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# Environmental Influences on Pediatric Obesity: An Examination of the 2007 National Survey of Children's Health (NSCH)

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# ENVIRONMENTAL INFLUENCES ON PEDIATRIC OBESITY: AN EXAMINATION OF THE 2007 NATIONAL SURVEY OF CHILDREN'S HEALTH (NSCH)

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## ABSTRACT

Obese children are more likely to become obese as adults; hence, they are at increased risk for a number of adult diseases. As with adult obesity, several variables contribute to the increasing prevalence of childhood obesity. The intent of this report is to illustrate the connection between childhood obesity and the social environmental interactions of populations. With the increasing prevalence of obesity in adults and children, healthcare and public health professionals view childhood overweight and obesity as one of the most serious public health concerns of our time. This research conducts a secondary analysis of the National Survey of Children's Health (NSCH). NSCH is a national survey conducted by the Data Resource Center for Child and Adolescent Health. The purpose of the NSCH was to estimate national and state-level prevalence for several physical, emotional, and behavioral child health indicators including information on the child's family and community environment. This research observed specific variable outcomes taken from the 2007 NSCH data collection for 10-17 year olds. Descriptive statistics, Spearman's Rank Order Correlation Coefficient (Spearman's Rho), and Pearson's Chi-Square test was conducted to determine relationships between environmental factors and weight status. This analysis revealed that the weight status of 10-17 year old children is adversely influenced by a combination of behavioral and built environmental factors.

# INTRODUCTION

*"Unhealthy diet and decreasing physical activity are behaviors resulting in increased rates of adolescent obesity"* (World Health Organization [WHO], 2010). Several medical professionals identify obesity as the new American epidemic (Stefan, Hopman, & Smythe, 2005). While more children are becoming overweight, the heaviest children are getting even heavier. Nearly 58 million Americans are regarded as overweight or obese, and the frequency of childhood obesity is rapidly growing. It is estimated that nearly 33 percent of adolescents are considered overweight or obese (American Academy of Child and Adolescent Psychiatry [AACAP], 2008).

Obesity contributes to psychological disorders like anxiety, depression, and eating disorders. Overweight and obese children are more likely to experience physiological conditions such as early puberty, sleep apnea, insulin resistance, diabetes, hypertension, and heart disease (U.S. Department of Health and Human Services [HHS], 2007). Overweight and obese adolescents are in jeopardy of being diagnosed with an adult disease and the likelihood of becoming an obese adult increases (HHS, 2007). Similar to adult obesity, several factors influence the prevalence of obesity in children.

Unhealthy weight gain associated with physical inactivity and a non-nutritional diet is responsible for nearly 300,000 deaths per year (HHS, 2007). The yearly healthcare cost associated with obesity related disease is estimated near $100 billion (HHS, 2007). Obesity is the most preventable disease which can cause death (Stefan, Hopman, & Smythe, 2005). With the prevalence of obesity increasing among adults and children, public health and healthcare professionals believe childhood overweight will be the most pressing public health responsibility of this century (Centers for Disease Control [CDC], 2010). With this in mind, preventing obesity is a primary public health concern.

The intent of this report is to bring attention to the epidemic of childhood obesity in the United States, as well as the danger the epidemic poses to our society and the quality of life for children. This paper will focus on contributing factors associated with childhood overweight in the United States.

## LITERATURE REVIEW

Throughout the last 30 years, the prevalence of overweight among children has progressed into an epidemic. Approximately one of every five children in the United States is considered overweight (Deitz, 2007). The prevalence of overweight has also been confirmed in toddlers (Deitz, 2007).

Adolescent overweight and obesity is known as a widespread nutritional illness among youth (Obesity Society, 2001). Forty-five percent of recent juvenile type 2 diabetes is linked to overweight and obesity (Deitz, 1997). The possibilities for orthopedic problems have risen in children due to childhood obesity (HHS, 2007). While children bear excess body mass that their bodies merely cannot manage, the occurrences of arthritis and bowed legs has become common (HHS, 2007). Overweight and obese children have an increased rate of skin disorders compared to healthy weight children (HHS, 2007). Obesity contributes to increased skin folding, resulting in problems such as dermatitis and heat rash (HHS, 2007).

All of these complications can cause health and financial obstacles for the health care system and for children. The medical care for obesity related diseases over the lifetime can be expensive. In 2001, economic statistics showed that yearly healthcare expenditures associated with obesity in adolescents nearly tripled from $35 million in 1979-1981 to $127 million in 1997-1999 (Deitz, 2007). Between 1987 and 2001, the United States healthcare costs appreciated by more than 25 percent due to obesity related treatments (Deitz, 2007).

The significant rise in childhood obesity indicates that obesity is not a temporary pattern among children and seems to be strongly related to the influences of the social environment. For instance, the prevalence of childhood obesity has been regularly linked to modern technology and fast food, which is perhaps responsible for the advanced sedentary culture among children.

Due to the importance of child and adolescent obesity as a public health matter, it is necessary to recognize the medical approach of practitioners who administer health care for children and adolescents. The most common but controversial indicator used to verify overweight and obesity is the Body Mass Index (BMI). For adults, a BMI over 25 percent is defined as overweight and a BMI of over 30 percent as obese (WHO, 2010). The American Academy of Pediatrics defines childhood obesity as occurring in kids who have a BMI of more than 30 percent (American Academy of Pediatrics [AAP], 2006). The BMI indicator was adjusted for youth to accommodate for yearly growth patterns. To calculate the BMI for children, height and weight is determined by applying the BMI formula. The results are outlined on the BMI-for-age growth charts to measure body mass index in comparison to that child's age group **(**Cloutier, Cohen, Gaughan, Jensen, & Kranz, 2006). The child's BMI ranking is recorded by a percentile. Any child with a BMI greater than the 95th percentile for that gender and age group is considered obese.

A certain amount of attention should be considered when depending exclusively on the BMI calculation, which does not acknowledge lean muscle tissue, bone, body type, or ethnic background. For instance, the body composition of African Americans and Asians may differ from other populations (Cloutier et al., 2006). Statistics from the latest National Health and Nutrition Examination Survey [NHANES] study indicates a strong relationship between life expectancy and the BMI. When comparing countries like Switzerland, Japan, Canada, and Sweden, they have higher life expectancies and considerably lower BMIs compared to the U.S.

In 2003, the American Academy of Pediatrics proposed that pediatricians record the BMI of all children. A majority of health care providers have been unsuccessful in addressing the BMI among the pediatric population (Caprio, 2006). In 2002, a study of pediatricians revealed that less than 20 percent calculated the BMI (Barlow, 2002).

## Factors Contributing to Childhood Overweight

The antecedents of childhood overweight and obesity are comprised of modifiable and non-modifiable exposure variables. Modifiable variables include unhealthy diet, sedentary activity, and physical inactivity. A non-modifiable variable for adolescent weight gain is genetics. Children with overweight parents are more likely gain extra weight, resulting in obesity (Huffman, Kanikireddy, & Patel, 2010). Socioeconomic and environmental statuses have the ability to be modifiable or non-modifiable variables. For instance, modifiable variables for schoolchildren may include exposure to fast food marketing, increased screen time, consuming calories during screen time, increased consumption of non nutritional high calorie foods, living at or below poverty, and physical inactivity (Huffman, Kanikireddy, & Patel, 2010).

Certainly, the reasons for obesity are intricate and involve environmental, biological, behavioral, and genetic determinants. Whereas specific health ailments can induce obesity, less than one percent of obesity is due to a physiological disorder (AACAP, 2008). A considerable number of medical professionals propose that the widespread development of obesity is linked to more serious environmental factors such as decreased physical activity and poor diet. In general, childhood obesity can be related to a family history of obesity, non-nutritional consumption, physical inactivity, medical illnesses, medications, family structure, low self-esteem, peer problems, and or additional psychological deficiencies (AACAP, 2008).

The World Health Organization identifies the primary antecedents of overweight and obesity as “increased consumption of energy-dense foods high in saturated fats and sugars, and reduced physical activity” (WHO, 2010). Additional data indicates that worldwide changes in eating behavior, lifestyle, and the dominance of “Western” nutrition contribute to the further development of worldwide obesity (Bornstein, Wong, & Licinio, 2008). This implies that other cultures can acquire similar disorders, provided they are exposed to the same environmental catalyst. Different cultures provide distinguishing opportunities to study how “old” genes relate with “new” environments. American born Asians are four times more prone to be overweight than their Asian born companions (Wang & Beydown, 2007). The risk for obesity increases in the foreign-born population with the number of years they spend in the United States (Wang & Beydown, 2007). Obesity research findings suggest a number of the most important variables which promote childhood obesity are genetics, socio-economic status, ethnicity, environment, lifestyle behavior, and physical activity. With this in mind, the intersection of several variables, opposed to an isolated variable alone, is likely responsible for the prevalence of global obesity.

## Genetics

Genetic components may determine the incidence of obesity in alternate ways. Statistics show that obesity may be a polygenic disorder, which attaches different genes to the probability of developing obesity over a lifetime. There is clinical data of human obesity conditions that were positively linked to genetic deficiencies (Shepherd, 2009). The "obesity gene" triggers leptin receptor mutations, defective pro-melanocortin, and leptin deficiencies; therefore, individuals diagnosed with a human obesity disorder will acquire an unusually large to overwhelming appetite for and consumption of food (hyperphagia) and becoming obese (Shepherd, 2009). The idea that genetic investigations might perhaps change the deficient genetics in certain people and absolutely resolve health disparities is unreliable. The reporting of the association between genetics and obesity appears to minimize the thought that nongenetic variables are partially responsible and obesity is a result of the interaction between genetic and environmental factors (Sankar, 2007). Obesity is a scientific diagnosis for uncommon genetic diseases like Prader-Willi syndrome (Bouchard & Rice, 1998). The prevalence of overweight and obesity among global civilization in previous years cannot be due to genetic factors alone. While the genetic traits of all human society have not altered in the last 30 years, the prevalence of obesity tripled among schoolchildren throughout that period (Ogden, Flegal, Carroll & Johnson, 2000).

Specific conditions are common in particular ethnic groups. For example, consuming significant amounts of sugar contributes to elevated levels of uric acid causing cardiorenal disease. High fructose corn syrup consumption could be the reason African Americans are commonly diagnosed with cardiorenal disease (Bornstein, Wong & Licinio, 2008). Uric acid levels are elevated in populations at risk for cardiovascular disease, like postmenopausal women, and individuals with high blood pressure or renal disease. The increased risk of cardiovascular disease combined with the western influence on native populations, immigration to western countries and urbanization plays a significant role in increased uric acid levels (Yusuf, Reddy, Ounpuu & Anand, 2001). The prevalence of kidney disease, obesity, hypertension, and diabetes in the United States throughout the last century has been linked to increased uric acid levels (Feig, Kang & Johnson, 2008).

## Socioeconomic Status and Ethnicity

Socioeconomic status is strongly associated with the inability to purchase nutritionally valuable food items and living in undesirable circumstances, which may place restrictions on the ability to perform physical activity. In times of economic difficulty, individuals may be limited to inexpensive lower quality, artificially processed foods, which are high in complex carbohydrates, sugar, and fats. Researcher Jennifer L. Black at New York University analyzed 90 studies released throughout 1997 and 2007 on neighborhood determinants of obesity. Black discovered that neighborhoods with low social and economic support have an elevated occurrence of community overweight and obesity. The study also discovered that subjects in low-income urban dwellings are more apt to report community limitations to physical activity, like the restricted option for daily outdoor exercise and limited means of access to larger grocery stores that offer nutritionally valuable food options (Black & Macinko, 2008). Conversely, a different study claims socioeconomic status was not a significant indicator and suggests the parent or guardian's level of education as responsible for adolescent weight gain (Science Daily Authors & Arizona State University Research, 2005). Other research suggests that more expensive healthy food options (organic) consumed in excess may also result in overweight and obesity (Shepherd, 2009).

The prevalence of overweight is significantly higher among specific ethnic populations such as Native Americans, Hispanics, and African Americans. Since 1986, the prevalence of obesity among African American and Hispanic children raised 120 percent opposed to a 50 percent increase among the non-Hispanic white population (U.S. Department of Health and Human Services [HHS], 2010). With Hispanic and African American families being three times more likely than white non-Hispanic families to live under reduced circumstances, socioeconomic status positions these populations at increased risk (Garcia, Lutfiyya, Lipsky, & Young, 2008).

The relationship between socioeconomic status and obesity in children differs by gender and ethnicity. Among non-Hispanic white children, obesity appears to decline as parental education and income advance. In particular, the prevalence of obesity in non-Hispanic white children between ages 12-17 in the 1988-1994 NHANES survey decreased for both males and females as household earnings increased. Conversely, Hispanic American and African American female obesity rates rise when household earnings increase (Grier & Kumanyika, 2006). The study found that increased rates for obesity in African American girls were elevated in the bottommost and uppermost income levels opposed to middle-class income levels (Grier & Kumanyika, 2006). The obesity rates for both groups decrease with advanced parental education. In addition, the National Heart, Lung, and Blood Institute's "Growth and Health Study" discovered ethnical dissimilarities in the connection between obesity and socioeconomic status (Grier & Kumanyika, 2006). These results found a relationship between obesity and parental education and income. However, this particular study acknowledges that a change in obesity rates between ethnic groups is not a result of differences in the average socioeconomic status between different ethnic populations.

Nevertheless, all low-income children are at increased risk of obesity regardless of ethnic background. Many authors have examined the NHANES data, searching for connections between socioeconomic status and obesity among children. One analysis of children in NHANES surveys between 1971-1974 and 1999-2002 finds increased rates of obesity in low-income children opposed to all children after 1976-1980 (Grier & Kumanyika, 2006). Likewise, the results of the National Longitudinal Survey of Youth for four to 12 years of age imply that all low-income children have increased obesity rates compared to high-income families with children (Grier & Kumanyika, 2006).

## Environmental Factors

Home, community environments, and school can determine individual conduct associated with nutritional consumption and physical activity. Several scientists and researchers link the obesity epidemic to environmental variables such as the accessibility and consumption of fast food to support increased energy intake and increased screen time (TV, computer, video gaming) to deter energy expenditure (Chou, Rashad, & Grossman, 2006). The modern American environment is supplemented with a surplus of easily accessible, cheap, highly palatable foods, combined with a lifestyle that requires minimal physical activity for survival (Hill & Peters, 1998). As a result, obesity continues to increase among our population because, while the body has superior physiological protection against the reduction of energy stores, it has limited protection against the increases of extra energy stores when food is easily available (Hill & Peters, 1998).

Recent research suggests that the design of most American suburbs contribute to the increase of childhood overweight (Lopez & Hynes, 2006). Specific chareristics of the built environment such as sidewalks, streetlights, and recreation areas seem to promote exercise and therefore undermine the likelihood of obesity occurring (Lopez & Hynes, 2006). Additional factors like cul-de-sacs, no recreation areas, and heavy traffic prevent physical activity (Lopez & Hynes, 2006). The study performed by Lopez and Hynes reveal that people who reside near recreational areas are more likely to partake in physical activity compared to those who reside further away. Communities comprised of residential, industrial, commercial, and office locations encourage physical activity, while communities specifically designed for housing decrease physical activity (Lopez & Hynes, 2006).

Accordingly, the modern American environment is characterized as an obesogenic environment, which pertains to an atmosphere that encourages weight gain and one that is not favorable for weight loss. In America, the convenient availability of energy dense, inexpensive food is only surpassed by technical advancements and its relationship to sedentary behaviors (Ard, 2007). Several contributing factors may influence our responses to an obesogenic environment, such as exposure amount and resource accessibility (Ard, 2007).

Another environmental factor that may contribute to childhood overweight is an unsafe neighborhood environment (Molnar, Gortmaker, Bull, & Buka, 2004). The NHANES adult Behavioral Risk Factor Surveillance System [BRFSS] provide evidence that individuals living in unsafe neighborhoods are more overweight, exercise less, and have inferior health in general compared to the overall population (Lopez & Hynes, 2006). This particular study reported that 63 percent of interviewees feared violence in the community and 60 percent did not allow their children to participate in outdoor activities because of community violence (Lopez & Hynes, 2006). This response was considerably higher when compared to suburban communities, which had not experienced comparable crime rates (Lopez & Hynes, 2006).

High crime rates are a reality in some unsafe communities. Crime can deteriorate community responsibility, depreciate the environment, and add increased stress on people. The belief that crime may occur in the community causes people to stay indoors, specifically the elderly and children (Lopez & Hynes, 2006). Safety concerns are a likely factor for decreased physical activity in unsafe neighborhoods (Lopez & Hynes, 2006). The lack of physical activity may correlate with increased sedentary indoor activity, which promotes obesity. Individuals living in unsafe environments are more likely to suffer from increased rates of obesity-associated disease, namely cardiovascular disease and diabetes (Lopez & Hynes, 2006).

Another concern in many communities is the absence of grocery stores, which provide a greater selection of reasonably priced nutritional items (Morland, Wing, Diez, & Poole, 2002). Distressed minority communities may not have the same availability to access quality nutritional items in comparison to communities with higher household incomes. According to the study by Morland, Wing, Diez, and Poole (2002), a large number of gas stations and grocery stores are more likely to be located in higher income communities in comparison to distressed communities. Further, there are three times as many establishments to consume alcohol in impoverished communities in comparison to communities with higher household incomes. The observation of community disparities disclosed that there are four times more grocery stores found in Caucasian communities in comparison to African American communities. Furthermore, fast food restaurants are more prevalent in low and medium-income communities and less prevalent in higher-income communities (Morland et al., 2002).

## Behavioral Factors

Several studies associate television viewing and exposure to marketing as the leading antecedent for the development of obesity in children (Story & French, 2004). The studies disclose that television viewing decreases energy expenditure which changes the energy balance in sedentary adolescents. One study concludes that time viewing television is associated with having an unhealthy body mass index (Signorinoi & Winter, 2008). Television exposure during times of food consumption is responsible for increased energy intake in children (Signorinoi & Winter, 2008).

Fast food corporations disperse billions of dollars annually on marketing to children. Ninety-five percent of fast food restaurant revenues are allocated for television marketing (Story & French, 2004). Every year, the typical child watches an estimated 20,000 to 40,000 food advertisements on television. Consequently, the majority of advertisements are for high-sugar, high-calorie, and high-fat dinners (Story & French, 2004). Marketing to children has been extended to company websites, Facebook, Twitter, and other digital media outlets as well. McDonald's web-based marketing begins with children as young as age two at Ronald.com. McDonald's and Burger King have designed elaborate web pages (McWorld.com, HappyMeal.com, and ClubBK.com) with virtual worlds and games to captivate children. In 2009, McDonald's websites received an average of 294,000 teen visitors and 365,000 child visitors every month (Fast Food Facts, 2010). In addition, Smartphone applications are available for eight fast food restaurant chains, which enable these corporations to target young consumers 24 hours a day (Fast Food Facts, 2010).

According to a recent study completed at Yale University, preschool children view 21 percent more fast food advertisements on television than they viewed in 2003 (Yale Office of Public Affairs & Communications, 2010). African American children view nearly 50 percent more fast food advertisements than their white counterparts. McDonald's and Kentucky Fried Chicken specifically target African American youth with television advertising, websites, and billboard advertising (Yale Office of Public Affairs & Communications, 2010). Although McDonald's and Burger King specifically offer healthy sides and drinks in child advertising, the restaurants serve french fries with kids' meals at least 86 percent of the time, and high sugar beverages 55 percent of the time (Yale Office of Public Affairs & Communications, 2010). Moreover, fast food companies, which are being pressured about portion sizes, are simply changing the name of their largest sides and beverages instead of eliminating these options. For instance, Burger King's 42-ounce "King" beverage is now the "large" alternative; the previous "large" 32-ounce beverage is now a "medium"; the previous "medium" 21-ounce beverage is now a "small"; and the previous "small" 16-ounce beverage is now the "value" alternative (Yale Office of Public Affairs & Communications, 2010).

Fast food diets high in sugar and fat may be at fault for influencing addictive behaviors in children resulting in over-consumption of food. The average children's fast food meal includes 1400 calories, 85 percent of recommended daily fat intake, 73 percent of recommended saturated fat, and only 30 percent of recommended fiber (Isganaitis & Lustig, 2005). Thus, children who take in fast food will consume more energy than those children who do not eat fast food.

Large fast food portions, combined with drinks high in sugar, promote increased energy intake (Story & French, 2004). Sugared beverage consumption has increased 70 percent in two - 18 year olds since 1977; at the same time, milk consumption decreased 38 percent (Story & French, 2004). Furthermore, fast food is accountable for more than 30 percent of the average family weekly food purchases over all ranks of socioeconomic status (Anand, 1998).

The United States Department of Agriculture [USDA] recommends that individuals on a 2,000-calorie daily diet should only consume 40 grams of sugar. However, sources of sugar such as corn sweeteners, sucrose, honey, maple syrup, and molasses are frequently hidden in a plethora of foods like salad dressing, ketchup, soups, crackers, pizza, pasta, bread, fruit drinks, and flavored yogurt. In fact, regardless of the government's recommendations to limit energy intake, the government strongly supports sugar producers and processors (Rigby, Kumanjika, & James, 2004).

## Energy Intake and Physical Activity

Regardless of the positive or negative food quality and nutritional values, the imbalance between calories consumed and calories expended can be culpable for unhealthy weight gain. The basal metabolic rate is denoted as the amount of energy needed to manage the resting body functions. Dietary thermogenesis is the energy (calories) essential to consuming and converting nutrition. According to the laws of energy balance and thermodynamics, an individual must have a caloric deficit to lose weight. This enables the body to manage stored adipose to supply for the energy deficit while expending calories. A calorie deficit can be achieved with the correct nutritional meal plan, physical activity, or the combination of both.

Decreased physical activity is an integral part of the energy balance equation. It is apparent that the decrease in physical activity has already developed by the time children begin high school (Anand, 1998). By the ninth grade, nearly 70 percent of females and 50 percent of males do not partake in effective exercise, sports, or physical activity (Anand, 1998). Obesity is the result of an unequal relationship between physical activity and the consumption of food. Children who consume more calories than they expend are likely to become less active and overweight. Overweight children have a different experience with physical activity compared to their non-obese counterparts. Relevant and productive physical activity is burdensome and they are often confronted with challenge during physical activity. Obese children may walk slower or walk with an irregular condition as a result of hip joint moments caused by their overweight body frame (Brown, Sutterby & Thornton, 2010). Deficient walking habits can cause physical movements to be demanding and increases the likelihood for potential structural deformities and tissue damage (Brown, Sutterby & Thornton, 2010). While children that have access to recreation areas or partake in physical activity are more likely to have a healthy body mass index (Brown, Sutterby, & Thornton, 2010).

Broadening the opportunities for alternative avenues to health education, exercise, and the development of organized community activities in impoverished neighborhoods, may have an effective impact on the childhood obesity epidemic. The American Heart Association proposes mandatory school physical education courses, which promote extra-curricular activities that increase activity levels and healthy lifestyles (American Heart Association [AHA], 2010).

However, the addition of physical activity among schoolchildren is complex. In an attempt to improve academic testing scores in math and reading, schools are removing opportunities for children to partake in recess and physical education classes (Brown, Sutterby, & Thornton, 2010). The CDC reports that physical education courses are being eliminated from schools across the country due to federal budget cuts (Sturm, 2005). Throughout the previous 20 years, the number of schools having physical education courses declined from more than 40 percent to nearly 25 percent (Sturm, 2005). Schools are reinforcing a sedentary environment among children. As a result, the decreasing levels of physical activity among schoolchildren may promote the growth in childhood overweight for future generations (Brown, Sutterby, & Thornton, 2010). Any child that does not participate in school physical education is likely to gain one inch more around the midsection and two pounds overall in comparison to schoolchildren participating in physical education courses (Brown, Sutterby, & Thornton, 2010).

Schoolchildren are not compensating for the lack of physical activity by increasing their physical activity away from school. Rather, children are likely to continue participating in sedentary activities after school. Increasingly popular sedentary activities have replaced the time used for physical activity. Several studies have reported data supporting a link between the amount of television viewing and becoming overweight (Story & French, 2004). Thus, consistent physical activity, combined with a nutritious diet, is perhaps the correct prescription for promoting health and preventing childhood overweight/obesity, diabetes, and other obesity-related disease (Brown, Sutterby, & Thornton, 2010).

## METHODS

This research is a secondary analysis of the data collected from the 2007 National Survey of Children's Health (NSCH). The NSCH is a nationwide survey sponsored by the U.S. Department of Health and Human Services Administration Maternal and Child Health Bureau

(MCHB), and is conducted by the National Center for Health Statistics (NCHS) of the Centers for Disease Control and Prevention (CDC). The objective of NSCH is to estimate national and state-level prevalence for several physical, emotional, and behavioral child health indicators including information on the child's family and community environment. Specific emphasis is placed on variables that may undermine the health of children and their families. The survey utilizes State and Local Area Integrated Telephone Survey (SLAITS) technology for sampling and administration. A total of 91,642 telephone surveys were completed nationally in 2007. Approximately 1,725-1,932 surveys were collected per state and all states exceeded the goal of 1,700 completed surveys. Survey results are weighted to represent the population of non-institutionalized children nationally and in each state.

This research observed specific variable outcomes taken from the 2007 NSCH data collection for 10-17 year olds. The analysis plan for this data includes descriptive survey statistics, Spearman's Rank Order Correlation Coefficient (Spearman's Rho), and Pearson's Chi-Square test.

## Hypothesis

This paper seeks to examine a set of behavioral and built environment factors that may influence a child's calculated BMI-for-age percentile. The research questions for this project were derived from the social determinants of health framework, which are the conditions in which people are born, grow, live, work, and age (Schulz et al., 2005). Obesity is caused by a caloric imbalance between energy consumption and energy expenditure. Treating obesity involves understanding the influencing elements of the built environment and behavioral factors, as well as recognizing the antecedent(s) responsible for caloric imbalance.

The core hypothesis investigates the relationship between pediatric obesity and several "obesogenic environment" variables, such as dietary and physical activity behaviors, perceived safety barriers, exposure to screen time, socioeconomic status, and ethnicity.

Hypotheses:

H-1: Children who do not engage in weekly physical activity are more likely to be classified as overweight or obese, than children who engage in weekly physical activity.

H-2: Children who have a television in their bedroom are more likely to be overweight or obese than children who do not have a television in the bedroom.

H-3: Children who spend more than two hours of daily leisure time using a computer are more likely to be overweight or obese than children who spend less than two hours of daily leisure time using a computer.

H-4: Children who spend more than two hours a day watching television, videos, or playing video games are more likely to be overweight or obese than children who spend less than two hours per day engaged in these activities.

H-5: Children without a park or playground area in the neighborhood are more likely to be overweight or obese than children who have access to a neighborhood park or playground.

H-6: Children living in unsafe neighborhoods are more likely to be overweight or obese than children who reside in neighborhoods perceived to be safe.

H-7: Non-Caucasian children are more likely to be overweight or obese than Caucasian children.

H-8: Children who live in households who earn less than 200% of the federal poverty level are more likely to be overweight or obese than children who live in households that earn higher than 200% of the federal poverty level.

Variables

| **Dependent Variable** | **Independent Variables** |
|---|---|
| Weight Status (derived from BMI percentile) | Amount of physical activity |
| | Presence of a television in bedroom |
| | Computer use not related to schoolwork |
| | Daily amount of screen time |
| | Availability of a park or playground |
| | Community safety |
| | Race classification |
| | Household poverty level |

## Analysis Procedure

Analyses were performed using SPSS (SPSS, Inc., Chicago IL). Analysis was conducted in three stages. Stage one introduces the descriptive statistics for the study variables. The descriptive statistics break down several components about the data, giving analysis about the research question and displaying percentages about the population from which the sample was taken. Stage two displays Spearman's Rho and determines the strength and direction of relationships that exist between a child's weight status and the dependent variables. Pearson's Chi-Square test was applied to determine a more specific nature of the relationship between the variables.

## RESULTS

The purpose of this study is to examine the relationships between environmental and behavioral influences and childhood overweight and obesity. Data from 2007 National Survey of Children's Health was analyzed to estimate the prevalence of childhood overweight and obesity in combination with identifying behavioral and environmental indicators.

This section introduces results that illustrate the relationship between the variables used in this research. Table 1 displays the frequency and percentage distribution of the sample child's gender. A total of 45,830 samples were collected with 47.9% being female and 52.1% being male.

Table 1
*Derived – Sex of Selected Child*

| | Frequency | Percent | Valid percent | Cumulative Percent |
|---|---|---|---|---|
| Male | 23,855 | 52.0 | 52.1 | 52.1 |
| Female | 21,975 | 47.9 | 47.9 | 100.0 |
| Total | 45,830 | 99.9 | 100.0 | |

Consistent with recent population surveys, sample children were classified as overweight or obese if their Body Mass Index percentile was equal to or greater than the 85th percentile from the CDC BMI-for-age chart. Table 2 displays the frequency and percentage distribution of the sample child's body mass index. Overall, 29% of children ages 10-17 years were overweight or obese.

Table 2

*Derived – BMI for age Classification for Sample Child, age 10-17 years*

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| Underweight – less than 5th percentile | 2,186 | 4.8 | 5.0 | 5.0 |
| Healthy weight – 5th to 84th percentile | 29,121 | 63.4 | 66.0 | 71.0 |
| Overweight – 85th to 94th percentile | 6,754 | 14.7 | 15.3 | 86.3 |
| Obese – 95th percentile or above | 6,040 | 13.2 | 13.7 | 100.0 |
| Total | 44,101 | 96.1 | 100.0 | |

The CDC recommends children and adolescents should perform 60 minutes (1 hour) or more of physical activity each day (CDC, 2011). With most children not meeting the recommended levels of physical activity, the 2007 NSCH requested information concerning daily physical activity for 20 minutes or more. Table 3 displays the frequency and percentage distribution of the days sample children participated in physical activity for more than 20 minutes. According to the survey, 24.2% of sample children participated in more than 20 minutes of exercise seven days a week. Moreover, 51.6% of the sample children participated in more than 20 minutes of physical activity 3-6 days per week and 24.2% participated in more than 20 minutes of physical activity two days or less per week.

Table 3

*During the past week, on how many days did sample child exercise, play a sport, or participate in physical activity for at least 20 minutes that made him/her sweat and breathe hard?*

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| 0 | 4,913 | 10.7 | 10.8 | 10.8 |
| 1 | 1,840 | 4.0 | 4.1 | 14.9 |
| 2 | 4,210 | 9.2 | 9.3 | 24.2 |
| 3 | 6,326 | 13.8 | 13.9 | 38.1 |
| 4 | 5,088 | 11.1 | 11.2 | 49.3 |
| 5 | 8,969 | 19.5 | 19.8 | 69.1 |
| 6 | 3,048 | 6.6 | 6.7 | 75.8 |
| 7 | 10,998 | 24.0 | 24.2 | 100.0 |
| Total | 45,392 | 98.9 | 100.0 | |

Table 4 displays the frequency and percentage distribution of the sample child's daily computer time away from school. 68.5% of sample children used the computer away from school 0-1 hours. Health professionals addressing this issue say screen time at home should be reduced to two hours or less a day, unless it pertains to schoolwork (HHS, 2011). This descriptive analysis shows only 13.4% using the computer for more than two hours not related to schoolwork.

Table 4
*Average daily time on a computer, other than schoolwork*

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| None | 5,621 | 12.2 | 12.7 | 12.7 |
| < 1 hour | 24,781 | 54.0 | 55.9 | 68.5 |
| 1-2 hours | 8,036 | 17.5 | 18.1 | 86.6 |
| 2-3 hours | 2,727 | 5.9 | 6.1 | 92.8 |
| 3-4 hours | 1,407 | 3.1 | 3.2 | 96.0 |
| 4-5 hours | 725 | 1.6 | 1.6 | 97.6 |
| > 5 hours | 1,065 | 2.3 | 2.4 | 100.0 |
| Total | 44,362 | 96.7 | 100.0 | |

Table 5 displays the frequency and percentage distribution of the sample child's daily amount of time spent watching television, videos, or video games. 79.2% of the sample children reported 0-2 hours of screen time a day and 20.8% reported two or more hours of daily screen time.

Table 5
*Average daily amount of time spent watching television, video, or video games*

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| None | 2,611 | 12.2 | 12.7 | 5.7 |
| < 1 hour | 20,143 | 54.0 | 55.9 | 50.0 |
| 1-2 hours | 13,254 | 17.5 | 18.1 | 79.2 |
| 2-3 hours | 4,577 | 5.9 | 6.1 | 89.3 |
| 3-4 hours | 2,215 | 3.1 | 3.2 | 94.1 |
| 4-5 hours | 1,146 | 1.6 | 1.6 | 96.7 |
| > 5 hours | 1,520 | 2.3 | 2.4 | 100.0 |
| Total | 44,362 | 96.7 | 100.0 | |

Table 6 displays the frequency and percentage distribution of the presence of a television in the sample child's bedroom. A total of 45,783 samples were collected with 50.8% having a television in their bedroom and 49.2% without a television in their bedroom.

Table 6

*Does the sample child have a television in his/her bedroom*

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| No | 22,519 | 49.1 | 49.2 | 49.2 |
| Yes | 23,264 | 50.7 | 50.8 | 100.0 |
| Total | 45,783 | 99.8 | 100.0 | |

Table 7 displays the frequency and percentage distribution of a park or playground existing in the sample child's neighborhood. A total of 45,482 samples were collected with 77.3% having a park or playground in their neighborhood and 22.7% reporting no park or playground in their neighborhood.

Table 7

*Does a park or playground area exist in sample child's neighborhood*

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| No | 10,346 | 22.5 | 22.7 | 22.7 |
| Yes | 35,136 | 76.6 | 77.3 | 100.0 |
| Total | 45,482 | 99.1 | 100.0 | |

Table 8 displays the frequency and percentage distribution of the parent's perception of whether their child was safe in the community or neighborhood. 55.2% of the surveyed parents believed their child was always safe in their community or neighborhood. 9.7% of the parent's believed their child was sometimes or never safe, which is noteworthy.

Table 8

*How often do you (parent) feel sample child is safe in your community or neighborhood*

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| Never | 652 | 1.4 | 1.4 | 1.4 |
| Sometimes | 3,760 | 8.2 | 8.3 | 9.7 |
| Usually | 15,927 | 34.7 | 35.1 | 44.8 |
| Always | 25,071 | 54.6 | 55.2 | 100.0 |
| Total | 45,410 | 98.9 | 100.0 | |

Table 9 displays the frequency and percentage distribution for Race classifications in the United States. A total of 43,366 samples were collected with 79.4% being white, 11.2% African-American, 4.8% Multiracial, and 4.6% Other.

Table 9

*Race Classification for all States (White, Black, Multiracial, Other)*

| | Frequency | Percent | Valid Percent | Cumulative Frequency |
|---|---|---|---|---|
| White | 34,451 | 75.1 | 79.4 | 79.4 |
| Black | 4,853 | 10.6 | 11.2 | 90.6 |
| Multiracial | 2,081 | 4.5 | 4.8 | 95.4 |
| Other | 1,981 | 4.3 | 4.6 | 100.0 |
| Total | 43,366 | 94.5 | 100.0 | |

Table 10 displays the frequency and percentage distribution of the sample household's poverty level based on the United States Department of Health and Human Services (DHHS) poverty guidelines.

A total of 41,973 samples were collected with 10.0% living at or below 100% of the poverty level, 50.1% living above 100% to at or below 400%, and 39.9% living above 400% of the poverty level.

Table 10
*Household Poverty Level*

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| At or below 100% of poverty level. | 4,194 | 9.1 | 10.0 | 10.0 |
| Above 100% to at or below 200% poverty level. | 6,641 | 14.5 | 15.8 | 25.8 |
| Above 200% to at or below 300% poverty level. | 7,690 | 16.8 | 18.3 | 44.1 |
| Above 300% to at or below 400% poverty level. | 6,719 | 14.6 | 16.0 | 60.1 |
| Above 400% poverty level. | 16,729 | 36.4 | 39.9 | 100.0 |
| Total | 41,973 | 91.5 | 100.0 | |

Tests of Hypotheses:

H-1: The correlation coefficient between the BMI and children who do not engage in weekly physical activity is -.065. The coefficient is significant at $P < 0.01$. It can be concluded that Spearman's Rank Order correlation revealed a statistically significant relationship between decreased weekly physical activity and a higher BMI classification. A Chi-Square test of independence of the relationship between weight status and a child not participating in weekly physical activity finds a statistically significant relationship between the variables. The P-value is highly significant, indicating an association between the variables ($X^2$=340.360, df=21, $p < 0.01$). Hypothesis 1 is supported; children who engage in less physical activity on a weekly basis are more likely to be overweight or obese.

H-2: The correlation coefficient between the BMI and sample children with a television in his/her bedroom is .104. The coefficient is significant at $P < 0.01$. It can be concluded that the Spearman's Rank Order correlation revealed a statistically significant relationship between sample children having a television present in their bedroom and a higher weight status classification. A Chi-Square test of independence of the relationship between weight status and children with a bedroom television finds a statistically significant relationship between the variables ($X^2$=542.972, df=3, $P < 0.01$). Hypothesis 2 is confirmed; children who have a television in their bedrooms are more likely to be overweight or obese.

H-3: The correlation coefficient between the BMI and children who spend leisure time using the computer is .023. The coefficient is significant at $P < 0.01$. It can be concluded that Spearman's Rank Order correlation revealed a statistically significant relationship between a higher BMI and computer use not related to schoolwork. A Chi-Square test of independence of the relationship between an elevated BMI and children who spend time on a computer unrelated to schoolwork finds a statistically significant relationship between the variables ($X^2$ =34.347, df=3, $P< 0.01$). Hypothesis 3 is confirmed; children who spend leisure time on a computer are more likely to be overweight or obese. However, due to limitations in the sample size, interpret these results with caution.

H-4: The correlation coefficient between weight status and higher levels of television or video game screen time is .117. The coefficient is significant at $P < 0.01$. It can be concluded that the Spearman's Rank Order correlation revealed a statistically significant relationship between increased TV or video game screen time and a higher weight status classification. A Chi-Square test of independence of the relationship between an elevated weight status and increasing amounts of overall screen time finds a statistically significant relationship between the variables ($X^2$=757.379. df=18, P <

0.01). Hypothesis 4 is supported; children who spend more time watching television or playing video games are more likely to be overweight or obese.

H-5: The correlation coefficient between weight status and presence of a neighborhood park or playground is -.031. The coefficient is significant at $P < 0.01$. It can be concluded that the Spearman's Rank Order correlation revealed a statistically significant relationship between the absence of a park or playground and a higher weight status. A Chi-Square test of independence of the relationship between an elevated weight status and children without a park or playground finds a statistically significant relationship between the variables ($X^2$=53.765, df=3, $P < 0.01$). Hypothesis 5 is confirmed; children who do not have access to a neighborhood park or playground are more likely to be overweight or obese.

H-6: The correlation coefficient between weight status and parents' perceptions of neighborhood and community safety is -.019. The coefficient is significant at $P < 0.01$. It can be concluded that the Spearman's Rank Order correlation revealed a statistically significant relationship between community safety and a higher weight classification. A Chi-Square test of independence of the relationship between an elevated weight status and community safety finds a statistically significant relationship between the variables ($X^2$=244.826, df=9, $P < 0.01$). Hypothesis 6 is confirmed; children's weight status is higher when parents perceive the neighborhood or community to be unsafe.

H-7: The correlation coefficient between weight status and Race classification is .085. The coefficient is significant at $P < 0.01$. It can be concluded that the Spearman's Rank Order correlation revealed a statistically significant relationship between Race classification and a higher weight status. A Chi-Square test of independence of the relationship between weight status and Race finds a statistically significant relationship between the variables ($X^2$=670.921, df=9, $P < 0.01$. This hypothesis is supported; Non-Caucasian children are more likely to be overweight or obese.

H-8: The correlation coefficient between weight status and children living below DHHS poverty guidelines is -.152. The coefficient is significant at $P < 0.01$. It can be concluded that the Spearman's Rank Order correlation revealed a statistically significant relationship between children living in poverty and a higher weight. A Chi-Square test of independence of the relationship between a weight status and poverty level finds a statistically significant relationship between the variables ($X^2$=1242.03, df=12, $P < 0.01$). Hypothesis 8 is supported; children living in poverty are more likely to be overweight or obese.

## DISCUSSION

The purpose of this research was to identify factors that are influential to increasing a child's calculated BMI-for-age. The prevalence of childhood overweight and obesity has become a primary public health concern. The rise in childhood overweight and obesity indicates that obesity is not a temporary pattern among children and seems to have a significant relationship with the social environment. For instance, the prevalence of childhood obesity has been regularly linked to modern technology and fast food, which is perhaps responsible for the advanced sedentary culture among children. The causes of obesity are complex and not fully understood, however it is confirmed that obesity is the result of energy intake exceeding energy expenditure. A child's social environment, obesogenic environmental factors, and lifestyle choices create a favorable environment for the occurrence of obesity.

Obesity is associated with several negative outcomes, including early puberty, sleep apnea, insulin resistance, diabetes, hypertension, and heart disease (HHS, 2007). Overweight and obese children are more likely to be diagnosed with an adult disease and the likelihood of becoming an obese adult increases (HHS, 2007). With the adverse side-effects overweight and obesity can cause in the lifespan, it is not surprising that obesity related healthcare costs are nearly $100 billion annually (HHS, 2007).

The goal of this study was to identify variables from the 2007 National Survey of Children's Health that negatively influenced the weight status of children. One of the most common approaches to gaining a general understanding of the causes of obesity is accomplished by comparing a child's weight status with specific environmental variables. This study examined survey responses from the parents of 10-17 year old children.

Analysis of the data revealed that the weight status of 10-17 year old children is adversely influenced by a combination of behavioral and environmental circumstances. Overall, 29 percent of children ages 10-17 years were overweight or obese, which is consistent with current surveys. Physical activity plays a highly significant role in childhood weight management and maintenance. In children, decreased physical activity levels are associated with an increase in weight status. Data collected in this research reported that 75.8 percent of children ages 10-17 years fail to meet the CDC recommendations of 60 minutes (1 hour) or more of physical activity each day. These findings are interesting considering the number of schools that have eliminated physical education classes, which has declined from more than 40 percent to nearly 25 percent in the last two decades (Sturm, 2005). It appears that some schools are reinforcing a sedentary environment for children.

Another environmental factor that influenced weight status was the amount of screen time per day and the presence of a bedroom television. The data revealed that 34.2 percent of children ages 10-17 years viewed more than two hours of screen time per day. The presence of a television in the child's bedroom could be partially responsible for increased screen time. More than half of the children surveyed had a television in his/her bedroom. Excessive amounts of watching television or videos, using a computer unrelated to schoolwork, and playing video games strongly influence the development of overweight and obesity in children. Certain data indicate that screen time is linked to an elevated BMI (Signorinoi & Winter, 2008). The American Academy of Pediatrics recommends that children view no more than 2 hours of accumulative screen time per day. To avoid excess screen time, parents can limit screen time to no more than 2 hours a day, remove the television from the child's bedroom, and partake in outdoor family activities opposed to watching television.

The other factors that influenced children's weight status were related to the child's built environment. Children are more likely to be overweight or obese if they are Non-Caucasian and live in poverty. While children of all income classes develop problems with weight status, there is a higher risk to children from low-income communities. These findings could be related to the absence of a park or playground in the community and the parent's perception of neighborhood safety. Neighborhood safety influences the amount of time children participate in outdoor physical activity. The ability to perform physical activity at home depends on the safety and access within the child's community. Children are more likely to engage in physical activity when their parents do not have safety concerns. Neighborhoods with lower crime rates have more children that participate in physical activity compared to communities with high crime rates. Children who engage in physical activity or have access to recreation areas are more likely to be of normal weight. In this analysis, it appears socioeconomic conditions limit a child's control over factors influential to weight status. Increasing the availability for access to physical education and the addition of community recreation in low-income communities, may have a positive influence on childhood overweight and obesity.

## Public Health Implications

The psychological and physiological problems related to the prevalence of childhood overweight and obesity is well documented. As a result, there are several public health approaches to reducing the prevalence of childhood overweight and obesity. A large number of public health and medical professionals agree that health promotion and obesity prevention is the primary strategy for managing the prevalence of childhood overweight and obesity. The school systems provide the most convenient intervention for children due to the significant amount of time children spend in this environment. Policies that increase school recreation areas, maintain playground equipment quality, and open school recreation areas on the weekends could be an effective model for the promotion and prevention of childhood overweight and obesity. The American Heart Association proposes mandatory school physical education courses, which promote extracurricular activities (e.g. weekend exercise) that increase activity levels and healthier lifestyles (American Heart Association, 2010).

## Limitations

Telephone surveys have lower response rates than face-to-face surveys, and therefore are at risk for bias compared to surveys completed in person. The 2007 National Survey of Children's Health was a landline telephone survey. The survey excluded approximately 13-14% of children living in households with only cell phones and 2% of children living in households with no phone coverage. Additionally, the NSCH did not include children living in institutional settings (National Survey of Children Health, 2007).

# CONCLUSION

The purpose of this research was to examine a set of behavioral and built environment factors that may influence a child's calculated BMI-for-age percentile. An ecological perspective was applied, hypothesizing that children's weight status was related to their behavioral and built environment. This analysis revealed that the weight status of 10-17 year old children is negatively influenced by a combination of behavioral and built environmental factors. Childhood overweight and obesity is a complex condition that needs to be further examined and discussed on several levels. It is important for families who are affected to not only understand the causes of overweight and obesity, but also have a means to proper care.

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# APPENDICES

Appendix A: Institutional Review Board Letter of Study Approval

WRIGHT STATE
UNIVERSITY

**Office of Research and Sponsored Programs**
201J University Hall
3640 Col. Glenn Hwy.
Dayton, OH 45435-0001
(937) 775-2425
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**DATE:** April 20, 2011

**TO:** Donny Dunfee, P.I., Student
Community Health, Center for Global Health
Sabrina Neeley, Ph.D., Fac. Adv.
Community Health, Center for Global Health

**FROM:** B. Laurel Elder, Chair
WSU Institutional Review Board

**SUBJECT:** SC# 4478
*'Environmental Causes of Pediatric Obesity'*

At the recommendation of the IRB Chair, your study referenced above has been recommended for exemption. Please note that any change in the protocol must be approved by the IRB; otherwise approval is terminated.

This action will be referred to the Full Institutional Review Board for ratification at their next scheduled meeting.

**NOTE: This approval will automatically terminate two (2) years after the above date unless you submit a "continuing review" request (see http://www.wright.edu/rsp/IRB/CR_sc.doc) to RSP. You will not receive a notice from the IRB Office.**

If you have any questions or require additional information, please call Robyn Wilks, IRB Coordinator at 775-4462.

Thank you!

Enclosure

RESEARCH INVOLVING HUMAN SUBJECTS

SC# 4478

ACTION OF THE WRIGHT STATE UNIVERSITY
EXPEDITED REVIEW
Assurance Number: FWA00002427

Title: 'Environmental Causes of Pediatric Obesity'

Principal Investigator: Donny Dunfee, P.I., Student
Community Health, Center for Global Health
Sabrina Neeley, Ph.D., Fac. Adv.
Community Health, Center for Global Health

The Institutional Review Board Chair has approved an exemption with regard to the use of human subjects on this proposed project.

REMINDER: Federal regulations require prompt reporting to the IRB of any changes in research activity [changes in approved research during the approval period may not be initiated without IRB review (submission of an amendment), except where necessary to eliminate apparent immediate hazards to subjects] and prompt reporting of any serious or on-going problems, including unanticipated adverse reactions to biologicals, drugs, radioisotope labeled drugs or medical devices.

B Laurel Elder Ph D

Signed Chair, WSU-IRB

Approval Date: April 20, 2011
IRB Mtg. Date: May 16, 2011

Appendix B: Linkage to Public Health Competencies

This research project achieved completion to the following Public Health Competencies (Competencies Project, Council on Linkages, April 2001):

*Analytic/Assessment Skills*

- ✓ Defines a problems
- ✓ Determines appropriate uses and limitations of both quantitative and qualitative data
- ✓ Selects and defines variables relevant to defined public health problems
- ✓ Identifies relevant and appropriate data and information sources
- ✓ Evaluates the integrity and comparability of data and identifies gaps in data sources
- ✓ Makes relevant inferences from quantitative and qualitative data
- ✓ Recognizes how the data illuminates ethical, political, scientific, economic, and overall public health issues

*Policy Development/Program Planning*

- ✓ Collects, summarizes, and interprets information relevant to an issue

*Communication Skills*

- ✓ Communicates effectively both in writing and orally, or in other ways
- ✓ Advocates for public health programs and resources
- ✓ Effectively presents accurate demographic, statistical, programmatic, and scientific information for professional and lay audiences

*Basic Public Health Sciences Skills*

- ✓ Defines, assesses, and understands the health status of populations, determinants of health and illness, factors contributing to health promotion and disease prevention, and factors influencing the use of health services
- ✓ Identifies and applies basic research methods used in public health
- ✓ Applies the basic public health sciences including behavioral and social sciences, biostatistics, epidemiology, environmental public health, and prevention of chronic and infectious diseases and injuries
- ✓ Identifies and retrieves current relevant scientific evidence
- ✓ Identifies the limitations of research and the importance of observations and interrelationships
- ✓ Attitudes: Develops a lifelong commitment to rigorous critical thinking