



Iowa Pilot Intervention Summary Report

School-Age Children's Nutrition &
Physical Activity Project School Years 2005-2007



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**Iowa Pilot Intervention Summary Report
School-Age Children's Nutrition and Physical Activity Project:
School Years 2005-2007**

Introduction

Over the past several decades, the prevalence of overweight and obesity has increased sharply for both adults and children. Nationally, the percentage of overweight children in the United States tripled between 1980 and 2002. Every year more U.S. children are identified as overweight. In 2003–2004, the prevalence of overweight among all U.S. children aged six to 11 years was 18.8 percent and the prevalence of at-risk for overweight was 18.4 percent (National Health and Nutrition Examination Survey (NHANES)).

Although childhood obesity has been a longstanding public health problem, recent increases have raised the level to epidemic proportions. A 2005 Institute of Medicine (IOM) report estimated that approximately nine million children over six years of age were overweight. These findings, based upon measured weight and height, reflect a substantial and alarming increase in childhood obesity.

Despite recommendations for a healthier diet, recent data show that the typical diet of today's children includes foods high in saturated fat, high in calorie dense foods, and low in fruit and vegetable consumption.

Poor dietary patterns and sedentary behaviors are not only linked to obesity, but to the development of a number of seriously disabling and life threatening conditions associated with obesity. For example, a potential complication of childhood overweight is Type 2 Diabetes Mellitus (DM), a condition also increasing by epidemic proportions. Besides Type 2 DM, overweight youth are at-risk of becoming overweight adults with associated problems of coronary artery disease, hypertension, stroke, respiratory problems, gallbladder disease, osteoarthritis, sleep apnea, some forms of cancer, and premature death. These are serious health consequences facing children and families across the nation. In addition, there are associated socioeconomic consequences, such as suboptimal school performance, the potential for decreased productivity across the life course, social stigmatization, and high health care costs.

This epidemic is concerning because being overweight impacts a child's current and future health. Overweight children are more likely to have increased blood pressure, cholesterol, lipid and insulin levels. They are also more likely to be obese as adults.

Promoting regular physical activity and healthy nutrition, as well as creating an environment that supports these behaviors, are essential to addressing the epidemic of overweight and obesity.



Physical Activity

Regular physical activity reduces the risk for heart attack, colon cancer, diabetes, and high blood pressure and may reduce the risk for stroke. It also helps to control weight, contributes to healthy bones, muscles, and joints, and is associated with fewer hospitalizations, physician visits, and medications. Moreover, physical activity need not be strenuous to be beneficial. For example, adults of all ages benefit from moderate-intensity physical activity, such as 30 minutes of brisk walking most days of the week.

Despite the proven benefits of physical activity, nationally about two-thirds of youth are not engaged in recommended levels of physical activity. Daily participation in high school physical education classes dropped from 42% in 1991 to 30.3% in 2007 (CDC, 2007).

The Critical Role of Healthy Nutrition

Research shows that healthy nutrition can help to lower the risk for many chronic diseases. However, a large gap remains between healthy dietary patterns and what Americans actually eat. In 2005, only one-fourth of U.S. adults ate five or more servings of fruits and vegetables each day (CDC, 2007). To help people improve their nutrition behaviors, the U.S. Department of Health and Human Services and the U.S. Department of Agriculture (USDA) have published *Dietary Guidelines for Americans* (<http://www.healthierus.gov/dietaryguidelines>).



Good nutrition begins in infancy. Non-breastfed children are at increased risk for overweight, asthma, and some childhood infections. Healthy eating patterns and physical activity are not only important for optimal growth and development throughout the childhood and adolescent years, but are also critical in the prevention of various health problems. Poor nutrition and sedentary behavior can increase the risk of infections, allergies, and anemia. It can also increase the risk of overweight in childhood, adult obesity, heart disease, and other chronic illnesses. It is important to identify unhealthy nutrition behaviors early in life so that intervention measures may be used to modify and improve children's nutritional intake and physical activity.

In Iowa, local and state entities have become increasingly concerned with the problem of childhood overweight and how to address the problem. The Iowa Department of Public Health (IDPH) has developed and implemented a comprehensive nutrition and physical activity plan for the prevention of obesity. The Iowans' Fit for Life Intervention, one component of Iowa's Comprehensive Nutrition and Physical Activity Plan, is a pilot project based on scientific evidence

and theory. Its purpose, within the context of the Centers for Disease Control (CDC)-funded Nutrition and Physical Activity to Prevent Obesity and Other Chronic Diseases project, is to implement and evaluate a nutrition and physical activity intervention.

The long term objective of the nutrition and physical activity plan is to develop a model program that will support and sustain the healthy lifestyle behaviors of eating more fruits and vegetables daily and being physically active 60 minutes every day that can be replicated in other communities.

Schools and their respective communities across the State of Iowa are participating in the nutrition and physical activity project. Students, school personnel, parents, and communities are encouraged to be a part of the intervention. Program evaluation includes consistent measures across time and follows relevant outcomes over several years.

The overall goals of the nutrition and physical activity project are to:

- Move children towards the healthy lifestyle behaviors of eating more fruits and vegetables daily to meet the recommendations from the 2005 Dietary Guidelines for Americans.
- Move children towards being physically active 60 minutes per day.

Following the socio-ecological model, the pilot intervention strategies were applied at four different levels: community, organization, interpersonal, and



Figure 1: Social Ecological Model

individual. At the community level, strategies included community or county health coalitions, media, and retail point of purchase. At the organizational level, strategies included school procedures and environment. At the interpersonal

level, strategies included parental involvement, and school to home initiatives. At the individual level, strategies included curriculum implementation, fruit and vegetable tasting opportunities, physical activity opportunities, incentives, and social support.

Twelve schools were randomly assigned to one of four programmatic groups.

- 1) Three schools had no formal program for the first two years (i.e., 2005-2007).
- 2) Three schools participated in the Free Fresh Fruit and Vegetable Program funded through United States Department of Agriculture (USDA) in cooperation with Iowa Department of Education (DOE).
- 3) Three schools participated in an Iowa Department of Public Health (IDPH) school and community program.
- 4) Three schools participated in the Free Fresh Fruit and Vegetable Program plus an IDPH school and community program.



Program Evaluation

Program evaluation surveys have been completed biannually by students, parents, teachers, food service staff, school nurses, principals, and community members. Qualitative evaluation consists of documenting teacher training feedback, community forums, and community coalition meetings. Teachers and staff have completed surveys of actual implementation, feedback on program elements, and a school assessment of the nutrition and physical activity environment.

At the Spring, 2007, assessment there was an excellent consented response rate. The consented response rate across all 12 schools ranged from 51.9 percent to 91.4 percent. See the Appendix for the participation rates across the 12 schools.

Measures and Measurement Instruments



The project is evaluated using both quantitative and qualitative measures obtained from different levels of influence (i.e., individual, family, school, community). The current report details quantitative outcome evaluation information from students and parents. Individual measures of Body Mass Index (BMI) serve as one of the primary student outcome measures and are obtained directly through visits to schools. Parent surveys are sent to the home and returned in sealed envelopes. Details on the assessments are provided below.

Student-level Individual Measures

Body Mass Index (BMI)

Anthropometric measures were obtained using standard techniques with stadiometers and scales. Measurement is conducted by IDPH staff who have been trained in the procedure.

- *Height* is measured with the student standing erect, without shoes, and with weight distributed evenly between both feet, heels together, arms relaxed at the sides, and the head in the Frankfort horizontal plane.
- *Weight* is measured with the student in pants, T-shirt (no shoes).

BMI is calculated from measured height and weight, plus birth date. Gender-specific BMI scores are used as one of the primary outcome measure since this has been shown to have the best sensitivity and specificity for classifying children that are overweight (Institute of Medicine, 2006).

Physical Activity Measures

Children's Physical Activity Correlates. A self-reported group of scales, the Children's Physical Activity Correlates (CPAC) (Welk, Schaben, & Shelley, 2004), was used to collect data on physical activity. The multi-dimensional scale captures an array of correlates of youth physical activity. The concepts are based on principles from social cognitive theory but are operationalized to be more relevant to children. Concepts in the scale are assessed using a structured alternative format to reduce tendencies for socially desirable responses (i.e., "Really true for me"; "Sort of true for me"). The psychometric properties of the component scales include:

- Attraction to Physical Activity

Five items from the Children's Attraction to Physical Activity (CAPA) scale were used to assess outcome expectations for physical activity (i.e., the value or benefit associated with regular participation). A previous study (Welk, Wood, & Morss, 2003) found that a composite measure based on a mean of 15 items (i.e., three from each of the original five scales) yielded a unidimensional construct with an alpha reliability of .82.

- Perceived Competence

Harter's Perceived Competence Scale was used to assess efficacy expectations (i.e., confidence in being able to be physically active).

The original scale includes five items, but past research (Welk et al., 2003) found that a reduced scale consisting of three items was sufficient to represent the construct. The alpha reliability of the reduced scale was .71.

- Parental Influence

Parental influence was assessed with four scales (three items per scale) that measured different dimensions of parental influence (i.e., role modeling, encouragement, involvement, and facilitation). For the present study, a composite indicator of parental influence was computed by taking the mean from the four different scales. The alpha reliability of the composite scale from previous research (Welk et al., 2003) was .81.



Physical Activity Questionnaire for Children. The Physical Activity Questionnaire for Children (PAQ-C) (Crocker et al., 1997; Kowalski et al., 1997a; Kowalski et al., 1997b) is designed to provide an overall indicator of physical activity in children. The instrument consists of nine items that capture a child's "typical" level of activity in different settings and different times. The PAQ-C is designed to evaluate the child's activity in the last seven days but can also be used to assess the "typical" level of physical activity. The scale uses a series of 10 questions that assess activity habits at different times of the day (i.e., both in and out of school, as

well as on evenings and weekends). Each question is scored on a 1 - 5 scale and the average of all 10 items is used to represent the activity level of the child. Thus, each question has an equal weight in the final score. While the score on the questionnaire does not provide a way to calculate time or calories spent in activity, it can be used to distinguish between active and inactive children or to demonstrate changes over time.

Nutrition Measures

Fruit and Vegetable Consumption. A food frequency instrument developed specifically for younger children (Cullen & Baranowski, 2003) was used. The seven survey items evaluate children's frequency of consumption from "Never" to "4 times per day" for each food item.



Food Preferences. The Food Preferences Survey for Children (Baranowski 1994) was used to track changes in food preferences that may be antecedent to changes in actual fruit and vegetable (FV) consumption. The survey included a list of FVs that children may or may not be familiar with. Items coded as "*I don't know what this is*" were

tracked for changes in awareness of FV. The mean of the remaining items (scored on a three point scale) reflect preferences.

Results

Sample

The majority of children involved were white, non-Hispanic (95.8%). Hispanic and African Americans made up approximately 1% of the sample, 1.3% were Asian, and 1% were Native American or of other ancestry. A large percentage of the children in the intervention come from a two parent household. Of those returning surveys, 71.8% of children come from a two parent household, 16.3% reported one parent and one step parent, and 11.9% of children are not currently living in a two parent household.

Body Mass Index

Height and weight measurements were taken to calculate each student's BMI. BMI is defined with the following equation: $[\text{weight in pounds} \div \text{height in inches} \times \text{height in inches}] \times 703$. More precisely, the percent overweight and the percent at risk for becoming overweight were determined by comparing the students' BMI to age-based and gender-specific national norms. Overweight is defined as a BMI at or above the 95th percentile by age; at risk for overweight is defined as a BMI between the 85th and less than 95th percentile by age.

Among the 3rd through 5th grade Iowa youth participating in the project measured during the Spring, 2007, assessment (1,202 students), 62.3 percent had a normal BMI; 19.6 percent were considered at risk for overweight; and 18.1 percent were considered overweight.

- Mean BMI-for-age percentile of the 3rd grade students was 64.2 (Girls- 62.5%; Boys- 65.7% (see Figures 2 and 3).
- Mean BMI-for-age percentile of the 4th grade students was 70.9 (Girls-72.2%; Boys-69.8%) (see Figures 2 and 3).
- Mean BMI-for-age percentile of the 5th grade students was 67.3 (Girls- 68.1%; Boys- 66.3% (see Figures 2 and 3).
- Sixty-six percent of 3rd grade boys, 57 percent of 4th grade boys, and 65 percent of 5th grade boys were in the normal BMI-for-age range (see Figures 4, 5, and 6).
- Sixty-five percent of 3rd grade girls, 60 percent of 4th grade girls, and 62 percent of 5th grade girls were in the normal BMI-for-age range (see Figures 4, 5, and 6).

Figure 2. BMI prevalence rates by grade among 3rd – 5th grade students, Spring, 2007 (N=1,202).

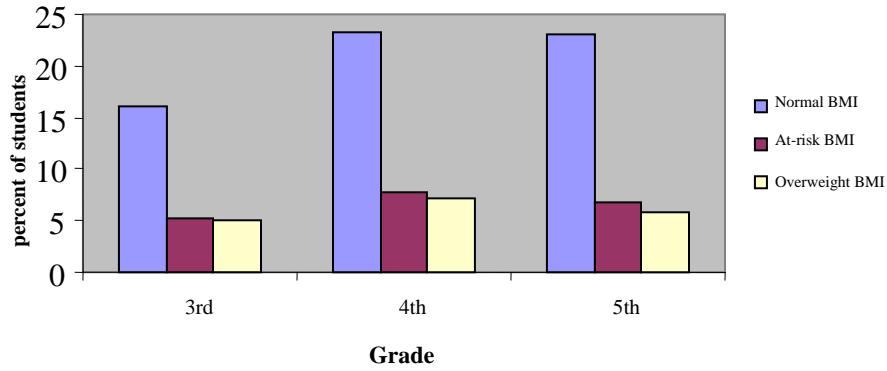


Figure 3. BMI prevalence rates by gender among 3rd – 5th grade students, Spring, 2007 (N=1,202).

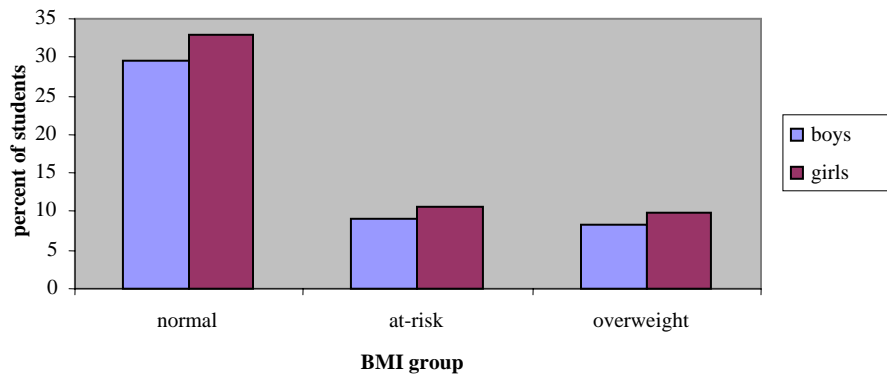
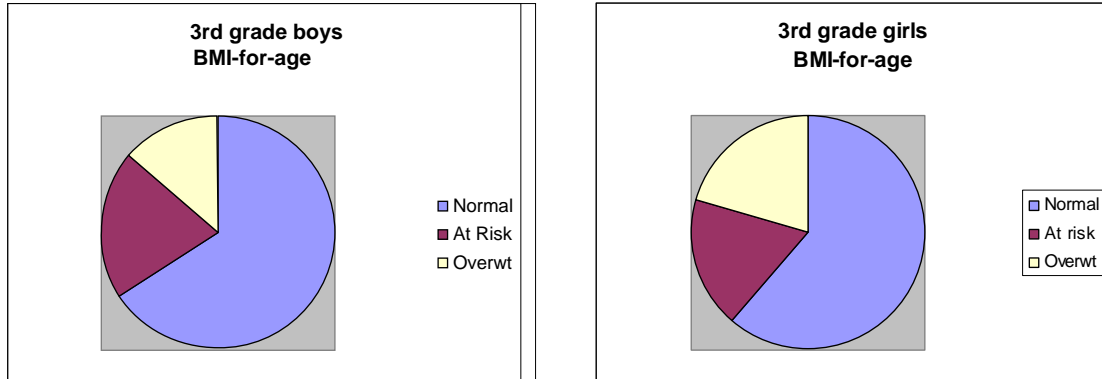


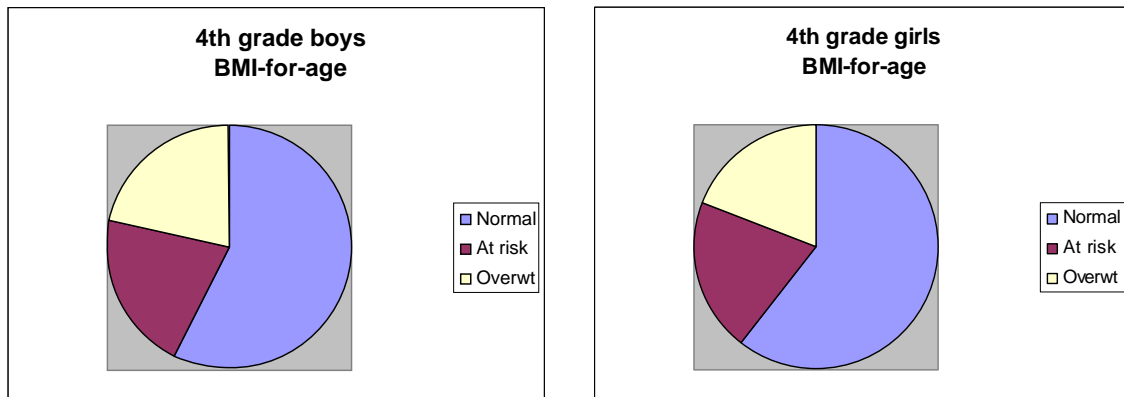
Figure 4 indicates approximately 34% of 3rd graders were overweight or at risk for overweight according to the Centers for Disease Control BMI-for-age charts.

Figure 4. BMI prevalence rates among 3rd grade students by gender, Spring, 2007.



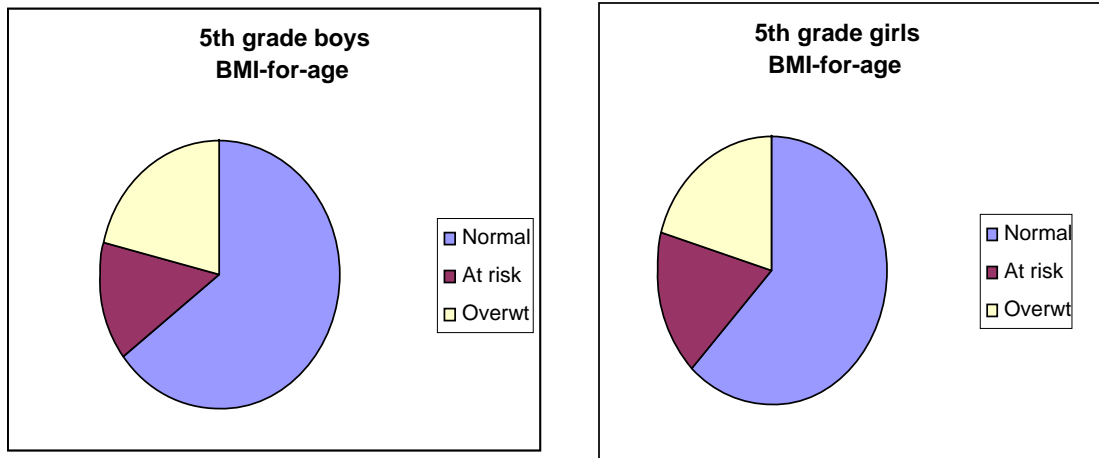
Approximately 38% of 4th graders were overweight or at risk for overweight according to the Centers for Disease Control BMI-for-age charts (Figure 5).

Figure 5. BMI prevalence rates among 4th grade students by gender, Spring, 2007.



The figures below indicate approximately 35% of 5th graders were overweight or at risk for overweight according to the Centers for Disease Control BMI-for-age charts.

Figure 6. BMI prevalence rates among 5th grade students by gender, Spring, 2007.



Youth Physical Activity

Physical activity was measured by items on the student self-reported PAQ-C and CPAC, plus pedometer step counts. Findings from the Spring, 2007, CPAC scales included significant differences. Fifth grade students in the intervention group receiving both programs (i.e., USDA and IDPH) had higher scores on the Attraction to Physical Activity Scale; 5th grade students in the condition receiving the IDPH program only had higher scores on the Parental Influence Scale (Table 1). Other significant findings include:

- Boys had higher physical activity competence than girls
- Boys had higher physical activity self esteem than girls

Table 1. Change score for the Children’s Physical Activity Correlates scales by group*

	No Program	USDA	IDPH	Both USDA & IDPH
Scales	Mean(SD)	Mean(SD)	Mean(SD)	Mean(SD)
Attraction to Physical Activity *	-.13 (.38)	-.01(.46)	.08 (.46)	.27 (.49)
Perceived Competence	-.24 (.58)	-.08 (.65)	.01 (.60)	.02 (.60)
Parental Influence*	-.03 (.37)	.24 (.43)	.30 (.41)	.19 (.65)
Self Esteem	-.04 (.70)	-.02 (.64)	.13 (.87)	.07 (.77)

* statistically significant.

5th grade only; Change from Fall, 2005 – Spring, 2007

Figure 7 illustrates scores on the Parental Influence scale by the specific BMI group (i.e., normal, at risk for overweight, overweight) for 4th and 5th grade students at the Spring, 2007, assessment. For the most part, students who had

high or moderate scores on the scale were in the normal BMI group. A small percentage of students who were considered overweight scored low, moderate, or high on the scale.

Figure 7. BMI prevalence rates by Parental Influence Scale among 4th and 5th Students, Spring, 2007.

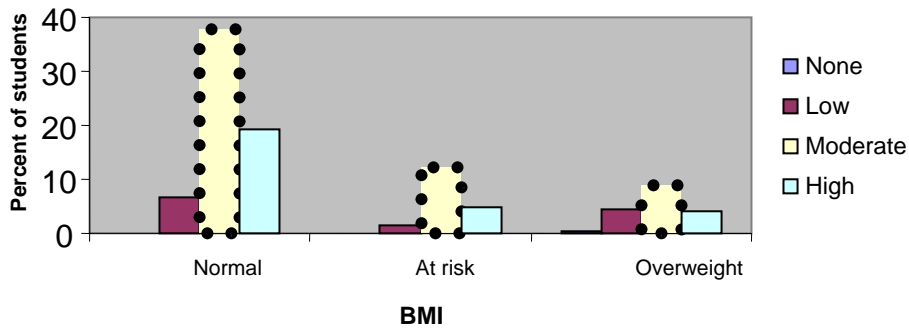


Figure 8 illustrates the Perceived Competence Scale scores (i.e., none, low, moderate, high) by BMI group (i.e., normal, at-risk for overweight, overweight) among 4th and 5th grade students at the Spring, 2007, assessment. Generally, students who had high or moderate scores on the Perceived Competence Scale were in the normal BMI group. In addition, a small but almost equal percentage of students who scored low, moderate or high on the Perceived Competence Scale were in the overweight group.

Figure 8. BMI prevalence rates by Perceived Competence Scale among 4th and 5th Grade Students, Spring, 2007.

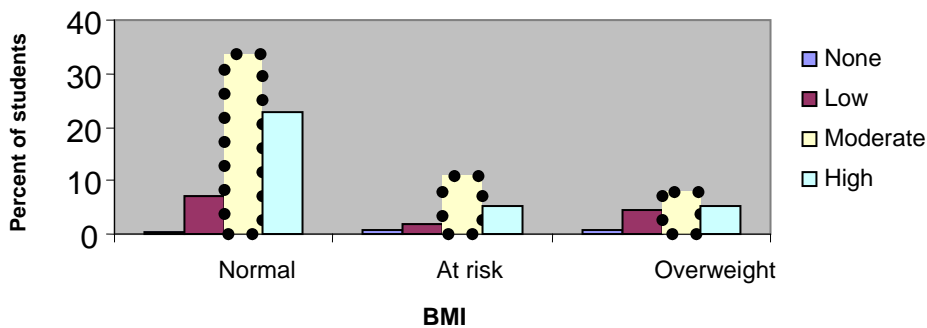
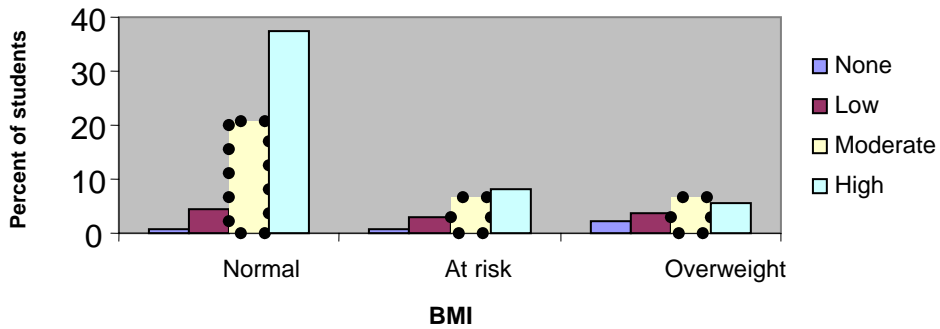


Figure 9 illustrates the Self Esteem Scale scores (i.e., none, low, moderate, high) by BMI group for 4th and 5th grade students at the Spring, 2007, assessment.

Generally, students who had high scores on the Self Esteem Scale were in the normal BMI group. An almost equal percentage of students who scored low on the scale were distributed across all three BMI groups.

Figure 9. BMI prevalence rates by Self Esteem Scale among 4th and 5th grade students, Spring, 2007.



Overall PAQ-C scores (i.e., inactive, somewhat active, very active) by gender for 5th grade students at the Spring, 2007, assessment are displayed in Figure 10. A higher percentage of girls compared with boys self-described as “somewhat active”. In addition, an equal percentage of boys self-described as “somewhat” to “very” active.

Figure 10. Physical activity levels by gender among 5th grade students, Spring, 2007.

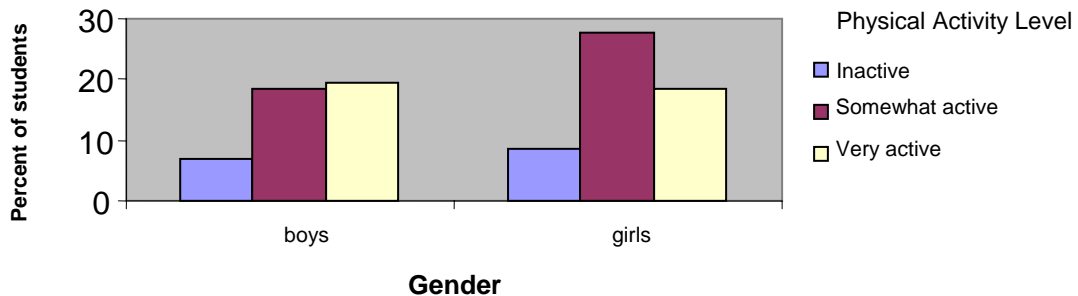


Table 2 illustrates change scores from baseline (Fall, 2005) to Wave 4 measurement (Spring, 2007) for several of the questions on the PAQ-C in which students were asked about their level of physical activity in the past week. The

total PAQ-C is scored on a scale of 1 “no activity” to 5 “very active.” A significant difference was found on the daily activity level question. Students in the group receiving the USDA intervention had a greater change in physical activity level than students in the other groups. In addition, students in the IDPH group had a greater change in physical activity in the preceding week than students in the other groups (i.e., 1.08). A greater percentage of girls compared to boys reported more intense levels of physical activity on the seven items. The greatest difference between boys and girls was found for the question related to activity levels during physical education classes (i.e., 38.9% for boys, 46.2% for girls).

Table 2. Change score for Physical Activity Questionnaire for Children by group*

	No Program	USDA	IDPH	Both USDA & IDPH
In the last 7 days:				
During your physical education classes, how often were your very active?	-.07	-.39	.17	.02
What did you do most of the time when you had recess?	.26	.24	-.31	.12
*On how many days right after school, did you do sports, dance or play games in which you were very active?	.12	.03	.86	.39
On how many evenings, did you do sports, dance or play games in which you were very active?	.33	.31	1.03	.64
During the last weekend, how many times did you do sports, dance or play games in which you were active?	.19	-.18	-.03	.35
How often you did physical activity (sports, dance, games) each day last week. *	.56	.09	1.08	.28

* statistically significant
5th grade only; change from Fall, 2005 – Spring, 2007

Table 3 illustrates gender differences for several of the questions on the PAQ-C in which students were asked about their level of physical activity in the past week. For the most part, a greater percentage of girls compared to boys reported more intense levels of physical activity on the seven items. The greatest difference between boys and girls was found for the question related to activity levels during physical education classes (i.e., 38.9% for boys, 46.2% for girls).

Table 3. Physical activity by gender*

	Boys %	Girls %
In the last 7 days:		
During your physical education classes, how often were you very active? ("quite often" to "always")	38.9%	46.2%
What did you do most of the time when you had recess? ("ran around and played quite a bit" to "ran and played hard most of the time")	38.9	46.2
On how many days right after school, did you do sports, dance or play games in which you were very active? ("4 times last week" to "5 times last week")	27.6	29.3
On how many evenings, did you do sports, dance or play games in which you were very active? ("4 times last week" to "5 times last week")	24.0	26.8
During the last weekend, how many times did you do sports, dance or play games in which you were active? ("4 times last week" to "5 times last week")	27.2	28.7
Which one of the following describes you best for the last 7 days? ("I quite often did physical things in my free time" to "I very often did physical things in my free time")	28.0	29.9

* statistically significant

Figure 11 illustrates scores on the Physical Exercise (PE) Class Activity Level Scale by the specific BMI group (i.e., normal, at risk for overweight, overweight) for 4th and 5th grade students at the Spring, 2007, assessment. For the most part, the greatest percentage of students who were the most active (i.e., “quite often” to “always”) during PE class were in the normal BMI group. A significantly smaller percentage of students who were the most active were considered overweight or at risk for overweight.

Figure 11. BMI prevalence rates by PE class activity level among 4th and 5th Grade Students, Spring, 2007.

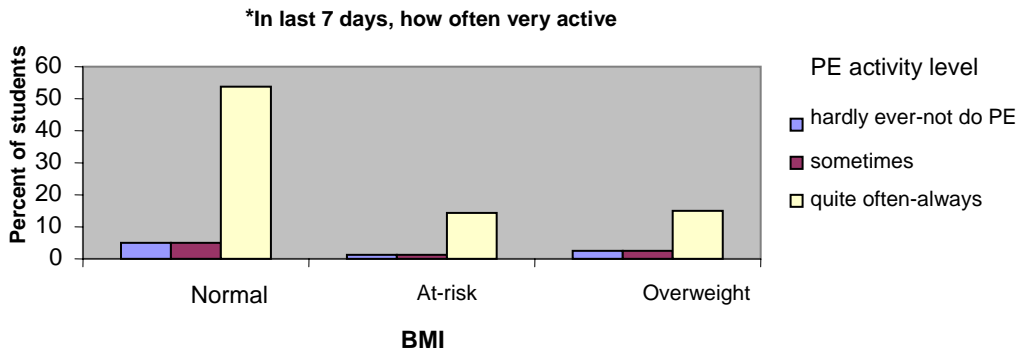


Figure 12 highlights the after school activity level scores by the BMI group for 4th and 5th grade students at the Spring, 2007, assessment. Generally, students who were in the normal BMI group indicated engaging in the denoted activities after school four to five times in the past week. A higher percentage of students who were considered at risk for overweight indicated engaging in the activities after school never or only one time in the past week.

Figure 12. BMI prevalence rate by after school activity level among 4th and 5th grade students, Spring, 2007.

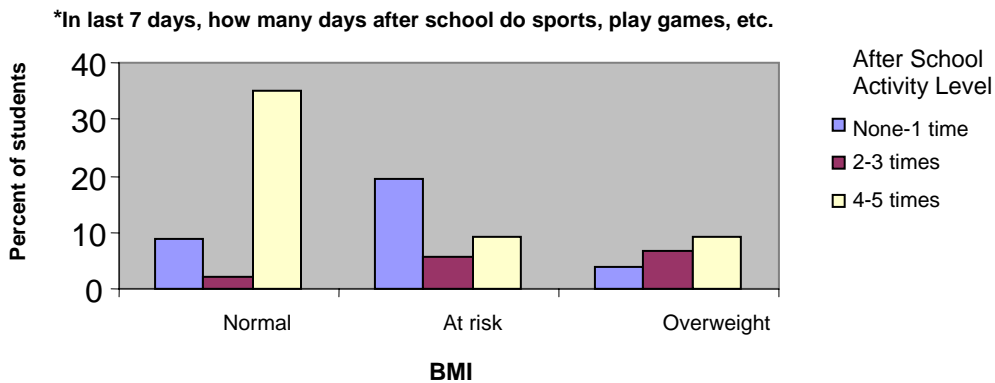


Figure 13 illustrates the evening activity level scores by the specific BMI group for 4th and 5th grade students at the Spring, 2007, assessment. Largely, students who engaged in evening activities 4 to 5 times in the past week were in the normal BMI group. A much smaller percentage of students who were considered overweight or at risk for overweight engaged in the evening activities.

Figure 13. BMI prevalence rates by evening activity level among 4th and 5th grade students, Spring, 2007

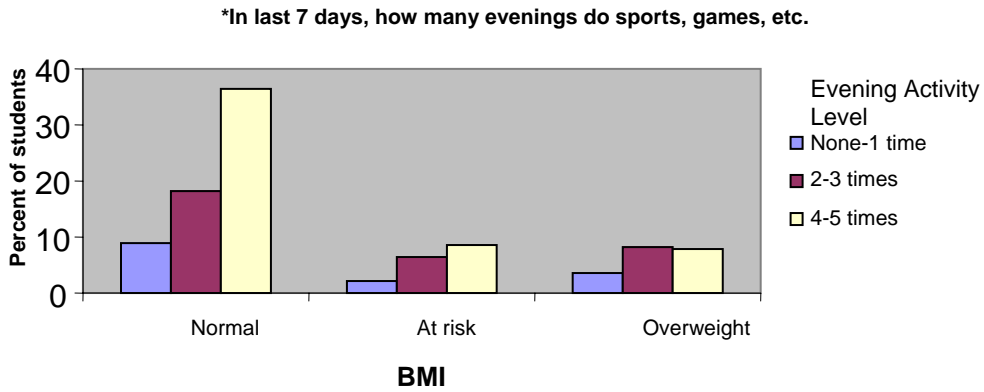
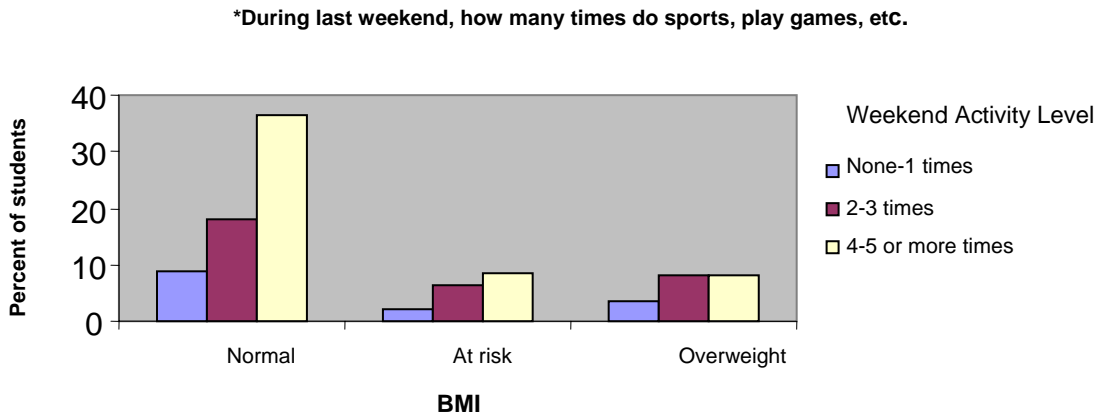


Figure 14 points out the weekend activity level scores by the BMI group. Typically, students who were in the normal BMI group engaged in weekend activities four to five times during the past week. A smaller percentage of students who were considered overweight or at risk for overweight engaged in weekend activities.

Figure 14. BMI prevalence rates by weekend activity level among 4th and 5th grade students, Spring, 2007.



Pedometer Counts

Pedometers were worn by 4th and 5th grade students for a total of four days. Average steps per day for this age group are 11,000 to 14,000 steps per day (President's Council on Physical Fitness and Sports, 2002).

There were significant differences in pedometer steps by school, group, and gender ($p < .05$). Figure 15 illustrates average daily pedometer steps by gender for both 4th and 5th grade students at the Spring, 2007, assessment at eight schools only. Significant differences were found between boys and girls between Day 1 and Day 4. Overall, boys had higher average daily pedometer steps than girls.

Figure 15. Daily pedometer steps among 4th and 5th grade students by gender, Spring, 2007*

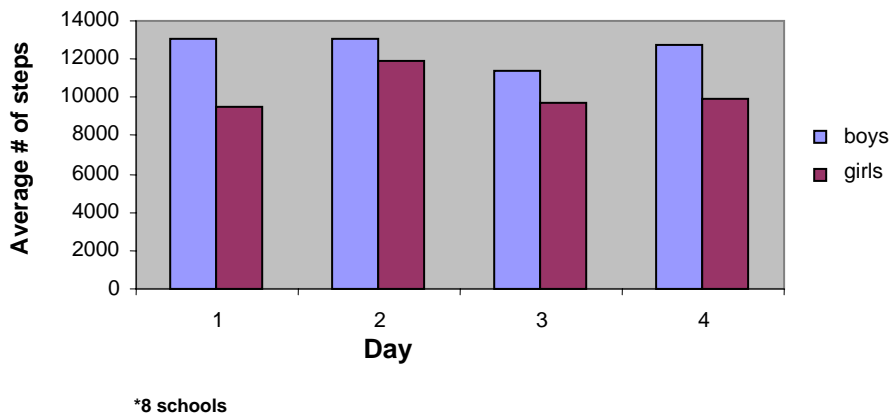


Figure 16 illustrates average daily pedometer steps by the BMI group (i.e., normal, at risk for overweight, overweight) for both 4th and 5th grade students at the Spring, 2007, assessment for eight schools only. For three of the four days, students who were in the normal BMI group had a higher pedometer step rate than the overweight or at risk for overweight BMI groups. However, the differences were small between the average daily number of steps and the BMI groups across the four days and were not statistically significant.

Figure 16. Daily pedometer steps among 4th and 5th grade students by BMI group, Spring, 2007

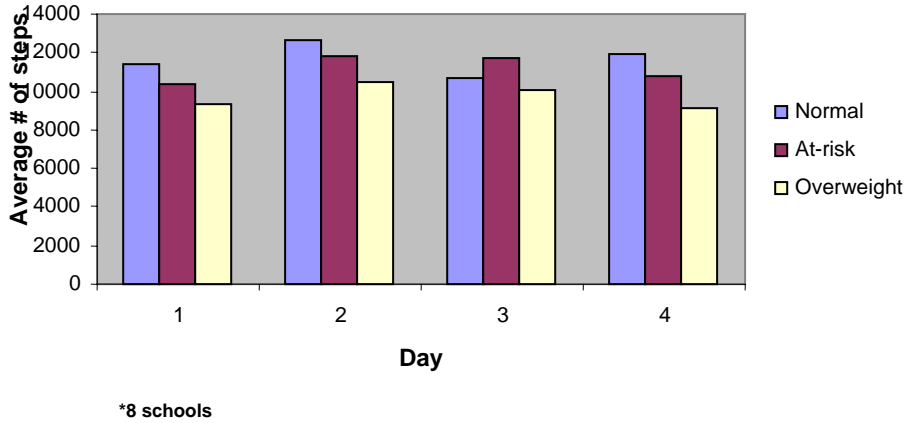
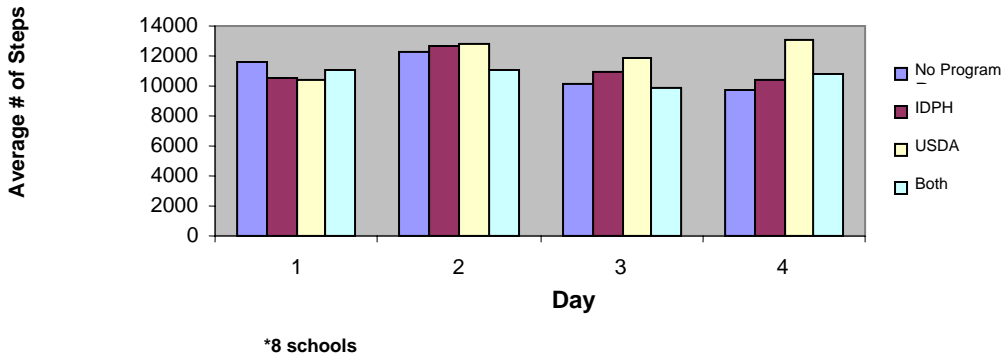


Figure 17 illustrates average daily pedometer steps by the program intervention group (i.e., control, IDPH, USDA, both) for both 4th and 5th grade students at the Spring, 2007, assessment for 8 schools only. For three of the four days, students who were in either the IDPH or the USDA program intervention group had a higher daily pedometer step rate than the remaining two groups, although it was statistically non-significant. This trend was demonstrated for the final three days of the pedometer assessment.

Figure 17. Daily pedometer steps among 4th and 5th grade students by group, Spring, 2007*



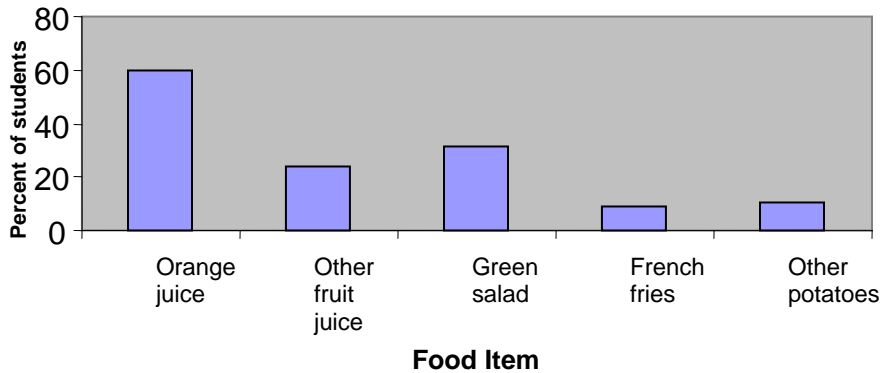
Youth Fruit and Vegetable Consumption

Fruit and Vegetable Frequency Survey. Fruit and vegetable consumption was measured by child self-report. A univariate analysis of fruit and vegetable

consumption with community entered as a random effect did indicate significant differences between schools' mean values of fruit and vegetable consumption.

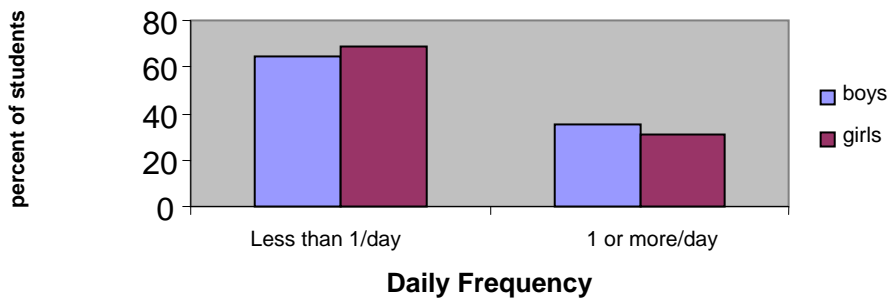
At the Spring, 2007, assessment, 59.5 percent of Iowa 4th and 5th grade students drank orange juice at least once each day and 24 percent of children drank other 100% fruit juice at least once daily; 31.1 percent ate green salad at least once daily; 9.1 percent ate French fries at least once daily; and 10.5 percent ate mashed, baked, or boiled potatoes at least once daily (Figure 18).

Figure 18. Daily food frequency among 4th and 5th grade students by group, Spring, 2007



At the Spring, 2007, assessment, an almost equivalent percent of boys and girls drank orange juice less than once daily (i.e., boys 64.8%, girls 69.1%, respectively), as well as once or more than once daily (Figure 19).

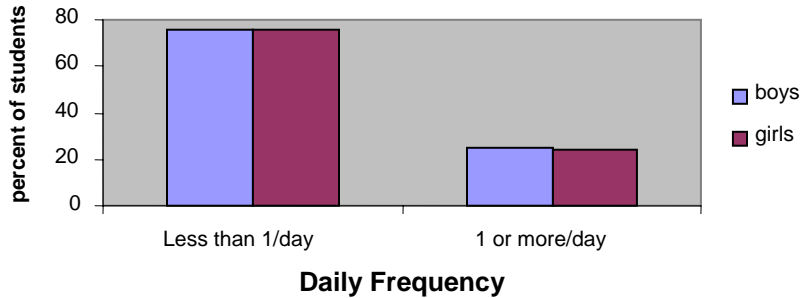
Figure 19. Daily orange juice frequency by gender, Spring, 2007



At the Spring, 2007 assessment, an almost equivalent percent of boys and girls drank 100% fruit juice (other than orange juice) less than once daily (i.e., boys 75.3%, boys 76%) as well as once or more than once daily (Figure 20). According to a study in the *Archives of Pediatrics & Adolescent Medicine* (2008), children ages 2 to 11 years old who consume 100% juice daily have better nutrient intake without an increased risk for overweight or obesity. In an analysis of data from the National Health and Nutrition Examination Survey (1999-2002), the juice consumption of

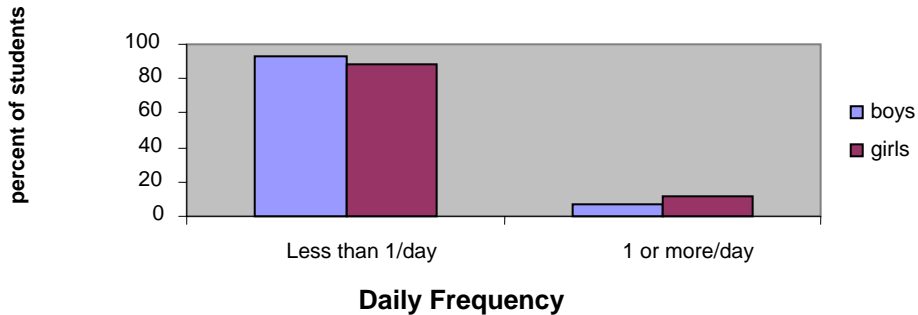
3,618 children 2 to 11 years of age was evaluated. Mean daily juice consumption was 4.1 fluid ounces. Compared with children not drinking 100% juice, those who did had significantly higher intakes of energy, carbohydrates, vitamins C and B₆, potassium, riboflavin, magnesium, iron, and folate; intakes of total fat, saturated fatty acids, discretionary fat, and added sugar were significantly lower. Compared with nonconsumers, children who drank 100% juice also consumed significantly more servings of total whole fruit.

Figure 20. Daily 100% juice frequency by gender, Spring, 2007



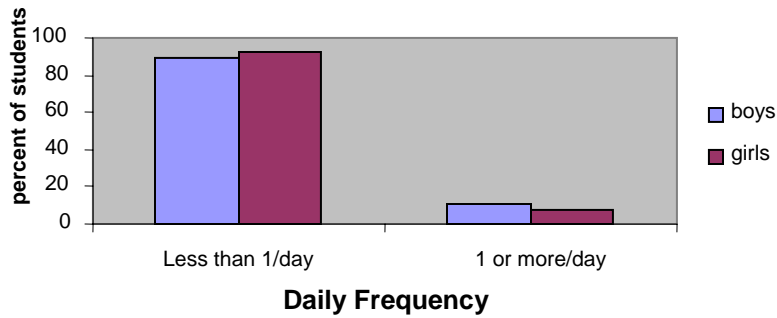
At the Spring, 2007 assessment, an almost equivalent percent of boys and girls ate green salad less than once daily (i.e., boys 92.9%, girls 88.8%) (Figure 21).

Figure 21. Daily green salad frequency by gender, Spring, 2007



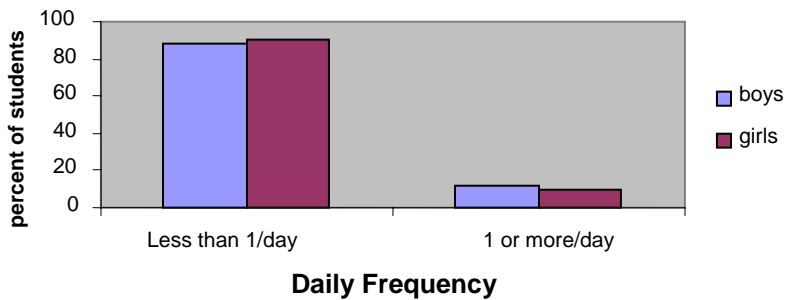
At the Spring, 2007 assessment, an almost equivalent percent of boys and girls ate French fries less than once daily (i.e., boys 89%, girls 92.7%, respectively) (Figure 22).

Figure 22. Daily French fry frequency by gender, Spring, 2007



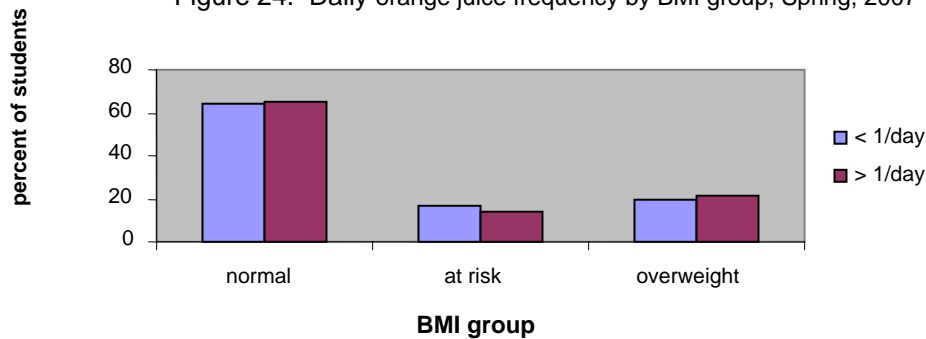
An almost equivalent percent of boys and girls ate baked, boiled, or mashed potatoes less than once daily (i.e., boys 88.2%, girls 90.1%, respectively) (Figure 23).

Figure 23. Daily baked/boiled/mashed potatoes frequency by gender, Spring, 2007



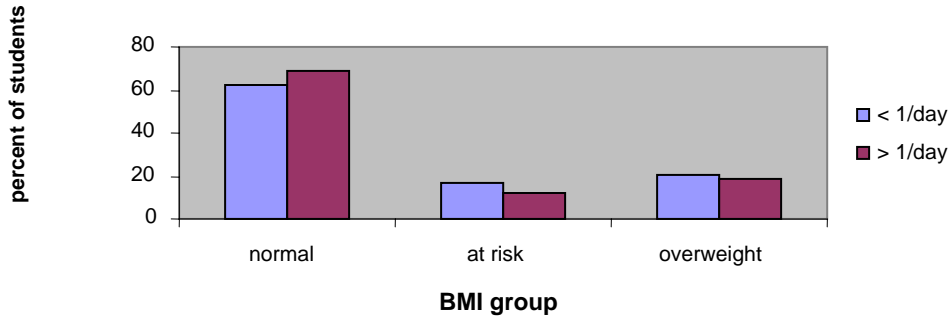
At the Spring, 2007, assessment, an almost equivalent percent of children across the three BMI groups (i.e., normal, at risk, overweight) drank orange juice less than once daily (i.e., 63.8%, 17%, 19.1%), as well as once or more than once daily (Figure 24).

Figure 24. Daily orange juice frequency by BMI group, Spring, 2007



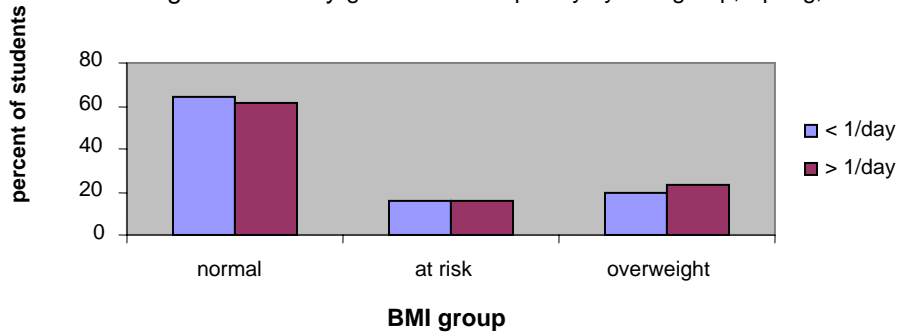
An almost equivalent percent of children across the three BMI groups drank 100% fruit juice (other than orange juice) less than once daily (i.e., 62.7% normal, 17.2% at risk, 20.1% overweight), as well as once or more than once daily (Figure 25).

Figure 25. Daily 100% juice frequency by BMI group, Spring, 2007



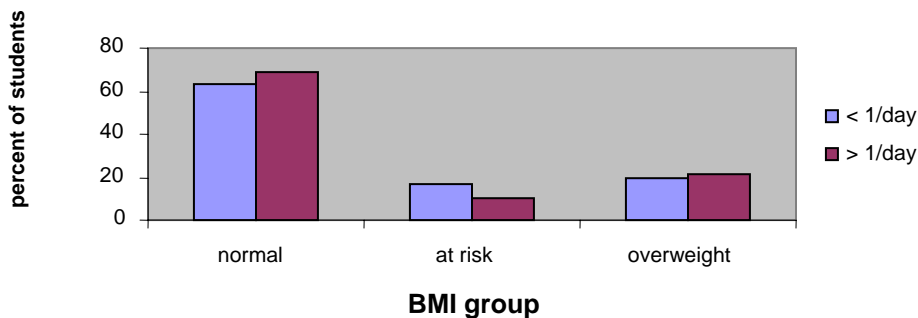
At the Spring, 2007, assessment, an almost equivalent percent of children across the three BMI groups (i.e., normal, at risk, overweight) ate green salad less than once daily (i.e., 64.6%, 15.8%, 19.5%) (Figure 26).

Figure 26. Daily green salad frequency by BMI group, Spring, 2007



Across the three BMI groups (i.e., 63.6%, normal, 16.6% at risk, 19.8% overweight) ate French fries less than once daily (Figure 27).

Figure 27. Daily French fries frequency by BMI group, Spring, 2007



At the Spring, 2007, assessment, an almost equivalent percent of children across the three BMI groups (i.e., normal, at risk, overweight) ate baked, boiled, or mashed potatoes (i.e., 64.4%, 16.4%, 19.1 (Figure 28).

Figure 28. Daily baked/boiled/mashed potatoes frequency by BMI group, Spring, 2007

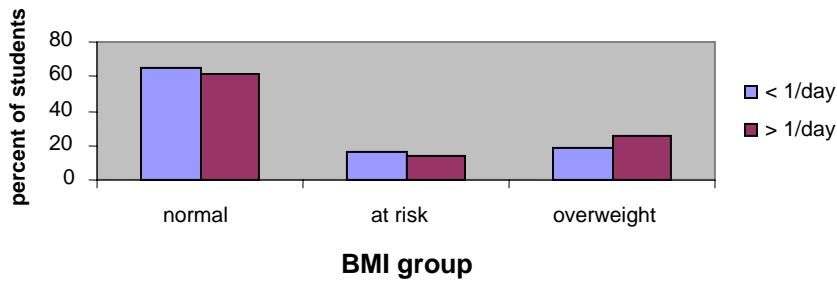


Table 4 illustrates Wave 4 scores on the fruit and vegetable frequency measure (Spring, 2007) controlling for the child’s score on the Wave 3 measure. A significant difference was found on the frequency of eating green salad; students in the group receiving the USDA intervention reported eating green salad more frequently than students in the other groups. In addition, students in the USDA group reported eating French fries (other fried potatoes) and baked/boiled/mashed potatoes more frequently than students in the other groups.

Table 4. School-level fruit and vegetable consumption by group

	No Program	USDA	IDPH	Both
In the past month, about how often did you:				
Drink 100% orange juice or grapefruit juice?	1.19	1.22	1.28	1.04
Drink 100% fruit juice not counting fruit drinks?	.73	.90	.97	.59
Eat green salad? +	.38	.46	.39	.42
Eat French fries or fried potatoes?*	.41	.56	.47	.47
Eat baked, boiled or mashed potatoes?*	.36	.63	.36	.42

* statistically significant; + marginally statistically significant
Time 4 controlling for Time 3 score

Youth Fruit and Vegetable Preferences

The survey included 17 questions to measure preferred fruit items, (e.g., apples, kiwis, carrots, spinach, strawberries, and winter squash) and 17 items to

measure preferred vegetable items (e.g., cucumber, green beans, lettuce, celery, and tomato). Each item was featured in the school-based curriculum. The preferences section reflected the items featured in the intervention. The preferences scale had three response categories and were coded as follows: 1="I don't like it," 2="I like it a little," and 3="I like it a lot." A fourth response category (i.e., 0="I don't know what it is") was excluded to assess preferences.

Table 5 shows Wave 4 mean preferences scores for the fruit items; Table 6 shows Wave 4 mean preferences scores for the vegetable items. At Wave 4, apples and corn had the highest mean scores (i.e., 2.81 and 2.81). Change scores between fruit and vegetable preferences between wave 3 and wave 4 were calculated. Significant differences were found between the intervention groups for three fruit items (i.e., apricots, grapes, and plums) and 2 vegetable items (i.e., broccoli and cucumbers).

Table 5. Fruit item means and standard deviation*

Fruit	Mean	Standard deviation
Apple	2.81	.45
Applesauce	2.54	.70
Apricot	1.69	.78
Banana	2.62	.62
Cantaloupe	2.27	.84
Fruit cocktail	2.13	.83
Grapes	2.78	.51
Kiwi	2.43	.77
Orange	2.62	.63
Mango	2.00	.87
Peach	2.35	.80
Pear	2.45	.75
Pineapple	2.43	.78
Plum	1.90	.87
Strawberry	2.68	.64
Tangerine	2.22	.86
Watermelon	2.72	.60

*4th and 5th grade students, Spring, 2007

Table 6. Vegetable item means and standard deviation*

Vegetable	Mean	Standard deviation
Avocado	1.53	.77
Potato	2.54	.69
Pepper	1.90	.86
Broccoli	2.17	.85
Carrots	2.57	.66
Cauliflower	2.07	.88
Celery	2.10	.85
Coleslaw	1.77	.89
Corn	2.81	.48
Cucumber	2.14	.88
French fries	2.73	.55
Green beans	2.35	.79
Lettuce	2.47	.76
Green peas	1.96	.88
Sweet potato	2.04	.88
Spinach	1.65	.81
Tomato	1.91	.89

*4th and 5th grade students, Spring, 2007

Tables 7 and 8 display fruit and vegetable preference changes from baseline to Wave 4 for fifth grade students only. Results indicate that preferences increased for at least six fruit items and for six vegetable items. 56% of fifth grade students experienced a positive change with respect to tangerines from baseline to the Spring, 2007, assessment. 41% of fifth grade students experienced a positive change with respect to peppers (green) from baseline to the Spring, 2007, assessment.

Table 7. Fruit preference change*

Fruit	N	% change
Tangerine	88	56
Mango	72	46
Kiwi	68	36
Fruit Cocktail	53	30
Cantaloupe	55	29
Pineapple	48	24

baseline to wave 4

*5th grade students, Spring, 2007

Table 8. Vegetable preference change*

Vegetable	N	% change
Pepper	71	42
Potato	59	29
Cauliflower	58	29
Cucumber	52	28
Celery	55	27
Broccoli	48	24

baseline to wave 4

*5th grade students, Spring, 2007

Limitations and Challenges

While the results are encouraging they must be interpreted with caution. Data were not systematically collected during this project to determine which elements of specific programs were implemented and which dosage was delivered. Without process data, it is not possible to ascertain if the changes were due to program implementation, potentially resulting in Type I error, or other nutrition or physical activity education that occurred at the same time. A Type I error occurs when a false positive finding is accepted or concluding that there is a statistically significant change when there is none.

There were challenges that threatened the validity of some findings. It is possible that the results were statistically significant due to the large sample size. For this reason, it is important to look at both the p-value as well as the difference between pre-test and post-test scores to gauge whether the difference was meaningful.

Appendix

BASELINE CONSENT RATES

SCHOOL	GRADE 3	GRADE 4	TOTAL
1	26 78.8%	21 72.4%	47 70.1%
35	30 83.3%	7 21.9	37 54.4
70	24 38.1	25 39.7	49 38.9
10	44 71	53 82.8	97 76.4
15	20 83.3	30 93.8	50 89.3
20	60 64.5	124 76.5	184 72.2
60	12 54.5	23 85.2	35 71.4
75	43 51.2	58 62.4	101 57.1
30	25 73.5	28 84.8	53 79.1
40	61 61.6	65 77.4	126 68.9
50	20 44.4	38 79.2	58 61.7
65	25 83.3	33 76.7	58 79.5

Wave 3 CONSENT RATES

SCHOOL	GRADE 3	GRADE 4	GRADE 5	TOTAL
1	30 63.8%	24 58.5%	20 64.5	74 62.2
35	22 71.0%	32 84.2	22 71.0	76 76.0
70	32 47.8	34 54.0	27 47.4	93 49.7
10	30 71.4	38 62.3	37 59.7	105 63.6
15	25 86.2	22 84.6	21 63.6	68 77.3
20	49 45.8	102 62.6	106 64.6	257 59.2
60	18 72.0	16 69.6	23 82.1	57 75.0
75	36 40.4	41 48.9	56 57.7	133 49.1
30	23 88.5	31 91.2	29 87.9	83 89.2
40	45 61.6	63 62.4	55 70.7	163 64.7
50	39 88.6	35 81.4	42 76.4	116 81.7
65	19 73.1	29 85.3	34 85.0	82 82.0

Wave 4 CONSENT RATES

SCHOOL	GRADE 3	GRADE 4	GRADE 5	TOTAL
1	30 63.8%	28 70.0%	23 79.3	81 69.8
35	22 71.0%	33 91.7	21 67.7	76 77.6
70	32 47.8	34 54.0	31 55.4	97 51.9
10	30 71.4	42 71.2	40 64.5	112 68.7
15	25 86.2	21 87.5	31 93.9	77 89.5
20	49 45.8	110 68.3	113 75.3	272 65.1
60	18 72.0	17 73.9	24 85.7	59 77.6
75	36 40.4	62 77.5	71 74.7	169 64.0
30	23 88.5	31 91.2	31 93.9	85 91.4
40	45 61.6	70 76.1	61 80.3	176 73.0
50	39 88.6	33 82.5	41 77.4	113 82.5
65	19 73.1	28 96.6	33 89.2	80 87.0

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Definitional Terms

Obesity—an excess of body fat compared to lean body tissue (muscle).

BMI—is used to screen for obesity, but in a particular child, follow-up diagnosis is needed to be certain that the child does have an excess of body fat. BMI is a measure that compares weight to height. For children, BMI is compared to other children of the same age and sex to give a “BMI-for-age” percentile. (Note-BMI is interpreted differently for adults.)

Underweight—BMI-for-age <5th percentile.

Normal—BMI-for-age 5th percentile to <85th percentile.

At risk of overweight—BMI-for-age 85th percentile to < 95th percentile.

Overweight—BMI-for-age \geq 95th percentile.

For more information, <http://www.cdc.gov/growthcharts/>

