FACTORS ASSOCIATED WITH BMI-FOR-AGE OF THIRD AND FOURTH GRADERS

by

Judy K. Martin

A Research Paper

Submitted in Partial Fulfillment of the

Requirements for the

Master of Science Degree

in

Food and Nutritional Sciences

Approved: 6 Semester Credits

_____

Dr. Janice M. Coker

_____

Dr. Esther G. Fahm

_____

Dr. Judith A. Herr

The Graduate School

University of Wisconsin-Stout

December 2003

The Graduate School
University of Wisconsin Stout
Menomonie, WI 54751

Abstract

Martin (Last Name) Judy (First Name) K. (Initial)

Factors Associated with BMI-for-Age of Third and Fourth Graders
(Title of Thesis)

Food and Nutritional Sciences
(Graduate Major)

Dr. Janice M. Coker (Research Advisor) December 2003 (Date) 111 pages (Number of Pages)

American Psychological Association Publication Manual, 5th Edition
(Name of Style Manual Used in this Study)

The objective of this study was to determine BMI (body mass index)-for-Age of third and fourth graders and compare to reported eating habits and activity patterns. Subjects included all consenting third and fourth graders (N = 103) at an elementary school, 51 girls and 52 boys. The design was a cross-sectional, descriptive study consisting of a 19-question student survey regarding breakfast habits, snack, beverage, and activity preferences. Statistical analyses included descriptives and cross tabulations for all variables, ANOVA to compare BMI to breakfast frequency, usual and preferred beverages, and frequency of meals/snacks while watching television (TV), t-tests to compare mean BMI to breakfast frequency, opportunities for physical activity, TV/computer availability and sweetened soft drink use, and chi-square to compare BMI

classification with preferences for leisure activities. BMI classification results were: *underweight* – 2 (1.9%), *normal weight* – 63 (61.2%), *at risk of overweight* – 22 (21.4%), and *overweight* – 16 (15.5%), similar to other published data. No single habit or preference was found to be associated with higher BMI-for-Age. This research helps to confirm the complex nature of childhood overweight. Multiple interventions are needed to impact this serious problem.

Acknowledgements

I would like to thank my thesis committee, Dr. Janice Coker, Dr. Judy Herr, Melinda Hanson, and Dr. Esther Fahm for their assistance with methodology and survey development, as well as technical assistance with reporting the results. I am especially grateful to my research advisor, Dr. Janice Coker, for her enthusiasm, encouragement, and cheerful, prompt assistance with every question.

Special acknowledgement must go to my daughters, Cheryl and Amy, who showed me the way. Cheryl showed me that it is possible to drive across the state to attend classes, while working at a full-time job. Amy accompanied me on my first trip to Stout, and offered advice that sustained me – "Just get in the car and go, Mom!" She also showed me that I could remember my high school algebra after 30 years to learn introductory statistics. Both daughters showed me computer techniques that I thought were beyond my comprehension. I am so proud of both of them, and it's good to know they are also proud of me!

It has been a privilege to work with my daughter, Cheryl, on the first "mother-daughter" thesis. Her energy and enthusiasm always supported and encouraged me.

I am grateful to research and statistical consultant Christine Ness, from Technology and Information Services, who assisted with wording of survey questions, statistical analysis of the surveys, and also with interpretation of the results.

My co-workers, Vickie Holton and Debbie Stout, were always helpful in covering for me when I needed a day or an afternoon off from work. They offered sympathy and understanding whenever I complained.

Special thanks goes to Lee VanHulle, Reading Specialist at Hortonville Elementary School, who assisted with wording and readability assessment of the survey.

Table of Contents

List of Tables

Chapter One

Introduction

According to the Surgeon General, 13% of children ages 6-11 years were overweight in 1999. This number has been increasing since the 1960s, when the prevalence of overweight increased from 4% to 11% for the years between 1960 and 1988-94. The 1999-2000 NHANES (National Health and Nutrition Examination Survey) survey indicated a prevalence of overweight of 15.3% among 6-11 year olds, indicating the prevalence of overweight is continuing to increase at an accelerated rate. Measurement and analysis of this problem has been the subject of significant research. This review of literature will highlight measurement of childhood overweight, particularly BMI-for-Age, and factors considered to be related to the problem, including physical activity levels, snacking habits, increases in soft drink consumption, increases in portion size and meals eaten away from home, and increases in sedentary activities such as television (TV) viewing and video game use.

Most research indicates a variety of environmental factors that tend to decrease physical activity and increase food intake as the cause of escalating rates of childhood overweight. Although genetic factors can play a role, genetic changes develop slowly over generations; environmental factors are considered the cause of the increases seen today.

Overweight in children and adolescents is a result of prolonged positive energy balance. That is, the calories children consume exceed the calories they expend. The exact reason for this imbalance among children is not clear (Odgen, Flegal, Carroll & Johnson, 2002).

Klesges, Shelton, and Klesges (1993) proposed that three factors make up the energy balance equation that determines children's body weight:

- Food intake, including sugar consumption, snacking habits, etc.
- Amount of physical activity
- Resting energy expenditure

Others have proposed additional factors, including genetic factors such as ethnicity, demographics such as family size and number of siblings, geographic location (area of the United States or rural versus urban), socioeconomic factors, educational levels of family, and even season of the year.

The purpose of this study was to determine which environmental factors might be associated with BMI among third and fourth graders. A survey was used to obtain information about food and activity habits and preferences from third and fourth grade students. Answers were then compared to BMI and/or BMI classification. Factors assessed included TV and computer availability in the bedroom, snack habits and preferences (student and parents), whether or not meals or snacks are consumed in front of the TV, beverage preferences and usual beverages, breakfast frequency and breakfast intake on the day of the survey, school lunch participation, type of milk used in the home, activity preferences for leisure time, opportunities for physical activity such as walking to school and whether or not a sidewalk is present at the home, and student perception of body size and physical activity level to compare to actual.

Chapter Two

Review of Literature

BMI-for-Age

Background. Previous growth charts developed by the National Center for Health Statistics in the 1970's only indicated height and weight percentile distributions of children of the same age. The revised 2000 growth charts published by the Center for Disease Control (CDC) include more comprehensive data and data more representative of the population, including data from several ethnic groups. Interestingly, however, data for body weight for NHANES III (National Health and Nutrition Examination Survey) subjects ages $\geq$ six years were excluded because these data were associated with an increasing trend in body weight that would have shifted the weight curves upward. The result would have been fewer children and adolescents identified as overweight or at risk for overweight. Thus, the reference population used to develop growth charts used today was not the United States population in the year 2000. Growth charts available today include BMI (body mass index) for age for boys and girls ages 2-20.

Definition. Body mass index (BMI) is a measure of weight in relation to height. BMI has been a well-established measure of overweight for adults and now is available for screening of children. It is calculated as follows:

Metric: BMI = weight (kg) / stature (cm) / stature (cm) x 10,000

or

English: BMI = weight (lb) / stature (in) / stature (in) x 703

If height and weight are known, BMI can be calculated easily using a pocket calculator, by looking up on a published table, or by using various on-line calculators, such as the

one available on the CDC website (http://www.cdc.gov/growthcharts). BMI can then be plotted on the BMI-for-Age charts for boys or girls ages 2-20. For example, the median weight of a 9-year-old boy is 63 pounds with a median height of 52.8 inches, resulting in a BMI of 15.9. The median weight of a 9-year-old girl is 63.9 lbs with a median height of 52.4 giving a BMI of 16.4. (Dietary Reference Intakes, 2002).

Classifications. Classifications for children ages 2-20 are as follows:

- BMI < 5th percentile = underweight
- BMI ≥5th through < 85th percentiles = normal weight
- BMI 85th to <95th percentile = at risk of overweight
- BMI ≥95th percentile = overweight

A BMI of the 95th percentile roughly corresponds to a BMI of 30 in young adults, which is defined as obese. A BMI in the 85th to 95th percentile corresponds to a BMI of 25 to 30 in young adults, which is defined as overweight. Thus, the children's BMI classifications do approximate those of adults. BMI percentile levels decrease until about four to six years of age, and then increase throughout the remainder of childhood, a phenomenon known as adiposity rebound. By age eight, most children are in the BMI percentile channel they will follow until the end of growth (CDC, 2003).

It is no longer recommended to label children as "obese", but rather "overweight" or "at risk of overweight", since "obese" is generally used to describe the amount of body fat, and BMI-for-Age does not detect the percentage of body fat.

Limitations and Validity. BMI-for-Age provides a practical and useful screening tool to identify need for further evaluation and assessment of childhood overweight because of its simplicity and low cost. Unfortunately, because of varying growth rates

and the wide range of heights and weights considered normal, BMI-for-Age charts may over-identify tall, apparently overweight children, while short, overweight children may not be detected. In addition, BMI-for-Age does not detect variations in body fat; for example, one child may have less fat and more lean and skeletal tissue than another child with the same BMI may. Daniels, Khoury, and Morrison (1997) also cautioned that BMI must be used with care in making race or gender comparisons of adiposity. However, Pietrobelli et al. (1998) found a strong association between BMI and fatness in children and adolescents aged 5-19 years, and Mei et al. (2002) recently confirmed the validity of the BMI-for-Age tables in predicting both overweight and underweight in children and adolescents.

Prevalence and Trends in Childhood Overweight

The incidence of childhood overweight is increasing, and the rate of increase is accelerating (Freedman, Srinivasan, Valdez, Williamson, & Berenson, 1997). According to the 1999-2000 data collection of the National Health and Nutrition Examination Survey (NHANES) as reported by Ogden, Flegal, Carroll, and Johnson (2002), the percentage of children ages 6 to 11 who are overweight as defined by being in $\geq 95^{th}$ percentile of BMI-for-Age has risen to 15.3%. They also reported that by comparison, NHANES I (1971-1974) data found only 4% of children ages 6-11 were overweight. If the “at risk of overweight” category of 85^{th} to 95^{th} percentile is included in this figure, the number increases to 30.3% of children studied, including 16% of males, and 14.5% of females. Percentages were higher still in a smaller study of 101 fourth- grade students in Texas, where 43% were overweight or at risk of overweight (Norris, McWhinney, & Grant, 2003).

Strauss and Pollack (2001) reported this increase as “dramatic” and “epidemic”. They found the sharpest increases among boys, African-Americans, Hispanics, and those living in southern states. Melnik, Jesaitis, Wales, and Bonam (1998) also noted regional differences. In New York City, they found a higher prevalence (19.7%) of overweight third graders compared to the national average of 13.7% (NHANES III). Weaker associations were found between socioeconomic status and weight and in educational level of the family reference person (Troiano & Flegal, 1998). Wolfe, Campbell, Frongillo, Haas, and Melnik (1994) found that children of lower socioeconomic status tended to be fatter.

The question arises when comparing increases in mean BMI if the results indicate a shift in the entire distribution of BMI, or just an increase in the upper portion of the distribution. Troiano and Flegal (1998) evaluated their data to answer this question and found little or no differences at the lower percentile distributions, but increasing differences at the higher percentile distributions. Thus, the heaviest appear to be getting heavier faster, a trend also noted in adults (Freedman, Khan, Serdula, Galuska, & Dietz, 2002).

Although data that is more current is not available for children, Mokdad et al. (2003) reported that the obesity (BMI >30) rate for adults climbed from 19.8% in 2000 to 20.9% in 2001. These increases were seen regardless of sex, age, ethnicity, or educational status. Unfortunately, it is likely that parallel increases will be observed in children as well.

Problems Associated with Overweight in Children

Coinciding with the increase in percentage of overweight children and adolescents is the increase in disease risk associated with higher adiposity levels. Diseases that were formerly thought of as adult diseases are becoming more common in children, particularly diabetes, hyperinsulinemia, dyslipidemias, hypertension, asthma, and sleep apnea.

Diabetes. One of the more catastrophic diseases from this list is diabetes. Pinhas-Hamiel et al. (1996) evaluated children diagnosed with diabetes in the Cincinnati area. They found steady increases in the presentation of new-onset diabetes from 1982 through 1994, with 33% of the new cases of diabetes among children 10-19 years old being Type 2 (or non-insulin dependent diabetes as it was described at the time of the study). The total number of cases of both insulin-dependent (Type 1) and non-insulin dependent diabetes also increased steadily during this period. Not surprisingly, most of the children studied were overweight. Only 8% of the children had a BMI in the normal range; the mean BMI was about 38 kg/m^2, well above the average BMI for the pediatric population as a whole of 27 kg/m^2.

Cardiovascular Risks. Cardiovascular risk factors are also increased in overweight children, including dyslipidemia, hyperinsulinemia, and hypertension. Freedman, Dietz, Srinivasan, and Berenson (1999) found substantial increases in the prevalence of the risk factors studied at BMI's above the 85^{th} percentile, with additional increases between the 95^{th} and 97^{th} percentiles. An overweight youth was 2.4 times more likely to have an elevated total cholesterol level, and 7.1 times more likely to have a high triglycerides level. Of all the overweight 5- to 10-year-olds studied, 61% had at least one

of the cardiovascular risk factors. They suggested that overweight in children should be considered as a screening tool, along with current screens for family history of high cholesterol or premature coronary heart disease. Since diagnostic criteria have recently been lowered, today's numbers may be even higher. For example, Freedman et al. (1999) used 200 mg/dL as the upper limit for normal total cholesterol, and the acceptable normal range for children today is <170 mg/dL (Smith & Steiner 2001). Although the impact on blood pressure caused by obesity is poorly documented, in children the long-term consequences can be even more severe because of the length of time youth will be exposed to the higher blood pressures. Paradis et al. (2003) found mean systolic blood pressures increased with increasing BMI categories in all age and gender groups (boys and girls ages 9, 13, and 16 years old).

Asthma. Asthma, a complex disorder that reduces airflow to the lungs, is a primary disease of early childhood, with 90% of cases diagnosed by the age of 6 years (Luder, 2002). Asthma has been increasingly associated with obesity in both children and adults, and the consistency of this relationship may suggest a causal relationship (Luder, 2002). In studying hospital discharges, Wang and Dietz (2002) found that two of the most frequent principal diagnoses when obesity was listed as a secondary diagnosis were asthma and diabetes. They found the rate of asthma increased as an obesity-related co-morbidity from 5.9% in 1979 to 1981 to 8.1% in 1997 to1999. Along with possible causes related to mechanical factors, immune modifications and genetic effects, environmental factors including diet and physical activity are currently being studied. Luder (2002) hypothesized that a diet high in fat and low in nutrients and antioxidants can lead to obesity and asthma.

Other Diseases. Other diseases related to childhood overweight include mental disorders, sleep apnea, and gallbladder disease. Hospital discharges for all of these have increased significantly during the past 20 years (Wang & Dietz 2002).

Quality of Life. Psychosocial consequences of childhood overweight can be social discrimination, negative self-image, parental neglect, and behavioral and learning problems (CDC, 2003). Schwimmer, Burwinkle, and Varni (2003) administered a quality of life survey to obese children, normal weight children, and children with cancer receiving chemotherapy ages 5 to 18 (N = 106). They found that obese children and adolescents reported significantly lower health-related quality of life, comparable to children with cancer undergoing chemotherapy.

Economic Costs. The cost of these health impairments associated with overweight children has been a strain on the nation's health care system (Wang & Dietz 2002). They reviewed hospital discharge information for children and adolescents aged 6-17 years from 1979 to 1999 and made some astounding discoveries. Hospital discharges for all obesity-associated diseases, using a 3-year pooled average, showed the prevalence of diabetes discharges increased from 1.43% to 2.36%, of obesity from 0.35% to 1.07%, sleep apnea from 0.15% to 0.59%, and gallbladder disease from 0.18% to 0.59% from 1979-1981 to 1997-1999. They also attempted to measure the cost in dollars. They found that, in adjusted 2001 constant dollars, annual hospital costs were about $35 million (0.43% of hospital costs) during 1979-1981, with an increase more than threefold to about $127 million (1.70% of hospital costs) during 1997-1999. If other costs in addition to hospital costs were considered, for example costs of physician visits and medications, this economic burden would be higher still. If adult obesity health care costs were

included, the numbers would increase exponentially. Since overweight children frequently grow up to be overweight adults, and since overweight parents frequently produce children at risk of overweight (Conci, Bope, MaWhinney, Czajka-Narins, & Alford, 1999), health care costs can continue to spiral upward. Clearly, this rising health and economic epidemic of childhood overweight needs prompt and aggressive interventions.

Nutritional Factors affecting Childhood Overweight

Children's Food Preferences. Children's food preferences for fatty foods and sweets may play a role in childhood overweight. Food preferences appear to be established by the ages of 2 or 3 years of age, and change little over the next 5 years (Skinner, Carruth, Bounds, & Ziegler, 2002). Skinner et al. (2002) evaluated the food preferences of 70 child and mother pairs over a 5-year period and found the most frequently liked foods were carbonated soda, sweets like cookies and donuts, snack foods like popcorn, crackers and potato chips, and popular fast foods like French fries and pizza. Apples were the only fruit/vegetable in the top list of liked foods, and were liked by 68 of 70 children surveyed. Vegetables were liked by less than half of the children. This low preference for vegetables may be related to maternal food preferences and availability in the home, but other factors, still unknown, may be present as well. Similar food preferences were found in a group of French children ages 9-11. Their top 10 favorite foods were fried potatoes, pasta, ice cream, orange juice, nut spread, chicken, chocolate, croissants, pizza, and cake (Bellisle and Rolland-Cachera, 2000).

Sugar and Carbonated Beverage Consumption. Increasing consumption of added sugars, particularly carbonated beverages, has been linked to the increase in childhood

overweight. Harnack, Stang and Story (1999) found that about one-third of school age (6 to 12 years old) children consume up to 9 ounces of carbonated beverages daily, another one-third consume over 9 ounces per day, and the remaining one-third were nonconsumers of carbonated beverages. French, Lin and Guthrie (2003) reported that the prevalence of soft drink consumption increased 48% between 1977-1978 to 1994-1995, with the mean intake increasing from 5 fluid ounces to 12 fluid ounces. Harnack, Stang and Story (1999) found that most (89%) of these beverages were the regular, sweetened type rather than the diet type. French, Lin and Guthrie (2003) reported an even lower percentage, finding that approximately 4% of carbonated beverages consumed by children ages 6 to 17 were of the diet or unsweetened type. It is clear that most children are consuming regular, sugar-sweetened carbonated beverages.

For all ages, higher intakes of carbonated beverages resulted in higher mean energy intakes, lower protein intakes, and lower intakes of nutrients. Guthrie and Morton (2000) found that the total intake of added sugars to be about 18.9% of total energy for 6-11 year olds, greater than the recommended 6-10%. They found a mean intake of 90.7-gram equivalents (the amount of added sweeteners comparable to the carbohydrate content of 1 gram of sucrose), or 18.9% of total energy intake, or about 363 additional calories from sweeteners daily. They found that children ages 6-11 get the highest percentage of added sugars from regular soft drinks (21.9%), followed by other sweets, such as candy, syrups, gelatin desserts (20.8%), then sweetened grains, such as cookies and cakes (13.8%), and fruitades or drinks (13.4%). Taken together, these four categories make up about 70% of added sugars. Surprisingly, sweetened breakfast cereals provided only 7.9% of added sugars. The contribution of added sugar from carbonated beverages

climbed throughout childhood, and peaked at ages 18-34 for both men and women, after which it began to decline.

Ludwig, Peterson, and Gortmaker (2001) found that as consumption of sugar-sweetened drinks increased, BMI-for-Age also increased, allowing them to predict a rise or fall in BMI over two years by measuring change in consumption of sugar-sweetened drinks. They suggested that consumption of sugar-sweetened drinks promotes overweight more than other categories of food because compensation at subsequent meals after drinking liquids is less complete than after consuming an equivalent amount of solid food.

Unfortunately, children's top food preferences are for carbonated sodas, breads, desserts, and snack foods (Skinner, Carruth, Bounds, & Ziegler, 2002). They found that carbonated soda was the most frequently liked food; with 100% indicating they liked it. These findings are supported by Pollack (1999) who reported that candy, gum, soft drinks, and ice cream were the top four products purchased by kids with their own money.

Breakfast Habits. Breakfast has been defined simply as the first meal of the day (Nicklas, O'Neil, & Berenson 1998) or as any food or beverage consumed between the hours of 5:00 a.m. and 10:00 a.m. (Siega-Riz, Popkin, & Carson, 1998). Popular culture expounds the value of eating breakfast. "Breakfast is the most important meal of the day" is often heard, and even television commercials for certain breakfast cereals advise that weight loss will result from eating that brand. The role of breakfast in improved learning has been established (Murphy et al. 1998). However, little is known about the role of breakfast and overweight, especially in children.

Research conducted in Spain, Korea and the Czech Republic found varying results. In Spain, Rocandio and Arroyo (2000) found no significant relationship between the caloric percentage of breakfast and BMI in a small group of children (*n*=32). In France, Bellisle, Rolland-Cachera, Deheeger, and Guilloud-Bataille (1988) found no significant difference in total energy intake, but that overweight children ate less breakfast and more at dinner than their leaner peers did. In a more recent study, Kovariva, Vignerova, and Osancova (2002) found that about 63% of Czech children ages 7-11 ate breakfast, and of those with higher body weight, fewer (54.1%) ate breakfast. Ortega et al. (1998) also found that the energy supplied by breakfast was significantly lower in overweight schoolchildren. Wolfe et al. (1994) found that children who skipped breakfast tended to be fatter than those who ate breakfast, except in single-parent homes. Bellisle and Rolland-Cachera (2000) found that 97% of French children ages 9-11 eat breakfast, with the most common foods consumed being chocolate milk, fruit juice, bread and butter with jam, honey or nut spread, and/or breakfast cereals. They also noted an increasing trend toward a more complete breakfast; that is, one containing a fruit, a cereal product and a dairy product. Interestingly, the television was on during breakfast for 25% of the children.

Siega-Riz, Popkin, and Carson (1998) found that breakfast consumption declined by 9% between the years 1965 and 1991 among 8- to 10-year old children. Nicklas et al. (1998) reported that between 1973 and 1988, 17% of 10-year-old children skipped breakfast, a number that decreased to 13% in 1987-88, after the introduction of the School Breakfast program in 1981. This study will evaluate the frequency of breakfast

eaten, and also obtain data about what was eaten for breakfast on the day of the survey (to facilitate recall).

Recently, energy intake from particular breakfast foods may be increasing. Smiciklas-Wright, Mitchell, Mickle, Goldman, and Cook (2003) found significant increases in the amounts of cereals (toasted oat rings and raisin bran) consumed per eating occasion (about 1/6 cup more for toasted oat rings, about 1/12 cup more for raisin bran) among 6-11 year olds.

Pereira et al. (2003) found that eating breakfast had beneficial effects on appetite, insulin resistance, and energy metabolism in adults, regardless of the foods eaten. Most regular breakfast eaters were 37 to 55% less likely to become obese or develop insulin resistance than irregular breakfast eaters. Whether these results would be true in children needs to be established.

Meals Eaten Away from Home. Americans spent 47.5% of their total food expenditure on meals away from home in 1999, an increase of 24.8% since 1990 (Clauson, 2000). Many of these meals eaten away from home provide larger portions with corresponding larger amounts of fat and calories than recommended. Zoumas-Morse, Rock, Sobo, and Neuhouser (2001) reported that although restaurant meals accounted for only 6% of all reported eating, the energy content of restaurant meals was 55% higher than the average energy intake of home-based eating occasions. A home-based meal contained an average energy amount of 424 $\pm$ 344 kcals, while a restaurant meal contained 767 $\pm$ 443 kcals. and about 36% of calories from fat. They summarized that children and adolescents consumed significantly more energy from fat and saturated fat when eating at a restaurant than at any other location. Taveras et al. (2003) supported

these results, reporting that the proportion of children eating >3 servings per week of fried food away from home (fast food) more than doubled over a three year period to 9.5% from 1996 to 1999, and that increasing fast food consumption was associated with increasing BMI in children ages 9 to 14. Wolfe et al. (1994) found that children who ate school lunch tended to be somewhat (but not significantly) more likely to be overweight.

Fat and Energy Intake. The role of fat and energy intake in childhood overweight remains uncertain. According to the 2002 Dietary Reference Intakes of the National Academy of Sciences Food and Nutrition Board, estimated energy needs of a 9-year-old boy range from a minimum of 1505 calories for a sedentary activity level to a maximum of 2359 calories for a very high level of activity. Cullen, Lara, and deMoor (2002) found in a study of fourth to sixth grade children, an average energy intake of 1568 $\pm$ 541 calories per day, with a mean % from fat of 36%, higher than the recommended 30%. They also found that the children practiced few low-fat behaviors, like using low fat items such as skim milk, and removing skin from chicken. Nicklas (1995) also found that 75% of 10-year old-children consumed more total fat, saturated fat, and cholesterol than the recommended amounts. However, Gortmaker, Dietz, and Cheung (1990) reported NHANES data indicating no statistically significant change in energy intake, and even a slight decrease in daily energy intake during the periods 1971-1973 to 1976-1980 (about 200 calories per day at the 90^{th} percentile), while at the same time the rate of obesity was increasing. They hypothesized that it is possible for the prevalence of obesity to increase even without increased energy intake, because of possible declines in lean body mass. However, other environmental forces that can cause energy imbalance may also be present because energy intake in excess of expenditure is still a requirement for weight

gain. More research needs to be done to establish the role of dietary fat and energy intake in childhood overweight.

Portion Size. Portion sizes have been increasing since the 1970s, and most marketplace portions are larger today than USDA standard servings (Young & Nestle, 2003). Many restaurants are offering "Supersize" or "Big Gulp" sizes. In fact, Young and Nestle found that most food products studied increased the portion size at least by a factor of two or more. For example, a Coca-Cola™ bottle when introduced in 1916 was 6.5 ounces; today's popular bottle is 20 ounces. A Hershey™ bar when introduced in 1908 was 0.6 ounce; today the smallest is 1.6 ounce, with still larger sizes of 2.6, 4, 7, and 8 ounces available. A chocolate chip cookie today may weigh 4 ounces, about eight times the "standard serving" of 0.5 ounce.

Several studies have investigated whether these larger portion sizes cause increased consumption. It appears that most people, except for very young children, will eat more when offered more. Rolls, Engell, and Birch (2000) found that 5 year olds ate larger amounts when presented with larger portions, regardless of their sex, liking for the food, or height and weight. Similarly, Rolls, Morris, and Roe (2002) found that adults consumed 30% more when offered the largest portion of macaroni and cheese compared to the smallest portion offered. Neither the serving method of the food nor the participants' sex, body mass index, or scores for dietary restraint influenced these results.

Television Viewing and Childhood Overweight

Decreased Physical Activity. The National Academy of Sciences Food and nutrition Board (2002) recommends one hour of moderately intense physical activity daily for both adults and children. Television (TV) viewing can reduce the time available

for this amount of physical activity. TV viewing among children is thought to impact weight in several ways, but the most significant association is from decreased physical activity while viewing.

Harrell, Gansky, Bradley, and McMurray (1997) found that TV viewing was one of the top three activities reported in a study of children's most common activities. They found that sedentary activities tended to be the most common, with 76% of the girls reporting a sedentary activity as one of their top three common activities (the top three, in descending order, were homework, bicycling, and watching television). Fewer boys, 62%, reported a sedentary activity as one of their top three common activities. The top three common activities for boys were, in descending order: video games, bicycling, and watching television. In this study, playing video games and watching television were considered sedentary activities, and bicycle riding was considered medium in intensity. The finding that girls tend to be less active than boys is supported by their previous research as well.

Video games are also a popular activity for children, but the energy expenditure associated with them is not significantly higher than TV viewing. In fact, Ridley and Olds (2001) found that the most popular video games were the ones with the lowest energy costs, usually the ones involving only rapid hand movements, and that the majority of children do not significantly increase their energy expenditure by playing video games. Both TV viewing and video game playing are sedentary activities, and may result in the displacement of more physically active pursuits.

TV viewing also results in spending time near or even below resting metabolic rate. Klesges, Shelton, and Klesges (1993) studied the effect of TV viewing on resting

metabolic rate, and found a “fairly profound” lowering of metabolic rate in a small sample of 15 obese girls and 16 normal weight girls ages 8-12 as they watched TV.

Nutritional Influences. TV viewing may impact weight in ways other than decreased physical activity and decreased metabolic rate. Other possible mechanisms are the influence of TV food commercials, possible increased snacking while viewing, and the influence of foods or food attitudes discussed or displayed during programs (Gortmaker, Dietz, & Cheung, 1990). For example, Byrd-Bredbenner, Grasso, and Finckenor (2001) studied the NRI (nutrition-related information) in prime time television programs. In an analysis of programs viewed by 2-11 year olds during prime time (8:00 to 11:00 pm Monday through Saturday and 7:00 to 11:00 pm on Sunday), they found that the average viewer saw about 17 scenes containing nutrition-related information. About 40% of these were judged to have some negative content, including one example that portrayed binge eating as fun and humorous. They also found that slim or average weight actors were shown eating low nutrient density foods, including fats, sweets or alcohol, about half the time. This may send a message that it is possible to eat a high fat, high sugar or high calorie diet and remain slim and healthy, a dissonant message that may influence children.

Difficulties in Measurement. Although TV viewing is often considered as a risk factor for overweight, its impact is difficult to measure. Cause and effect may be reversed. It could be possible that overweight results in increased TV viewing and is not the consequence of TV viewing (Robinson, 1998). Some researchers have demonstrated a significant association between adiposity and TV viewing, while others have found no relationship. In most cases, the associations have been small. Further complicating the

question is the difficulty in accurately measuring TV viewing and physical activity. Other confounding factors involve activities conducted while viewing, such as fidgeting or moving around, versus sitting still or moving very little (Harrell et al. 1997).

Relationship to BMI. Saelens et al. (2002) found that TV viewing hours were significantly related to children's BMI in children ages 6-12. However, other researchers have found contradictory results in 3-4 year old children (DuRant, Baranowski, Johnson, & Thompson, 1994) and in sixth and seventh grade girls (Robinson, Hammer, et al.1993). DuRant et al. found that although the 3-4 year olds who watched more television were less physically active, there was no evidence of increased adiposity. This study was unique because it did not rely on self-report, but rather on direct observation of the children's activities. The short attention span of this age group to TV viewing may also have been a factor, since the longest median bout of TV viewing was only 15 minutes. Robinson, Hammer, et al. (1993) also found no significant association among BMI, triceps skin fold thickness, level of physical activity or change in any of these over time.

Conversely, Gortmaker (1990) concluded that the prevalence of obesity increased 2% (from 15% to 17%) for each additional hour of TV watched among adolescents in their study. They reported Nielsen data indicated TV viewing time by adolescents increased from 18 hours per week in 1968 to 25 hours per week in 1983, and may now be approaching 40 hours per week, not including the use of videos or computer or video games. They concluded that inactivity (likely influenced by TV viewing) is the most important determinant of obesity, since obesity increased while NHANES I and NHANES II data indicate that energy intake actually decreased slightly during the same period.

Saelens et al. (2002) found correlates affecting the total amount of TV time to be:

- Number of meals with the TV on
- Number of TVs in the home
- Whether or not a TV was in the child's bedroom
- Whether or not a VCR was in the home

The most significant correlate with total TV watching was the number of meals eaten while watching TV. Children with TVs in their rooms watched more TV than children without a bedroom TV, a finding also supported by Dennison, Erb, and Jenkins (2002).

There was no significant difference by season in TV viewing, however increases in BMI have been noted in the fall and winter, possibly because of increased food intake, especially "heartier" high-fat choices, while at the same time physical activity may be decreased due to the cold weather (Gortmaker, 1990).

Anderson, Crespo, Bartlett, Cheskin, and Pratt (1998) measured TV watching in categories of $\leq$ 1 hour per day, 2-3 hours per day, or $\geq$ 4 hours per day. They found that boys and girls who watched 4 or more hours of TV per day had the highest BMI's, while children who watched less than 1 hour of TV per day had the lowest BMI's. They also found that 32% of 8-10 year old boys watched 2-3 hours of TV per day, while 34% of 8-10 year old girls watched 2-3 hours per day. At the same time, they found the lowest physical activity levels among girls, with 23% of 8-10 year olds reporting two or fewer bouts of vigorous physical activity per week.

Even though the role of TV viewing in the development of childhood overweight remains uncertain, several studies have indicated that interventions to reduce TV viewing

time can reduce BMI. Robinson (1999) used an intervention to reduce TV viewing, videotape, and video game use in 198 students in third and fourth grade. The intervention, designed to decrease media use without targeting any specific behaviors as replacements, was successful in reducing TV viewing from about 15 hours per week to about nine hours in the intervention group, and also decreased meals eaten in front of the TV. Statistically significant relative decreases in BMI, and measures of fatness, such as triceps skin fold thickness, waist circumference, and waist-to-hip ratios were noted in the intervention groups. Similarly, Faith et al. (2001) used a stationary cycle as a contingency for TV viewing in ten obese children ages 8 to 12 who watched at least two hours of TV per day per self-report. Results indicated that TV viewing and total body fat were both significantly reduced in the treatment group.

Chapter Three

Methodology

Description of Methodology

A survey to assess eating habits and food preferences, as well as activity habits and preferences, of third and fourth graders was developed in cooperation with thesis committee members and statistical consultant, Christine Ness. The survey was designed to be administered directly to students in the classroom. This was a joint project with the physical education instructor at Hortonville Elementary School, and included all third and fourth grade students. The study was approved by the Institutional Review Board at UW-Stout for the survey, and UW-LaCrosse for the physical education part of the study. Consenting students would answer the survey questions, and participate in the physical education project, which would be to wear pedometers for three days to assess activity levels. Students were weighed and measured and BMI was calculated. BMI was compared to eating habits and food preferences, and to step count data collected from the pedometers.

Pilot Test

After obtaining permission from the teacher and principal, a pilot test of the survey was conducted on Friday, February 21, 2003 at St. Peter's Lutheran School in Reedsburg, Wisconsin in a class of 17 third graders. The teacher noted that the reading ability of the students was comparable to that of public school students. On the day of the pilot test, 14 of the 17 students were present.

The teacher had sent home a note to the parents explaining the pilot test and offering an opportunity for any family/child to decline participation. No one declined to

have his or her child participate. Students were asked again before the surveys were distributed if there was anyone who preferred not to participate. All students agreed to take the survey.

The researcher arrived about 8:00 a.m. at the start of the school day. After the lunch and milk break counts were taken, the survey was introduced by reading the prepared introduction, along with a description of the purpose of the pilot test, a process which took about 3-4 minutes. Students were reminded that their names should not be written on the surveys. The teacher remained at her desk in the back of the classroom.

After distribution of the surveys, the questions were read to the students one at a time. The researcher waited until it appeared all students had stopped writing before reading the next question. Students were advised to raise their hand if they had a question at any time. Administration of the entire survey took about ten minutes. One student asked, "How do you spell "Reese's Puffs™?" The second question was about the types of milk in the refrigerator; the student was unsure whether to mark two kinds. The last question about self-perception of body size caused several of the students to giggle. The final question was whether or not to write the name on the survey. After the survey, students were asked if they felt the survey was easy or difficult to answer. Twelve of the fourteen students felt it was easy.

Results. Approximately 15 minutes was required to introduce, distribute, and conduct the survey. The researcher needed to clarify two of the questions. Most of the students felt the survey questions were easy to answer. A review of the completed surveys indicated most of the questions were answered appropriately, including the open-ended questions. Only minor changes were made in the survey because of this pilot test.

For the actual survey, two researchers were available, one to read the questions, and one to circulate the room, answering questions and monitoring student's answers. After the survey, a note of thanks was sent to the teacher and apples were provided for the students.

Research Design

The survey consisted of 19 simple questions that third and fourth graders could easily answer. See appendix H for the survey instrument. The questions were read aloud to the students to remove any barriers related to reading ability. The Flesh-Kincaid Grade Level for readability was 3.2 (Microsoft Word 2000). The reading specialist at Hortonville Elementary School also provided suggestions to improve readability and comprehension.

Subjects

Subjects were all third and fourth grade students at Hortonville Elementary School in Hortonville, Wisconsin. This age group was selected for their expected ability to read and answer questions correctly. Other factors considered were that most had passed the adiposity rebound phase, but were not likely to have entered puberty yet. Eight classes, including four third-grade and four fourth-grade classes, were surveyed. The subjects ranged in age from 8 to 11 years old; five were 8-years old, 49 were 9-years old, 48 were 10-years old, and one was 11-years old. See Table 1 for gender and grade distribution of subjects.

Table 1

Number and Distribution of Subjects (N = 103)

Gender	3rd Grade	4th Grade	Total
Boys	24	28	52
Girls	25	26	51
Total	49	54	103

Hortonville is 10 miles west of Appleton, Wisconsin. The median income is $50,391, higher than the state median income of $43,791. The Hortonville school district is an independent local school district with 2,764 students. The district has achieved an Education Index™ ranking in the 58th percentile, and a national ranking in the 47th percentile, indicating Hortonville schools are comparable to schools in other areas. About three-fourths (76.7%) of families live in single, detached housing. Hortonville ranks in the 10th percentile for crime statistics, making it a very safe area for children to live and play (eNeighborhoods, Inc., 2003).

Procedures

On Monday, March 10, 2003, the Hortonville School Board approved the project, which included the survey as well as the research to be conducted by the physical education instructor. On Monday, May 5, approximately 188 informed consent letters were sent home with all third and fourth graders at Hortonville Elementary School. For students who were absent that day, the letter was sent home on the next day of attendance. Parents were asked to return the signed letters by Friday, May 9, but responses were accepted until Wednesday, May 14. By this date, 105 signed consent

forms were received, a return rate of 56%. Response rates were slightly greater for fourth graders (59%), compared to third graders (53%).

The health room aide at Hortonville Elementary School measured the height and weight of each subject using a Health o Meter Scale (Health o Meter, Inc., Bridgeview, Illinois) using the protocol recommended by the National Center for Chronic Disease Prevention and Health Promotion (http://www.cdc.gov/nccdphp/dnpa/bmi/meas-height.htm; http://www.cdc.gov/nccdphp/dnpa/bmi/meas-weight.htm). The Physical Education instructor calibrated the scale prior to data collection. Students wore their school clothes but removed their shoes. The health room aide measured height in inches to the nearest quarter-inch, and weight in pounds to the nearest quarter-pound.

Body mass index (BMI) was calculated using a Microsoft Excel Spreadsheet (Microsoft Windows XP Home Edition).

(Body Mass Index = Weight/Height/Height * 703)

Each student's BMI was plotted on the CDC's BMI-For-Age percentile gender-specific growth chart and was classified as overweight ($\geq$ 95th percentile), at-risk ($\geq$85th to <95th percentile), normal ($\geq$5th to <85th percentile), or underweight (<5th percentile). Table 2 indicates the BMI ranges used to determine the classifications.

Table 2

Values Used to Determine Body Mass Index (BMI) Classifications

	Girls		Boys	
Classification	Age 9	Age 10	Age 9	Age 10
Underweight	<13.7	<14	<14	<14.2
Normal	13.8-19.1	14<20	14-18.4	14.2-19.4
At-Risk	19.2-21.8	20-22.8	18.5-21	19.5-22.1
Overweight	≥21.9	≥22.9	>21	>22.1

Note. These values were estimated from the National Center for Health Statistic's body mass index-for-age growth charts for boys and girls aged 2-20 years (2000).

Note. Body Mass Index (BMI) = [wt (lb) / ht (in) / ht (in)] x 703

On Monday, May 12, an e-mail memo was sent to the eight classroom teachers, requesting permission to conduct the survey on Friday, May 16 during the first two hours of the day. All teachers responded affirmatively, and a schedule was prepared to visit the eight classes between 8:10 a.m. when school began, and 10:30 a.m. The teacher was asked to remain in the room, in case of emergency and to help maintain discipline, but was requested not to comment or assist the students in any way with the questions.

Prior to the survey, the name of each participating student was written onto his or her copy of the survey. This was done to make distribution more efficient, and to assure that each survey could be identified with a name. Names were needed on each survey to allow the completed surveys to be matched with height and weight data, which was collected separately. Confidentiality was protected by immediately placing all completed

surveys in a sealed envelope until time for data analysis. A word search activity sheet was provided to students not participating, to keep them occupied while the survey was being conducted.

On the day of the survey, the researchers introduced themselves, (Judy Martin, dietitian and researcher, and Cheryl Richardson, physical education instructor, researcher and assistant) the survey and activity sheets were distributed, and the questions were read, one at a time. Students were observed to be sure everyone had answered each question before proceeding to the next. After the last question, the surveys were gathered and placed in an envelope labeled with the teacher's name. Since one student was absent from school, and one was not available to take the survey, 103 completed surveys were collected. Small tokens of appreciation were distributed to all students in the classroom, including those not participating in the survey. Later, a note of thanks and a small plate of homemade cookies were sent to the classroom teachers.

The following questions arose during the survey:

- Does a long driveway count as a sidewalk? (Answer- yes)
- I live half the time with Mom and half with Dad. I have a computer in my room at one house, but not the other. How should I answer the question? (Answer- yes to computer in room)
- What difference does it make if I have a computer in my room or not? (Answer - please answer yes or no to computer in room)
- What if I ride my bike to school? (Answer- yes to walk to school).
- What if we have more than one kind of milk in refrigerator (Answer – list all)

- What if we don't know what our parent's favorite snack is? (Answer – write "don't know")
- What if our favorite activity if we have a free hour is not listed here? (Answer –write it in the blank line)

The surveys were delivered to research and Statistical Consultant, Christine Ness, on June 12, 2003 for analysis.

Data Analysis

Data analysis was done using SPSS, Version 11.0, Chicago, Illinois. Data analysis included descriptive statistics for all variables. Cross-tabulations were used to evaluate type of milk used in the home, frequency of school lunch, and relationship between parent and student snack choices. Chi Square was used to evaluate preferences for leisure activities. Independent groups t-tests were used to compare means of BMI for boys and girls in both grades, and to compare mean BMI to breakfast intakes by food category on the day of the survey, opportunities for physical activity (sidewalk available and walk or bike to school), TV/computer availability in bedroom, and sweetened soft drink use. An analysis of variance (univariate) was used to compare BMI to breakfast frequency, usual and preferred beverages, and frequency of meals/snacks in front of the TV.

Limitations

Several strengths and limitations of this study must be noted. As expected, obtaining data directly from students using simple questions provided complete and accurate responses. The open-ended questions yielded meaningful and individualized information. Survey administration was quick and efficient, with a 100% return of completed surveys.

Several weaknesses were noted in the survey instrument. A small number of students were confused or upset by the questions; for example, one child started to cry because he was unable to recall what he had for breakfast. Some of the students may have misunderstood the questions. Some students also may have answered with what they perceived to be an appropriate answer, rather than an accurate response. A few students had difficulty writing answers to the open-ended questions. One answer to an open-ended question was indecipherable. Some of the questions could have been re-worded to be more specific, particularly the question about the preferred activity for a free hour. Students should have been advised to answer only one favorite snack or drink to make data analysis more straightforward.

The results of this study may not be generalizable because of the lack of ethnic diversity of the students; most were White. The students came from a higher socioeconomic background than the overall population, further limiting generalizability of the results. Another possible limiting factor was the response rate of slightly greater than half of the students (56%), because the reasons for not participating are unknown. Students or families may have simply failed to return their consent forms, or may have chosen not to participate for a specific reason, such as fear of embarrassment.

Chapter Four

Results and Discussion

Introduction

The purpose of this study was to obtain information about food and activity habits and preferences directly from third and fourth grade students and compare to BMI. Factors assessed included TV and computer availability in the bedroom, snack habits and preferences (student and parents), beverage preferences, breakfast habits, school lunch participation, type of milk used in the home, activity preferences, opportunities for physical activity such as walking to school, and student perception of body size and physical activity level to compare to actual. Completed surveys were received from 103 students including 52 boys and 51 girls. Most students were able to provide complete and legible answers to the questions.

Body Mass Index (BMI)

Ranges. Body mass index (BMI) ranged from a minimum of 12.87 to a maximum of 31.53, with a mean of 19.09. Weights ranged from 40 pounds to 143 pounds with a mean of 81.55 pounds. Heights ranged from 46.75 inches to 65.5 inches, with a mean of 54.23 inches. The mean age was 9.44 years; the median age was 9 years. The mean BMI for fourth graders (19.90) was higher than that for third graders (18.20), as expected. An independent groups t-test using gender as the independent variable found no significant difference between mean BMI of boys and girls in both grades. Table 3 shows BMI ranges by grade and gender.

Table 3

BMI Ranges by Grade and Gender (N = 103)

Group	Minimum	Maximum	Mean BMI +/- *SD*	Median
3rd Grade				
Girls (*n* = 25)	13.89	27.43	18.32 +/- 3.18	17.40
Boys (*n* = 24)	12.87	27.80	18.07 +/- 3.35	17.80
4th Grade				
Girls (*n* = 26)	15.11	31.53	19.76 +/- 3.98	18.95
Boys (*n* = 28)	14.82	30.17	20.02 +/- 4.06	18.49
All Students	12.87	31.53	19.09 +/- 3.73	18.05

Note. Body Mass Index (BMI) = [wt (lb) / ht (in) / ht (in)] x 703

Third and fourth graders vary significantly in height, weight, and body mass index, but no significant difference was found in mean BMI of boys compared to girls in either third or fourth grade.

Body Mass Index- for-Age Classifications. Body mass index classifications were estimated from the CDC growth charts (see Methodology section for values used). The 8-year-olds and 11-year-old were included, although those values are not displayed in Table 2. Sixteen (15.5%) of the students were classified as overweight, a number similar to results reported by Freedman, et al. (1997). If the “at-risk” and “overweight” categories are combined, 36.9% are overweight or at risk of becoming overweight. Numbers of “at risk” and “overweight” students are similarly distributed for boys and

girls, and third and fourth graders. See Table 4 for distribution of BMI-for-Age classifications by grade and gender.

Table 4

Body Mass Index (BMI) -for-Age Classifications by Grade and Gender (N = 103)

	Underweight		Normal		At Risk		Overweight	
Group	*n*	%	*n*	%	*n*	%	*n*	%
3rd Grade								
Girls (*n* = 25)			17	68.0	5	20.0	3	12.0
Boys (*n* = 24)	2	8.3	13	54.2	6	25.0	3	12.5
4th Grade								
Girls (*n* = 26)			17	65.4	5	19.2	4	15.4
Boys (*n* = 28)			16	57.1	6	21.4	6	21.4
Total (*n* = 103)	2	1.9	63	61.2	22	21.4	16	15.5

Note. Body Mass Index (BMI) = [wt (lb) / ht (in) / ht (in)] x 703

The two underweight students in third grade may be considered outliers. They were twins, born pre-term, who are still experiencing physical challenges that may affect growth. The normal, at risk, and overweight categories closely parallel results reported by Odgen, et al., (2002).

Student Assessment of Body Size Compared to Mean BMI. Students were asked if they considered themselves too thin, just right, too heavy, or if they did not know. These categories were then compared to mean BMI for each group. Sixty (58.3%) of the students were able to correctly classify themselves. Table 5 shows that mean BMI

increases for each increasing weight group, but the range overlaps, indicating that nearly half of the students did not estimate their body size correctly.

Table 5

Student Assessment of Body Size Compared to Mean BMI (N = 103)

Student Assessment	*n*	%	Mean BMI +/- *SD*	Range
Too Thin	6	5.8	15.82 +/- 1.05	13.89 - 17.03
Just Right	67	65.0	18.43 +/- 2.92	13.78 - 30.17
Too Heavy	14	13.6	23.60 +/- 4.18	16.43 - 31.53
Don't Know	16	15.5	19.11 +/- 4.04	12.87 - 27.52

Note. Body Mass Index (BMI) = [wt (lb) / ht (in) / ht (in)] x 703

A cross-tabulation comparing body mass index-for-age classification with perceived body size indicated 47 of the 63 (74.6%) normal BMI-for-age students correctly classified themselves. Of the two underweight students, one classified himself as normal and one said, “don’t know”. Of the 22 at-risk students, 14 (63.6%) felt they were just the right size, four (18.2%) felt they were too heavy and four (18.2%) did not know. Of the 16 overweight students, five (31.3%) thought they were just right, eight (50%) thought they were too heavy, and three (18.8%) did not know.

Students were then separated by gender to see if boys or girls were more accurate in their self-assessment of body size. A cross-tabulation using boys showed that of the 12 at-risk boys, seven (58.3%) thought they were just the right size, two (16.7%) thought they were too heavy and three (25%) did not know. Of the overweight boys, three (33.3%) thought they were just right, four (44.4%) correctly identified themselves as too heavy, and two (22.2%) did not know.

A cross-tabulation using girls showed that of the ten at-risk girls, seven (70%) thought they were just the right size, two (20%) thought they were too heavy, and one (10%) did not know. Of the seven overweight girls, two (28.6%) thought they were just the right size, four (57.1%) correctly identified themselves as too heavy, and one (14.3%) did not know. Table 6 shows the distribution of body mass index classification compared to student assessment for boys and girls.

Table 6

Comparison of Student Assessment of Body Size to BMI Classification by Gender (N = 103)

	Body Mass Index (BMI)-for-Age Classification											
	Normal				At Risk				Overweight			
Student	Boys		Girls		Boys		Girls		Boys		Girls	
Assessment	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
Too Thin	4	13.8	2	5.9								
Just Right	20	69.0	27	79.4	7	58.3	7	70.0	3	33.3	2	28.6
Too Heavy			2	5.9	2	16.7	2	20.0	4	44.4	4	57.1
Don't Know	5	17.2	3	8.8	3	25.0	1	10.0	2	22.2	1	14.3
Total	29	100	34	100	12	100	10	100	9	100	7	100

Note. Body Mass Index (BMI) = [wt (lb) / ht (in) / ht (in)] x 703

These results indicate that boys and girls have similar accuracy in their self-assessment of body size. More than half of the "at risk" students, both boys and girls, incorrectly classified themselves as "just right". These results are important because students who correctly self assess their body size may be more receptive to interventions to maintain an appropriate weight.

Nutritional Factors

Breakfast. Students were asked how often they ate breakfast, and then answered a follow-up question asking what they had for breakfast that morning before coming to school. For the question, "How often do you eat breakfast before coming to school?" more than half of the students, 61.2% (n = 63), reported that they always ate breakfast. Forty (38.8%) indicated that they sometimes or never ate breakfast. An analysis of variance (univariate) using BMI as the dependent variable and frequency of breakfast intake as the independent variable showed no significant associations. The mean BMI of students indicating they "always" ate breakfast was 18.80, those who answered "sometimes" was 19.32, and those who answered "never" was 20.42. This may be because more of the fourth graders, who were taller and heavier with a greater BMI, were less likely to eat breakfast. Usual breakfast habits of boys and girls were similar. See Table 7.

Table 7

Usual Breakfast Frequency by Grade Level and Gender (N = 103)

	Third Grade (*n* = 49)				Fourth Grade (*n* = 54)					
	Boys (*n* = 24)		Girls (*n* =25)		Boys (*n* = 28)		Girls (*n* = 26)		Combined	
Frequency	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
Always	17	70.8	18	72.0	14	50.0	14	53.8	63	61.2
Sometimes	7	29.2	5	20.0	10	35.7	10	38.5	32	31.1
Never			2	8.0	4	14.3	2	7.7	8	7.8
Total	24	100	25	100	28	100	26	100	103	100

On the day of the survey, students were asked what they had for breakfast before coming to school. Answers were categorized as follows:

- Nothing, water, or a vitamin only
- Cereal (either hot or cold) - milk was assumed to be added if not mentioned separately
- Other grains, including bagels, waffles, muffins
- Fruit or juice
- Milk or yogurt
- Protein sources, including meat, cheese, egg, or peanut butter

An independent groups *t*-test using BMI as the dependent variable and eating something (any of the five categories except nothing) for breakfast as the independent variable indicated no significant differences in BMI. The “nothing for breakfast” group had a slightly higher mean BMI of 19.63, compared to the “something for breakfast” group, which had a mean BMI of 18.98. This result was likely because fewer fourth graders ate breakfast, and the fourth graders had a higher BMI, as expected. See Table 8 for details of food items eaten for breakfast.

Table 8

Number of Students Consuming Each Breakfast Item on the Day of the Survey (N = 101)

Group	Nothing	Cereal	Other Grain	Fruit/Juice	Milk/Yogurt	Protein Item
3rd Grade						
Girls	7	12	9	9	15	0
Boys	3	9	9	4	13	2
Combined	10	21	18	13	28	2
4th Grade						
Girls	9	14	6	7	15	1
Boys	13	12	6	1	15	2
Combined	22	26	12	8	30	3
Total Number	32	47	30	21	58	5
Percentage	31.7%	46.5%	29.7%	20.8%	57.4%	5.0%

Note. Percentages do not equal 100% because some students consumed multiple food groups

. Although no significant associations between breakfast habits and BMI were found, several important observations can be made. About one-third of students had no breakfast on the day of the survey, a number similar to the number who indicated they sometimes or never ate breakfast in another question. This number is higher than the 17% reported by Nicklas (1998). Cereal was the most frequent choice for breakfast. This may be an area where energy intakes are higher, because Smiciklas-Wright et al. (2003) found that cereal portions were increased per eating occasion among 6 to11-year-olds. Only about one-fifth of students had fruit or juice for breakfast. There was no difference in breakfast frequency between boys and girls in either grade. Fewer fourth graders ate breakfast than third graders. Perhaps this is the beginning of a trend towards skipping breakfast.

Types of Milk Used at Home. All students answered the question, "What type of milk do you have in the refrigerator at home?" with 42 reporting that they had multiple kinds. Thirteen students reported a combination of 2% milk and chocolate milk. The second most frequently occurring combination was 2% milk and skim milk, reported by six of the students. Only two students reported using exclusively whole milk. Four additional students had whole milk available in combination with other types. Thus, whole milk was available in the homes of only six students (5.8%). Since milk should play an important role in the diet of children, it could be hypothesized that using lower fat milk would provide fewer calories and thus help maintain a desirable weight. A cross-tabulation of type of milk used at home with BMI-for-Age classification showed that five of the students who had whole milk at home were in the "normal" weight category, and

the sixth one was in the “at risk” category. Table 9 shows the frequency of types of milk used.

Table 9

Types of Milk Used in Students' Homes (N = 103)

Type of Milk	Frequency	%
Fat Free Milk	42	40.8
1% Milk	18	17.5
2% Milk	44	42.7
Whole Milk	6	5.8
Chocolate Milk	26	25.2
Soy Milk	3	2.9
No Milk	1	1.0
Don't Know	17	16.5

Note. The total % exceeds 100 because some students in all categories except *no milk* and *don't know* reported more than one type of milk in the home.

Type of milk used in the home appears to have no relationship to BMI-for-Age among the third and fourth graders surveyed, and most of the students had reduced-fat milk in the home. Recommending changing to lower fat milk would likely not be a useful intervention to reduce the incidence of childhood overweight, especially since only about 58% of the students reported milk as their usual beverage.

Usual and Preferred Beverages. Students were asked, “What do you drink most often?” and, “What is your favorite thing to drink?” Answers were classified into the following groups: water, soda or other sweetened soft drink such as Kool-Aid™, milk or flavored milk, juice or a juice drink such as Sunny D™, or other.

An analysis of variance (univariate) was conducted using BMI as the dependent variable and usual beverages as the independent variables. Results showed no significant differences between groups. An independent groups *t*-test using BMI as the dependent variable and preferred beverage of soda or other sweetened soft drink as the independent variable found no significant relationship. Table 10 shows a comparison of students’ usual beverage to what they reported as their favorite beverage.

Table 10

Comparison of Students' Usual Beverage to Preferred Beverage

	Usual (*N* = 101)		Preferred (*N* = 102)	
Beverage	*n*	%	*n*	%
Water	57	56.4	14	13.7
Soda or Kool-Aid	13	12.9	39	38.2
Milk/Flavored Milk	58	57.4	26	25.5
Juice/Juice Drink	19	18.8	23	22.5
Total	*	*	102	100

Note. * Since some students gave multiple answers, the total exceeds the total *N* and the percentage does not equal 100.

These findings do not support the hypothesis that drinking soda or other sweetened beverages results in higher body weight. It is interesting to note that, although the most frequently consumed beverages were water and milk or flavored milk, 38.2% of the students said their favorite beverages were soda or other sweetened soft drinks, a finding also reported by Skinner et al. (2002).

School Lunch. Students were asked, “How often do you eat the school lunch?” A cross- tabulation was done comparing BMI classification to frequency of eating school lunch. Table 11 shows the frequency of eating school lunch for the different BMI classifications.

Table 11

Frequency of Eating School Lunch Per Body Mass Index (BMI) Classification (N = 103)

	Body Mass Index Classification								
Frequency of	Underweight		Normal		At Risk		Overweight		Total
School Lunch	*n*	%	*n*	%	*n*	%	*n*	%	*n*
Always			34	54.0	8	36.3	11	68.8	53
Sometimes	1	50.0	24	38.1	12	54.5	5	31.3	42
Never	1	50.0	5	7.9	2	9.1			8
Total	2	100	63	100	22	100	16	100	103

Note. Body Mass Index (BMI) = [wt (lb) / ht. (in) / ht (in)] x 703

From Table 11, it can be noted that 36.3% (8/22) of the “at risk” students and 68.8% (11/16) of the “overweight” students always ate the school lunch, compared to 54% (34/63) of the normal weight students. If the “at risk” and “overweight” groups were combined to make a larger sample, then 19 of 38 students (50%) always ate school lunch, a percentage similar to the normal weight students. No association between BMI classification and regular consumption of school lunch can be demonstrated because of the small numbers. These findings agree with Wolfe et al. (1994) who found a small, but not significant, increased prevalence of overweight in children eating school lunch. A chi-square was attempted, but results were unusable because of insufficient numbers. This is an area for further study.

Snacking Habits. Students were asked, “What is your favorite food to eat for a snack?” and “What do you think is your parents’ favorite food to eat for a snack?” Results were evaluated separately and then compared to see if there was a relationship between student and parent snacking habits. Snacks were divided into the following categories: candy, chips/crackers/pretzels/popcorn, fruit/vegetable including mainly apples/bananas/oranges, main dish including pizza/tacos/macaroni and cheese, protein-containing foods including meat/cheese/nuts/eggs, sweetened grains including cookies/granola bars/, toaster pastries such as Pop-Tarts™, milk/yogurt/ice cream, and “don’t know”.

The most frequently reported favorite snack with children was fruit or vegetable (*n* = 33), closely followed by salty snacks such as chips, crackers, pretzels, or popcorn. (*n* = 30). These same two categories were also the most popular with parents. The most popular snack with parents was chips (*n* = 17), followed by fruit/vegetable (*n*=14). An interesting finding was that 50% of students did not know what their parents' favorite snack would be. This finding for a preference for a fruit or vegetable as a snack conflicts with Skinner (2002), who found that the most frequently-liked foods were soda, sweets, salty snacks, and fast foods. Table 12 compares student and parent favorite snacks.

Table 12

Comparison of Student and Parents' Favorite Snack (as Perceived by Student)

	Student Favorite (*N* = 102)		Parent Favorite (*N* = 101)	
Food Category	Number	%	Number	%
Candy	17	16.5	4	3.9
Chips/Crackers	30	29.1	17	16.8
Fruit/Vegetable	33	32.0	14	13.9
Main Dish	8	7.8	4	4.0
Protein Item	6	5.8	6	5.9
Sweetened Grain	20	19.4	9	8.7
Milk/Yogurt	7	6.8	5	5.0
Don't Know	1	1.0	50	49.5

Note. Main dishes included pizza, tacos, and macaroni and cheese. Protein items Included meat, cheese, eggs, and nuts. Sweetened grains included cookies, granola bars, and toaster pastries, such as Pop-Tarts™.

Note. Since some students gave multiple answers, the total exceeds the total *N* and the percentage does not equal 100.

A cross-tabulation between BMI-for-Age classification and favorite snack as fruit or vegetable indicated that higher percentages of the “at risk” and “overweight” students preferred fruit or vegetables for snacks. See Table 13.

Table 13

Number of Students Indicating Fruit or Vegetable as Favorite Snack Compared to Body Mass Index (BMI) Classification

BMI Classification	Fruit or Vegetable as Favorite Snack (*N* = 33)	
	Number	%
Underweight (*n* = 2)	1	50.0
Normal (*n* = 63)	16	25.4
At Risk (*n* = 22)	10	45.5
Overweight (*n* = 16)	6	37.5

Note. Body Mass Index (BMI) = [wt (lb) / ht (in) / ht (in)] x 703

These results were unanticipated. One might expect that parent and child favorite snacks might be more similar because of the availability of the same snacks in the home, and that parents would model snacking behavior for children. It is also surprising that 50% of students could not identify their parent's favorite snack. One might also expect that "at risk" and "overweight" children would prefer higher calorie and higher fat snacks, such as candy or chips. Finally, it is a good surprise that the most frequently reported favorite snack was fruits and vegetables. These findings must be interpreted with caution because of the small sample, and because students may have reported what they thought was an appropriate answer.

TV and Computer Availability in Bedroom. Students were asked, "Is there a TV in the room where you sleep?" and, "Is there a computer in the room where you sleep?" About one-third (37.9%) of students had a TV in their bedroom. See Table 14. The mean

BMI was higher for students having a TV (19.92) compared to students with no TV (18.70). The mean age of both groups was 9.44 years. Fourth graders were slightly more likely to have a TV (n = 22), compared to third graders (n = 17). Three of the fourth graders had both a TV and a computer in their bedroom, while none of the third graders had both. An independent groups T-test using TV in bedroom as the independent variable showed that the difference in mean BMI was not significant.

Fewer students (11.7%) reported having a computer in their bedroom. The mean BMI for students having a computer in their bedroom was also higher (21.05) compared to students without a computer in their bedroom (18.83). An independent groups t-test using computer in bedroom as the independent variable found no significant difference. Fourth graders were more likely to have a computer (n = 9), compared to third graders (n = 3). This is also shown by comparing the mean ages of the students, which was 9.75 years for those with a computer, and 9.40 years for those with no computer in the bedroom.

Table 14

Number of Students with TV or Computer in Bedroom Compared to Mean BMI (N = 103)

	TV in Bedroom			Computer in Bedroom		
Answer	*n*	%	Mean BMI +/- *SD*	*n*	%	Mean BMI +/- *SD*
Yes	39	37.9	19.72 +/- 4.14	12	11.7	21.05 +/- 5.57
No	64	62.1	18.70 +/- 3.43	91	88.3	18.83 +/- 3.37
Total	103	100		103	100	

Note. Body Mass Index (BMI) = [wt (lb) / ht (in / ht. (in)] x 703

Saelens et al. (2002) found that children with a TV or computer in their bedroom are likely to spend more time using it, and thus might spend less time in physically active pursuits. These results indicate a slightly higher, but not statistically significant, difference in BMI for children with a TV or computer in their bedroom. The difference may be due to the greater numbers of fourth graders, who would be expected to have a higher BMI, who had TVs and computers.

Meals and Snacks Eaten in Front of the TV. Students were asked, "How often do you eat a snack while watching TV?' and "How often do you eat meals while watching TV?" Table 15 shows that significant numbers of the students eats snacks and meals in front of the TV at least sometimes. Only about 15% indicated they never ate snacks in front of the TV.

Table 15

Frequency of Snacks/Meals Eaten While Watching TV

	Snack (*N* = 103)		Meal (*N* = 103)	
Frequency	Number	%	Number	%
Always	6	5.8	10	9.7
Sometimes	82	79.4	62	60.2
Never	15	14.6	31	30.1
Total	103	100	103	100

An analysis of variance (univariate) evaluating frequency of snacks while watching TV indicated no significant difference in body mass index between those "always", "sometimes", and "never" snacking in front of the TV. In fact, body mass index increased as frequency of snacking decreased. Another analysis of variance (univariate) evaluating frequency of meals eaten in front of the TV also indicated no significant difference in body mass index, with a similar pattern of increasing BMI with decreasing frequency of snacking.

These were unanticipated findings. Possible explanations were that the question had low validity in that it did not adequately measure the variable, that students had trouble answering the question, or that students answered with what they thought was a favorable answer. This is an area for further investigation.

Physical Activity Factors

Opportunities for Physical Activity. Students were asked, "Is there a sidewalk in front of your house?" A sidewalk would provide easy and safe access to activities such as

walking, running, in line skating, and other physically active pursuits. Students were also asked, “Do you walk or bike to school?” Table 16 shows a comparison of mean BMI to opportunities for physical activity. An independent groups t-test, using “sidewalk in front of house” as the independent variable, showed no significant association with BMI. Similarly, no association was found with BMI using “walk or bike to school” as the independent variable. Most students, about 85%, did not walk or bike to school or have a sidewalk in front of their house.

Table 16

Comparison of Mean BMI to Opportunity for Physical Activity (N = 103)

	Presence of Sidewalk at Home			Walk/Bike to School		
Answer	*n*	%	Mean BMI +/- *SD*	*n*	%	Mean BMI +/- *SD*
Yes	15	14.6	18,65 +/- 2.53	15	14.6	19.2 +/- 2.78
No	88	85.4	19.16 +/- 3.9	88	85.4	19.06 +/- 3.88

Note. Body Mass Index (BMI) = [wt (lb) / ht (in) / ht (in)] x 703

Note. The 15 students who answered yes to walk/bike to school included 5 who answered yes and 10 who answered sometimes.

The hypothesis was that having a sidewalk available would increase physically active outdoor recreation such as walking, running, biking or inline skating; however, no association with BMI was found. The number of students with sidewalks available was small because most neighborhoods in Hortonville do not have sidewalks. Few students walk or bike to school, possibly because buses are provided in all areas, and Hortonville is bisected by a heavily traveled highway. Some parents may consider it unsafe for their children to walk or bike to school.

Preferred Leisure Activities. Students were asked what they would like to do if they had one free hour to do anything they wanted. The choices were watch TV, make or eat a snack, play a video game, ride bike, play outside (yard or playground), play a sport such as basketball or soccer, play a quiet game inside like checkers, read a book or do homework, use computer, or don't know. Students were also given an opportunity to write in a preference not on the list. Answers were then classified into sedentary versus active as follows:

Active leisure activities were riding a bike, playing outside, playing a sport, doing gymnastics, using a trampoline, riding a horse or scooter, running or inline skating.

Sedentary leisure activities were watching TV or playing video games, reading a book or doing homework, using a computer, drawing or coloring, playing with friends, shopping, playing with baby sister, and spending time with parents.

Table 17 shows the distribution of sedentary and active activity preferences compared to BMI classification.

Table 17

Preference for Leisure Activities Compared to BMI Classification (N= 103)

Preferred	Underweight		Normal		At Risk		Overweight		Total	
Activity	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	%
Sedentary	1	50.0	26	41.3	5	22.7	3	18.8	35	34.0
Active	1	50.0	37	58.7	17	77.3	13	81.2	68	66.0
Total	2	2	63	100	22	100	16	100	103	100

Note. Body Mass Index (BMI) = [wt (lb) / ht (in) / ht (in)] x 703

Note. Sedentary activities included watching TV, playing video games, reading or doing homework, using computer, drawing/coloring, playing with friends, shopping or spending time with siblings or parents.

Active activities included riding bike, playing outside, playing a sport, gymnastics, using trampoline, riding a horse or scooter, and running or inline skating.

Results showed a greater preference for active activities among the three largest groups, with 68 (66%) of all students indicating a preference for an active leisure pursuit. The top three leisure pursuits were *play outside* (*n* = 27), followed by *play a sport* (*n* =19), and *ride my bike* (*n* = 14). A higher percentage of the "at risk" and "overweight" groups preferred an active leisure activity, 77.3% and 81.2% respectively. A chi-square showed no significant association of BMI classification with preference for sedentary or active leisure activities. Only four (3.9%) of the students said they would watch TV in a free hour, and ten (9.7%) said they would play a video game. These findings conflict with

Harrell et al. (1997), who found that TV viewing was among the top three preferred leisure activities.

These results were unexpected. The expected result was that at risk and overweight students would prefer less active pursuits and that preference might have contributed to their higher BMI classification. However, these results must be interpreted with caution because of the small sample size. Students may have also answered with what they perceived to be a “good” answer.

Student Assessment of Physical Activity Levels. Students were asked about the amount of usual physical activity they felt they had. The choices were “lots of exercise/physical activity after school”, “some exercise after school”, “exercise only in Physical Education class at school”, or “don’t know”. See Table 18 for comparison of self-assessment of usual physical activity to BMI classification.

Table 18

Number of Students in Each Physical Activity Category by BMI Classification

(N = 103)

	Number of Students Per BMI Classification									
Amount of	Underweight		Normal		At Risk		Overweight		Total	
Activity	*n*	%	*n*	%	*n*	%	*n*	%	*n*	*%*
Lots After School			33	52.4	14	63.6	5	31.3	52	50.4
Some After School	1	50.0	20	31.7	7	31.8	11	68.7	39	37.9
Only in Phy. Ed.			4	6.3	1	4.5			5	4.9
Don't Know	1	50.0	6	9.5					7	6.8
Total	2	100	63	100	22	100	16	100	103	100

Note. Body Mass Index (BMI) = [wt (lb) / ht (in) / ht (in)] x 703

About 50% of students felt they get lots of exercise after school, and 37.9% answered they get at least some exercise after school. Surprisingly, a higher percentage (63.6%) of the “at risk” students said they got lots of activity after school. Only five (4.9%) believed they got exercise only in Physical Education classes, and interestingly, these were four of the normal weight students and one of the “at risk” students. The overweight students all felt they got at least some exercise after school. These findings support results reported by others, including Robinson, Hammer, et al. (1993) and DuRant et al. (1994), who found no association between physical activity and increased adiposity.

These findings were unexpected. From this data, one might conclude that most students feel they are physically active after school. The students who felt they got little exercise were mainly those of normal weight. This was a subjective question, with no definition for amount of exercise, so these results are only an estimate. Results may also be affected by the small numbers of overweight and at risk students. In addition, some students may have answered what they perceived as an appropriate answer.

Chapter Five

Summary, Recommendations, and Conclusions

Summary

These results serve to confirm the complex nature of the problem of childhood overweight. Clearly, more research is needed before the causes of the increase in childhood overweight can be identified with any certainty. It is likely that the current problems result from complex interactions among nutritional, physical activity, and genetic factors. No individual factor in this study was clearly associated with increasing BMI.

About one-third of the students were found to be overweight or at risk of overweight, similar to other published estimates. The distribution of *overweight* and *at risk* students was similar among boys and girls and third and fourth graders. About 60% of students were able to correctly identify their BMI classification.

No statistically significant relationship was found between the frequency of meals or snacks eaten in front of the TV and mean BMI. About one-third of students did not eat breakfast on the day of the survey and a similar number indicated they sometimes or never ate breakfast, but no statistically significant relationship to BMI was found. Fruits, vegetables, and salty snacks were the most popular snacks reported by students. No significant relationship to BMI and snacking habits was found. Most students reported using lower fat milk in the home; no relationship to type of milk used and BMI was found. Beverage preferences had no relationship to BMI in this study. A greater percentage of the *at risk* and *overweight* students ate the school lunch, a finding that needs further investigation.

Particularly puzzling is the lack of relationship to physical activity. Many of the students preferred physically active pursuits and felt that they got at least some exercise after school. In the concurrent study, the students were found to be meeting or exceeding the recommended 11,000 steps per day with mean steps per day of 13,540 (Richardson, 2003). Most students did not walk or bike to school, which would provide an additional opportunity for physical activity daily, but may not be advisable in all settings because of lack of sidewalks, traffic concerns, and weather or neighborhood safety issues.

Recommendations

Current Interventions. Examples of two current efforts to address the problem of childhood overweight include the After School Snack Program offered by the National School Lunch Program (USDA, 2003) and the Center for Science in the Public Interest (CSPI) School Food toolkit (2003). The After School Snack Program would provide a healthy snack to low-income children of at least two items from the following categories: fluid milk, meat or alternative, fruit or vegetable or juice, or a serving of whole or enriched grain. The purpose is to reduce intake of unhealthy snacks and reduce portion size at the evening meal, thus decreasing overall energy intake. The CSPI toolkit advocates decreasing use of exclusive soft drink contracts between schools and Coca-Cola™ or Pepsi™, lengthening lunch periods to allow children more time to eat, increasing healthy foods in the school cafeteria, and improving vending choices. Other efforts to improve food and beverage choices in school vending machines or reduce availability of vended foods are being considered by school boards in many areas.

The American Academy of Pediatrics (AAP) (2003) recommends determining and plotting BMI yearly to monitor weight trends, and limiting children's TV viewing to

two hours per day or less. They also recommend promotion of breast-feeding, a healthy diet, and increased unstructured physical activity. The AAP acknowledges that few studies on prevention of childhood overweight have been performed, but based on limited research, recommends the above because of the need to be proactive in addressing the problem of childhood overweight. The AAP reports that evidence does exist that children today are less physically active than previous generations, but other risk factors and the interactions among them are poorly defined. See http://www.aap.org/policy/s100029.html for further information. Interventions recommended must be carefully evaluated in controlled studies to determine their effectiveness. Areas for further research might be evaluating the effectiveness of the AAP recommended interventions.

Recommendations for Determination and Use of BMI-for-Age

All students should have their BMI determined yearly, not just in the physician's office, but also during routine weight measurements at school. Schools are in the best position to provide this because physician visits are often hurried, and the visit is usually for other, more immediate health concerns. Students in the *at risk* or *overweight* categories should have follow up testing of percent body fat to confirm whether the child is, in fact, overweight. The BMI determination and classification should be provided to parents with appropriate recommendations for nutrition and physical activity interventions. Schools should provide this information, not to make judgments or embarrass students or parents, but as a routine screening similar to vision tests and other health screenings. Students and parents must be receptive to learning about their BMI classification and what it means. Those involved in obtaining weight measurements at school, such as teachers, school nurses, health educators, and Physical Education

instructors can benefit from using the training module provided by the Center for Disease Control and Prevention at http://www.cdc.gov/nccdphp/dnpa/growthcharts/training/modules/module1/text/page1a.htm

More than half of the *at risk* students did not recognize their BMI classification (answering they were just the right size). It is likely parents and teachers may also fail to identify students in this category, but this group of students may particularly benefit from BMI determination, classification, further assessment, and early intervention if indicated. Students in the *overweight* category must receive further assessment with appropriate interventions.

Specific Recommendations Based on This Study

A particularly disturbing finding of this study was the frequency of breakfast skipping, with 31.7% indicating they had no breakfast on the day of the survey, and 38.9% indicating overall they only sometimes or never ate breakfast. Efforts must be made to educate students and parents on the importance of a healthful breakfast, along with ideas for quick and healthful choices. The School Breakfast program should be expanded to include all schools.

Since about one-third (38.2%) of the students preferred soda, in addition to decreasing availability of soda in vending machines, etc., efforts should be made to decrease soda portion sizes available to kids. An 8-ounce can would be preferable to the 20-ounce bottles currently being promoted by beverage companies. Beverage makers should be encouraged to develop healthier, lower-sugar drinks that would be acceptable to children.

Meals or snacks should not be eaten while watching TV, and careful consideration must be made by parents about whether a TV or computer is appropriate for the child's bedroom. Parents should model appropriate snacking behavior (healthy foods in small portions, eaten in the kitchen, with the TV off). Since this study showed that 50% of students did not know what their parent's favorite snack was, parents need to model and discuss healthy snacks with their children, and be sure the kids are paying attention!

Conclusions

All of the above suggested interventions have the potential to increase awareness, decrease energy intake, and increase physical activity, but at this time, it is not known which might be most effective. Further research needs to evaluate individual interventions to determine their safety, acceptance, and efficacy. No one intervention is likely to have a large impact, but multiple interventions taken together may be effective. Schools must play a larger role in providing a healthy environment for children, including encouraging healthy food choices, providing nutrition education for both students and parents, and offering more opportunities for physical activity. Physical education programs must be expanded rather than reduced. Schools should have a dietitian, health promotion or wellness specialist on staff to assist in developing and managing appropriate programs. The final objective must be healthy, normal weight kids.

References

American Academy of Pediatrics (2003, August). *Policy Statement – Prevention of Pediatric Overweight and Obesity.* Retrieved October 21, 2003 from http://www.aap.org/policy/s100029.html

Andersen, R. E., Crespo, C. J., Bartlett, S. J., Cheskin, L. S., & Pratt, M. (1998). Relationship of physical activity and television watching with body weight and level of fatness among children: Results from the third national health and nutrition examination survey. *Journal of the American Medical Association, 279* (12), 938-942.

Bellisle, F., Rolland-Cachera, M. F., & The Kellogg Scientific Advisory Committee (2000). Three consecutive (1993, 1995, 1997) surveys of food intake, nutritional attitudes and knowledge, and lifestyle in 1000 French children, aged 9-11 years. *Journal of Human Nutrition and Dietetics, 13,* 101-111.

Bellisle, F., Rolland-Cachera, M. F., Deheeger, M., & Guilloud-Bataille, M. (1988). Obesity and food intake in children: Evidence for a role of metabolic and/or behavioral daily rhythms. *Appetite, 11*(2), 111-118. Abstract retrieved from PubMed, June 28, 2002.

Byrd-Bredbenner, C., Grasso, D., & Finckenor, M. (2001). Nutrition messages on prime-time television programs. *Topics in Clinical Nutrition, 16* (4), 61-72.

Center for Disease Control and Prevention, National Center for Health Statistics. (2003). *Use and interpretation of the CDC growth charts*. Retrieved March 18, 2003, from http://www.cdc.gov/growthcharts/

Center for Science in the Public Interest (2003, September 15). *School Foods Tool Kit: A Guide to Improving School Foods and Beverages.* Retrieved October 21, 2003 from http://cspinet.org/schoolfood/

Clauson, A. (2000). Spotlight on national food spending. *FoodReview, 23* (3), 15-17.

Conci, F. C., Bope, A. A., MaWhinney, S., Czajka-Narins, D., & Alford, B. B. (1999). Body composition, dietary intake, and energy expenditure in nonobese, prepubertal children of obese and nonobese biological mothers. *Journal of the American Dietetic Association 99* (1), 58-65.

Cullen, K. W., Lara, K. M., & deMoor, C. (2002). Children's dietary fat intake and fat practices vary by meal and day. *Journal of the American Dietetic Association, 102* (12), 1773-1778.

Daniels, S. R., Khoury, P. R., & Morrison, J. A. (1997). The utility of body mass index as a measure of body fatness in children and adolescents: Differences by race and gender. *Pediatrics*, 99, 804-807.

Dennison, B. A., Erb, T. A., & Jenkins, P. L. (2002). Television viewing and television in bedroom associated with overweight risk among low-income preschool children. *Pediatrics*, *109* (6), 1028-1035.

DuRant, R. H., Baranowski, T., Johnson, M., & Thompson, W. O. (1994). The relationship among television watching, physical activity, and body composition of young children. *Pediatrics*, *94*, 449-455.

eNeighborhoods.com. *School and Neighborhood Facts for Hortonville, WI,* retrieved September 13, 2003 from http://www.eNeighborhoods.com

Faith, M. S., Berman, N., Moonseong, H., Pietrobelli, A, Gallagher, D., Epstein, L., Eiden, M. T., & Allison, D. B. (2001). Effects of contingent television on physical activity and television viewing in obese children. *Pediatrics, 107,* 1043-1048.

Freedman, D. S., Dietz, W. H., Srinivasan S. R., & Berenson, G. S. (1999). The relation of overweight to cardiovascular risk factors among children and adolescents: The Bogalusa Heart Study. *Pediatrics,* 103, 1175-1182.

Freedman, D. S., Khan, L. K., Serdula, M. K., Galuska, D. A., & Dietz, W. H. (2002). Trends and correlates of class 3 obesity in the United States from 1990 through 2000. *Journal of the American Medical Association, 288* (14), 1758-1761.

Freedman, D. S., Srinivasan, S. R., Valdez, R. A., Williamson, D. F., & Berenson, G. S. (1997). Secular increases in weight and adiposity among children over two decades: The Bogalusa Heart Study. *Pediatrics, 99* (3), 420-426.

French, S. A., Lin, B-H. & Guthrie, J. F. (2003). National trends in soft drink consumption among children and adolescents age 6 to 17 years: Prevalence, amounts, and sources, 1977/1978 to 1994/1998. *Journal of the American Dietetic Association, 103* (10), 1326-1331.

Gortmaker, S. L., Dietz, W. H., & Cheung, L. W. Y. (1990). Inactivity, diet, and the fattening of America. *Journal of the American Dietetic Association, 90* (9), 1247-1255.

Guthrie, J. F., & Morton, J. F. (2000). Food sources of added sweeteners in the diets of Americans. *Journal of the American Dietetic Association, 100* (1), 43-48.

Harnack, L., Stang, J., & Story, M. (1999). Soft drink consumption among US children and adolescents: Nutritional consequences. *Journal of the American Dietetic Association, 99* (4), 436-441.

Harrell, J. S., Gansky, S. A., Bradley, C. B., & McMurray, R. G. (1997). Leisure time activities of elementary school children. *Nursing Research, 46* (5), 246-253.

Klesges, R. C., Shelton, M. L., & Klesges, L. M. (1993). Effects of television on metabolic rate: Potential implications for childhood obesity. *Pediatrics*, *91*, 281-286.

Kovariva, M., Vignerova, J., Blaha, P., & Osancova, K. (2002). Bodily characteristics and lifestyle of Czech children aged 7.00 to 10.99 years, incidence of childhood obesity. *Central European Journal of Public Health, 10* (4), 169-73. Abstract retrieved from Medline, March 21, 2003.

Luder, E. (2002). Obesity and asthma: Complex interactions. (2002). *Topics in Clinical Nutrition*, 17 (3), 23-30.

Ludwig, D. S., Peterson, K. E., & Gortmaker, S. L. (2001). Relation between consumption of sugar-sweetened drinks and childhood obesity: a prospective, observational analysis. *The Lancet*, 357, 505-508.

Mei, Z., Grunner-Strawn, L. M., Pietrobelli, A., Goulding, A., Goran, M. I, & Dietz, W. H. (2002). Validity of body mass index compared with other body-composition *American Journal of Clinical Nutrition*, 75, 978-985.

Melnik, T. A., Jesaitis, A. T., Wales, K. R., & Bonam, S. B. (1998). Prevalence of overweight among third- and six-grade children-New York city, 1996. *MMWR: Morbidity & Mortality Weekly Report, 11/20/98, 47* (45), 980-984.

Mokdad, A. H., Ford, E. S., Bowman, B. A., Dietz, W. H., Vinicor, F., Bales, V. S., & Marks, J. S. (2003). Prevalence of obesity, diabetes, and obesity-related health risk factors, 2001. *Journal of the American Medical Association, 289* (1), 76-79.

Murphy, J. M., Pagano, M. E., Nachmani, J., Sperling, P., Kane, S., & Kleinman, R. E. (1998). The relationship of school breakfast to psychosocial and academic functioning: cross-sectional and longitudinal observations in an inner-city school sample. *Archives of Pediatrics and Adolescent Medicine, 152* (9), 899-907. Abstract retrieved from Medline, February 2, 2003.

National Academy of Sciences, Food and Nutrition Board (2002). *Dietary Reference Intakes for Macronutrients.* Retrieved December 7, 2003 from http://.www.nap.edu/openbook/, 113,143-144.

Nicklas, T. A. (1995). Dietary studies of children: The Bogalusa Heart Study experience. *Journal of the American Dietetic Association, 95*, 1127-1133.

Nicklas, T. A., O'Neil, C. E., & Berenson, G. S. (1998). Nutrient contribution of breakfast, secular trends, and the role of ready-to-eat cereals: A review of data from the Bogalusa Heart Study. *American Journal of Clinical Nutrition, 67* (suppl.), 757S-763S.

Norris, T., McWhinney, S., & Grant. L. (2003, October). *Prevalence of overweight and obesity in school age children.* Poster session presented at the annual Food and Nutrition Conference and Expo of the American Dietetic Association, San Antonio, TX.

Ogden, C. L., Flegal, K. M., Carroll, M. D., & Johnson, C. L. (2002). *Journal of the American Dietetic Association, 288* (14), 1728-1732.

Ortega, R. M., Requejo, A. M., Lopez-Sobaler, A. M., Quintas, M. E., Andres, P., Redondo, M. R., Navia, B., Lopez-Bonilla, M. D., & Rivas, T. (1998). Difference in the breakfast habits of overweight/obese and normal weight schoolchildren. *International Journal of Vitamin and Nutrition Research, 68* (2), 125-32. Abstract retrieved from PubMed, June 28, 2002.

Paradis, G., Lambert, M., O'Loughlin, J., Delvin, E., Levy, E., Lavallee, C., Aubin, J., & Hanley, J. A. (2003). Early consequences of the obesity epidemic: Elevated blood pressure in children and adolescents in Quebec, Canada. Paper presented at the American Heart Association Annual Conference, abstract retrieved March 18, 2003 from http://aha.agora.com/abstractviewer

Pereira, M. A., Van Horn, L., Slattery, M., Jacobs, D. R. Jr., & Ludwig, D. S. (2003). *Reported breakfast habits and incidence of obesity and the insulin resistance syndrome in young black and white adults: The CARDIA study*. Paper presented at the American Heart Association Annual Conference, abstract retrieved March 18, 2003 from http://aha.agora.com/abstractviewer

Pietrobelli, A., Faith, M. S., Allison, D. B., Gallagher, D., Chiumella, G., & Heymsfield, S. B. (1998). Body mass index as a measure of adiposity among children and adolescents: A validation study. *Journal of Pediatrics, 132* (2), 204-210.

Pinhas-Hamiel, O., Dolan, L. M., Daniels, S. R., Standiford, D., Khoury, P. R. & Zeitler, P. (1996). Increased incidence of non-insulin-dependent diabetes mellitus among adolescents. *Journal of Pediatrics, 128* (5), 608-615.

Pollack, J. (1999). Foods targeting children aren't just child's play. *Advertising Age, 70* (9), 16.

Richardson, C. L. (2003). Effect of school activity programs on body mass index and step counts in children. *Unpublished master's thesis,* University of Wisconsin at LaCrosse.

Ridley, K., & Olds, T. (2001). Video center games: Energy cost and children's behaviors. *Pediatric Exercise Science, 13,* 413-421.

Robinson, T. N. (1999). Reducing children's television viewing to prevent obesity. *Journal of the American Medical Association,* 282 (16), 1561-1567.

Robinson, T. N. (1998). Does television cause childhood obesity? *Journal of the American Medical Association, 279* (12), 959-960.

Robinson, T. N., Hammer, L. D., Killen, J. D., Kraemer, H. C., Wilson, D. M, Hayward, C. H., & Taylor, C. B. (1993). Does television viewing increase obesity and reduce physical activity? *Pediatrics, 91,* 273-280.

Rocandio, A. M., Ansotegui, L., & Arroyo, M. (2000). Relationship between breakfast and obesity among school-aged children. *Revista Clinica Espanola, 200* (8), 420-423. Abstract retrieved from PubMed, June 28, 2002.

Rolls, B. J., Morris, E. L., & Roe, L. S. (2002). Portion size of food affects energy intake in normal-weight and overweight men and women. *American Journal of Clinical Nutrition, 76* (6), 1207-1213.

Rolls, B. J., Engell, D., & Birch, L. L. (2000). Serving portion size influences 5-year-old but not 3-year-old children's food intakes. *Journal of the American Dietetic Association, 100* (2), 232-234.

Saelens, B. E., Sallis, J. F., Nader, P. R., Broyles, S. L., Berry, C. C., & Taras, H. L. (2002). Home environmental influences on children's television watching from early to middle childhood. *Developmental and Behavioral Pediatrics, 23* (3), 127-132.

Schwimmer, J. B., Burwinkle, T. M & Varni, J. W. (2003). Health-related quality of life of severely obese children and adolescents. *Journal of the American Medical Association, 289* (14), 1813-1819.

Siega-Riz, A. M., Popkin, B. M., & Carson, T. (1998). Trends in breakfast consumption for children in the United States from 1965 to 1991. *American Journal of Clinical Nutrition, 67* (suppl.), 748S-756S.

Skinner, J. D., Carruth, B. R., Bounds, W., & Ziegler, P. J. (2002). Children's food preferences: A longitudinal analysis. *Journal of the American Dietetic Association, 102* (11), 1638-1647.

Smiciklas-Wright, H., Mitchell, D. C., Mickle, S. J., Goldman, J. D., & Cook, A. (2003). Foods commonly eaten in the United States, 1989-1991 and 1994-1996: Are portion sizes changing? *Journal of the American Dietetic Association, 103* (1), 41-47.

Smith, D., & Steiner, R. D. (2001). Hyperlipidemia in children: Should we care? *Topics in Clinical Nutrition, 16* (2), 17-31.

Strauss, R. S., & Pollack, H. A. (2001). Epidemic increase in childhood overweight, 1986-1998. *Journal of the American Medical Association, 286* (22), 2845-2848.

Taveras, E. M., Berkey, C. S., Rifas-Shiman, S. L., Ludwig, D. S., Field, A. E., Colditz, & G. A., Gillman, M. W. (March 6, 2003). *A Longitudinal study of fried food consumption away from home and body mass index in older children and adolescents.* Paper presented at the American Heart Association Annual Conference, abstract retrieved March 18, 2003 from http://aha.agora.com/abstractviewer

Troiano, R. P., & Flegal, K. M. (1998). Overweight children and adolescents: Description, epidemiology, and demographics, *Pediatrics, 101* (suppl.), 497-504.

United States Department of Agriculture, National School Lunch Program (2003, September 17). *Make USDA Snacks a Healthy Part of your Afterschool Care Program.* Retrieved October 21, 2003 from http://www.fns.usda.gov/cnd/Care/Regs-Policy/Snacks/NewsRelease.htm

Wang, G., & Dietz, W. H. (2002). Economic Burden of Obesity in Youths Aged 6 to 17 years: 1997-1999. *Pediatrics, 109* (5) (Electronic Version).

Wolfe, W. S., Campbell, C. C., Frongillo, E. A., Haas, J. D., & Melnik, T. A. (1994). Overweight schoolchildren in New York state: Prevalence and characteristics. *American Journal of Public Health, 84* (5), 807-813.

Young, L. R., & Nestle, M. (2003). Expanding portion sizes in the US marketplace: Implications for nutrition counseling. *Journal of the American Dietetic Association, 103* (2), 231-234.

Zoumas-Morse, C., Rock, C. L., Sobo, E. J., & Neuhouser, M. L. (2001). Children's patterns of macronutrient intake and associations with restaurant and home eating. *Journal of the American Dietetic Association, 101* (8), 923-925.

Appendix A

Protection of Human Subjects in Research Form

University of Wisconsin Stout

Protection of Human Subjects in Research Form

www.uwstout.edu/rps/humnsubjform.doc

Data collection/analysis cannot begin until there has been IRB approval of this project.

Directions:

- **Individuals who have completed the UW-Stout Human Subjects Training and can prove certification are eligible to file this form.**
- **This form must be filed and approved prior to any student (undergraduate or graduate), faculty, or staff conducting research.**
- **Complete this form on-line and print. Handwritten forms will not be accepted. *For your benefit, save your completed form in case it needs to be revised and resubmitted.***
- **Send or take the completed form, with required signatures and required materials attached, to Stout Solutions • Research Services, 11 Harvey Hall.**

Research is defined as a systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge.

A human subject is defined as a living individual about whom an investigator obtains either 1) data through intervention or interaction with the individual; or 2) identifiable private information.

Investigator(s):
Name: Judy K. Martin ID: 5108400001020397 Daytime Phone # 608-524-6487 ext. 1061
e-mail address: martinjk@mwt.net Signature: _____

Name: ID: Daytime Phone #
e-mail address: Signature: _____

Name: ID: Daytime Phone #
e-mail address: Signature: _____

For students:
Research Advisor's Name: Dr. Janice Coker Department: Food and Nutrition
Signature:
_____ Date of Approval: _____
Research Advisor: Have you completed UW-Stout's Human Subjects Training? Yes ☐ No ☐. **Training must**

be completed prior to IRB review of this form.

Project Title: **Factors Associated with BMI (Body Mass Index)-for-Age of Third and Fourth Graders**

Sponsor (Funding agency, if applicable):

Is this project being supported by Federal funding? Yes ☐ No ☒

You must answer all of the following questions completely and attach all required forms.

1. Describe the proposed research stating the objectives, significance, and detailed methodology (approximately 250-500 words; descriptions are to be written in future tense).
   The objective of this study is to identify factors correlated with BMI-for-Age of 3rd and 4th graders, in order to assist in targeting useful interventions. This information is important to obtain since the prevalence of overweight, and resulting increase in chronic disease such as diabetes, is a significant public health problem. The proposed study will use a survey, developed by the researcher, to determine various aspects of children's eating and exercise habits and preferences. The population to be studied will be all consenting 3rd and 4th graders at Hortonville Elementary School (approx. 200 students). Each participant will have their height and weight measured and BMI determined in Phy. Ed. class by the Phy. Ed. instructor. The proposed survey will be administered by the researcher (after parental/student consent) in each classroom during the first 2 hours of the day to faciliate better recall of breakfast intake. All data collection is planned to occur on one day, and the date will be previously unannounced to the students. The Phy. Ed. instructor is also planning to conduct research on these same students to determine physical activity using pedometers. See attachment for details of methodology.

2. Does your research involve human subjects or official records about human subjects? Yes ☒ No ☐
   If yes, continue with this form. If no, stop here!

3. Human subjects training must be completed prior to filing this form. Have you completed UW-Stout's Human Subjects Training (http://www.uwstout.edu/rps/hstraining)? Yes ☒ No ☐

4. Please note that research cannot begin until this project has been approved by the IRB. When is the data collection for the research *intended* to begin and end? **Date not yet chosen, pending IRB approval, but expected to be completed on one day** to **Feb., 2003** (enter month/year)

5. Can the subjects be identified directly or through any type of identifiers? Yes ☒ No ☐ If yes, please explain.
The surveys will need the student's name attached in order to compare BMI, and other data to be collected by the Phy. Ed. teacher (she is obtaining her own IRB approval for her part of the project). Once the data is analyzed, the original surveys will be destroyed. Immediately after completion, each class's surveys will be placed in a sealed envelope with the grade and teacher name on the outside. These will be stored safely in the researcher's home, and all information obtained will be held confidential. BMI-for-Age results will be stored securely in the Phy. Ed. instructor's computer within a locked office. All surveys and BMI recording forms will be destroyed after analysis is completed.

6. Special precautions must be included in your research procedures if any of these special populations or research areas are included. Are any of the subjects:

(a) minors (under 18 years of age)? Yes ☒ No ☐

(b) legally incompetent? Yes ☐ No ☒

(c) prisoners? Yes ☐ No ☒

(d) pregnant women, if affected Yes ☐ No ☒

(c) illegal conduct? Yes ☐ No ☒

(e) institutionalized? Yes ☐ No ☒

(f) mentally incapacitated? Yes ☐ No ☒

Does the research deal with questions concerning:

(a) sexual behaviors? Yes ☐ No ☒

(b) drug use? Yes ☐ No ☒

by the research?

(d) use of alcohol? Yes ☐ No ☒

7. Voluntary participation/consent form:
Describe the method (a) for selecting subjects and (b) for assuring that their participation is voluntary. If subjects are children and they are capable of assent, they must give their permission, along with that of their parent, guardian, or authorized representative. NOTE: A school district cannot give permission or consent on behalf of minor children.
The subjects will be all consenting students in 3rd and 4th grade at Hortonville Elementary School. A parental/student consent letter will be sent home with all students 1-2 weeks prior to the planned survey administration. Signatures of both parent/guardian and student will be obtained and kept on file. See attached copy of parental consent information -one page of information and one page informed consent form to be signed and returned.

8. Procedures: Describe how subjects will be involved in detail, especially if the study involves false or misleading information to subjects or withholds information such

that their informed consent might be questioned or if the research uses procedures designed to modify the thinking, attitudes, feelings, or other aspects of the behavior of the subjects.

Students will be asked to fill out a 15 -question, multiple choice-type survey with a few open-ended questions about their eating and activity habits. Surveys will be administered in the first classes in the morning to facilitate recall of breakfast intake. See methodology attachment for further details.

9. Confidentiality: Describe the methods to be used to ensure the confidentiality of data obtained.

Names will be included on the surveys to allow for comparison with BMI and other data. Each class's completed surveys will be placed in a sealed envelope labeled with the class and teacher name. All envelopes will be held securely in the researcher's home until after data analysis, when the originals will be destroyed. No individual student's results or name will be included in the final report.

10. Risks: Describe the risks to the subjects and the precautions that will be taken to minimize them. (Risk includes any potential or actual physical risk of discomfort, harassment, invasion of privacy, risk of physical activity, risk to dignity and self-respect, and psychological, emotional, or behavioral risk.) Also, address any procedures that might be different from what is commonly established practice for research of this type.

I do not identify any significant risks to the students by filling out this survey, or having their height and weight measured. Measurement of height and weight may cause some emotional discomfort in sensitive students, but this will be minimized by assuring privacy and avoiding comments about the height/weight. Some discomfort may arise by having the researchers administer the survey related to disruption of the daily routine, but this will be minimized by having the teacher remain in the room and explaining that the survey will be brief.

11. Benefits: Describe the benefits to subjects and/or society. (These will be balanced against risk.)

The information that is gathered can help identify interventions that parents, teachers, and schools can take to help modify eating and exercise habits to achieve a healthier BMI-for-Age. Potential benefits to students and their families may come from an increased awareness of activity levels from wearing the pedometers. For an educational benefit, we plan to prepare a letter for parents with the BMI-for-Age, the appropriate classification, and an educational paragraph about it's significance to send out after the data is analyzed.

12. Attachments to this form: (NO ACTION WILL BE TAKEN WITHOUT THESE FORMS)

a) Description of the proposed study, as requested in number one.
b) Consent form(s). Form(s) should include explanation of procedures, risk, safeguards, freedom to withdraw, confidentiality, offer to answer inquiries, third party referral for concerns, and signature (only if the subjects can be identified by any means. If the survey is strictly anonymous, then a signature is not required). Sample consent forms can be found at www.uwstout.edu/rps/ConsentForms.PDF.
c) Questionnaire/Survey Instrument. Also, if the survey is being conducted verbally, a copy of the introductory comments and survey questions being asked must be attached to this form. If the survey is a published/purchased instrument, a photocopy of the complete survey will suffice.

The project or activity described above must adhere to the University's policies and institutional assurance with the U.S. Department of Health and Human Services regarding the use of human subjects. University review and approval is required. **REMINDER: You are in violation of UW-Stout, UW System, and federal government policies if you begin your study before IRB approval is obtained.**

Projects that are not completed within one year of the IRB approval date must be submitted again. Annual review and approval by the IRB is required.

- -

Institutional Review Board Action:

______ Project approved through expedited review.

______ Project approved through expedited review provided minor modifications are completed.

______ Project approved through the full board review process; date of meeting: ______________________________

______ Additional information is requested. Please see attached instructions and resubmit.

______ Project not approved at this time.

Signature: ____
Institutional Review Board Chair or Designee / date

11/2002

Appendix B

Supplement to Protection of Human Subjects in Research

Methodology Details

Methodology Details

(Supplement to Protection of Human Subjects in Research Form)

Body Mass Index For Age: is an age and gender-specific screening tool for children ages 2-20. It is not a direct measure of body fatness, but rather a commonly accepted index for classifying the amount of fat in the body. It is calculated by dividing weight in kilograms by height in meters squared: BMI = Weight (kg) / Height $(m)^2$

CDC (Center for Disease Control) BMI-for-Age classifications will be used to classify the BMI's:

Below 5^{th} percentile = underweight
5^{th} through 84^{th} percentile = normal weight
85^{th} to 95^{th} percentile = risk of overweight
Above 95^{th} percentile = overweight

Each child will be weighed and measured privately in the Phy. Ed. instructor's office. Weights will be obtained in stocking feet, with street clothes on, in the morning hours before lunch. Heights will be measured on a Health-0-Meter scale and rounded to the nearest inch. Weights will be measured in pounds on the Polar Health First TriFit 620 scale. Heights and weights will be entered into a computer program that will calculate the BMI. (TriFit Software, Version 4.6, Polar Health First Corporation, Albuquerque, NM). This data will be stored in the Phy. Ed. instructor's computer within a locked office until time for data analysis. Only the researchers will have access to this data. After data analysis, the individual BMI-for-Age and classification along with an educational note about it's significance will be sent home in a sealed envelope with each participant if requested by the parents.

Survey Administration: The survey will be administered to each 3^{rd} and 4^{th} grade class after obtaining permission from the teacher. The teacher will be asked to remain in the room to increase comfort level of the students and help with any discipline problems or emergencies, but will not participate in the survey administration. Two people will administer the survey, the Phy. Ed. teacher who is doing other parts of this study and myself. One will read each question and one will circulate the room to privately answer any questions and assure the correct question is being answered. For consistency, these roles will not be rotated. Although the survey is written at a 2^{nd} grade reading level, reading each question aloud will help control for variations in reading ability of the students. After the questions are all answered, the surveys will be placed in a sealed envelope labeled with the grade and teacher's name. The envelopes will be stored securely in the researcher's home until time for data analysis. After the data is analyzed, the original surveys will be destroyed.

Pedometer Testing: This is a separate study being completed by the Phy Ed. teacher. Students will wear pedometers for 3 days (2 week days and 1 weekend day) to determine the amount of steps taken daily, a good measure of activity level. Approval for this part of the study will come from UW-LaCrosse Institutional Review Board.

Appendix C

Letter from Institutional Review Board Requesting Revisions

Date: February 10, 2003

To: Judy K. Martin

cc: Janice Coker
Food and Nutrition

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

Subject: **Protection of Human Subjects--Expedited Review**

Your project, "Factors Associated With BMI (Body Mass Index)-for-Age of Third and Fourth Graders," requires additional information. The reviewer had the following questions/concerns:

- Item #5 response: Because the research subjects are minors, confidentiality is paramount. Item #5 of the form addresses this issue but does not tell us what the final disposition of the data will be. Please add a sentence stating that the surveys will be destroyed after analysis is completed.
- Item #8 response: The wording "multiple choice-type survey will a . . ." should be changed to read "multiple choice-type survey with a . . ."

Actual Survey Instrument:

- Questions 3 and 4 appear invasive and irrelevant to answering the research question. Removing these questions is recommended.
- Question 15: Would "Play outside" include activities such as fishing, hunting, swimming, etc.? If not, perhaps the choices are too limiting.

Please revise and resubmit. Thank you.

SF:ls

Appendix D

Letter Approving Project from Institutional Review Board

Date: February 18, 2003

To: Judy K. Martin

cc: Janice Coker
Food and Nutrition

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

Subject: **Protection of Human Subjects--Expedited Review**

Your project, "Factors Associated with BMI (Body Mass Index)-for-Age of Third and Fourth Graders," 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.

This project is approved through February 6, 2004. Research not completed by this date must be submitted again outlining changes, expansions, etc. Annual review and approval by the IRB is required.

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:ls

Appendix E

Letter to Hortonville School Board Requesting Permission for Study

Dear Members of the School Board of Hortonville Area School District:

As you may know, the prevalence of overweight among children has been increasing since the 1960's, with a current estimate of 15.3% of children ages 6-11 years being in the 95th percentile or above for BMI (body mass index)-for-Age. BMI-for-Age is a screening tool recommended by the CDC (Center for Disease Control) to classify amount of fat in the body. Childhood overweight often leads to adult overweight and a resulting increase in chronic diseases, such as diabetes, hypertension, and cardiovascular disease. The determination of factors affecting this increase can aid in the development of useful interventions.

We would like permission to conduct the following study at Hortonville Elementary School. Cheryl Richardson and Judy Martin propose to collect the following data from 3rd and 4th graders:

- Measure height and weight and then calculate BMI (body mass index)-for-Age
- Determine physical activity levels by having the students wear pedometers
- Have each child complete a survey concerning their eating and exercise habits

The above data will then be correlated to identify relationships to BMI-for-Age.

The pedometers would be placed during normal physical education classes. The researchers will administer the written survey during the first classes of the day after obtaining permission from the 3rd and 4th grade teachers. No teacher time or materials will be required. The survey is estimated to take 10 minutes of the student's time to complete.

Attached are copies of our proposed parental informed consent letter and a sample student survey. All results will be confidential. The Institutional Review Boards of UW- Stout and UW-LaCrosse have approved this proposed study.

We consider this study an important step in identifying factors related to childhood overweight, and are anxious to begin. We will be glad to provide our results for your use in identifying any interventions the school may wish to take to impact this serious health problem.

If you have any questions, please call Judy Martin at 608-524-6487, ext. 1061, or Cheryl Richardson at Hortonville Elementary, ext. 1105. We will contact you in approximately one week to discuss the proposed study, answer any questions, and obtain your permission. Thank you very much for your consideration.

Sincerely,

Judy K. Martin
Cheryl L. Richardson

Appendix F

Informed Consent Letter to Parents

Dear Students and Families:

As you may know, the prevalence of overweight among children has been increasing since the 1960's. Currently, over 15% of children ages 6-11 are classified in the 95th percentile or above for weight related to height. Childhood overweight often continues into adulthood, increasing the risk of chronic diseases, including diabetes, high blood pressure, and heart disease.

We are asking permission for your child to participate in a study at Hortonville Elementary School. The school has already given the approval for this study to be conducted. All 3rd and 4th grade students are being invited to participate.

The study will have 3 parts:

1. Each student will wear a pedometer, which measures how many steps they take. Students are already familiar with these since they currently wear them in Phy. Ed. class. This will give an estimate of the amount of physical activity they get each day.
2. Students will have their height and weight measured, and BMI-for-Age calculated. BMI (body mass index) is a measure of weight related to height.
3. Each student will complete a 15-question survey during his or her regularly scheduled classes. The questions are about eating and exercise habits.

The results will then be evaluated to see which factors might be related to BMI-for-Age.

The benefits of participating in this study include a greater awareness of usual physical activity from wearing the pedometer, and the determination of BMI to assess underweight, normal weight, or overweight. The results of this study may also have possible benefits in helping find ways for schools, parents or teachers to address the problem of childhood overweight.

The information gathered will be strictly confidential. Only the researchers will have access to the data collected. The results of this study may be published in scientific literature or be presented at professional meetings. Any reports created from this study will contain no names or other identifying characteristics of the students. A copy of the study results will be available upon request.

If you or your child have any questions about the proposed study, please call Cheryl Richardson at Hortonville Elementary School, phone: 779-7911, ext. 1105, or research advisor Dr. Richard Mikat, phone: 608-785-8182 at UW-LaCrosse, or Judy Martin at 608-524-6487 (work), or research advisor Dr. Janice Coker at UW-Stout, phone: 715-232-2239. Questions may also be directed to Dr. Dan Duqueet, Chair of the UW-LaCrosse Institutional Review Board for the Protection of Human Subjects, phone: 608-785-8124, or Sue Foxwell, Human Protections Administrator, UW-Stout Institutional Review Board for the Protection of Human Subjects in Research, phone: 715-232-1126.

If you agree to have your child participate, **please sign the attached informed consent page, have your child sign it, and return it to your child's teacher as soon as possible.** Thanks for your assistance with this project!

Judy K. Martin

Cheryl L Richardson

Appendix G

Informed Consent Form for Family and Student to Sign

Informed Consent

The title of this study is:

Factors Associated with BMI (body mass index)-for-Age of 3rd and 4th Graders

I have been informed that the purpose of this study is to explore the relationship between eating and exercise habits, daily activity levels, and body mass index. I have been informed that my participation will involve completing a 15-question survey about my eating and exercise habits that my height and weight will be measured. I have been informed that this portion of the study will occur at Hortonville Elementary School and will require approximately 25 minutes of my school day to complete. I have been informed that the final requirement for participation in this study is to wear a pedometer during my waking hours for three days in a one-week period – two weekdays and one weekend day.

I have been informed that I may experience some discomfort reading the survey questions. To minimize any possible discomfort, the survey questions will be read aloud to me. I have been informed that I may also experience some discomfort having my height and weight assessed. To lessen my discomfort, the Phy.Ed instructor will measure my height and weight privately. I will be wearing my regular school clothes with my shoes off to be weighed and measured.

I have been informed that my participation in this study is voluntary and that I can withdraw from the study at any time for any reason without penalty. My grades will not be affected in any way by my participation in this study.

Parent/Guardian_____ Date_____

Student_____ Date_____

Appendix H

Copy of Survey Given to Students

3rd and 4th Grade Survey Name_____

Good Morning!

Please answer the following questions. There are no right or wrong answers!
If you need help with a question, raise your hand.

(Circle one answer)

1. How old are you?
    a. 8
    b. 9
    c. 10
    d. Other: _____

2. Are you a:
    a. Boy
    b. Girl

3. Is there a sidewalk in front of your house?
    a. Yes
    b. No
    c. Don't know

4. Do you walk to school?
    a. Yes
    b. No
    c. Sometimes

5. Is there a TV in the room where you sleep?
    a. Yes
    b. No

6. Is there a computer in the room where you sleep?
    a. Yes
    b. No

7. How often do you eat breakfast before coming to school?
    a. Always
    b. Sometimes
    c. Never

8. What did you eat and drink before you came to school today?
   (List <u>everything</u> you had. If you did not eat yet today, write "nothing".)

9. What is your favorite thing to drink?
   (Circle one answer)
   a. Milk
   b. Juice
   c. Water
   d. Soda (pop) like Pepsi, root beer, Mountain Dew
   e. Other? _____

10. What kinds of milk does your family have in the refrigerator at home?
    (Circle one or more answers)
    a. Whole milk
    b. 2% milk
    c. 1% milk
    d. Skim milk
    e. Chocolate milk
    f. Soy milk
    g. We don't usually have milk
    h. I don't know

11. What is your favorite food to eat for a snack?

12. How often do you eat a <u>snack</u> while watching TV?
    a. Always
    b. Sometimes
    c. Never

13. How often do you eat <u>meals</u> while watching TV?
    a. Always
    b. Sometimes
    c. Never

14. What do you think is your parents' favorite food to eat for a snack?

15. If I had one free hour to do anything I wanted to, I would:
(Circle only one answer)
    a. Watch TV
    b. Make or eat a snack
    c. Play a video game
    d. Ride my bike
    e. Play outside (in the yard or at a playground)
    f. Play a sport, such as basketball or soccer
    g. Play a quiet game inside, like Checkers or Lego's
    h. Read a book or do homework
    i. None of these! I would like to: _____
    j. Don't know

16. How often do you eat hot lunch at school?
    a. Always
    b. Sometimes
    c. Never

17. I think that I:
(Circle one answer)
    a. Get lots of exercise after school
    b. Get some exercise after school
    c. Get exercise only in Phy. Ed. Class at school
    d. Don't know

18. I think that I am:
(Circle one answer)
    a. Just the right size
    b. Too thin
    c. Too heavy
    d. Don't know

All done! Thank you for answering the questions!

Appendix I

Copy of Oral Introduction and Instructions for Completing Survey

Verbal introduction and instructions for completing the survey:

Good Morning! My name is Judy Martin. I am working on a research project to help find out what kids like to eat and do for exercise. You may have heard your parents or teachers talking about the fact that people today (grown ups and kids) are gaining weight. Gaining too much weight sometimes causes people to develop diseases like diabetes or high blood pressure, especially as they get older. Many people today are concerned about this. I have some questions for you to answer today. Your answers may show us ways to help you and your parents eat good food, get more exercise, and be healthier. As I read each question to you, circle the one answer that best tells what you think. Please follow along carefully to be sure you are on the right question. For questions that ask what foods you or your family eat, be sure to tell the truth. There are no right or wrong answers! Raise your hand if you don't know how to answer any questions, and we will help you. No one here at school will see your answers. The survey will take just a few minutes to complete. If you do not want to fill out this survey, you may choose not to and that will be OK.

Appendix J

Copy of Procedure from CDC Used for Measuring Height

BMI: Body Mass Index
Body Mass Index-for-Age (Children)
How to Measure Height

Children who are 2 years of age or older, cooperative, and able to stand on their own are measured standing.

Equipment:

A standing height board or stadiometer is required. The device has a flat vertical surface on which a measuring rule is attached. It has a movable headpiece and either a permanent surface to stand on or the entire device is mounted on the wall of a room with a level floor.

Procedure for measuring a child:

1. Remove the child's shoes, hats, and bulky clothing, such as coats and sweaters. Undo or adjust hair styles and remove hair accessories that interfere with measurement.

2. The child should stand erect, with shoulders level, hands at sides, knees or thighs together and his weight evenly distributed on both feet. The child's feet should be flat on the floor or foot piece, with both heels comfortably together and touching the base of the vertical board. When possible, all four contact points (i.e., the head, back, buttocks, and heels) should touch the vertical surface while maintaining a natural stance (see Figure 1). Some children will not be able to maintain a natural stance if all four contact points were touching the vertical surface. For these children, at a minimum, two contact points — the head and buttocks, or the buttocks and heels — should always touch the vertical surface.

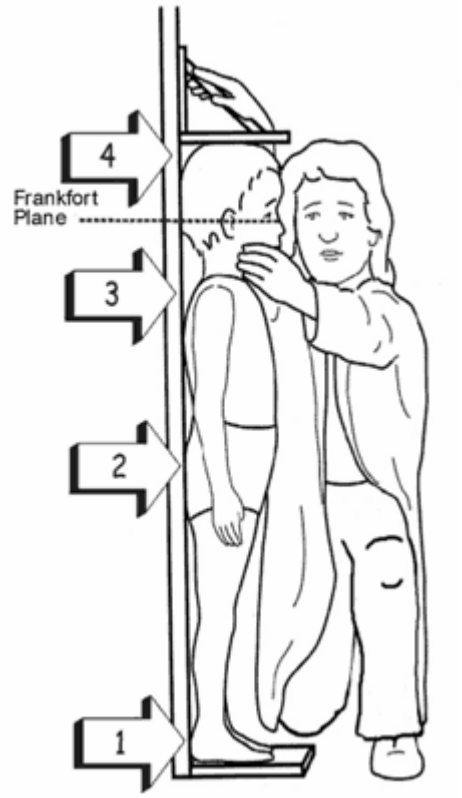

Figure 1

3. Position the child's head by placing a hand on the chin to move the head into the Frankfort Plane as shown in Figure 1. The Frankfort Plane is an imaginary line from the lower margin of the eye socket to the notch above the tragus of the ear.

When aligned correctly, the Frankfort Plane is parallel to the horizontal headpiece and perpendicular to the vertical back piece of the stadiometer. This is best viewed and aligned when the examiner is directly to the side and at eye level with the child.

4. Lower the headpiece until it firmly touches the crown of the head and is at a right angle with the measurement surface. Check contact points as shown in Figure 1 to ensure that the lower body stays in the proper position and heels remain flat. Some children may stand up on their toes, but verbal reminders are usually sufficient to get them in proper position. If a 2-year-old is developmentally immature and cannot follow directions, it may indicate that a recumbent length should be taken instead. Read the stature to the nearest 1/8th inch (1 mm). Record results immediately.

Appendix K

Copy of Procedure from CDC Used for Measuring Weight

BMI: Body Mass Index
Body Mass Index-for-Age (Children)
How to Measure Weight

Children who are 2 years of age or older, cooperative, and able to stand on their own are measured standing.

Equipment:

Infants are weighed using an infant pan or table model scale which is on a level surface. Children who are able to stand without assistance should be weighed using a platform scale. This may be a beam balance scale or a digital (electronic load cell or strain gauge) scale. Scales should be calibrated on a routine basis.

Procedure for weighing children:

1. Remove the child's outer clothing and shoes.

2. Place the scale in the "zero" position before the child steps on the scale.

3. Have the child stand still with both feet in the center of the platform.

4. Read the measurement to the nearest 1/4 pound (100 gms) and record results immediately.