

## Nutrition, Activity, and Health Status of Elementary Children

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### **Abstract**

*Obesity is a global concern with an alarming increase in the rate of overweight children. National statistics indicate that 18.8% of children are overweight. (Centers for Disease Control, 2004; 2007b). Limited data exists for elementary school children in Wisconsin, including Menomonie. Forty-two subjects from two elementary schools participated in the study. Height, weight, body mass index (BMI), triceps skinfold and midarm, and waist and hip circumference were measured. Subjects also completed a survey measuring nutrition knowledge, behavior, and intention as well as diversity in physical activity and attitude. Results indicated 16.7% of children in the study were overweight. Trends indicated there was an increase in the prevalence of overweight children with age as well as gender. As nutrition knowledge increased, intentions toward healthy eating behavior also increased. No correlation existed between nutrition knowledge, behavior, or intentions with respect to some components of diversity of physical activity and their attitude to be physically active. Thus effective interventions for this age group should include nutrition education as well as encouraging an active lifestyle.*

The Centers for Disease Control (Centers for Disease Control, 2004; 2007b) indicate 18.8% of children ages 6 – 11 years are currently overweight. The projected rise in obesity across this population is of utmost concern; especially because studies indicate over 70% of overweight adolescents become overweight adults (Dietz, 2004; United States Department of Health and Human Services, 2001). The extreme rise in the prevalence of childhood obesity has raised the awareness of the issue and has created opportunity for action to be taken to curb this rapidly growing trend and protect the future of our children. The Institute of Medicine (2005) reported the obesity epidemic has impacted each gender as well as all ages, races, and ethnic groups in the United States.

Limited data for the number of children affected by childhood obesity exists for elementary age children in Wisconsin, especially rural communities. The purpose of this study was to assess the prevalence of childhood obesity in order to provide a framework for a longitudinal study in the Menomonie community. It evaluated the extent of childhood obesity among children 6-11 years of age in Menomonie, Wisconsin.

### **Methods**

#### *Participants*

Before data collection began, approval from UW-Stout Institutional Review Board was sought and granted. All public elementary schools in Menomonie, Wisconsin were asked to participate, and two schools volunteered to do so. Grades 1, 3 and 5 were selected to capture various ages in the elementary school population. Additionally, these grades were selected in hope that future studies would be conducted every 2-4 years and capture similar grade intervals for comparison of data. In order to obtain participants, letters were distributed to parents of

children in these grades through school orientation prior to the start of the 2006-2007 school year. Only parent signature on the informed consent was required for participation in the study. However, parents were provided information on the purpose of the study and specific anthropometric measurements. During data collection, parents were not present and any child that expressed concern about participation was not required to continue with participation. Parents were also given the option to have results mailed to them, with a brief explanation of their child's results and contact information for future interpretation.

### *Anthropometric Measurements*

A variety of anthropometric measurements were assessed to provide multiple indicators of a child's health status. Height, weight, calculated BMI, triceps skinfold, midarm circumference, and hip/waist ratio were used to assess the body composition of elementary students. Measurements were collected by trained graduate students and undergraduate assistants from UW-Stout at participating elementary schools in Menomonie, WI.

Height and weight was measured using a portable stadiometer mounted to a calibrated DETECTO physician's scale (model 338) which measured to the nearest millimeter (mm) and kilogram (kg). Height and weight were used to calculate BMI using the metric formula:

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

This calculated BMI was then plotted on the BMI-for-age-and-gender chart produced by Centers for Disease Control (2007) to determine the child's risk category: underweight, normal weight, at risk for overweight, and overweight.

Skinfold and circumference measurements were also used to determine child's health status. Midarm, hip and waist circumference was measured with a calibrated Gulick II measuring tape (model 67020), read to the nearest 0.1 cm and then compared to a reference table (McDowell, Fryar, Hirsch, & Ogden, 2005) to determine body composition. No reference tables for hip circumference exist for children. Triceps skinfold thickness test was measured in triplicate using a Lange skinfold caliper (model 68902). The average value was compared to a reference table (McDowell, et. al., 2005) to determine body composition.

### *Survey Instrument*

The Hearts 'N Parks survey, developed by the National Heart, Lung, and Blood Institute in conjunction with the National Recreation and Park Association (2004), was adapted from the validated CATCH survey and utilized in this study. One feature of the child survey was that it included pictures with the answers making it easier to administer the survey to younger grades (6-11 year olds). Knowledge, attitudes, and behaviors pertaining to nutrition and physical activity can be assessed with this tool by utilizing the answer key provided with the survey. A score was calculated giving one point for each correct answer from which a percent correct value was calculated. The survey was broken down into categories relating to nutrition knowledge, behavior, and attitude, physical activity attitude, and questions regarding diversity of physical activity. These categories were analyzed to determine where interventions should be focused.

### *Data Analysis*

Descriptive analyses (mean, median, standard deviation, standard error, minimum and maximum ranges) were run to profile anthropometric measurements. Cross-tabulation of

frequency counts and percentages between BMI categories and school, gender, and grade were conducted.

Pearson correlation coefficient for age, height, weight, BMI category, triceps, waist, hip and mid arm circumference were analyzed against the variables for nutrition knowledge, nutrition behavior, nutrition intentions, physical activity and activity intentions. Independent t-tests were run to compare nutrition information (knowledge, behavior and intentions) to physical activity within a subject. Levene's test for equal variances was used to check for homogeneity of variances. Independent t-tests were used to determine if there were significant differences between gender and school. Analysis of Variance (ANOVA) with Duncan's and Newman-Keuls range tests looked at the possible correlation between nutrition knowledge, behavior, intentions as well as activity using grade level as the independent variable.

## **Results**

Only two of six elementary schools in the School District of the Menomonie Area participated in this study. From these, a total of 42 students in grades 1, 3 and 5 took part in this study. The following trends, as shown in Table 1, were observed: 1) the risk for children falling into the overweight category tended to increase with grade level and 2) there were noticeably more boys versus girls (as percentage of total) in the healthy weight category compared to other categories. Overall, BMI indicated 16.7% of elementary age children in Menomonie were overweight and 26.2% were at risk for overweight. Other anthropometric measurements, including mid arm circumference, triceps skin fold, and hip and waist circumference, did not show findings different from those determined using BMI (data not shown).

Table 1

*Percentage of Participants' BMI by Grade, Gender and School*

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

*Note:* Values are reported as frequency of the mean, n in parenthesis.

-- Dashes indicate data regarding grade, gender, and school are not provided to protect the participant's identity.

The child survey addressed nutrition knowledge, behavior, and intentions as well as attributes regarding physical activity. Overall, nutrition knowledge was significantly higher than the child’s behavior and intentions to eat healthy as shown in Figure 1.

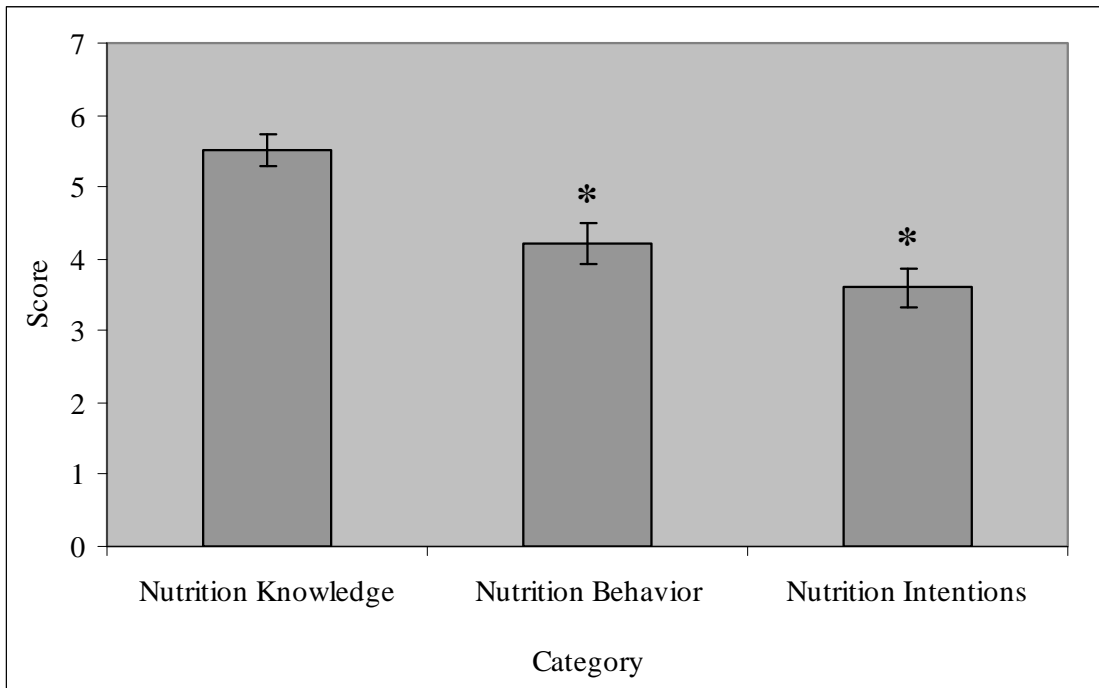
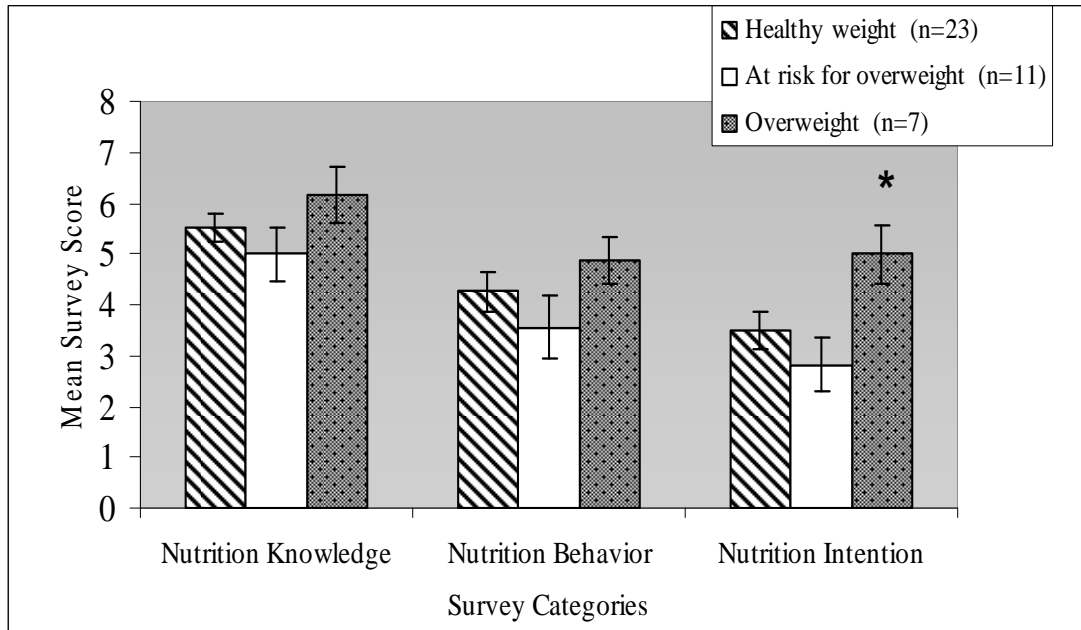


Figure 1. Mean child nutrition survey scores.

\*  $p < 0.05$ , MANOVA indicated significance in nutrition behavior and intentions categories with respect to nutrition knowledge. Values are shown with standard error.

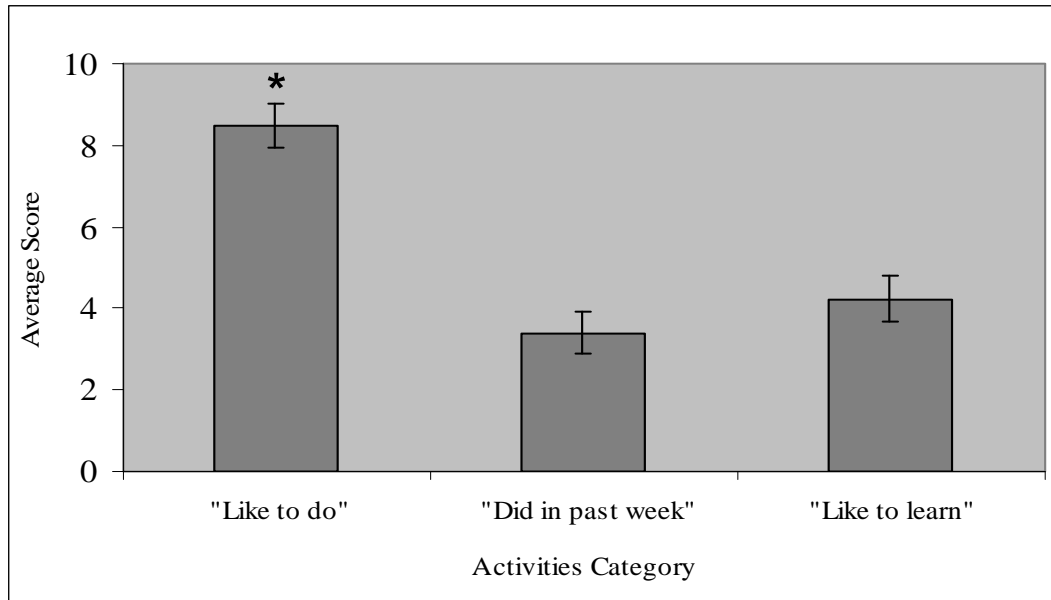
As nutrition knowledge increased, healthy eating behaviors and intentions for eating healthy also tended to increase (data not shown). There was a consistent pattern of overweight children scoring higher than their healthy and at risk for overweight peers in the nutrition subcategories as shown in Figure 2. Intentions to eat healthier among overweight children were greater than their peers. This is an important finding as it may suggest the social pressures felt by these children.



*Figure 2.* Average nutrition survey scores based on health status.  
 \* $p < 0.05$ , one way ANOVA between health status and within survey category is shown with standard error. Underweight category not analyzed due to  $n=1$ .

Nutrition scores were significantly different with respect to grade. This was expected with the increase in cognitive development in higher elementary school grade levels. More appropriately, the analysis of the survey was conducted in regards to gender and school. Independent t-tests indicated no difference between nutrition subcategories for grade and school (data not shown).

Survey results also indicated that the number of different activities children like to do was significantly greater than the number of activities children actually did (Figure 3). Children reported that they like to do 8.48 (mean)  $\pm$  3.44 (standard deviation) different activities every week, but actually only did 3.4 (mean)  $\pm$  3.29 (standard deviation) different activities in the last week. Different activities children like to do were also significantly greater than what children want to learn how to do (mean score 4.24 with standard deviation  $\pm$  3.52, Figure 3), implying that skill development and knowing game rules are less important for this age group.



*Figure 3.* Mean child physical activity scores.

\* $p < 0.05$ , MANOVA indicated significance between “like to do” and categories “did in past week” and “like to learn”. Values are shown with standard error.

## Discussion

Overall, BMI indicated 16.7% of elementary age children in Menomonie were overweight and 26.2% were at risk for overweight. This is consistent with national values which indicate 18.8% of children (ages 6 – 11 years) are currently overweight (Centers for Disease Control, 2004; 2007b) and a single state report stating that 16-18% of children in Wisconsin are overweight while 28-37% are at risk for overweight (Hughes, Murdock, Olson, Juza, Jenkins, Wegner, & Hendricks, 2006). Wisconsin lacks additional information regarding the status of this age group as reported estimates are based on the Youth Health Behavior Risk survey for grades 9-12 (Centers for Disease Control, 2006). Wang (2006) predicts the rate of overweight children could increase to as much as 46% by the end of the decade, contradicting achieving the Healthy People 2010’s goal of reducing childhood obesity to 5% by 2010 (United States Department of Health and Human Services, 2000). Baseline data collected for Menomonie, WI, gives a snapshot of the population and the opportunities to conduct further measurements to determine change. This data will be valuable in determining the effectiveness of future interventions.

No correlation existed between the categories of nutrition or physical activity with health status. While these factors were not affected directly, promoting both nutrition education and physical activity are still key components for lifestyle change. Any intervention should also be multi-faceted (school, family, community). School-based interventions are necessary because this is where children spend the majority of their day. Family- and community-based interventions allow involvement of the family targeting healthy lifestyles to continue at home. Other efforts could target gender, as girls are at greater risk at being overweight (National, Heart, Lung and Blood Institute, 2007). Recommendations for local public health departments and school districts would be to seek grant funding and coordinate with coalitions in their town to implement interventions.

Triceps skinfold and midarm, hip, and waist circumference did not provide information different from that provided by BMI, gender, and age. Thus, the more invasive measures may not be warranted in future studies. This may have been a contributing factor to low participation as parents may have been alarmed at the use of these procedures on their children. Higher participation would allow for comparison between grades at each school, gender within each grade and with state and national data.

#### References

- Centers for Disease Control. (2004). *Prevalence of overweight among children and adolescents: United States, 2003-2004*. Retrieved June 15, 2006, from [http://www.cdc.gov/nchs/products/pubs/pubd/hestats/obese03\\_04/overwght\\_child\\_03.htm](http://www.cdc.gov/nchs/products/pubs/pubd/hestats/obese03_04/overwght_child_03.htm).
- Centers for Disease Control. (2006). *National Health and Nutrition Examination Survey 2001-2002*. Retrieved June 19, 2006, from <http://www.cdc.gov/nchs/nhanes.htm>.
- Centers for Disease Control. (2007a). *Center for Disease Control growth charts: United States*. Retrieved March 15, 2007, from <http://cdc.gov/nchs/about/major/nhanes/growthcharts/background.htm>.
- Centers for Disease Control and Prevention. (2007b). *Overweight prevalence*. Retrieved May 31, 2007, from <http://www.cdc.gov/nccdphp/dnpa/obesity/childhood/prevalence.htm>.
- Dietz, W. H. (2004). Overweight in childhood and adolescence. *New England Journal of Medicine*. 350, 855-857.
- Hughes, P., Murdock, D., Olson, K., Juza, R., Jenkins, K., Wegner, A., & Hendricks, B. (2006). School children have leading risk factors for cardiovascular disease and diabetes: The Wausau SCHOOL project. *Wisconsin Medical Journal*, 105(5), 32-39.
- Institute of Medicine. (2005). *Preventing childhood obesity; Health in the balance*. Washington, DC: The National Academies Press.
- McDowell, M., Fryar, C., Hirsch, R., & Ogden, C. (2005, July 7). Anthropometric reference data for children and adults: United States population, 1999-2002. *Advance Data from Vital and Health Statistics. National Center for Health Statistics*, 361, 1-32.
- National Heart, Lung and Blood Institute. (2007). *Overweight girls at risk for cardiovascular disease*. National Institute of Health News. Retrieved May 10, 2007, from <http://www.nhlbi.nih.gov/new/press/07-01-08.htm>.
- National Recreation and Park Association. (2004). *Hearts n' Parks – report of 2004 magnet center performance data*. United States Department of Health and Human Services. Retrieved June 30, 2006, from [http://nhlbi.nih.gov/health/prof/heart/obesity.hrt\\_n\\_ok/2004\\_report.pdf](http://nhlbi.nih.gov/health/prof/heart/obesity.hrt_n_ok/2004_report.pdf).
- United States Department of Health and Human Services. (2000). *Healthy people 2010: Understanding and improving health*. [Electronic version]. Washington, DC.
- United States Department of Health and Human Services. (2001). *The surgeon general's call to action to prevent and decrease overweight and obesity*. [Electronic version]. Rockville, MD.
- Wang, Y., & Lobstein, T. (2006, March). Worldwide trends in childhood overweight and obesity. [Electronic version]. *International Journal of Pediatric Obesity*, 1, 11- 25.