Nutrition, Physical Activity and Health Assessment of School Age Children in Menomonie, Wisconsin

by

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ABSTRACT

The Centers for Disease Control indicate 18.8% of children (ages 6 – 11 years) are currently overweight and Wang (2006) predicts this to increase to as much as 46%. Limited data exists for elementary age children in Wisconsin. This study evaluated the extent of childhood obesity among children 6-11 years of age in Menomonie, Wisconsin, and analyzed the following relationships: anthropometric measurements with gender, age and school; weight status with nutrition and physical activity parameters; and nutrition with physical activity. Forty-two subjects from two schools participated in the study. Height, weight, body mass index (BMI), triceps skinfold, and midarm, waist and hip circumference were measured. Subjects also completed the Hearts 'n Parks survey which measures nutrition knowledge, behavior and intention as well as diversity in physical activity and attitude.

Results indicated 16.7% of children in the study were overweight. There was a trend towards an increase in the prevalence of overweight children with age. Girls were more likely to be overweight than boys. Intention to eat nutritiously was greater in overweight children than in other weight categories. As nutrition knowledge increased, intentions and eating behavior also increased. No positive correlation existed between nutrition knowledge, behavior or intentions with the diversity of physical activity children like to or actually do and their attitude to be physically active. Thus effective interventions for this age group should include nutrition education as well as encouraging an active lifestyle.

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Chapter I: Introduction

Childhood obesity is a national concern. It has dramatically increased over the last few decades and reached an epidemic status. According to the Centers for Disease Control and Prevention (Centers for Disease Control, 2004; 2007a), 18.8% of the children are currently overweight. Wang and Lobstein (2006) have predicted by the year 2010, the prevalence of overweight children will rise to 46%. The projected rise in obesity across this population is of utmost concern especially since studies indicate over 70% of overweight adolescents become overweight adults (Dietz, 2004; United States Department of Health and Human Services, 2001). Although the term obesity is used, the Centers for Disease Control (2006) uses "overweight" for classification in children instead of the term adult term obesity. Studies involving childhood obesity however look at the "at risk for overweight" and "overweight" population. The "at risk for overweight" category is indicated by a body mass index (BMI) between the 85th and 95th percentile for age and gender while the "overweight" category is indicated by a body mass index greater than the 95th percentile. Both "overweight" and "at risk for overweight" status in children and adolescents has dramatically increased in the last 40 years according to Fowler-Brown and Kahwati (2004). The extreme rise in the prevalence of childhood obesity has raised the awareness of the issue and has created opportunity for action to be taken to curb this rapidly growing trend and protect the future of our children. The Institute of Medicine (2005) reported the obesity epidemic has impacted each gender, all ages, races, and ethnic groups in the United States.

Globally, an increase in body mass index has created a public health issue. Obesity among adults and children has the world concerned, but there has been a focus on

childhood obesity due to the ramifications obesity can have on overall life. Obesity in children and adolescents is a serious issue with many physical health and social consequences that often continue into adulthood. The American Obesity Association (2005) stated that implementation of prevention programs can help better understand treatment for youngsters in order to control the obesity epidemic. The rate of childhood obesity is important to monitor because it can track the progression of diseases and co-morbidities occurring in adulthood. According to the Institute of Medicine (2005), the effects of obesity on children's physical health can be immediate as well as long term. They indicated at least 60% of overweight children in a population based sample had at least one cardiovascular risk factor – which included high total blood cholesterol, triglycerides, insulin, or blood pressure. Type 2 diabetes, which used to be referred to as adult onset diabetes, is increasing in youth and associated with the rise in number of overweight children. Many of these co-morbidities can be decreased if we can curb the rate of childhood obesity. In Mullen and Shield (2003), other health factors that affect the health of overweight children include the development of orthopedic abnormalities due to increased weight on developing joints, asthma, sleep disorders, gastrointestinal issues, and psychosocial conditions. Schwartz and Puhl (2003) stressed psychosocial issues are on the rise with overweight children. The social stigma of overweight puts shame on the individual and lowers self esteem. These can affect academics, socializing skills, happiness, and success in childhood and into their adult lives. Fontaine, Redden, Wang, Westfall, and Allison (2003) predicted the obesity epidemic has the potential to reduce children's life expectancy because of the increased risk for co-morbidities; this would be the first time in decades that United States life expectancy may decrease.

Moran (1999) stated tackling the childhood obesity issue early can promote healthy eating and physical activity, which have an impact on the entire family and minimize the long-term effects. The United States Surgeon General issued a Call to Action to Prevent and Decrease Overweight and Obesity, which targeted this national public health priority (United States Department of Health and Human Services, 2001). It was also noted that greater attention needed to be focused on childhood obesity, so numerous agencies formed an action plan. Since children heavily rely on their parents and the education system, it has been difficult to focus on the individual needs of the children. Mullen and Shield (2003) suggested population-based outlooks look at the environment as a major cause of the rapid rise in childhood obesity. Included in this category are factors such as family structure, lifestyle habits, and eating patterns. Decreased physical activity in youth may be due to the reliability on the automobile, decreased safe areas for outdoor play, reduced physical education class time, and technology. These have impacted our daily living activities and significantly impacted the amount of calories expended. Other factors associated with the rise in obesity relating to diet point to eating patterns, portion sizes, and increased consumption of convenience or fast food items, which are typically higher in calories and fat. School-based interventions center on the population, rather than individuals affected to improve overall health of the population.

Healthy People 2010 is a national initiative that challenges communities and individuals to ensure good health and longevity are available to all and encourage communities to take action in reduction and prevention of major health problems including childhood obesity. One major health objective is to reduce childhood obesity to 5% by the year 2010 (United States Department of Health and Human Services, 2000).

Menomonie is a rural town in Wisconsin residing in Dunn County and it is estimated that 19% of all individuals in this county are overweight (Schumann & Remington, 2005). Data is specifically lacking for tracking the prevalence of overweight children. With many small communities, assessments and interventions do not take place often as they are limited by personnel and funding. Communities are assessed by studies conducted in larger cities of their state, assuming they represent a similar profile. In 2003, an obesity task force was created in Menomonie that consisted of community leaders, organizations, and University of Wisconsin-Stout. Issues that pertained to childhood obesity and the measures needed to take to curb the epidemic were discussed. Data collected in this study assessed the rate of childhood obesity in elementary school children, providing a baseline for longitudinal studies to be launched to assess future health of our children.

The government has taken a step to slow the rate of childhood obesity through mandating a School Wellness Policy. By the start of the 2006-2007 school year, all school districts who receive funding under the Child and Nutrition Act of 2004 are required to institute a School Wellness Policy which has been mandated by the United States Department of Agriculture's Food and Nutrition Service (n.d.). Each policy addresses areas of concern for each school district in regards to school lunch, additional food offerings in the school, physical activity and nutrition education. The School District of the Menomonie Area wrote a policy that addressed these areas, but the need to assess a sample of children that would give a snapshot of the school district was identified. The evidence provided by this assessment would be used to change programs and practices the community uses. The framework could be utilized by other small communities in

order to assess their own strategies. It would also provide an opportunity to launch a longitudinal study for future implementations an impact in childhood obesity.

Statement of the Problem

The purpose of this study was to determine if physical activity, diet, and body mass index are related to the health status in elementary aged students. Data collected from elementary students in grades 1, 3, and 5 during the 2006-2007 school year at two elementary schools in Menomonie, Wisconsin was analyzed to make an assessment on their health status in relationship to childhood obesity. The participants dietary habits and diversity in physical activity were assessed using the Hearts n' Parks child survey which was adapted from a validated diet survey the Child and Adolescent Trial for Cardiovascular Health (CATCH) (National Recreation and Park Association, 2004). Anthropometric measurements (height, weight, calculated BMI, triceps skinfold measurement and hip/waist ratios) were taken by a trained member of the research staff using calibrated scales equipment and growth charts for calculating percentile rankings for BMI. Triceps skinfold measurement were measured using a Lange skinfold caliper. Data collection sheets and surveys were coded in order to link results to the individual but also to maintain confidentiality.

Purpose of the Study

The purpose of this study was to assess the prevalence of childhood obesity in order to provide a framework for a longitudinal study in the Menomonie community. Differences in body composition in relation to dietary habits, physical activity and weight status were reviewed in order to make the assessment. This comprehensive assessment will provide data to implement new programs to reduce the prevalence of childhood obesity as well as a framework for a longitudinal study.

Hypotheses

This study is to look for a correlation between dietary habits, physical activity, and body composition in normal and overweight children from grades 1, 3, and 5 in the Menomonie School District.

1. There is no relationship between the dietary habits and diversity in physical activity with overall health in children in the Menomonie school district.

2. There is no relationship between dietary habits and physical activity levels in children in the Menomonie school district.

Additional Research Questions

- Are there differences in the percent of overweight children in grades 1, 3, and 5?
- Are male or female students more likely to be overweight in grades 1, 3, and 5?
- Is the rate of childhood obesity in Menomonie lower than the state average?
- Is the rate of childhood obesity in Menomonie lower than the national average?

Assumptions of the Study

Assumptions of this study include that children, assisted by parents, will complete surveys honestly, accurately, and completely as possible. It is also assumed that

participants who have signed consent forms will participate in all steps of the process to gather data for each variable. Another assumption was all equipment used for measurements (scale, stadiometer, tape measures, and calipers) were calibrated correctly to ensure accuracy of the data. Finally, all personnel assisting in the data collection understood their training and performed measurements accurately.

Limitations

Menomonie is a small rural town in Wisconsin where 94% of the population is white according to the United States Census Bureau (2000); Asian, Hispanic, African American, and American Indian make up the remaining 6% of the population. With the dominance of one ethnic group, there are limitations to extrapolate the findings for all cultures. Only two elementary schools expressed interest in participating in the study which limits the sample size further. According to verbal communication with the School District of the Menomonie Area Board office, ethnicity was 78% and 90% Caucasian decent for School Y and School X, respectively. Since this study relied on parental consent of their children to participate in the study, sample size may be a limitation when analyzing the statistical data. Participation is on a volunteer basis only, with the intent that participants will complete all aspects of the study. Because there are multiple components, some participants may choose to complete only some of the tasks. Although students are not required to complete all of the tasks in the study, it is encouraged in order to evaluate associations between diet, physical activity, and the assessment results. Components that are not completed will limit the number of participants completing the entire study. Data collected on the survey depends on participants answering the questions on what their current eating behaviors honestly and not what they feel the

researcher wants to see. Limitations on the diet survey were to provide estimated data in regards to high calorie, high fat diets and not on the composition of the diet regarding fruit, vegetable, or whole grain food intake. Another limitation of this study was the accuracy of anthropometric measurements as some of the younger children may not be as cooperative with the researcher/staff thus affecting results.

Definition of Terms

The following terms have been defined for the purpose of this study.

Anthropometric: Refers to comparative measurements of the body. Those that are used to assess growth and development in children include height, weight, and weight-for-height. Other measurements include skinfold, waist, hip, and arm circumference which assesses body fat.

At Risk for Overweight: Over optimal body weight, but not currently in the overweight category. Defined as greater than 85th to less than the 95th percentile.

Body Composition: Assessment of body fat and lean body mass.

Body Mass Index (BMI): For children, age and gender specific charts indicate the level of body fat based on height and weight BMI categories are defined as underweight, healthy weight, at risk for overweight and overweight.

Childhood Obesity: According to the American Obesity Association (2005), the term "childhood obesity" may refer to both children and adolescents. Children are 6-11 years of age, while adolescents are 12-17 years of age. This paper focuses on children between the ages of 6-11 years of age.

Lean Body Mass: Mass of the body without fat.

Normal Weight: Optimal body weight; categorically defined as greater than the 5th percentile to less than the 85th percentile.

Overweight: Over optimal body weight defined as greater than the 95th percentile.

Underweight: Body weight less than optimal categorically defined as less than the 5th percentile.

Methodology

The methods used in this study asked parents to allow their child in grades 1, 3, and 5 at two elementary schools to participate. Letters to parents, informing them of the study, were distributed in orientation packets sent out prior to the start of the 2006-2007 school year. Parents signed consent forms to have their children participate in the study and were informing during the mandatory orientation day about the time and date of the study. The methods used in the physical assessment of body composition of elementary students were anthropometric measurements. The Hearts n' Parks survey was used for the assessment of nutrition and physical activity. The body composition was assessed by collecting height and weight of individuals, skinfold measurements, and calculating their body mass index. Nutrition knowledge, attitude and behavior as well as physical activity levels and intention were measured with this survey. The Hearts n' Parks survey which was adapted from the validated and reliable CATCH survey.

Chapter II: Literature Review

Introduction

Information presented in this chapter pertained to obesity, methods for assessment, and treatment options. An overview of obesity, the difference among youth, prevalence among society, and plausible explanations for a rise in its occurrence are shown. Next, health, emotional, and psychosocial effects associated with obesity will be discussed. This is followed by methods to assess children to determine risk factors for obesity. The chapter closes with various treatment options focused on school, community, and family based interventions.

Definition of Obesity

The general definition for overweight and obesity for children as defined by the Centers for Disease Control and Prevention (2006b) is a range of weight that is more than healthy weight range for any given height. Mullen and Shield (2003) defined obesity as the presence of excess adipose tissue in the body, and while overweight as a lesser degree of adipose tissue present. The adult population is assessed using height and weight to calculate a body mass index number. This equation cited from Willett, Dietz, and Colditz (1999) uses weight in kilograms (kg) divided by the square of the height reported in meters (m), and appears as kg/m^2. Each individual is placed into a category from their body mass index number (BMI) which determines a level of adiposity and associated health risks in that category. The National Heart, Lung, and Blood Institute (n.d.) published the Body Mass Index for adults as seen in Appendix A. The BMI and classification categories are slightly different as "at risk for overweight" in children reflects the overweight category in the adult population and "overweight" regarding

children is the obese category in adults. Another difference in BMI between adults and children is the use of age and gender for BMI category determination. The distinction between age and gender is not taken into account for adults.

Cited in *Pediatrics* (Goran, 1998), body mass index is the best tool to measure adiposity in children although Gazzaniga (1991) stated BMI calculations used in adults are not as accurate in children. Thus, to account for growth factors, the Expert Committee on Clinical Guidelines for Overweight Adolescent Preventive Services recommended BMI categories be based off of charts developed with BMI-for-age-, and-gender cited in Himes and Dietz (1994). The main difference is accounted for in the changes in adipose tissue, muscle and bone mass during stages of development. The rationale is excess weight of a heavy child may be due to increased muscle mass and better bone development, not necessarily excess fat as the amount of lean body mass affects the overall BMI. Therefore, using age based growth charts in combination of height and weight provides a better classification of health status in children (Gazzaniga, 1991; Himes & Dietz, 1994; Dietz & Bellizzi, 1999). The definitions for BMI-for-age-, and-gender are listed in Table 1.

Table 1

BMI Category for Children

Status Category	Percentile Rank
Underweight	Less than 5th percentile
Healthy weight	5th up to 85th percentile
At-risk of overweight	85th to less than 95th percentile
Overweight	Equal to or greater than 95th percentile

(Centers for Disease Control, 2006b)

The "at risk of overweight" category indicates that a child may become overweight as an older child or adult unless lifestyle modifications are changed. The "overweight" category indicates the child is currently overweight and may remain at that status through adult years without interventions. The BMI classification for children is dependent on height, weight, age, and gender, so two children could have the same BMI number, yet fall into different categories. For example a 5 year old child with a BMI of 18 falls in the "overweight" category while the same BMI at age 9 classifies the child in the "healthy" weight category. The Centers for Disease Control (2000) has published growth charts for boys and girls aged 2-20 years old (Appendix B, www.cdc.gov/growthcharts). Children's BMI numbers compared to adults correspond to different meanings. Table 2 (extrapolated from Centers for Disease Control Clinical Growth Charts, 2000) demonstrates how BMI's for various aged children would correspond on the percentile rankings to indicate if they fell into the "at risk for overweight" group at the 85th percentile or the "overweight" group at the 95th percentile. For example, a BMI of 18.5 for a six year old indicates the child is "overweight", yet on

for an 8 year old it falls in the "at risk for overweight" classification and could be "healthy weight classification for a 10 year old.

Table 2

BMI and Children

Age	BMI for 85th Percentile "at risk"	BMI for 95th Percentile "overweight"
6	17	18.5
7	17.5	19.5
8	18	21
9	19.5	22
10	20.5	24
11	21.5	25

It is important that consistent forms are used by health professionals and parents to assess children. An expert committee in 1997, recommended BMI curves from the revised growth charts should be used to assess and treat childhood weight status on children older than 2 years of age (Centers for Disease Control, 2000). Reported in *Modern Medicine* (2007), Klein stated pediatrician's screen for BMI only 52% of the time. This screening tool is the first step in the screening process for overweight children and can be a flag for potential medical concerns that may affect development and growth patterns.

Prevalence

The Institute of Medicine (2005) stated, in 1970, only 4% of children 6 to 11 years of age were overweight. According to the Centers for Disease Control (2004; 2007a), results from the 2003-2004 National Health and Examination Survey, known as NHANES, indicated 18.8% of the nation's children are currently overweight. The National Education Association Health Information Network (n.d.) estimated over 30% of children six to eleven years of age in the United States are either overweight or at risk of being overweight. This number has tripled in the last twenty years and Wang and Lobstein (2006) have predicted by the year 2010, the prevalence of overweight children will rise to 46%. With half of this population at risk for being overweight by the end of this decade, there is a need for individual cities and counties to determine the status of their community. Dunn County has limited data regarding BMI; through their health check program they were able to identify that 25% of the children ages 2-20 were at risk for overweight and 12% were overweight (personal communication with Dunn County Public Health, 2006). The national Youth Risk Behavior Survey sponsored by the Centers for Disease Control (n.d.) indicated 10% of Wisconsin high school students are overweight, and an additional 14% are at risk for being overweight. Overall, the data from Dunn county health department indicates their small population is comparable to state findings.

The American Dietetic Association (2006) identified overweight as a major problem for children and adolescents in the United States. The percentage of overweight children has been a growing trend and has reached epidemic status. The American Dietetic Association indicated their position, an intervention to combat the growing trend,

was focused on multiple programs including the family, community, school, and individual (American Dietetic Association, 2006). The American Dietetic Association does not stand alone as the United States Department of Health and Human Services has taken a great step in reducing this trend. Overweight children are of concern to the nation. One public health objective of the in Healthy People 2010 is to decrease the rate of childhood obesity 50% by the end of the decade (United States Department of Health and Human Services, 2000).

The occurrence of childhood obesity has raised concerns in the medical profession because the effect is extrapolated in adulthood. The Centers of Disease Control (2004) estimated the prevalence of overweight adults to be 58.1%. Normal and overweight children under 10 years of age who have obese parents are at a two-fold risk of being overweight as adults as compared to children with normal weight parents (Institute of Medicine, 2005). Research has stated there is a positive correlation between the rising number of obese adults and number of children becoming overweight (Whitaker, Wright, Pepe, Seidel, & Dietz, 1997). Noted by Wang (2002), early sexual maturation can be promoted by obesity in children resulting in advanced bone age, higher bone density, and increased sex hormone levels. Mustillo, Worthman, Erkanli, Keeler, Angold and Costello (2003) suggested psychological consequences of overweight which includes a negative effect on self-esteem, and increased depression. More surprisingly, the American life expectancy may be reduced by 5 years (Olshansky, Pasaro, Hershow, Layden, Carnes, Brody, et. al., 2005). This could be the first time in decades that life expectancy for children is not higher than their parents. The potential reduction in life expectancy is due to the increased risk for co-morbidities in adolescents. Cardiovascular

disease, arthritis, high cholesterol, glucose intolerance, and Type 2 diabetes, contributed to these risks (Fowler-Brown & Kahwati, 2004). Interventions to reduce childhood obesity are justified.

The presence of overweight children does not distinguish between socioeconomic or regional differences. Institute of Medicine (2005), identified ethnic minority groups such as Hispanic, non-Hispanic black, and Native Americans as affected in greater numbers than other ethnic groups. They also indicated children of low socioeconomic status are affected in greater proportion, but the disparities are not as prevalent as among ethnic groups. Knowing which disparities exist can assist communities in identifying interventions to reduce the rate of obesity.

Reasons for Obesity on the Rise

The United States Surgeon General reports that overweight children are increasingly present because of decreased physical activity, unhealthy eating habits, genetics, the environment, or a multiple of those factors (United States Department of Health and Human Services, 2001). Smaller family size, race, seasons, urban living and socioeconomic status are also players in the childhood obesity game (Dietz & Gortmaker, 1984). However, the actual cause for obesity has not been determined, yet there are many contributing factors correlating to the increase (Mullen & Shield, 2003).

One contributing factor for a small segment of the population is genetics. A child's chance of being overweight tripled if they had one obese parent (Whitaker, Wright, Pepe, Seidel, & Dietz, 1997). This risk had a 13-fold effect if both parents were obese. Moran (1999) declared other genetic conditions may predispose a child to obesity:

such as Doron's Prader-Willi, Turner's syndrome, hypothyroidism, and hyperinsulinemia. Thus, we can not ignore genetics.

Over the years, there has been an increase in overweight children which may be due to decreased physical activity. Healthy People 2010 created 3 health objectives focusing on increased physical activity and reduced sedentary behavior among children (United States Department of Health and Human Services, 2000). This decrease may be due to, but not limited to: 1) technologic advances such increased television, computer, cell phone usage has taken the active free time into sedentary activities. 2) safety concerns and community design, kids rarely walk or bike to school like they did years ago, instead most rely on their parents to drop them off or wait for a bus and 3) reduction in physical activity classes in our elementary schools. Ultimately these factors lead to an overall decline in daily activity levels. Activities involving physical exertion of energy are being replaced by sedentary activities. According to a study completed by Centers for Disease Control's School Health Policies and Programs Study (Kolbe, Kann & Brener, 2001), only 8% of elementary schools provide the required 150 minutes per week of physical activity. The Youth Media Campaign Longitudinal Study indicated over 60% of children ages 9-13 years of age do not participate in physical activity outside of school and over 20% do not participate in any physical activity (Centers for Disease Control, 2003). The American Academy of Pediatrics policy statement (2001) indicated 65% of children aged 8-18 years old have a TV in their bedrooms. They also found the time spent on all forms of media was almost five and a half hours per day. Combine that with the seven hours children are at school and there is very little time to be active.

The Youth Behavior Risk Survey conducted by Centers for Disease Control (2003) gave a good estimate on activity levels for high school ages but data for elementary and middle school children is lacking. Again, based on the limited data in Wisconsin, we are not clear on the activity levels of children in Dunn County. Assessing the diversity in activities can give us an indication whether a child may be physically active on a routine basis or not. Energy expenditure is one important area of focus because if we are not active these excess calories can add to our waistline.

Energy intake has been affected by portion sizes, high calorie foods, and inadequate food choices. Fruits and vegetables are nutrient dense foods because for the amount of calories that are consumed and are rich in essential nutrients. The decline in consumption of produce in general has led to an increase in high calorie and high fat foods which appears to be a convincing factor to the increase in obesity. Only 30% of children are achieving number of serving recommendations for fruits, vegetables, grains yet 40% are exceeding sugar and discretionary fat intake (Munoz, Krebs-Smith, Ballard-Barbash & Cleveland, 1997). NHANES 2001-2002 data provided by the Centers for Disease Control (2007b) indicated a positive association between energy intake and television viewing. Combining increased energy intake and decreased physical activity correlated into increases in body weight.

Over the last 30 years, portion sizes have increased. Controlled portion size can is part of controlling caloric intake. One study indicated portion size and energy content of foods were significant factors for children above 6 years of age when associated with BMI percentile (Huang, 2004). Energy intake is a concern along with reasons why we

consume the amounts of food we do or our behaviors. These factors need to be taken into account when we look for explanations to our increase in energy.

Two factors contribute to onset of obesity in childhood are behavior and metabolism. Behavior encompasses eating behaviors and physical activity patterns. Stated by Smith (1999), eating behaviors include how a child learns to eat, social influences, family structure and personal beliefs, characteristics/availability to food, appetite and satiety. Family structure is different today than it has been in the last few decades. According to Eisenberg, Olson, Neumark-Sztainer, Story and Bearinger (2004), 26.4% of families only consumed seven meals together in a week. Family life also impacts physical activity levels of children. The percentage of single parent households has increased in the last 30 years. Twenty-five percent (25%) of children live in single parent households leaving the children to take care of themselves while their parents work more than one job (Federal Interagency Forums on Child and Family Statistics, 2005). Working parents need to rely on school and childcare. Children do not receive the recommended 60 minutes per day of physical activity in these programs (Institute of Medicine, 2005). With safety issues in their neighborhoods and working parents, kids rely on media for entertainment resulting in declining opportunities for physical activity.

Environmental factors can also have a contributing impact on obesity relating to the decline in physical activity and changes in eating patterns. The Youth Media Campaign Longitudinal Survey conducted by Centers for Disease Control, reported that 61.5% of children aged 9-13 years did not participate in any organized physical activities during non-school hours and 22.6% do not participate in free play activities. In addition, the School Health Policies and Programs Study 2000 (Kolbe, Kahn & Brener, 2001)

reported only 8% of elementary schools provide daily physical education or its equivalent of 150 minutes per week. Physical activity patterns have dramatically changed since children are not receiving the required amount of physical activity at home or school.

Families now rely on vehicles for instead of physical activity modes of transportation. Environmental factors forced the dependency on vehicles because of community design, lack of sidewalk infrastructure and safe routes to school. In addition, community design has also led to fewer recreation facilities that are close to neighborhoods. Chores used to be an integral part of a child's daily activities and the decrease in physical labor has also intensified the decrease in energy expenditure. All of these factors have had a significant impact on the reduction of physical activity time for the entire family.

Effects on Health

Obesity has associated health risks as well. The risk for cardiovascular disease, diabetes, and orthopedic conditions are major health problems manifesting in younger adults (Fontaine, et al., 2003; Freedman, Dietz, Srinivasan, & Berenson, 1999). At least one major cardiovascular disease risk factor; insulin resistance, dyslipidemia, and high blood pressure, was found in 60% of the overweight children participating in the Bogalusa Heart Study (Freedman, et. al., 1999). Insulin resistance in childhood is usually the result of obesity (Goran & Sothern, 2006). This disease which commonly appeared as adults approached middle-age is becoming increasingly popular and has accounted for a 33% increase in new pediatric diabetes diagnosis (Kaufman, 2002). Results from the Wausau SCHOOL project indicated that insulin resistance was detected in 50% of the participants who fell into the "at risk category". In addition, this study revealed 39% had

at least one lipid abnormality and by 11th grade 38% had 2 lipid abnormalities. Twenty nine percent of these participants also had abnormal blood pressure (Hughes, Murdock, Olson, Juza, Jenkins, Wegner, & Hendricks, 2006). These co-morbidities have an effect on life expectancy (Fontaine et. al, 2003). Steinberger and Daniels (2003) stated the prevention of childhood obesity and managing the increasing level of insulin resistance was increasing physical activity levels and decreasing caloric intake was the primary prevention to manage the increasing levels of insulin resistance noted in this population.

Psychological conditions have also been increasing over the past 20 years with the increasing prevalence of obesity. These overweight children are experiencing psychological issues such as low self esteem, depression, and discrimination due to their weight status. These have one of the greatest impacts on emotional development in childhood (Mullen & Shield, 2003). Overweight individuals may be socially stigmatized by their leaner peers; leading to less participation in athletic activities (Gidding, Rudolph, Daniels, Rosenbaum, VanHorn, & Marx, 1996). One study indicated differences between body image were noted for age, gender and weight (at baseline) where gender, ethnicity and weight status were associated with self-esteem (Schwartz & Puhl, 2003). Stereotypes of individuals based on body image can lower self-esteem by indicating overweight children are lazy, sloppy, ugly, and stupid (Kirkpatrick & Saunders, 1978). The damaging effects on psychosocial development of overweight children affect academic and socialization skills (Schwartz & Puhl, 2003).

Health and psychosocial effects from obesity can affect the individual, but society is impacted economically. Obese patients have higher number of hospitalizations, prescriptions, days off of work, and outpatient claims (Raebel , Malone, Conner, Xu,

Porter, & Lanty, 2004). Insurance claims for obese patients are $200 higher than costs associated with non-obese individuals. Wee, Philips, Legedza, Davis, Souku, Colditz and Hamel (2005) stated the increase in health care expenses was associated with elevated BMI, primarily with hospital and prescription drug costs for treatment of cardiovascular diseases. Bungham, Satterwhite, Jackson and Morrow (2003) found there are significant differences in health care costs between normal and overweight individuals but there was little difference in cost increases between overweight and obese groups. The World Health Organization indicated health care costs associated with obesity represent 36% and 77% of all health expenditures and pharmaceutical costs compared to a normal weight individual (World Health Organization, 2003). With the increase in health care costs for all and overweight individuals contributing to these costs, the treatment and prevention of this disease is of utmost importance.

Assessments

Conducting a risk assessment should be the first step conducted on an overweight individual (Kushner & Blatner, 2005). BMI has been used to define overweight and obesity in adults but is a screening tool in children (Samour & King, 2005). Pediatricians monitor growth of children to ensure they are meeting specific milestones. Starting at age 2, physicians are advised to monitor growth with gender and age specific body mass index charts (Centers for Disease Control, 2000). The amounts of adiposity in children are reflected in BMI fluctuations. Typically, BMI was lower during the preschool years and increases in adolescence as the reach adulthood. Girls naturally differ from boys in the amount of adipose tissue they possess therefore, Pietrobelli, Faith, Allison, Gallagher, Chiumello, and Heymsfield (1998) indicated BMI was the appropriate tool to assess BMI

in children as it takes into account these differences in growth patterns. BMI is still calculated as kg/m^2 in children but then is used to plot against age and gender on BMI growth charts. Cut-off points were established from national reference samples of the NHANES database (Centers for Disease Control, 2000) and the classification of a child "at risk" or "overweight" allows health professionals to monitor growth accordingly (Dietz & Bellizi, 1999).

Other tools to assess body composition include: hydrostatic weight, dual energy x-ray absorptiometry (DEXA), magnetic resonance imaging (MRI) and bioelectrical impedance (Parizkova & Hills, 2000). Although reliability is high, these methods require expensive pieces of equipment and are not utilized in a practical setting. Mullen and Shield (2003) indicated past practices to assess overweight and obesity in children included triceps skinfold, weight-for-height by age, and gender as well as body mass index. Today, because of ease of assessment and cost effectiveness, BMI is still been the assessment tool of choice (Must & Anderson, 2006). Changes to diet and lifestyle may hold promising benefits as that child has the opportunity during the normal childhood growth to reduce their risk for being overweight with small lifestyle changes.

Goran (2006) stated there is not a single method that works best on pediatric patients, therefore if cost and equipment are not an issue, multiple methods should be used to get an accurate determination of body composition. Roche, Siervogel, Chumlean, and Webb (1981), stated anthropometric measurements can be used to positively correlate percent body fat in children with large measurements values for midarm, abdominal circumferences and skinfold measurements of triceps and subscapular skinfolds. Goran and Sothern (2006) indicate triceps and supscapular skinfold thickness

are most commonly used in the pediatric setting. Skinfold measurements have been used for many years to determine body density, fat mass or percent body fat (Goran, 2006). Van-den-Broeck and Wit (1997) stated skinfold thickness have high variability but with training, reliability can be obtained. Usually body fatness is measured with multiple skinfold measurements on various sites on the body, however, Chomtho, Fewtrell, Jaffe, Williams, and Wells (2006) indicated single arm measurements is useful in predicting body fatness in healthy children. These single arm measurements include triceps skinfold and midarm circumference. In reality, skinfold measurements are the most cost effective measurement of body fat as it pulls subcutaneous fat and skin away from the body and measures the double fold created. Upper arm measurements include triceps skinfold and midarm circumference which looks at body fat in addition to muscle mass (Samour & King, 2005). Midarm circumference was the upper arm measurement of girth accounting for bone, muscle and fat (Samour & King, 2005). Midarm circumference is widely used in the assessment of body composition however bio-electrical impedance has been highly accepted according to Parizkova and Hills (2000).

Estimations for body composition can come from developed equations (Goran, 2006). Although multiple sites give most accurate results, for confidentiality and ease of accessibility, triceps measurements and midarm circumference were the only measurements performed in this study. Triceps skinfold and midarm circumference reference tables (McDowell, Fryar, Hirsch, & Ogden, 2005) have been developed using data from NHANES. These tables were developed from a base of primarily Caucasian children so reference standards for other ethnic populations have not been conducted and may not be reflected accordingly.

Mueller, Marbella, Harrist, Kaplowitz, Grunbau, and Labarthe (1989) indicated that body circumferences in children reflect the level of adiposity but have not necessarily reflected the distribution of the adipose pattern. Circumference at the waist, hip and thigh are commonly associated with fat distribution yet waist and hip are good predictors of intra-abdominal fat (Goran, 1998). Waist circumference was used to indicate risk in normal and overweight individuals according to Hark and Morrison (2003). Excess fat, visceral adipose tissue, is stored in this portion of the abdominal area which the waist circumference measurement is taken. The waist circumference is an independent reflection of disposition for developing diabetes, dyslipidemia, hypertension, cardiovascular disease. Waist circumference may be above normal in some individuals even if BMI is in healthy weight levels. According to Van den Broeck and Wit (1997), dual energy X-ray absorptiometry (DEXA), medical imaging methods such as MRI and computerized axial tomography (CAT) are devices that can measure fat tissue directly and are a useful measure to validate anthropometric measurements. Since these were not available and quite expensive, they were not considered for the purpose of this study.

There are an abundance of surveys to assess nutrition and physical activity. Diet surveys that have been used are: 24-hour recalls, diet records, food frequencies, or diet history. Each has its advantages and disadvantages but recommendations for elementary school children include conducting food frequency, checklist and food security survey (Potischman, Cohen, & Picciano, 2006). For purposes of this study, the Hearts 'n Parks survey was chosen as it was adapted from the validated Child and Adolescent Trial for Cardiovascular Health (CATCH) survey (National Recreation and Park Association, 2004). The survey was developed for the Hearts 'n Parks program was supported by the

National Heart, Lung and Blood Institute, National Institute of Health and the National Recreation and Park Association where the goal was to reduce obesity and the risk of cardiovascular disease by encouraging American's to live a healthier lifestyle. The age appropriate survey is divided into three separate surveys: child (ages 6-11 years), adolescent (ages 12-17 years), and adult (ages 18+ years). The survey tool related areas of nutrition knowledge, behavior, intention, diversity in physical activities and attitudes in order to strive for a healthy weight, eat a heart-healthy diet and encourage regular intervals of physical activity.

Treatment

The primary focus on treatment should ultimately focus on promoting healthy lifestyles (Institute of Medicine, 2005). However, with the large number of overweight children today, we need to use a primary, secondary and tertiary approach in preventing and reducing overweight children (American Dietetic Association, 2006). The primary goal is to promote healthy lifestyle to achieve desired weight or reduce the rate of weight gain. Weight loss is not the preferred intervention of choice as it may interfere with growth and development in children.

Appropriate treatment recommendations also include behavior modification. Family-based treatment is strongly encouraged as the parents have a strong influence on their children (Institute of Medicine, 2005). Programs which increased physical activity should be aimed at the family to decrease sedentary behaviors. American Academy of Pediatrics (2001) stated physical activities benefit the child and the family by improved social contact, lowered stress, built strength, controlled appetite, burned calories, improved health, prevented disease. Family-based interventions was also a key to the

reduction in childhood obesity as involvement as a family shows a parents influence can directly impact their child's behavior more than other role models (Parizkova & Hills, 2000).

School-based interventions are a special focus for this population since the majority of their day is spent at school (Mullen & Shield, 2003). They have ample opportunities and the mechanism to impact children of this age group to promote ample physical activity and nutrition education regarding healthy eating opportunities. Classroom curricula should be initiated if they have not been already to incorporate knowledge regarding nutrition and physical activity. This education can also focus on healthy behaviors and improved attitudes regarding lifestyle changes (American Dietetic Association, 2006). Healthy eating opportunities could be provided through the school lunch program as well as vending and snack sales at the school in order to reiterate the lessons into healthy eating occasions.

Community-based programs also show promising results such as the Hearts 'n Parks program as it was a collaboration between the National Recreation and Parks Association and the National Heart, Lung and Blood Institute. The challenge with community-based programs is the need for facilities to hold events in and the lack of research indicating the most effective programs in these settings (Mullen & Shield, 2003). These community-based programs may help to lead into changes in public policy.

Chapter III: Methodology

Included in this chapter are selection of subjects, and description of the instrumentation for anthropometric assessment methods. In addition, procedures for data collection and analysis are discussed. This chapter concludes with limitations of the methodology and study in general.

Subject Selection and Description of Data Collection Procedures

Before data collection began, approval from UW-Stout Institutional Review Board was sought and received (Appendix C). All public elementary schools in Menomonie, Wisconsin were asked to participate in this study. Two elementary schools volunteered to participate in the study: School X and School Y elementary schools. In order to obtain participants, letters were distributed to parents of children in grades 1, 3 and 5 in these two schools in the fall of 2006. Distribution of the information packets (Appendix D) occurred in different manners based on each school's method of material distribution for the first week of school. At one school, the researcher was present at the mandatory orientation day in which all parents of 1st, 3rd and 5th graders were given the packet along with a brief explanation of the research. In contrast, the other school distributed the material by sending the information packets home with children in these grades with a letter endorsed by the principal. It was estimated that at least 30 students per grade level would participate.

Informed Consent

Informed consent was obtained from parents or guardians of the participating children prior to data collection. Parents received the informed consent form (Appendix E) with their information packet (Appendix D). The information packet consisted of

background materials about the measurements and how they would be performed. The last page asked for their child's voluntary participation in the study. Parents having more than one child in the selected grades were asked to fill out a consent form for each child. After granting permission for their child to participate in the study, they signed the informed consent form and returned it to the main office at the child's school or gave it to the researcher directly. Participants were assigned a random numeric identifier in order to match individual assessment with survey results.

Anthropometric Measurements

Various anthropometric measurements were conducted to assess childhood obesity. Graduate and undergraduate research volunteers were recruited and trained by the researcher on how to conduct all measurements. All volunteers provided a copy of their Human Subjects Training form to the researcher and participated in two training sessions. The training session had two main purposes: 1) have research volunteers demonstrate the ability to accurately measure the various anthropometric variable prior to data collection and 2) to instruct volunteers on protocol: no comments would be made regarding measurements and all data is confidential (Appendix F). A letter would be sent home stating the results. On October 19 and November 2, student researchers performed the measurements at the participating schools. It was possible to schedule the research volunteers to perform the same measurements on all children at school locations, increasing accuracy and consistency of data.

Classroom teachers were reminded of the students participating in the study prior to data collection. One research volunteer escorted the students to and from the data collection site. Another research volunteer was at the check-in station and this was the

only person, besides the researcher, to see the children's names and identification numbers. At check in, a folder with measurement data collection sheet, survey (Appendix G) and thank you certificate inside, was given to each child. At School Y, an empty classroom was provided for data collection. To ensure privacy, the room was divided into secluded areas to perform each measurement. The research volunteer greeted the child and briefly explained what measurement would be performed. This reduced anxiety and increased cooperation from the children. The Hearts n' Parks survey was administered to the participating children during this time and will be discussed below. School X's data collection was similar with the exception of the room used for measurements. A conference room was provided where height and weight measurements were performed in a secluded corner. Check-in and surveys were completed at the other end of the room and all other measurements were performed in a small private room with the research volunteers and individual child participant.

The data collection sheet (Appendix H) contained demographic questions (sex, age, gender, and ethnicity) as well as the anthropometric measurements to be performed. The measurements (in order taken) included: standing height, knee height, weight, midarm circumference, triceps skinfold, hip and waist. Research volunteers were trained to measure knee height measurement in the event that an accurate standing height could not be taken. They were also instructed that if the child could not stand alone on the scale an adult would hold the participant and the appropriate weight subtracted to determine the participant's actual weight. All participants were able to be weighted without assistance. Standing height was collected on all participants; no knee height measurements were recorded. In addition, growth charts for specific disabilities like

Down's syndrome were available from Centers for Disease Control but were not used as in this study.

Height and weight was measured using a portable stadiometer mounted to a calibrated DETECTO physician's scale, model number 338. Height and weight protocol, developed by Lee and Nieman (2003), was modified accordingly. The research volunteers measured child's height to the nearest millimeter (mm) and weight to the nearest kilogram (kg). Height and weight were used to calculate BMI using the following metric formula:

$$\text{BMI} = \text{weight (kg)} \div (\text{height (cm)})^2 \times 1000$$

This calculated BMI was then plotted on the BMI-for-age-and-gender chart produced by Centers for Disease Control (Appendix B). The BMI on the data sheet corresponded with the appropriate risk category: underweight, normal weight, at risk for overweight and overweight.

Midarm circumference was measured with a calibrated Gulick II measuring tape, model number 67020. This instrument has a tensioning mechanism at one end to increase consistency of measurements. The protocol for determining the midarm circumference, found in Appendix H, is read to the nearest 0.1 cm (Lee & Nieman, 2003) at the midpoint between acromion and olecranon process. The midarm circumference result was then compared to a reference table (Appendix I) to determine percentile categories in children (McDowell, Fryar, Hirsch, & Ogden, 2005). Percentile categories were not listed on the data collection sheet but entered into the SPSS database.

Triceps skinfold thickness test was measured using a Lange skinfold caliper, model number 68902. The measurement was taken at the previously marked midpoint

between the acromion and olecranon process. This measurement was repeated in triplicate, waiting 30 seconds between readings. An average was calculate and this was compared to a reference table (Appendix I) (McDowell, et. al., 2005). Percentile categories taken from this reference table were not on the data collection sheet but entered into SPSS.

Hip and waist circumference was measured using a calibrated Gulick II measuring tape, model number 67020. Sensitivity and embarrassment of the student (wearing minimal clothing) was taken into account and the protocol of Lee and Nieman (2003) was modified in that children were asked to lift up their shirts to expose their abdomen only. If they were uncomfortable with this request, the measurement was taken over their clothing while estimating the midaxillary line. The same method for measuring the waist circumference was taken regardless of the amount of clothing used and compared to a reference table (McDowell, et. al., 2005) for waist circumference percentiles in children. Hip circumference and hip and waist ratio reference tables were not applicable to children.

Survey Instrument

To assess dietary and physical activity patterns, the Heart 'n Parks instrument was used. This survey was adapted from the Coordinated Approach to Child Health (CATCH) survey (National Recreation and Park Association, 2004). The Hearts n' Parks age appropriate (child, adolescent, and parent) survey instrument has been used by the National Blood, Lung, and Heart Institute and has since been modified for use in the We Can! program (National Institute of Health, n.d.). For this study, the child survey was used as the questions have pictures associated with the answer which allows feasibility to

use with the 6-11 year old population (Appendix C). The scored survey is broken down into categories relating to nutrition knowledge, behavior, attitude, physical activity attitude as well as questions regarding diversity of physical activity. Scores are calculated based on giving one point for each correct answer from which a percent correct value can be calculated. These categories can then be analyzed to determine where interventions should be focused.

All questions relating to nutrition had a potential score of seven possible points for selecting the healthiest answer. Knowledge in the nutrition area asked a series of questions relating to "which food is better for your health". Each question under this category has pictures above the choices. The next section on the survey regarded nutrition behavior and was set up like the nutrition knowledge section with a category question of "what foods do you eat most of the time". The last nutrition section focused on intentions, relating to their attitudes about choosing certain foods. The category was set up with a main question that asked "what would you do", followed by pictorial questions.

The next series of questions related to physical activity; more specifically the child's diversity of physical activity. For 14 various activities, respondents were asked to answer accordingly if they "like to do this", "if they have done this in the past week" or "if they would like to learn how to do this".

The last section on the survey was in regard to attitude. This section titled "physical activity and you" had a potential for 12 points. Questions varied and were a basic Likert scale using yes, no, sometimes or great, okay, not good. Two points were given for the most positive answer, 1 point for the next and 0 for the least positive answer.

Each child completed the survey on their own with clarification from the research volunteers, if needed. Parents were not present since data collection occurred during the school day. Teachers did not accompany any students to the data collection area.

Data Analysis

Statistical analysis for this study was computed with the assistance of Christine Ness, research and statistical consultant for the University of Wisconsin Stout. All data was analyzed using the Statistical Program for Social Sciences, version 14.0 (SPSS, 2005), Chicago, Illinois.

Descriptive analysis (mean, median, standard deviation, standard error, minimum and maximum ranges) were run to profile anthropometric measurements. The output of information provided a means of comparison to reference tables allowing determinations to be made regarding the rate of obesity in Menomonie elementary school children. Cross-tabulation of frequency counts and percentages between BMI categories and school, gender, and grade were conducted. Diet and physical activity survey questions were coded. Analysis of surveys included a scoring component as the survey was broken into sections and scored according to the answer key provided by the Hearts n' Parks program.

Pearson correlation coefficient for age, height, weight, BMI category, triceps, waist, hip and mid arm circumference were analyzed against the variables for nutrition knowledge, nutrition behavior, nutrition intentions, physical activity and activity intentions. Independent t-tests were run to compare nutrition information (knowledge, behavior and intentions) to physical activity within a subject. Levene's test for equal variances was used to check for homogeneity of variances. Independent t-tests were used

to determine if there were significant differences between gender and school. Analysis of Variarance (ANOVA) with Duncan's and Newman-Keuls range tests looked at the possible correlation between nutrition knowledge, behavior, intentions as well as activity using grade level as the independent variable.

Limitations

One major limitation was participation in Menomonie. Only 2 of 6 elementary schools participated in this research study. Of these two schools a total of 42 students in grades 1, 3 and 5 took part in this study. More participants were needed to increase confidence in interpreting the results. Higher participation would have allowed for comparison between grades at each school, gender within each grade, state and national data.

Another limiting factor to consider is the lack of ethnic diversity in the city of Menomonie. Ethnicity affects the variations in anthropometric measurements as Centers for Disease Control growth charts are based off the diversity of the United States population. The diversity in Menomonie across all populations is relatively small in comparison.

The decision to perform hip and waist measurements over minimal clothing was an anthropometric limitation of the study. To avoid embarrassment, these measurements were taken over minimal clothing. Reference tables do not take into account measurements over clothing so results were minimally impacted.

Chapter IV: Results

This chapter will include the results of the study including demographic and item analysis. The remainder of this chapter summarizes the findings based on the research objectives for the study.

Item Analysis

In the fall of 2006, forty-two participants from grades 1, 3, and 5 at two elementary schools in Menomonie, Wisconsin were volunteered by their parents to partake in this research. The approximate potential number of participants from these grades was 250 and of that 16.8% (n=42) participated in the study. Of these 42 participants, 15 were from School X elementary and 27 from School Y elementary; ranging in age from 6-11 year old as indicated in Table 3.

Table 3.

Age of Participating Children

Age in years	n	%
6	9	21.4
7	9	21.4
8	15	35.7
9	3	7.2
10	4	9.5
11	2	4.8

Based on gender, there were 40.5% (n=17) boys and 59.5% (n=25) girls. The percentage of participants in grades 1, 3, and 5 was 42.9% (n=18), 45.2% (n=19), and 11.9% (n=5), respectively. Corresponding ages for these grade levels are typically ages 6-7 years (grade 1), 8-9 years (grade 3), and 10-11 years (grade 5) with participants in this study having similar demographics (Table 4). Data was not reported between boys and girls of the same grade or between schools due to confidentiality and low participation of each group. Of the children participating in the study, 90.5% (n=38) were Caucasian, 4.8% (n=2) were Hispanic, 2.4% (n=1) were Hmong and 2.4% (n=1) was unknown.

Table 4

Number of Participating Children by Grade and School

	1st Grade	3rd Grade	5th Grade
School X	3 (6-7 yrs)	11 (8-10 yrs)	1 (10 yrs)
School Y	15 (6-7 yrs)	8 (8 yrs)	4 (10-11 yrs)
Total	18	19	5

Anthropometric measurements were taken from each of the participants. On two occasions, measurements were not collected (midarm for one participant and waist and hip measurements on another participant).

BMI, an indication of body fatness (Mullen & Shield, 2003) was calculated from the height (cm) and weight (kg) measurement, then plotted along with child's age on Centers for Disease Control growth charts BMI-for-age-and-gender developed by the National Center for Health Statistics in conjunction with the National Center for Chronic

Disease Prevention and Health Promotion to indicate a percentile (Centers for Disease Control, 2000) (Appendix B). There was 100% compliance of the measurements taken indicating 2.4% (n=1) were underweight, 54.8% (n=23) had a healthy weight, 26.2% (n=11) were at risk for being overweight, and 16.7% (n=7) were overweight (Figure 1 and Table 5). The range of calculated BMI's was 13.7 to 48.2 while the average calculated BMI for all participants was 18.3 (standard deviation ±5.4). Since correlating BMI to a health status is dependent on age, data is reported based on percentile category from the growth charts (Appendix B).

Anthropometric measurements are reported in Figure 1 by percentile category (with raw data in Table 6). Overall, these measurements indicated the majority of children fell in the normal category. Results for hip measurement were not used for analysis in this study based upon incomplete reference tables for children. Overall, of the population that was overweight, half fell in the >95th percentile for midarm circumference, triceps skinfold and waist circumference.

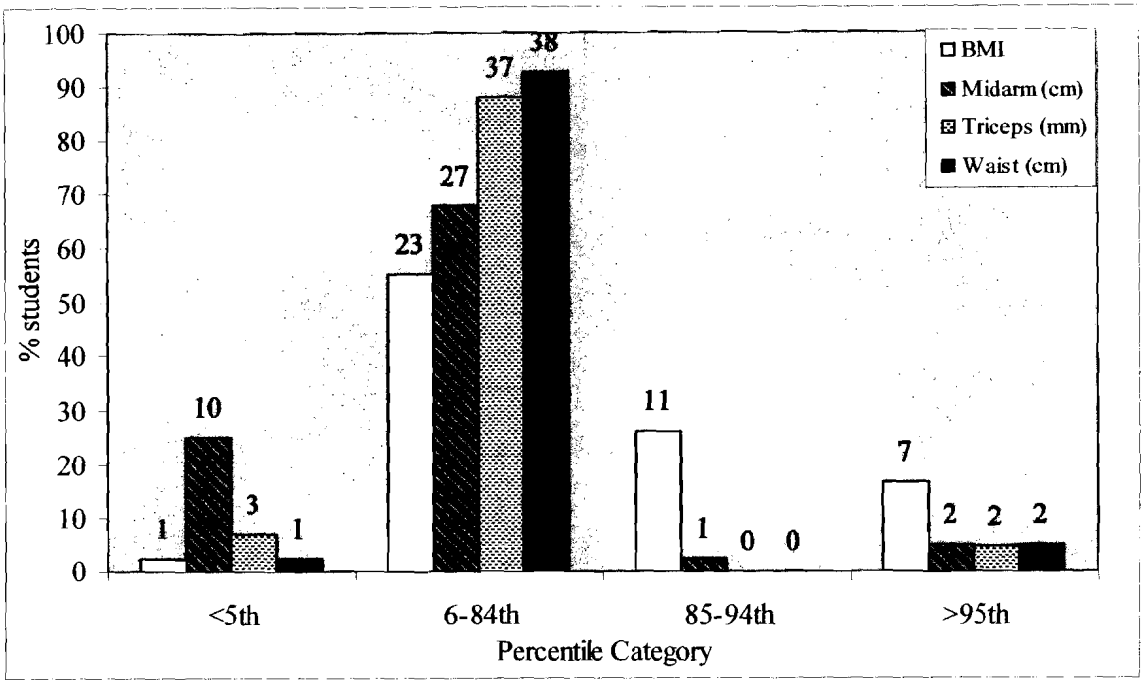

Figure 1. Frequency of anthropometric results related to percentile categories. Values are reported as frequency of the mean with n listed above.

Table 5 demonstrates the breakdown of BMI categories based on grade, gender and school. The small sample size did not allow for statistical comparisons. However the following trends are observed. The risk for children falling into the overweight category tended to increase with each grade level. There were noticeably more boys versus girls in the healthy weight category. No significant difference between the genders for midarm, triceps, waist and hip circumference was found ($p>0.05$, independent t-test with Levene's test for equality of variance). When comparing schools, body weights and mid-arm circumferences were significantly higher at School X than School Y ($p<0.05$, independent t-test, data not shown). BMI percentile was nearly significantly greater at school X than school Y ($p=0.058$, independent t-test, data not shown).

Table 6

Mean Anthropometric Scores of Participating Children

Group	BMI Percentile[a]	Midarm (cm)	Tricep (mm)	Waist (cm)	Hip (cm)
1st grade					
boys	63.3 (24.5, 9)	17.2 (1.8, 8)	9.1 (2.6, 9)	56.4 (3.9, 8)	66.4 (6.4, 8)
girls	62.8 (35.0, 9)	19.2 (2.9, 8)	11.5 (5.2, 9)	60.1 (7.7, 9)	69.2 (7.6, 9)
3rd grade					
boys	60.0 (22.4, 5)	19 (2.0, 5)	9.5 (1.7, 5)	60.5 (3.7, 5)	73.3 (4.0, 5)
girls	72.6 (28.0, 14)	21.6 (3.1, 14)	13.9 (4.1, 14)	63.3 (6.5, 14)	76.2 (6.7, 14)
5th grade					
boys	88.3 (5.8, 3)	23.7 (2.3, 3)	17 (5.7, 3)	74.2 (9.3, 3)	88.8 (5.9, 3)
girls	72.5 (31.8, 2)	104 (41.7, 2)	26 (19.3, 2)	93.0 (48.1, 2)	29.3 (11.0, 2)

Values are reported as means with standard deviation and n in parenthesis respectively.

Table 5

Percentage of Participants' BMI by Grade, Gender and School

	Overall	Grade			Gender		School	
	%	1st	3rd	5th	Boys	Girls	School X	School Y
Underweight	2.4 (1)	--	--	--	--	--	--	--
Healthy weight	54.7 (23)	61.1 (11)	57.9 (11)	20.0 (1)	70.6 (12)	44.0 (11)	53.3 (8)	55.6 (15)
At risk	26.2 (11)	33.3 (6)	15.8 (3)	40.0 (2)	23.5 (4)	28.0 (7)	26.7 (4)	25.9 (7)
Overweight	16.7 (7)	5.6 (1)	21.1 (4)	40.0 (2)	5.9 (1)	24.0 (6)	20.0 (3)	14.8 (4)

Values are reported as frequency of the mean, n in parenthesis respectively.
-- Dashes indicate data regarding grade, gender and school are not provided to protect the participant's identity.

Survey

The 41 question, Hearts n' Parks (National Recreation and Park Association, 2004) scored survey is broken into five categories: knowledge, behavior, and intentions relating to nutrition and activities and attitude corresponding to physical activity. All 42 participants completed the survey.

The nutrition knowledge section asked the respondent what foods they felt were better for their health. The results for the knowledge portion of the survey indicated the mean score for identifying the healthiest answer with standard deviation was 5.5 ±1.45. MANOVA between nutrition knowledge, behavior and intentions indicated nutrition knowledge was significantly higher than the child's behavior and intentions to eat healthy at $p<0.05$ (Figure 2).

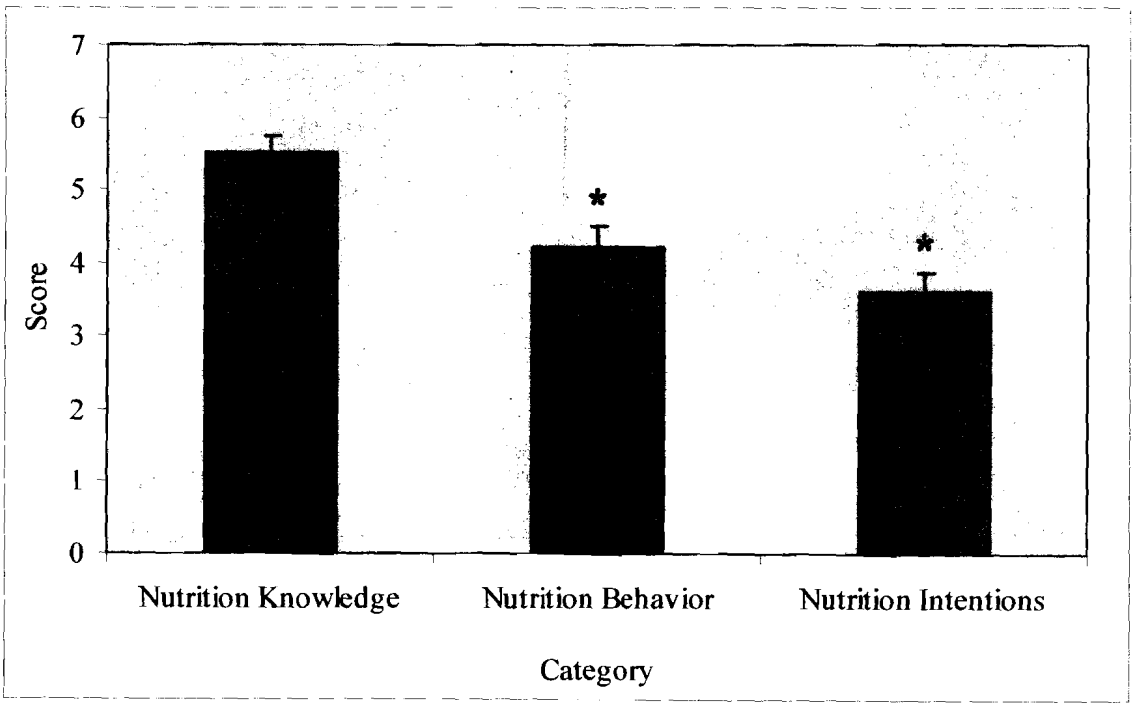

Figure 2. Mean child nutrition survey scores.
* $p<0.05$, MANOVA indicated significance in nutrition behavior and intentions categories with respect to nutrition knowledge. Values are shown with standard error.

On four questions, over 88% of the participants had the correct response. The remaining three questions had less than 67% of the respondents answering the question correctly. The participants scores were lower when choosing items better for their health such as white bread versus wheat bread, cold cereal versus eggs and bacon, and regular milk versus low-fat/ fat free milk as indicated in Table 7.

Table 7

Survey Results Regarding Nutrition Knowledge

Which food is better for your health?	Healthiest Answer (% correct)
Donut vs. *toast*	97.6%
Grapes vs. candy bar	97.6%
Orange vs. cookies	97.6%
Green salad vs. French fries	88.1%
Whole wheat vs. white bread	66.7%
Regular vs. *low-fat/fat free milk*	57.1%
Cold cereal vs. eggs/bacon	45.2%
Total category average score	78.6%
Std deviation	20.7%

n=42. Healthiest answer is shown in *italics*. Items are listed in descending % correct order rather than the order of questions presented on the survey.

The section regarding nutrition behavior asked "what do you eat most of the time". Of the 7 questions, the mean score for the healthiest answers in this section with

standard deviation was 4.21 ± 1.84 (Table 8). Children most often eat a hot dog versus a sandwich with lettuce and tomato, and regular milk over lowfat/fat free milk.

Table 8

Survey Results Regarding Nutrition Behavior

What foods do you eat most of the time?	Healthiest Answer (% correct)
Chocolate cake vs. *orange*	81.0%
Cookies vs. *apple*	73.8%
Fruit juice vs. soda	71.4%
Regular vs. *low-fat/fat free milk*	57.1%
Ice cream vs. *fresh fruit popsicle*	56.1%
Baked potato vs. French fries	52.7%
Hot dog vs. *sandwich w/ lettuce & tomato*	45.2%
Total category average score	60.2%
Std deviation	26.1%

n=42. Healthiest answer is shown in *italics*. Items are listed in descending % correct order rather than the order of questions presented on the survey.

As in other nutrition sections, the last seven scored asked participants "what would you do" related to intentions regarding food choices. The mean score with standard deviation was 3.60 ± 1.82 (Table 9). The results varied with a range from 15 to 83% correct responses; 3 questions scored below 50%.

Table 9

Survey Results Regarding Nutrition Intention

What would you do?	Healthiest Answer (% correct)
Candy bar vs. *fresh fruit*	83.3%
Eating food without salt/ salt before eating	69.0%
Baked potato vs. French fries	59.5%
Popcorn w/ salt & butter or *without*	50.0%
Regular vs. *low-fat/fat free milk*	42.9%
Hamburger vs. *green salad*	40.5%
Ketchup or *tomato* on hamburger	15.0%
Total category average score	51.4%
Std deviation	26.0%

n=42. Healthiest answer is shown in *italics*. Items are listed in descending % correct order rather than the order of questions presented on the survey.

Pearson correlation existed between all nutrition subcategories as determined with Pearson correlations. As nutrition knowledge increased, healthy eating behaviors ($p<0.05$) and intentions for eating healthy ($p<0.01$) also tended to increase. The Pearson correlation between eating behaviors and intentions was also very highly significant ($p<0.01$).

Nutrition survey scores were analyzed against health status categories (Figure 3). There was a consistent pattern of overweight children scoring higher than their healthy and at risk for overweight peers in the nutrition subcategories. One way ANOVA

between weight status categories and within nutrition survey subcategories indicated nutrition intention among overweight children was significant at $p<0.05$. All other categories were not significant.

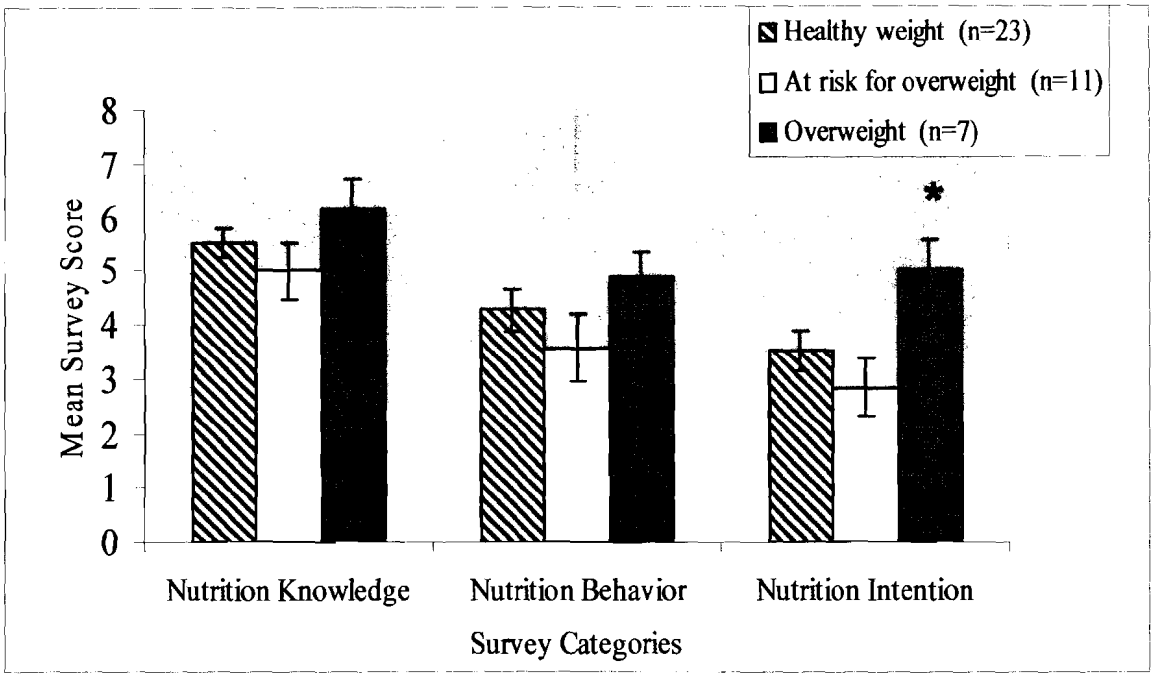

Figure 3. Average nutrition survey scores based on health status.
*$p<0.05$, one way ANOVA between health status and within survey category is shown with standard error. Underweight category not analyzed due to n=1.

Nutrition categories were analyzed against demographic and anthropometric data. The independent variable, grade, was analyzed against nutrition knowledge, behavior and intentions. All items in the nutrition category indicated levels of significance with regard to age for nutrition knowledge at $p<0.01$ and nutrition behavior and intention at $p<0.05$ (Figure 4). Independent t-tests showed no significance between nutrition subcategories for gender or school.

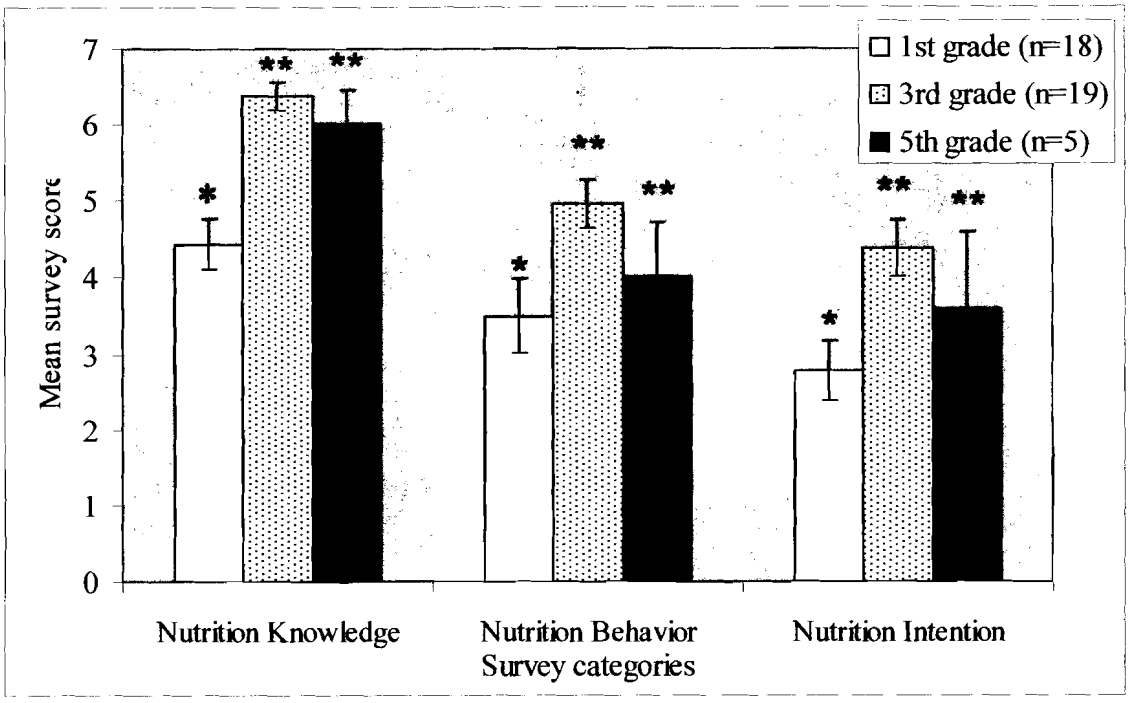

Figure 4. Mean nutrition survey scores based on grade.
*p<0.05 and ** p<0.01, one way ANOVA between grades and within nutrition subcategories is shown with standard error.

The second half of the survey dealt with diversity of physical activity. Respondents were given a list of fourteen activities and were asked "I like to do this", "I've done this in the past week" or "I would like to learn to do this". One point was given for each activity for a possibility of 14 points. Depicted in Figure 5, different activities children like to do was significantly greater than activities students actually did. Different activities children like to do were also significantly greater than what students want to learn how to do. A Pearson correlation indicated there was a positive relationship between the number of activities a child did in the last week and their desire to learn about certain activities ($p<0.05$).

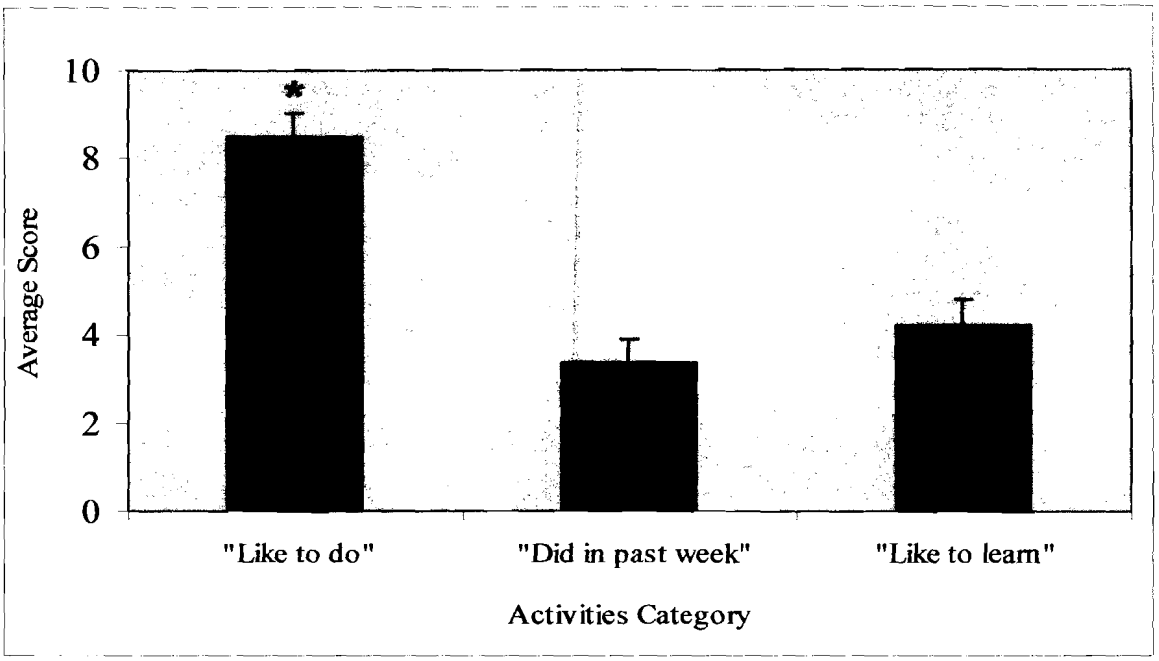

Figure 5. Mean child physical activity scores.
*p<0.05, MANOVA indicated significance between "like to do" and categories "did in past week" and "like to learn". Values are shown with standard error.

Table 10

Physical Activity Results

	Like to do	Did past week	Learn more
jumping jacks/ running	70.0%	47.5%	15.0%
tag/ hopscotch/ dodgeball/ kickball	69.0%	45.2%	11.9%
jump rope	71.4%	37.1%	20.0%
swimming	68.3%	34.1%	19.6%
Biking	80.5%	34.1%	19.5%
Soccer	45.9%	32.4%	37.8%
Football	53.4%	26.7%	56.6%
Dancing	75.0%	25.0%	35.8%
Bowling	73.7%	21.3%	19.0%
basketball	61.2%	19.5%	52.8%
softball/ baseball	61.2%	16.8%	38.9%
volleyball	40.0%	14.3%	60.0%
rollerskate/ rollerblade/ skateboard	66.7%	13.9%	38.8%
Tennis	38.7%	12.9%	58.0%
mean	60.5%	24.3%	30.3%
std dev	24.5%	23.5%	25.1%

n=42. Values are % of participants' responses and listed in descending order for like to do rather than the order of questions presented on the survey.

Statements regarding physical activity ("like to do", "did in past week", "like to learn more") were analyzed against demographic and anthropometric data. No significant difference was seen between grade levels and the physical activity subcategories (ANOVA with Student Newman-Keuls and Duncan's test). No gender differences existed with any of the physical activity categories. (Independent t-tests with Levene's test for equality of variances). Independent t-tests were also performed between schools with no significant differences observed. When physical activity components were compared with anthropometric measurements; triceps skinfold and mid-arm circumference was positively correlated with "done in the past week" as compared to the other categories ($p<0.05$, Pearson correlation). Other anthropometric measurements were not significant.

Pearson correlation between physical activity subcategories indicated a positive relationship between "like to learn more" and "did in past week", $p<0.05$). It was not analyzed to determine if children want to learn more about the activities they did in the past week or if they are interested in learning additional activities.

The last segment of the survey asked the participants about their attitude regarding activities. The average overall attitude for all participants was 75%. Table 11 demonstrates the percentage of scores and their relation to the most positive answer highlighted in bold. There was an overall positive attitude toward how children feel toward physical activity. Those categories that scored poorly related to being active, whereas attitude towards ability was generally high. Boys attitude towards activity (9.7 ± 1.2) was significantly higher than girls attitude (8.6 ± 1.9) at $p<0.05$ using Pearson correlation.

Table 11

Physical Activity Attitude

	Yes	Sometimes	No
1. Rather watch TV than be active	26.8%	46.3%	*26.8%*
2. Playing sports is fun	*87.8%*	7.3%	4.9%
	Not good	Okay	Great
3. Feeling about ability to kick ball	4.9%	36.6%	*58.5%*
4. Feeling about running long distance	24.4%	24.4%	*51.2%*
5. Feeling about ability to hit ball with bat	12.2%	26.8%	*61.0%*
6. Feel about ability to play many sports	0.0%	7.3%	*92.7%*

n=41. Values are broken down by % answers for all answer combinations.
Most positive score is shown in *italics.*

To determine if there was a relationship between dietary habits and physical activity, Pearson correlation was run and indicated there was no significant difference between nutrition and physical activity subcategories.

Chapter V: Discussion

This chapter contains the comparison and discussion of data collection and the relationship to other findings. Recommendations to reduce the prevalence of childhood obesity in our community will conclude this chapter.

Limitations

One major limitation was attracting enough volunteers to participate in the study. Depending on the school there were groups which contained only one individual child. Grade and gender was, at times, not analyzed due to the lack of representation in the groups. For more statistically sound data a greater number of participants were needed. The low participation may have been caused by lack of information given to the parents despite the researcher efforts. Anthropometric measurements may have steered parents away from allowing their children to participate.

Another limitation was the lack of ethnic diversity. Menomonie is reflective of Wisconsin but not reflective of the diversity in the United States. The population in the study was 90.4% Caucasian while Menomonie is 96.1% of Caucasian decent and Wisconsin ethnicity is 88.9% Caucasian (United States Bureau, 2000). This study, Menomonie, and Wisconsin are not reflective of the United States population which is 75.1% Caucasian decent (United States Census Bureau, 2000). These factors make it more appropriate to generalize findings to Wisconsin than United States population.

While diversity of physical activity is important, one limitation of the survey was it did not reflect the quantity of physical activity. A respondent may answer they only participate in one or two activities in a week, but in actuality may be getting the United

States Surgeon General's recommended 30-60 minutes of daily activity (United States Department of Health and Human Services, 2001).

Data regarding parental habits are not represented in this study. This information would help determine if parents provide healthy food choices. Looking at the family component would help determine the level of intervention needed to reduce the prevalence of childhood obesity.

Conclusions

Overall, BMI indicated 16.7% of elementary age children in Menomonie were overweight and 26.2% are at risk for overweight. Limited studies have gathered data representing elementary school children. Hughes, et. al, (2006), indicates 16-18% of the children in Wisconsin are overweight and 28-37% are at risk for overweight. Wisconsin does not have other information regarding the status of this age group as estimates are based on the Youth Health Behavior Risk survey for grades 9-12 (Centers for Disease Control, 2006a). Ultimately, if the children in the state of Wisconsin are reflective of these two studies, then the concern is if we will achieve Healthy People 2010's goal of reducing childhood obesity to 5% by 2010 (United States Department of Health and Human Services, 2000).

Relationships between nutrition, diversity in physical activity and their affect on overall health status does not exist. Overweight children had greater intentions to eat healthy compared to the healthy and at risk for overweight groups. Speculations on increased intentions may be impacted by social stigmas of their overweight classifications (Mustillo, et. al, 2003, Mullen & Shield, 2003; Schwartz, 2003). The intentions to eat healthy may not reflect the child's behaviors (Smith, 1999). These may

be due to environmental, socioeconomic factors, family size, unhealthy eating habits or combination of those factors (Mullen & Shield, 2003; Dietz & Gortmaker, 1984; US Department of Health and Human Services, 2001).

Differences between grades indicate there is a trend in increasing BMI from grades 1, 3 and 5. However, generalizations can not be made due to the small sample size in 5th grade. A dramatic increase in the prevalence of overweight children between children in grades 1 and 3 jumping from 5.6% to 21.1% was noted. This rise appears to be the "at risk for overweight" children moving into the "overweight" category. This is of concern as studies indicate overweight adolescents have over a 70% risk of becoming an overweight adult (Dietz, 2004; United States Department of Health and Human Services, 2001). National Heart Lung and Blood Institute (2007) indicated that girls who were overweight in childhood were 11-30 times more likely to become obese young adults than their healthy weight peers. With one fifth of the girls in this study being overweight, it proposes concerns for the future besides additional co-morbidities. This may suggest that as these children grow, the number of overweight children in the school district will continue to rise only to be extrapolated to the adult population. Thus, a continued rise in overweight individuals will present a plethora of health issues and increase economic costs on society (Wang & Lobstein, 2006, Dietz, 2004;States Department of Health and Human Services, 2001).

Although there were a similar amount of boys (n=17) and girls (n=25) participating in this study; there was a difference in the percentage of each gender in the BMI categories. Overall, girls are 1.76 times more likely than boys to be in the "at risk for overweight" or "overweight" category compared to the boys in this same age group.

This is comparable with findings from the National, Heart Lung and Blood Institute Growth Health Study (2007) that found that girls were 1.6 times more likely to be overweight during the 9-12 year old range. These results indicate that stronger interventions directed at preadolescent females are needed.

Diversity in physical activity is not correlated with childhood weight status in the Menomonie school district. The lack of significance for this category may be partially due to the combination of all ages and with a larger sample size, additional information may have been gleaned grades. Boys indicated a more positive attitude over the girls. Interventions should target girls' ability and confidence regarding a variety of physical activities with BMI category.

There were no relationships between nutrition and diversity of physical activity with BMI category. Therefore one may not be a predictor of the other and is most likely a balance between the two. Thus interventions addressing both may be needed as this study considered diversity of physical activity and not actual amounts of activity.

The Centers for Disease Control BMI-for-age-and-gender charts are the best tool for assessing obesity as it takes into account gender, age, height, and weight (Centers for Disease Control, 2000). Malina and Katzmarzyk (1999) showed triceps and BMI being similar for categorizing health status. With an opposing trend reported here, additional research on the child population could determine if triceps skinfold is as predictable as using body mass index for screening overweight individuals. However, triceps measurements may be more frightful. One parent contacted the school reporting the child thought he/she had received a shot. There was 100% compliance with height and weight measurements.

Nutrition behavior did not portray a relationship with anthropometric measurements. A positive correlation between "things I've done in the past week" was seen with skinfold and midarm circumference which indicates these measurements may be affected by the number of activities a child is involved in during the week. Overall, the importance of the anthropometric measurements did not reveal findings that would indicate their use in a future study looking at these parameters. All were significant at the $p<0.01$ interval except BMI. There was a positive relationship between height, age, midarm circumference and body weight in relation to nutrition knowledge and intention. This is to be expected, as these demonstrate factors of physical growth and cognitive development.

Nutrition intention portrayed significance with overweight status. This may suggest overweight children have the greatest intention to eat healthy in an attempt to lead a healthier lifestyle. This may be due to peer pressure and the need to socialize with their peers (Schwartz & Puhl, 2003).

There was a positive relationship between knowledge and behavior as well as knowledge and intentions. This relationship did not exist with a child's weight status. Children had similar knowledge of nutrition and similar behaviors across the weight categories (Figure 3). Knowing a child's nutrition score is not a predictor of weight status. However, and perhaps most important, as knowledge increases, behavior and intentions increase. This suggests that children are developing life long skills are necessary. Physical activity subcategories indicate the positive correlation between "like to learn more" and "did in the past week". This relationship may exist because children want to learn more about the activities they participated in the past week. The lack of

relationship between nutrition and physical activity subcategories suggests the need for intervention strategies to address both areas.

The Hearts n' Parks survey was used in this study and findings from this study were compared to Hearts n' Parks results (National Recreation and Park Association, 2004). Pilot programs for Hearts n' Parks ran from 2000-2004, the age of participants differed in the two studies. Table 12 shows the differences in age groups participating in the 2004 survey. Total number of participants across all Hearts n' Parks sites were 2,039 compared to 42 in the Menomonie study. Overall, the Menomonie group had very few over the age of 10 participating in the program. Based on gender, both groups had equal representation.

Table 12

Age Comparison of Participants

	Hearts n' Parks*	Menomonie
less than 6 yrs	7.7%	0.0%
6 & 7 yr old	20.3%	42.8%
8 & 9 yr old	35.9%	42.9%
10 & 11 yr old	36.1%	14.3%

*Data taken from Hearts n' Parks – 2004 Magnet Report

Performance scores and attitude regarding activities were comparable in all nutrition categories despite the large differences in sample size (Table 13).

Table 13

Child Survey Scores

	Menomonie		Hearts n' Parks[a]	
Scored Survey Sections	n	Mean	n	Mean
Nutrition Knowledge	42	78.6%	1772	76.7%
Nutrition Behavior	42	60.1%	1759	53.6%
Nutrition Intentions	42	51.4%	1758	50.6%
Activities Attitude	42	9.05	1581	8.83

Values are represented as percentage of the total possible score. Activities attitude is listed as the numerical value.
[a]Data taken from Hearts n' Parks – 2004 Magnet Report

Results from specific nutrition questions were of interest. Findings from this study indicated that fewer children know, consume or would like to consume low-fat/fat-free milk. In regards to carbohydrate knowledge, children also struggled choosing if whole grain or white bread was better as well as which breakfast item was a better choice.

Recommendations

Several recommendations can be made regarding the tools used in this study and their findings. First, additional studies addressing the prevalence of childhood obesity are needed in Menomonie, Wisconsin. Wisconsin has plans in place to combat obesity but more data is needed to determine if interventions are working. Healthiest Wisconsin 2010 and Healthy People 2010 have both established a health priority of reducing obesity by the end of the decade. The Wisconsin nutrition and physical activity state plan has been put in place to help prevent obesity and reduce chronic disease in our state. Wisconsin

State Plan 2015 is to decrease percentage of children who are at risk for overweight or overweight to 15% (Wisconsin Partnership for Activity and Nutrition, 2005) yet the Healthy People 2010 objective is more aggressive aiming at a reduction to 5% of children as overweight. These future studies could be completed 2 years down the road looking at these same children or taking another group and comparing it with these findings. With any study, a larger sample size is needed to allow generalization to the childhood population as well as allow for comparison between grades, gender and schools. Other suggestions include repeating this project with other grade levels in the future. The major downfall of this project was the lack of participation despite the efforts to inform and market the study as well as perform the measurements at the school where the children were accessible. Endorsement of the project was well received by the school principals and teachers however, participation was still lacking. Meeting with the school counselor and school nurse may have assisted in rewording materials or educating the parents further. The lack of participation in grade 5 could have been attributed to the parents letting the child decide if he/she wanted to participate in the study. Since children in these grades are heading into puberty and shy about their bodies, this may have been a deterrent in itself. Another option could have been to provide an all school family night event where parents would be present during data collection. This strategy may or may not have had an impact on the overall participation rate.

Secondly, the survey used needs to be refined. One suggestion is regarding quantity of physical activity. The analysis of activity levels should be analyzed in addition to physical activity diversity. It is recommended children receive 60 minutes of moderate physical activity each day (United States Department of Health and Human

Services, 2001). If using the Hearts n' Parks survey for future studies, a secondary survey regarding the quantity of daily and weekly physical activity should be considered. The survey provided baseline information for nutrition knowledge, behavior and intention however, some questions were interpreted differently. It was difficult to extrapolate if children consumed enough fruits, vegetables and whole grains let alone how often they consumed junk food. While the pictorial format was easy to administer to this population, additional questions should be added to gain additional information regarding their actual diet.

Third, we do not know the habits of the parents. If parents provide the healthy foods to their children yet the children make the choices not to consume these foods, then interventions should focus on the children. If the parents do not provide healthy foods and the children intend to consume them, then interventions would focus on the parent. Adding components to the study in addition to collecting data on the child would help determine the level of interventions more accurately.

Fourth, anthropometric measurements beyond height and weight may have affected participation. Since BMI data is a reliable predictor of health status (Goran, 1998), the need to collect tricep skinfold and midarm, waist, and hip circumference should be evaluated in future studies.

Finally, since there was no correlation between nutrition and physical activity, multi-faceted interventions need to be developed and implemented. Here multi-faceted needs to based on both nutrition and physical activity education. The means of delivering this intervention should also be multi-faceted (school, family, community). School-based interventions are necessary since this is where children spend the majority of their day.

Family- and community-based interventions will allow involvement of the family targeting healthy lifestyles to continue at home. Other involvements could target gender as girls are at greater risk at being overweight (National, Heart, Lung and Blood Institute, 2007). Interventions targeting this population are important because of the impact on an at risk population.

Additional data needs to be gathered to determine if Wisconsin can meet the 2010 goal. Methodology used in this thesis study could be used as a simple model for future data collections in Menomonie or similar Wisconsin communities. Finally, recommendations for local public health departments and school districts would be to seek grant funding and coordinate with coalitions in their town to implement interventions.

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Appendix A: Adult BMI Chart

Body Mass Index Table

	Normal						Overweight					Obese												Extreme Obesity															
BMI	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
Height (inches)	Body Weight (pounds)																																			
58	91	96	100	105	110	115	119	124	129	134	138	143	148	153	158	162	167	172	177	181	186	191	196	201	205	210	215	220	224	229	234	239	244	248	253	258
59	94	99	104	109	114	119	124	128	133	138	143	148	153	158	163	168	173	178	183	188	193	198	203	208	212	217	222	227	232	237	242	247	252	257	262	267
60	97	102	107	112	118	123	128	133	138	143	148	153	158	163	168	174	179	184	189	194	199	204	209	215	220	225	230	235	240	245	250	255	261	266	271	276
61	100	106	111	116	122	127	132	137	143	148	153	158	164	169	174	180	185	190	195	201	206	211	217	222	227	232	238	243	248	254	259	264	269	275	280	285
62	104	109	115	120	126	131	136	142	147	153	158	164	169	175	180	186	191	196	202	207	213	218	224	229	235	240	246	251	256	262	267	273	278	284	289	295
63	107	113	118	124	130	135	141	146	152	158	163	169	175	180	186	191	197	203	208	214	220	225	231	237	242	248	254	259	265	270	278	282	287	293	299	304
64	110	116	122	128	134	140	145	151	157	163	169	174	180	186	192	197	204	209	215	221	227	232	238	244	250	256	262	267	273	279	285	291	296	302	308	314
65	114	120	126	132	138	144	150	156	162	168	174	180	186	192	198	204	210	216	222	228	234	240	246	252	258	264	270	276	282	288	294	300	306	312	318	324
66	118	124	130	136	142	148	155	161	167	173	179	186	192	198	204	210	216	223	229	235	241	247	253	260	266	272	278	284	291	297	303	309	315	322	328	334
67	121	127	134	140	146	153	159	166	172	178	185	191	198	204	211	217	223	230	236	242	249	255	261	268	274	280	287	293	299	306	312	319	325	331	338	344
68	125	131	138	144	151	158	164	171	177	184	190	197	203	210	216	223	230	236	243	249	256	262	269	276	282	289	295	302	308	315	322	328	335	341	348	354
69	128	135	142	149	155	162	169	176	182	189	196	203	209	216	223	230	236	243	250	257	263	270	277	284	291	297	304	311	318	324	331	338	345	351	358	365
70	132	139	146	153	160	167	174	181	188	195	202	209	216	222	229	236	243	250	257	264	271	278	285	292	299	306	313	320	327	334	341	348	355	362	369	376
71	136	143	150	157	165	172	179	186	193	200	208	215	222	229	236	243	250	257	265	272	279	286	293	301	308	315	322	329	338	343	351	358	365	372	379	386
72	140	147	154	162	169	177	184	191	199	206	213	221	228	235	242	250	258	265	272	279	287	294	302	309	316	324	331	338	346	353	361	368	375	383	390	397
73	144	151	159	166	174	182	189	197	204	212	219	227	235	242	250	257	265	272	280	288	295	302	310	318	325	333	340	348	355	363	371	378	386	393	401	408
74	148	155	163	171	179	186	194	202	210	218	225	233	241	249	256	264	272	280	287	295	303	311	319	326	334	342	350	358	365	373	381	389	396	404	412	420
75	152	160	168	176	184	192	200	208	216	224	232	240	248	256	264	272	279	287	295	303	311	319	327	335	343	351	359	367	375	383	391	399	407	415	423	431
76	156	164	172	180	189	197	205	213	221	230	238	246	254	263	271	279	287	295	304	312	320	328	336	344	353	361	369	377	385	394	402	410	418	426	435	443

Source: Adapted from Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults: The Evidence Report

Appendix B: Center for Disease Control Growth Charts

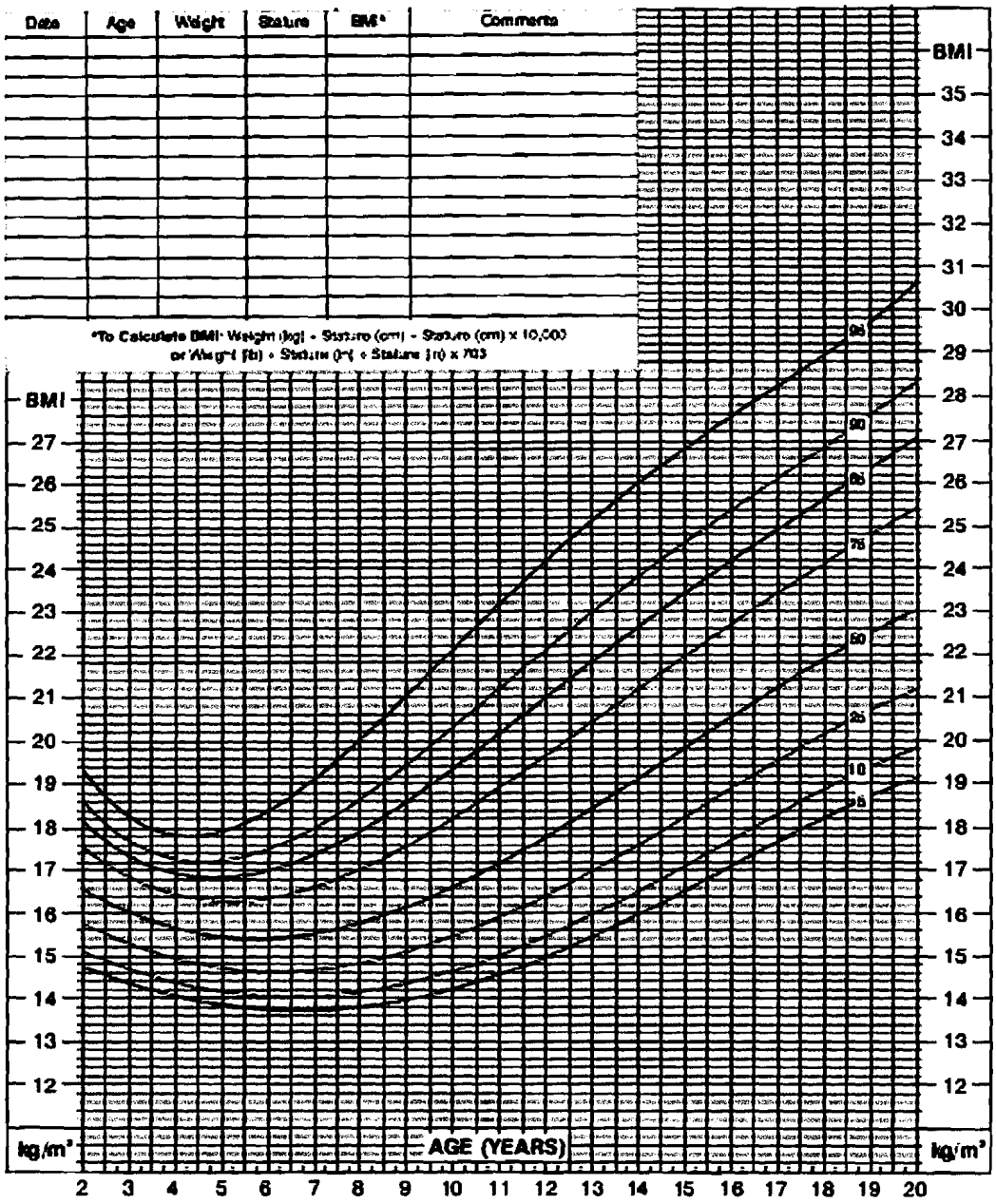
2 to 20 years: Boys
Body mass index-for-age percentiles

NAME _____

RECORD # _____

Date	Age	Weight	Stature	BMI*	Comments

*To Calculate BMI: Weight (kg) ÷ Stature (cm) ÷ Stature (cm) x 10,000
or Weight (lb) ÷ Stature (in) ÷ Stature (in) x 703



Published May 30, 2000 (modified 10/16/00).
SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000). http://www.cdc.gov/growthcharts

CDC
SAFER · HEALTHIER · PEOPLE™

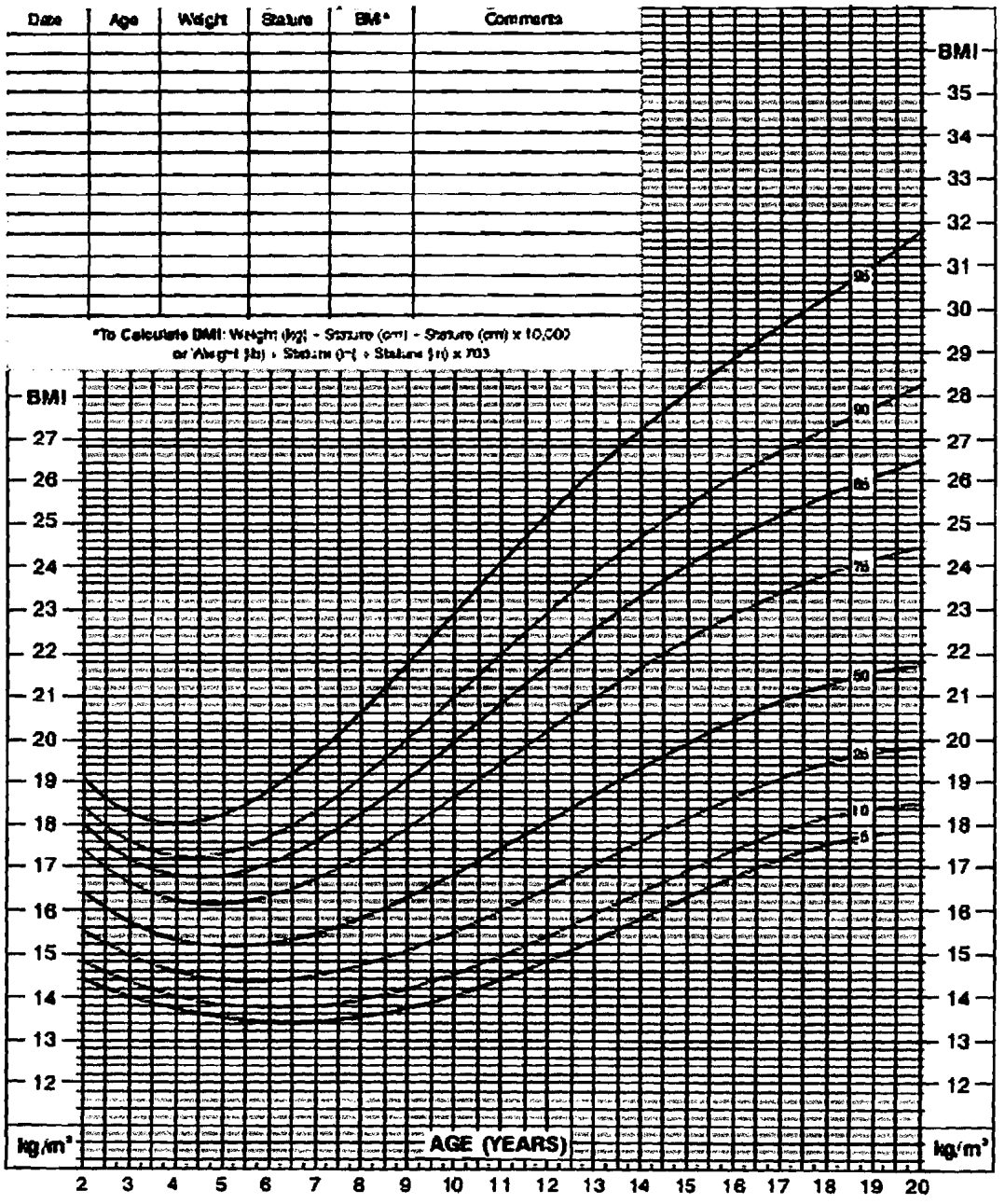
2 to 20 years: Girls
Body mass index-for-age percentiles

NAME _____

RECORD # _____

Date	Age	Weight	Stature	BMI*	Comments

*To Calculate BMI: Weight (kg) ÷ Stature (cm) ÷ Stature (cm) x 10,000
or Weight (lb) ÷ Stature (in) ÷ Stature (in) x 703



Published May 30, 2000 (modified 10/16/00).
SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).
http://www.cdc.gov/growthcharts

Appendix C: IRB Approval Form

Stout Solutions • Research Services
152 Voc Rehab Building

University of Wisconsin-Stout
P.O. Box 790
Menomonie, WI 54751-0790

715/232-1126
715/232-1749 (fax)
http://www.uwstout.edu/rps/

Date: July 21, 2006

To: Diane Rasmussen

Cc: Dr. Ann Parsons

From: Sue Foxwell, Research Administrato
Protections Administrator, UW-Stout Institutional Review Board for the Protection of Human Subjects in Research (IRB)

Subject: **Protection of Human Subjects**

Your project, "*Nutrition, Physical Activity and Health Assessment in the Menomonie School District,*" has been approved by the IRB through the expedited review process. The measures you have taken to protect human subjects are adequate to protect everyone involved, including subjects and researchers.

Reviewer comment: Excellent research study – well designed, timely.

Please copy and paste the following message to the top of your survey form before dissemination:

This research has been approved by the UW-Stout IRB as required by the Code of Federal Regulations Title 45 Part 46.

This project is approved through July 20, 2007. Modifications to this approved protocol need to be approved by the IRB. Research not completed by this date must be submitted again outlining changes, expansions, etc. Federal guidelines require annual review and approval by the IRB.

Thank you for your cooperation with the IRB and best wishes with your project.

***NOTE: This is the only notice you will receive – no paper copy will be sent.**
SF: dd

Appendix D: Information Packet

Dear Parent/Guardian,

Hello! My name is Diane Rasmussen. I am a graduate student in the Food and Nutrition Department at UW-Stout. Childhood obesity is a growing epidemic and I, a parent of two young children, would like to know the rate in our own community so we can work together to find a solution. For my thesis project, I would like to involve school age children at {name of school} to look at the rate of childhood obesity in Menomonie. I hope you take the time to read this text and choose to have your child volunteer in this project.

The study will consist of measures of height and weight as well as collecting information on food intake. Before you agree to be a part of this study, it is important you understand the various aspects. This research study, along with the informed consent, has been reviewed by the Institution Review Board, which protects the rights of the participants. It is important that you read and understand the enclosed information before allowing your child to participate. If you have questions about the study or your child's rights, please address them before signing this form. During orientation week {dates TBD} at {school name}, myself or another individual involved in this study will be available to answer questions you may have or discuss the study in detail. The study is voluntary, so you have the right to withdraw your child from the study at any time.

There will be two types of data collected in this study: 1) Survey responses will be obtained from you (parent/guardian) and from your child. These surveys will be sent home to for you and your child to complete and return. 2) Your child will have measurements taken including height, weight, skinfold thickness, waist and hip circumference as well as strength and flexibility measurements. In addition, you will be invited to attend a family-based event at the end of the study scheduled for the second half of the school year. If you give permission to participate, please sign the consent form(s) and return to me no later than {TBD}.

If you have any questions, please contact Diane Rasmussen at 715-834-0822 or rasmussendi@uwstout.edu.
Sincerely,

Diane Rasmussen

Food and Nutritional Sciences Graduate Student

Parent Consent for Participation in UW-Stout Approved Research Study
Nutrition, Physical Activity and Health Assessment in the Menomonie School District

Investigator:
Diane Rasmussen
rasmussendi@uwstout.edu
715-834-0822

Research Advisor:
Dr. Ann Parsons
parsonsa@uwstout.edu
715-232-2563

Description/ purpose
The purpose of this study is to assess the prevalence childhood obesity in the Menomonie School district. {name of school} has agreed to let me come in and collect data with permission from participants' parents. Today, 15% of Wisconsin's youth are overweight and studies project that in 2010, about 46% of our children will be overweight. Data I will collect allows me to assess the community and my report findings. This may affect future programs to promote healthy lifestyles.

What will my child and I do for this study?
If you agree to have your child participate in this study, your child will have basic measurements of height, weight, triceps skinfold (measures amount of body fat on upper arm of body), hip and waist circumference, flexibility, and strength. In addition, your child will answer questions about his/her diet and physical activity. You (parent/guardian) will be asked to fill out another survey. A family-based event held later in the school year, will summarize some of my findings and will ask you to fill out a post survey.

Risks and Benefits
There are no risks associated with this study. Answering survey questions will not harm you or your child in any way. Height, weight, skinfold, hip/waist circumference, strength and flexibility will be done behind privacy curtains, partitions, or in a separate room. This minimizes the chance of someone observing the measurements and reduces embarrassment to your child. Participants may feel light pressure, similar to that of a slight pinch, when measuring skinfold. No marks or damage to the skin will occur with this test. Trained personnel will do all measurements performed measurements.

Individual information will not be shared with others. Only the primary researchers and key personnel will have access to this data. There are no personal benefits except the knowledge gained during the study. The research staff will provide your child's assessment to you at the end of the study. You can present this information to your child's physician, who may help you improve your child's overall health. Those participating in all components of the study will receive a thank you gift upon completion. In addition, your child may receive a reward such as a sticker, pen or pencil on the day measurements are collected. There is no cost to you. A summary report will be available at the end of the study and presented to the Menomonie School District, Dunn County Health Department, and Red Cedar Medical Center.

Location
We will send some surveys home with your child. Other surveys will be completed at school during the data collection. Privacy for your child is of importance, so the forms on which data

is collected will not reveal names, only an identification number. The researcher and designated staff member are the only personnel with access to the list identifying your child's number. A post survey will be given later in the year at a family-based event.

All measurements will occur at {name of school} during the normal school day in an assigned room. To ensure privacy and avoid embarrassment in front of peers, all measurements will be taken privately. Those persons assisting with data collection have been trained. These measurements will be done confidentially, professionally and accurately.

Confidentiality
We will assign a numeric identifier so we can track your child's data in order to ensure confidentiality. This also allows us to send your child's individual results to you at the completion of the specific components of the study. These matched names and numbers will be in a locked area. Informed consent forms will identify the identifying number associated with the particular child and will be kept in a separate locked area away from other data. All other data will have the id number assigned to it, not your child's name. These records will not be available to others, including your family physician, without written consent from you. Upon completion of the study, these documents will be shredded.

Right to Withdraw
Participation in this study for you and your child is entirely voluntary. Should you choose to participate, you may discontinue your participation at this time without incurring adverse consequences.

If you agree to participate in this study, please sign the following form and return it to the main office of your child's school. This study has been reviewed and approved by The 's Institutional Review Board (IRB). The IRB has determined that this study will not harm participants and that it meets the ethical obligations required by federal law and University policies. If you have questions or concerns regarding this study, please contact the Investigator or Advisor. If you have any questions, concerns, or reports regarding your rights as a research subject, please contact the IRB Administrator.

Investigator: Diane Rasmussen
rasmussendi@uwstout.edu or 715-834-0822

Advisor: Dr. Ann
parsonsa@uwstout.edu or 715-232-2563

IRB Administrator
Sue Foxwell, Research Services
152 Vocational Rehabilitation Bldg.
UW-Stout
Menomonie, WI 54751
715-232-2477
foxwells@uwstout.edu

Thank you for your time reading this information.

Appendix E: Consent Form

Statement of Consent:
"By signing this consent form, you agree to allow your child to participate in the project entitled, ***Nutrition, physical activity, and health assessment in Menomonie School District.***"

I understand and have read the information presented. I understand my child's participation is entirely voluntary and can be withdrawn at any time during the study.

- ☐ I give permission for my child to participate in the survey only
- ☐ I give permission for my child to participate in anthropometric measurements (height, weight, skinfolds, circumference, etc.)
- ☐ I give my child permission to participate in both surveys and anthropometric measurements

_____
Child's printed name

_____ _____
Signature of parent or guardian Date

Statement of Consent:
"By signing this consent form, you agree to participate in the project entitled, ***Nutrition, physical activity, and health assessment in Menomonie School District.***"

I understand and have read the information presented. I understand my participation is entirely voluntary and can be withdrawn at any time during the study.

- ☐ I will participate in the surveys
- ☐ I will not participate in the surveys

_____
Printed name of participating parent/guardian Date

_____
Signature of participating parent/guardian Date

At the end of the study your child's results will be returned to you if you wish. In order to do so, a mailing address needs to be provided. (optional)

_____
name

_____
street address city state zip code

Appendix F: Training Protocols

Nutrition, Physical Activity and Health Assessment Staff Training
October 9, October 12, and October 19, 2006

Dates for data collection:
October 2006
November 2006

All volunteers will be required to turn in a copy of Human Subjects training prior to data collection. If you have not completed Human Subjects training please go to: http://www.uwstout.edu/rs/humansubjects.shtml click on Human Subjects training and complete the module. It will take about 30 minutes to complete. Once you have completed the training, print off at least one copy of the page indicating you have completed the training. You will need these for other nutrition classes.

Volunteers will also complete a training session and attend a second session to verify they can perform the measurements. This will also allow time to complete training or answer questions that arise after training.

To ensure confidentiality of the child and ensure others do not hear specific measurement results, a few precautions are placed on this study.
Children will not be identified by name. The following exceptions apply:

1) The individual who escorts the participants from the classroom to the designated data collection area will be allowed to call the participant by name only when getting them from the classroom.
2) The individual who is stationed at the check-in station and will distribute the folders to the participant. They will ask for the participant's name, look on the spreadsheet for the corresponding id number, retrieve their folder and hand it to the participant.

Those performing measurements can talk to the participants but they can not ask or call them by name. In addition, you will not be giving them results of their measurements. You may talk to relieve anxiety by letting the participant know what you are doing for each measurement.

Sample Script during Data Collection
Midarm circumference

1) Greet the participant "Hi, how are you today"
2) Explain the measurement "First we are going to measure your arm then mark it with a marker to know where to take the measurement. Then will take this instrument (show them the tape measure)put it around your arm and take a measurement. "
3) Record the measurement on the data collection sheet and place inside folder.
4) Let the child know we will wipe off the mark at another station.
5) Thank the participant, give them their folder and have them move on to the next station.
6) Wipe down the tape measure with a disinfectant wipe.

Skinfold measurement

1) Greet the participant "Hi, how are you today"

2) Explain the measurement "We are going to use this instrument to take some measurements. We will take 3 measurements and will only take about a minute. You may feel like a light pinch but it will not hurt."
3) Record the measurements on the data collection sheet and place inside folder.
4) Let the child know you are going to wipe the mark off of their arm.
5) Use alcohol and cotton ball to wipe off the mark on the back of the arm.
6) Thank the participant, give them their folder and have them move on to the next station.
7) Wipe down the pads of the instrument with a disinfectant wipe.

Hip/waist ratio

1) Greet the participant "Hi, how are you today"
2) Explain the measurement "We are going to take this instrument and measure around your hips and waist. You will not need to take any clothes off."
3) Have them lift their arms slightly so you can get the tape measure around them.
4) Record the measurements for hip and waist on the data collection sheet and place inside folder.
5) Thank the participant, give them their folder and have them move on to the next station.
6) Wipe down the instrument with a disinfectant wipe.

Height/ weight

1) Greet the participant "Hi, how are you today"
2) Explain the measurement. "First you will have to take off your shoes. Then we will step on the platform to record some measurements."
3) Start with weight. Record the measurement on the data collection sheet.
4) Let the participant know there will be another measurement performed.
5) Have them stand straight, arms to the side and align head in the Frankfort plane. Bring the measuring rod down so it touches the top of their head and take the measurement looking straight on.
6) Record the measurement and place data collection sheet inside folder.
7) Raise the measuring rod.
8) Thank the participant, give them their folder and have them move on to the next station once they have put their shoes on.
9) Use an alcohol wipe to clean the platform and wipe the measuring rod.
10) Make sure scale is set to zero and rod (for height) is raised to avoid injury.

Survey

1) Help child take survey from their folder and give a pencil to each participant. Let them know you are here to answer any questions.
2) Depending on the age group (ie. 1st grade), you may need to read the question to them.
3) Once they have completed the survey, put the survey into their folder and place entire folder into file box.
4) Thank the participant and escort the participants back to their classroom.

Balance Beam Scale

Equipment:
Balance beam scale
Calibrated weights
Log book
Alcohol wipes

Equipment Information:
DETECTO Physician's Scale
Model Number: 338
Tech Support: (417) 673-5007
www.detectoscale.com

Set up Procedures:

- Scale with attached measuring rod (stadiometer) should be placed on a hard, flat surface. If a hard surface is not available, a hard wooden platform can be used.
- Use a carpenter's level to ensure the scale is at a horizontal plane.
- This instrument is being moved from site to site, so to ensure accuracy of the measurement, calibrate the scale daily.
- Select appropriate verified and calibrated weight and use on a daily basis. (100 lb weight will be used for the purpose of this study)
- Make sure the upper and lower beams are pointing to zero. If not, do so by moving the weight poises (the little weights that slide along the beams) so they are pointing to the zero line.
- Place weight on the scale platform and move the weight poises on the sliding scale starting with the largest poise and using the smallest to fine tune and down to the pound until it is balanced.
- To record the weight, add up the numbers corresponding to the large and small poises.
- Record this weight on the Calibration Log and verify it is reading the same weight as the amount of weight you placed on the scale. Take 2 measurements to ensure the accuracy. If scale does not read accurately refer to scale's instruction manual for the procedure to calibrate the scale.
- Remove the weights and remember to move the beams back to zero.

Procedures for Use:

- The subject should remove shoes, socks and extra layers of clothing (jackets, sweatshirts, etc)
- The subject should step on the platform (face forward) and place their feet slightly apart toward the middle of the scale. This will ensure weight is evenly distributed on both feet. Their arms should hang next to their body and should not be holding anything.
- Move the (lower weight) away from zero until the marker drops below the center point, then slide the weight back one notch so it is above the center point. Move the (upper weight) away from zero until the marker is centered and the beams balance. This may take a few times adjusting the (upper weight) back and forth until the scale balances. Read the measurement to the nearest quarter pound and return the weights to zero.
- Measurement should be taken to the nearest 100 g (0.1 kg) or ¼ pound.
- Clean after each use by wiping down surfaces with alcohol (wipes) or sanitizing solution

Errors to avoid:

1. Scale not calibrated to zero
2. Adult scale placed on carpeting or pad – should be on hard surface
3. Subject not centered on scale
4. Subject not undressed accordingly (shoes, coats, etc.)
5. Measurement taken when subject was moving
6. Measurement taken before balance beam indicator stopped moving
7. Measurement not recorded immediately
8. Measurement not repeated
9. Subject had not voided recently

Portable Stadiometer – Standing Height
Using measuring rod attached to balance beam scale

Equipment:
Scale
Calibrating rod
Alcohol swabs

Equipment information:
DETECTO Physician's Scale
Model number: 338
Tech Support: (417) 673-5007
www.detectoscale.com

Set-up Procedure:

- Scale with attached measuring rod (stadiometer) should be placed on a hard, flat surface. If a hard surface is not available, a hard wooden platform can be used.
- Use a carpenter's level to ensure the scale is at a horizontal plane.
- Height rule should be checked with standardized rods and corrected if greater than 2 mm. Refer to scale's instruction manual for calibration procedure. Record in log book.

Procedures for Use:

- Subject should be barefoot, remove hair accessories if they interfere with height measurements, and wearing minimal clothing for correct body positioning.
- Standing with heels together, arms to the side, legs straight, shoulders relaxed and head in the Frankfort horizontal plane. [Frankfort plane is the top of the external auditory meatus (ear canal) should be level with the inferior margin of the bony orbit (cheek bone).]
- Heels, buttocks, shoulder blades and back of the head should be against the vertical surface of the stadiometer (if the subject cannot touch all four points, they should touch at least two or three)
- Just before taking the measurement, the subject should inhale deeply and hold the breath while the headboard is lowered (the headboard should be lowered just enough to compress the hair) Height is recorded to the resolution of the height rule.
- If the participant is taller than the measurer, a platform should be used so the measurer can properly read the height rule.
- The measurement should be taken to the nearest 0.1 cm or 1/8 in.
- Since height and weight are recorded using the same instrument, use alcohol swabs after subject has completed these tasks to clean the platform of the scale.

Errors in Measurement:

- Scale not calibrated correctly
- Subject did not remove shoes or hair was interfering with the measurement
- Head is not in proper position (Frankfort plane)
- Knees were bent
- Feet were not flat on the floor
- Measurer was at an angle when recording the height measurement
- This should not be used for those confined to a wheel chair. Using the knee height caliper and appropriate equation will help estimate height for these individuals.

Reading and Recording Measurements
Measurements can be difficult to read especially if the subject is taller than the measurer. In that case the measurer should stand on a platform so they can look straight on to the measuring device. Some instruments read both English and metric units. Be sure to read appropriate units and record on the data collection sheet accordingly.

Be sure to read to the nearest ¼" using the vertical lines provided (this may change to ½" depending on the measuring rod). When a measurement falls between two readings record the nearest ¼" and if it is exactly between randomly select eight higher or lower reading.

Mid-Arm Circumference

Equipment:

Calibrated measuring tape

Information:

Gulick II Measuring Tape
Model number: 67020
Customer Service: (608)735-4718

Procedure:

- Subject stands straight with right arm hanging freely along the side.
- Using the midpoint on the upper arm previously marked for skinfold measurement, place the measuring tape perpendicular around the upper arm.
- Pull tape tight enough to lightly compress the skin. When using the Gulick II measuring tape, align the tape's zero-line along the tape's graduations. Pull on the tensioning mechanism until the calibration point is seen. Read measurement where it lines up with the zero line.
- Read measurement to nearest 0.1 cm.

Errors in Measurement:

- Tape measure was not aligned correctly on arm.
- Tape measure was compressed too much or too little
- Right arm was not used
- Measurement was not recorded in cm

Triceps Skinfold Measurement

Equipment:

Skinfold caliper
Marker
Measuring tape

Information:

Lange skinfold caliper
Model number: 68902
Customer Service: (608) 735-4718 or ctech@mwt.com

Set-up Procedure:

- Prior to use, check to ensure skinfold caliper reads zero when not in use.

Procedures for Use:

- All measurements should be taken on right side of the body. Have the subject stand face forward, bend right elbow at 90° angle with palm facing upward.
- Place the end of the tape measure on the acromion process (bony part on the top of the shoulder) and measure to the olecranon process (elbow). The midpoint of this measurement is where you will place a mark with your pen.
- Inform the subject to relax arm and allow it to hang loosely at the side of their body.
- At the mark, you will grasp the skinfold firmly with your thumb and index finger and pull the skin away from the body.
- Hold the caliper perpendicular to the site and put the pads of the calier ½" below your hold. Wait 4 seconds and read the measurement.
- Release the trigger on the caliper and wait 30 seconds before taking the next measurement.
- Record the measurement to the nearest 0.5 mm on the data collection sheet.
- A total of three measurements should be taken on each subject. Rest for 15 seconds in between measurements.

Errors in Measurement:

- Did not measure true skinfold
- Measurement should not be taken when skin is moist because you may grab extra skin and reflect large values
- Do not take measurements after exercise as body fluid shifts and reflect larger values

Waist and Hip Circumference

Equipment Information:

Gulick II Measuring Tape
Model number: 67020
Customer Service: (608) 735-4718

Procedures for Use:

- Subject should be barefoot, arms next to side and standing up straight for correct body positioning.
- Waist circumference is measured by wrapping the tape measure around the middle at the level of your belly button just above your iliac crest (hip bone).
    - The subject should be relaxed and exhale as the measurement is taken.
    - Make sure the tape measure is parallel to the floor and is snug but does not compress the skin. [It could be the smallest area below the rib cage but above the umbilicus (belly button).]
    - Waist circumference was measured midway between the lower rib margin and the iliac crest in the horizontal plane.
    - For overweight or obese individual locate the right iliac crest by using the fingertips to gently feel for the highest point on the hip bone on the subject's right side.
- Record the measurement to the nearest 0.1 cm.

- Hip circumference is measured at the two bony prominences felt in front of your hips.
    - This could be the larger extension of the buttocks.
    - Make sure the tape is parallel to the floor and is snug but does not compress the skin.
- Record the measurement to the nearest 1 cm.

Errors in Measurement:

- Subject was not exhaling while taking either measurement
- Subject was not standing up straight

Knee Height
for body weight and height estimation

Equipment:

Large sliding caliper
Alcohol wipes

Equipment information:

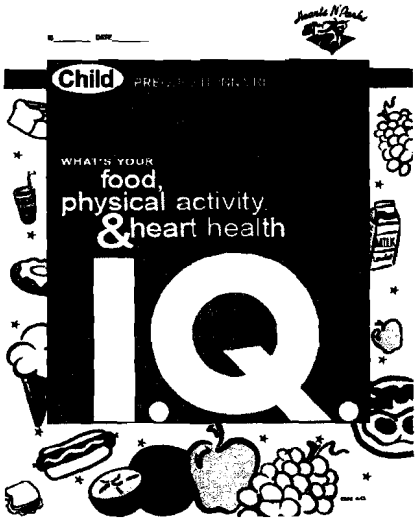
Set-up Procedure:

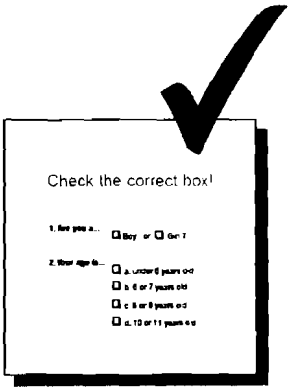
- *This will only be used when standing height can not be measured.
- Subject should be laying down or in a wheelchair with socks removed and exposing the leg if possible.
- The knee and ankle should be at a 90 degree angle. Use the square to ensure these angles are correct. The blade of the large sliding caliper is placed at under the heel and runs parallel along the tibia. The other blade of the caliper is placed behind the shaft of the fibula or right above the knee cap.
- The caliper is tightened with just enough pressure to compress the tissue.
- Measurement is recorded to nearest 0.1 cm.
- This number is placed into the equation below to estimate the height.
- Another equation, listed below is used to estimate weight with the addition of other measurements.

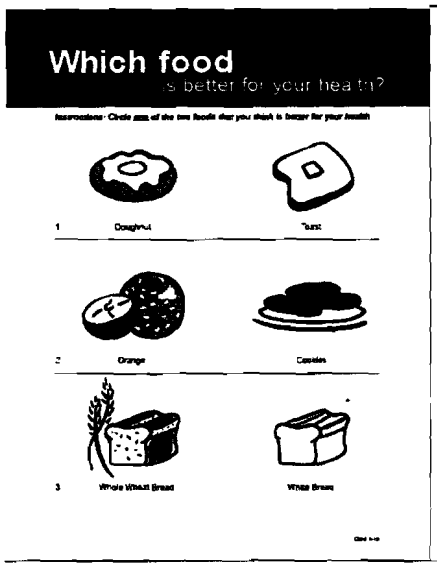
Errors in Measurement:

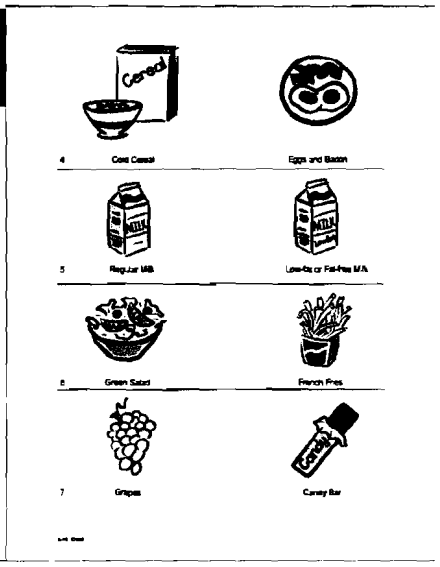
- Subject did not remove shoes or socks
- Knee and ankle were not in 90 degree position
- Caliper was not aligned correctly with leg or was not compressing skin
- This should be used for those confined to a wheel chair or can not stand up straight.

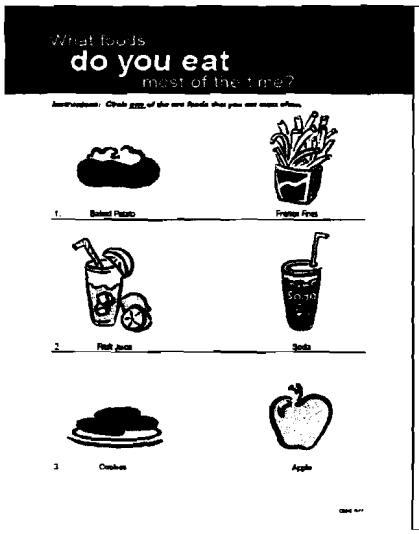
Appendix G: Child Survey

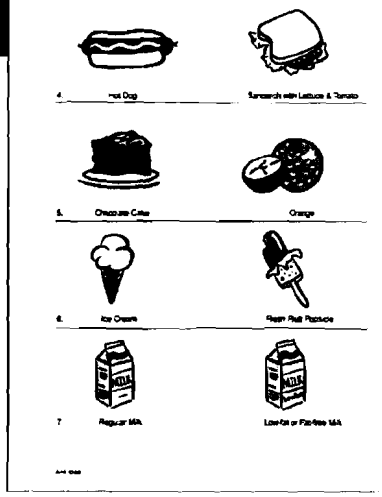

Child
WHAT'S YOUR
food,
physical activity
&heart health
I.Q.

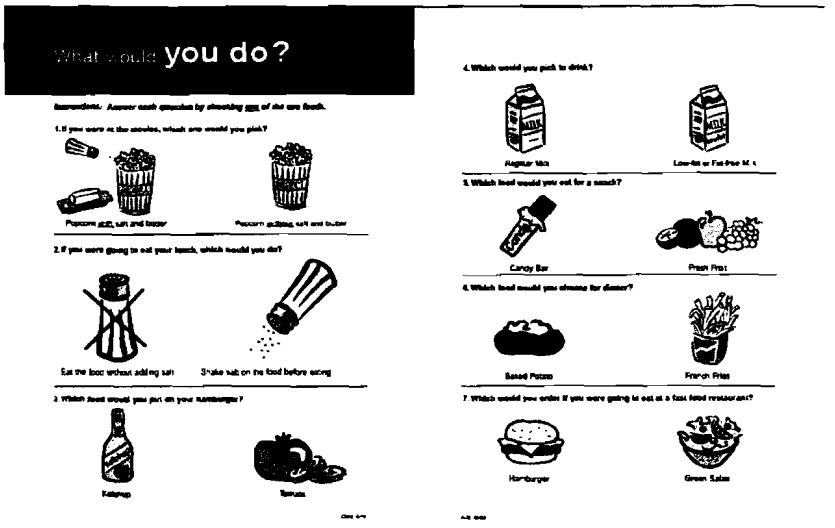

Check the correct box!


Which food
is better for your health?


Cereal
4 Cold Cereal
Eggs and Bacon
5 Regular Milk
Low-fat or Fat-Free Milk
6 Green Salad
French Fries
7 Grapes
Candy Bar


What foods
do you eat
most of the time?
1. Baked Potato
Fried Fries
2. Fruit Juice
Soda
3 Cookies
Apple


4. Hot Dog
Sandwich with Lettuce & Tomato
5. Chocolate Cake
Orange
6. Ice Cream
Fresh Fruit Popsicle
7 Regular Milk
Low-fat or Fat-Free Milk



What would you do?

Instructions: Answer each question by choosing one of the two foods.

1. If you were at the movies, which one would you pick?

Popcorn with salt and butter

Popcorn without salt and butter

2. If you were going to eat your lunch, which would you do?

Eat the food without adding salt

Shake salt on the food before eating

3. Which food would you put on your hamburger?

Ketchup

Tomato

4. Which would you pick to drink?

Regular Milk

Low-fat or Fat-Free Milk

5. Which food would you eat for a snack?

Candy Bar

Fresh Fruit

6. Which food would you choose for dinner?

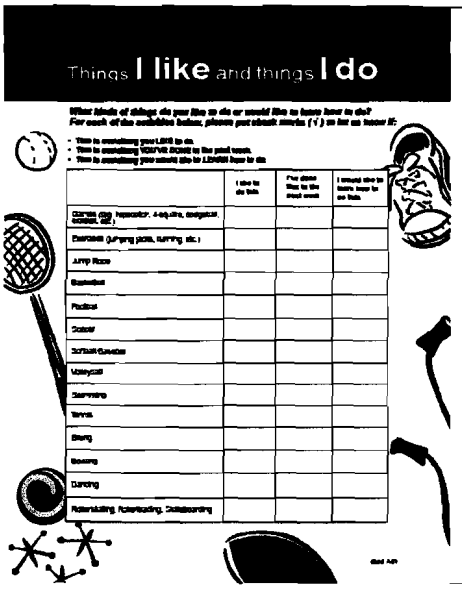
Baked Potato

French Fries

7. Which would you order if you were going to eat at a fast food restaurant?

Hamburger

Green Salad

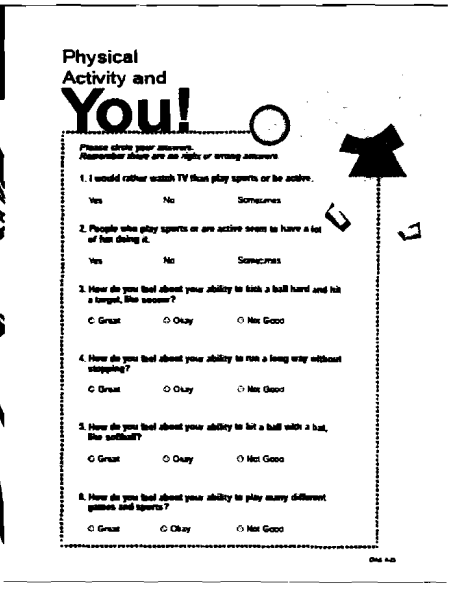


Things I like and things I do

What kinds of things do you like to do or would like to learn how to do?
For each of the activities below, please put check marks (✓) in for as many as:

- Time is something you LIKE to do.
- Time is something YOU'VE DONE in the past week.
- Time is something you would like to LEARN how to do.

	I like to do this.	I've done this in the past week.	I would like to learn how to do this.
Dancing (eg. hopscotch, 4-square, skipping, double dutch, etc.)			
Exercise (jumping jacks, running, etc.)			
Jump Rope			
Basketball			
Hockey			
Soccer			
Softball/Baseball			
Volleyball			
Swimming			
Tennis			
Skiing			
Boxing			
Dancing			
Rollerskating, Rollerblading, Skateboarding			



Physical Activity and You!

Please circle your answers.
Remember there are no right or wrong answers.

1. I would rather watch TV than play sports or be active.

Yes No Sometimes

2. People who play sports or are active seem to have a lot of fun doing it.

Yes No Sometimes

3. How do you feel about your ability to kick a ball hard and hit a target, like soccer?

○ Great ○ Okay ○ Not Good

4. How do you feel about your ability to run a long way without stopping?

○ Great ○ Okay ○ Not Good

5. How do you feel about your ability to hit a ball with a bat, like softball?

○ Great ○ Okay ○ Not Good

6. How do you feel about your ability to play many different games and sports?

○ Great ○ Okay ○ Not Good

From: NHLBI Health Information Center [mailto:NHLBIInfo@nhlbi.nih.gov]
Sent: Thu 10/5/2006 9:43 AM
To: Rasmussen, Diane M
Subject: Hearts n Park Survey CRM:00210806

Dear Ms. Rasmussen:

On behalf of the National Heart, Lung, and Blood Institute (NHLBI) Health Information Center, we are responding to your request to use the Hearts N' Parks survey.

The information contained in materials published by the NHLBI is in the public domain. No further permission is required to reproduce or reprint the information in whole or in part. However, organizations that reproduce NHLBI publications should cite the National Heart, Lung, and Blood Institute as a part of the National Institutes of Health and the United States Department of Health and Human Services as the source. This applies to printed publications as well as documents from the NHLBI Web site. Organizations may add their own logo or name. We further ask that no changes be made in the content of the material, and that the material as well as any NHLBI Internet links should not be used in any direct or indirect product endorsement or advertising.

If you have an interest in heart, lung, blood, or sleep disorders, join the National Heart, Lung, and Blood Institute's Health Information Network (NHLBI HIN). HIN members get quick, convenient access to trustworthy information applicable to everyday practice, delivered to their e-mail boxes approximately twice a month. Subscribe at http://emall.nhlbihin.net/hp2010/default.asp.

We hope this information will be helpful to you.

Sincerely,

NHLBI Health Information Center
PO Box 30105
Bethesda, MD 20824
Tel.: 301-592-8573
Fax: 301-592-8563
E-mail: nhlbiinfo@nhlbi.nih.gov
Web site: http://www.nhlbi.nih.gov

Appendix H: Data Collection Sheet

ID# ___ ___ ___ Date:_____

DATA COLLECTION SHEET

Gender: Male Female School:_____

Date of Birth: _____ Grade:_____

Ethnicity: (check one) Teacher:_____

- ☐ White
- ☐ African American
- ☐ Hispanic/Latino
- ☐ Asian
- ☐ American Indian
- ☐ Other

Measurements

Remember to circle the appropriate form of measurement whether inches/cm or lbs/kg

Height (inches/cm) _____ _____

Weight (lbs/ kg) _____ _____

BMI % _____ (from age and gender appropriate growth chart)

Triceps skinfold (mm) _____ _____ _____

Waist circumference (inches/cm) _____ _____

Hip circumference (inches/cm) _____ _____

Mid Arm circumference () _____

Knee Height () _____
(if standing height can't be obtained)

Appendix I: Anthropometric Measurement Reference Tables

Table 28. Triceps skinfold in millimeters for persons 3 months–19 years–number of examined persons, mean, standard error of the mean, and selected percentiles, by sex and age: United States, 1966–1994

Sex and age	Number of examined persons	Mean	Standard error of the mean	Selected percentile								
				5th	10th	15th	25th	50th	75th	85th	90th	95th
Male												
3–5 months	290	10.5	0.21	*	7.9	8.4	9.2	10.7	11.7	12.5	13.2	*
6–8 months	330	10.2	0.23	*	7.5	7.9	8.5	9.9	11.6	12.5	13.3	*
9–11 months	275	9.5	0.26	*	7.1	7.4	8.1	9.2	10.7	11.1	11.9	*
1 year	647	9.4	0.15	6.4	6.9	7.2	7.9	9.1	10.7	11.7	12.1	13.1
2 years	555	9.1	0.13	6.4	6.7	7.3	7.9	8.9	10.4	11.1	11.5	12.4
3 years	479	8.8	0.20	*	6.4	6.8	7.5	8.6	10.0	10.8	11.6	*
4 years	523	9.0	0.13	6.0	6.6	6.9	7.5	8.6	10.0	11.4	12.0	12.5
5 years	497	8.7	0.20	6.0	6.5	6.8	7.2	8.1	9.5	10.3	11.2	13.6
6 years	279	9.9	0.46	*	6.0	6.4	7.1	8.5	10.8	12.9	14.5	*
7 years	283	9.7	0.45	*	6.1	6.4	7.1	8.7	10.7	13.3	16.6	*
8 years	282	10.9	0.39	*	6.5	6.4	7.5	8.8	12.3	15.7	20.1	*
9 years	276	12.4	0.69	*	6.6	6.9	7.6	9.7	15.4	21.3	23.9	*
10 years	299	12.5	0.63	*	6.0	6.9	8.2	10.4	15.5	20.8	22.3	*
11 years	282	13.6	0.76	*	6.7	7.2	9.6	11.3	18.2	19.5	22.3	*
12 years	300	13.5	0.77	*	*	7.6	9.6	12.9	17.4	19.2	*	*
13 years	182	12.4	0.89	*	*	6.4	7.1	10.5	15.7	19.7	*	*
14 years	183	11.0	0.82	*	*	6.2	6.7	8.3	13.4	17.0	*	*
15 years	182	12.1	1.00	*	*	6.0	6.7	9.5	13.8	19.2	*	*
16 years	191	11.1	0.86	*	*	6.6	7.1	8.6	13.6	17.0	*	*
17 years	191	11.3	0.82	*	*	5.9	7.2	8.9	12.8	19.2	*	*
18 years	169	10.9	0.56	*	*	5.7	6.3	8.3	12.6	16.8	*	*
19 years	160	12.1	1.05	*	*	6.3	7.5	9.3	12.2	21.9	*	*
Female												
3–5 months	309	10.4	0.21	*	7.9	8.2	9.7	10.3	11.8	12.3	12.6	*
6–8 months	261	9.9	0.29	*	*	7.6	8.2	9.4	11.3	12.2	*	*
9–11 months	316	9.6	0.24	*	7.1	7.4	8.0	9.2	10.9	11.9	12.7	*
1 year	626	9.7	0.16	6.5	7.1	7.4	8.1	9.6	11.0	11.9	12.4	13.5
2 years	545	9.5	0.17	*	7.1	7.4	7.9	9.2	10.9	11.6	12.3	*
3 years	554	9.7	0.21	*	7.1	7.4	8.1	9.1	10.9	11.8	12.4	*
4 years	539	10.3	0.29	*	7.3	7.7	8.4	9.6	11.6	12.8	13.4	*
5 years	554	10.3	0.27	*	7.3	7.8	8.2	9.6	11.4	12.8	14.4	*
6 years	273	10.3	0.48	*	*	7.1	7.8	9.3	11.1	13.6	*	*
7 years	289	11.9	0.59	*	*	7.4	7.9	10.6	14.5	18.0	*	*
8 years	244	12.4	0.64	*	*	7.9	8.5	10.7	14.2	17.6	*	*
9 years	270	14.4	0.64	*	*	8.2	8.9	12.1	16.5	23.9	*	*
10 years	255	15.0	0.81	*	*	8.7	10.1	12.9	18.1	21.7	*	*
11 years	263	15.1	0.78	*	*	9.8	9.9	12.8	19.8	21.2	*	*
12 years	270	15.2	0.56	*	*	9.2	9.6	13.2	19.4	23.4	*	*
13 years	218	17.5	0.89	*	*	10.4	11.7	15.9	22.3	24.4	*	*
14 years	216	18.7	0.98	*	*	11.6	12.4	17.3	22.5	25.4	*	*
15 years	183	17.9	0.98	*	*	11.1	12.4	16.7	20.7	25.7	*	*
16 years	202	19.6	0.95	*	*	12.0	14.0	16.8	21.8	25.4	*	*
17 years	191	20.0	0.98	*	*	12.4	14.2	19.6	24.8	27.3	*	*
18 years	165	18.4	1.67	*	*	*	13.9	17.9	24.2	*	*	*
19 years	167	19.6	1.13	*	*	*	14.0	18.5	24.1	*	*	*

* Figure does not meet standard of reliability or precision.
NOTE: Pregnant women are excluded.

Table 4. Mid-upper arm circumference in centimeters for persons 3 months–19 years: number of examined persons, mean, standard error of the mean, and selected percentiles, by sex and age: United States, 1988–1994

Sex and age	Number of examined persons	Mean	Standard error of the mean	Selected percentile								
				5th	10th	12th	25th	50th	75th	85th	90th	95th
Male												
3–5 months	330	14.6	0.12	*	13.2	13.5	13.9	14.5	15.4	15.7	16.0	*
6–8 months	318	15.3	0.12	*	13.8	14.0	14.4	15.2	16.1	16.6	17.0	*
9–11 months	275	15.6	0.12	*	14.1	14.5	14.9	15.7	16.4	16.8	17.1	*
1 year	631	16.1	0.09	14.4	14.6	15.0	15.4	16.0	16.9	17.3	17.7	18.2
2 years	574	16.5	0.09	14.8	15.1	15.4	15.8	16.3	17.2	17.8	18.0	19.5
3 years	483	16.9	0.13	15.0	15.4	15.7	15.9	16.8	17.7	18.2	18.6	19.0
4 years	542	17.3	0.11	15.3	15.6	16.0	16.4	17.1	18.0	18.4	19.6	19.5
5 years	495	17.9	0.13	15.5	16.0	16.2	16.9	17.7	18.6	19.3	19.6	20.7
6 years	279	18.9	0.25	*	16.4	16.9	17.1	18.4	19.6	20.5	22.7	*
7 years	268	19.3	0.24	*	17.1	17.6	17.9	18.9	20.3	21.3	21.7	*
8 years	281	20.4	0.21	*	17.5	18.0	18.4	19.6	21.8	23.4	24.7	*
9 years	276	21.7	0.34	*	18.3	19.6	19.2	20.7	24.2	25.3	27.0	*
10 years	264	22.6	0.34	*	18.7	19.2	20.1	22.0	25.0	26.6	27.5	*
11 years	281	23.6	0.39	*	19.7	20.0	21.1	22.7	25.5	27.4	28.1	*
12 years	302	25.2	0.48	*	*	21.6	23.1	24.1	27.3	28.5	*	*
13 years	181	25.7	0.45	*	*	22.0	23.6	24.6	27.8	28.6	*	*
14 years	185	26.1	0.76	*	*	23.9	24.3	27.0	29.8	30.6	*	*
15 years	183	28.5	0.51	*	*	24.9	25.9	27.5	31.1	33.3	*	*
16 years	191	29.2	0.50	*	*	25.6	26.6	28.4	31.2	32.6	*	*
17 years	193	30.7	0.51	*	*	26.7	27.7	30.0	33.1	35.3	*	*
18 years	169	30.1	0.53	*	*	25.9	27.4	29.8	31.8	34.5	*	*
19 years	161	31.5	0.52	*	*	27.9	29.6	30.8	33.7	35.8	*	*
Female												
3–5 months	308	14.0	0.13	*	12.7	12.9	13.3	14.0	14.8	15.2	15.6	*
6–8 months	282	14.9	0.14	*	*	13.6	13.9	14.7	15.4	16.1	*	*
9–11 months	315	15.2	0.12	*	13.6	14.0	14.4	15.2	15.9	16.4	16.7	*
1 year	627	15.9	0.09	14.0	14.4	14.7	15.0	15.9	16.7	17.0	17.5	17.5
2 years	538	16.3	0.09	*	15.0	15.2	15.5	16.2	17.0	17.4	17.5	*
3 years	501	17.0	0.11	15.1	15.5	15.9	16.1	16.8	17.6	18.1	18.5	19.3
4 years	527	17.6	0.17	*	15.6	15.9	16.4	17.3	18.2	19.0	19.4	*
5 years	555	18.1	0.13	*	16.1	16.3	16.9	17.8	19.0	19.7	20.6	*
6 years	272	18.7	0.25	*	*	16.7	17.2	18.1	19.5	21.1	*	*
7 years	270	19.9	0.34	*	*	17.1	17.6	19.3	21.4	23.5	*	*
8 years	245	20.6	0.33	*	*	17.9	18.6	20.0	21.5	23.3	*	*
9 years	272	22.1	0.47	*	*	18.4	19.3	20.9	24.0	26.5	*	*
10 years	253	22.6	0.42	*	*	19.0	19.9	21.8	24.6	26.5	*	*
11 years	259	23.7	0.40	*	*	20.1	21.2	23.5	25.7	27.4	*	*
12 years	220	24.5	0.48	*	*	20.0	21.5	23.8	27.1	28.3	*	*
13 years	217	26.3	0.53	*	*	22.1	23.0	25.4	29.1	31.1	*	*
14 years	218	26.9	0.45	*	*	23.0	24.0	25.9	28.5	31.1	*	*
15 years	180	26.7	0.45	*	*	23.9	24.2	25.9	28.1	30.1	*	*
16 years	204	27.3	0.47	*	*	23.5	24.7	26.4	29.5	31.3	*	*
17 years	195	27.7	0.56	*	*	24.2	25.2	27.0	29.3	31.2	*	*
18 years	170	27.4	0.55	*	*	*	24.4	26.5	29.8	*	*	*
19 years	168	28.2	0.63	*	*	*	25.2	27.2	29.6	*	*	*

* Figure does not meet standard of reliability or precision.
NOTE: Pregnant women are excluded.

Table 47. Waist circumference in centimeters for persons 2-19 years—number of examined persons, mean, standard error of the mean, and selected percentiles, by sex and age: United States, 1988-1994

Sex and age	Number of examined persons	Mean	Standard error of the mean	Selected percentile								
				5th	10th	15th	25th	50th	75th	85th	90th	95th
Male												
2 years	534	47.9	0.20	43.5	44.4	45.0	46.0	47.7	49.5	50.6	51.6	53.1
3 years	485	49.9	0.31	45.1	46.0	46.6	47.5	49.3	51.2	52.1	53.2	55.5
4 years	542	51.6	0.25	46.4	47.2	47.9	48.9	51.4	52.9	54.4	55.3	57.2
5 years	492	53.0	0.31	47.6	48.4	48.9	50.1	52.5	54.9	56.0	57.3	61.2
6 years	278	55.7	0.64	*	49.6	50.5	51.5	54.1	57.9	59.7	60.5	*
7 years	263	57.4	0.63	*	51.6	52.1	53.0	55.7	59.4	62.7	64.2	*
8 years	262	60.0	0.72	*	52.7	53.6	54.6	58.0	63.7	67.2	72.6	*
9 years	272	63.3	0.91	*	54.1	55.0	56.7	59.6	68.8	75.0	78.1	*
10 years	269	65.1	0.93	*	55.1	56.1	57.9	62.9	69.5	76.7	77.5	*
11 years	281	69.7	1.02	*	58.2	59.0	61.0	65.1	74.1	81.1	84.4	*
12 years	302	72.2	1.20	*	*	61.1	64.5	69.1	80.2	84.5	*	*
13 years	181	73.0	1.35	*	*	61.7	65.0	69.6	80.4	85.5	*	*
14 years	185	77.4	1.51	*	*	66.6	67.5	73.1	79.5	85.5	*	*
15 years	182	78.7	1.54	*	*	66.9	69.6	75.4	85.4	92.1	*	*
16 years	191	79.3	1.23	*	*	70.1	71.4	75.0	82.0	85.8	*	*
17 years	190	81.0	1.26	*	*	70.9	73.0	77.6	84.5	94.7	*	*
18 years	169	80.2	1.35	*	*	71.0	71.9	77.0	84.9	91.0	*	*
19 years	162	82.1	1.33	*	*	72.1	75.1	79.2	86.2	94.6	*	*
Female												
2 years	527	46.0	0.25	*	44.2	44.9	45.9	48.0	49.8	50.8	52.0	*
3 years	502	48.9	0.35	43.6	45.5	46.1	47.1	49.3	51.6	53.3	54.5	57.2
4 years	527	52.1	0.46	*	47.2	47.9	49.0	51.1	53.7	55.6	56.9	*
5 years	554	53.3	0.41	*	47.9	48.6	49.6	52.8	55.4	57.4	58.9	*
6 years	273	54.6	0.78	*	*	49.1	50.4	53.0	56.5	60.1	*	*
7 years	263	57.6	0.82	*	*	50.7	52.2	55.4	60.4	64.6	*	*
8 years	244	58.4	0.94	*	*	53.1	54.1	56.2	62.1	65.4	*	*
9 years	273	62.9	1.14	*	*	53.5	55.9	59.8	66.6	73.0	*	*
10 years	254	64.7	1.22	*	*	54.0	57.1	61.3	69.5	76.1	*	*
11 years	268	67.4	1.05	*	*	58.7	60.5	65.8	72.6	77.6	*	*
12 years	270	69.9	1.26	*	*	59.9	61.7	67.8	77.1	79.5	*	*
13 years	216	74.0	1.45	*	*	62.9	66.4	71.6	80.3	85.6	*	*
14 years	217	76.4	1.40	*	*	65.6	69.2	74.0	82.9	89.3	*	*
15 years	183	74.1	1.43	*	*	65.3	69.1	71.6	77.6	81.3	*	*
16 years	204	76.5	1.19	*	*	67.1	69.7	72.2	81.3	84.8	*	*
17 years	191	78.5	1.10	*	*	69.1	70.1	76.3	81.8	91.3	*	*
18 years	169	76.5	1.72	*	*	*	69.0	74.6	81.1	*	*	*
19 years	170	78.6	1.99	*	*	*	69.6	76.2	82.5	*	*	*

* Figure does not meet standard of reliability or precision.
NOTE: Pregnant women are excluded.