. Literature also indicates that breastfeeding decreases the likelihood of overweight and obesity among children and adolescents. Therefore, it would be interesting to compare the findings with a similar kind of study using different survey instrument as well.

The additional investigations are needed also because the successful identification of the predictors of obesity epidemic might help to develop a good strategy for preventing the obesity epidemic.

CONCLUSION

Many studies reviewed for this thesis revealed the serious concern regarding overweight and obesity found among children and adolescents. With an intention of contributing to the body of knowledge regarding what social factors or variables impact the likelihood of children's and adolescents' being overweight or obese, this thesis selected a list of variables that could be divided into three groups - socio-demographics, activities that children preferred to participate in during their free time and the health conditions – and tested if significant relationships existed between each of these groups and the prevalence of overweight and obesity. A logistic regression was conducted to test the relationships between each of these groups and the prevalence of overweight and obesity among children and adolescents between the ages of 10 and 14.

Based on the findings, the current study suggests that socio-demographic variables have a greater influence on the prevalence of overweight or obesity among children and adolescents than activities that children preferred to participate in and health variables. Therefore, more attention should be given to the strategy directed toward the socio-demographic characteristics. Since Non-Hispanic black children and Hispanic children were found to be more vulnerable for the likelihood of overweight or obesity, a strategy directed toward these racial groups that helps them fight with this obesity epidemic might be very productive. Moreover, a program that educates those mothers who attend less than high school education, and helps them recognize obesity as a disease, should be given prior importance.

The study indicates that children's preference for listening to music increases the likelihood of their being overweight or obese. The increasing popularity of personal listening devices such as I-Pods, and music download websites such as I-tunes might have encouraged more children and adolescents to spend more time listening to music. Therefore, attention should also be directed to the strategy that helps reduce the amount of time that children and adolescent spend on such activities.

Overall, only a careful strategy that helps children and adolescents fight overweight and obesity would be beneficial to help reduce this alarming and serious disease called "obesity".

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