

Examining the Effect of Gardening on Vegetable Consumption Among Youth in Kindergarten through Fifth Grade

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ABSTRACT

Introduction: Funded by a grant from the makers of Hidden Valley® Salad Dressings the objective of this study was to determine if the introduction of a school-wide gardening program would affect overall vegetable consumption among elementary school youth. The study's setting was Elmore Elementary, Green Bay, Wisconsin, 1 of 27 elementary schools in the Green Bay Area Public School District.

Program Description: The school's salad bar was used to measure changes in vegetable consumption during school lunch. School food service staff recorded the weight of vegetables selected from the salad bar. The daily total weight of vegetables selected from the salad bar was divided by the number of students purchasing lunch that day. The resulting factor (average grams per child) was charted to monitor changes in consumption. After approximately 10 weeks of data collection, a gardening program was introduced. Food service staff continued to record weights, allowing for a quantitative analysis of the group's consumption prior to, during, and postintervention.

Results: Selection of vegetables from the salad bar decreased ($r = -.403$) during the first 2½ months of the study. During the intervention period, selection increased ($r = .3940$) and continued to show a slight rise postintervention ($r = .2037$).

Conclusion: The negative trend in daily salad bar selection before intervention was reversed, and a steady increase per day was seen during the intervention period. This suggests that intervention helped increase consumption rates per student. Consumption continued to increase postintervention, although at a lesser

rate than during intervention. The average daily value also showed a slight increase between intervention and postintervention. This suggests that gardening intervention lessons and activities were retained by the students after the lessons and activities were completed.

INTRODUCTION

Obesity rates in the United States have increased dramatically over the last 30 years, and obesity is now epidemic in the United States. Data for 2003-2004 and 2005-2006 indicated that approximately two-thirds of US adults and one-fifth of US children were either obese (defined for adults as having a body mass index [BMI] ≥ 30.0) or overweight (defined for adults as BMI of 25.0-29.9 and for children as at or above the 95th percentile of the sex-specific BMI for age-growth charts).^{1,2} States and communities are responding to the US obesity epidemic by working to create environments that support healthy eating and active living^{3,4} and by giving public health practitioners and policymakers an opportunity to learn from community-based obesity prevention efforts. The Green Bay Area Public School District (GBAPSD) Food Service Department's transformation has been led by key organizations that worked together to create change. They include the University of Wisconsin-Green Bay Dietetics Department, Brown County UW-Extension, and Brown County Healthy Weight Coalition for Youth. These organizations have partnered to implement nutrition education and healthy eating habits and assisted in improving the National School Breakfast Program and National School Lunch Program. The mission statement of the GBAPSD Food Service Department states that it is "committed to providing all children with high quality meals that are safe and nutritious, following the regulations of the USDA - National School Lunch Program. Our intent is to provide all students with the knowledge and skills necessary to make life-long healthy and enjoyable food choices."

The GBAPSD Food Service Department has worked

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hard to increase fruit and vegetable choices within the National School Breakfast and Lunch Programs and to eliminate non-nutritious food choices such as french fries, candy bars, and soda sold in its cafeterias. Additionally, the 2008 Local Wellness Policy requires that all ala carte and vending sales in the GBAPSD comply with a 35% - 10% - 35% ruling whereby total fat must be <35% of recommended daily value (based on a 2000-calorie diet), saturated fat must be <10% of the recommended daily value, and sugar must be <35% of the total product's weight.

PROGRAM DESCRIPTION

The Gardens Reaching Our World (GROW) project was a collaboration between Brown County UW-Extension's Community Garden Program and Green Bay Area Public Schools Food Service Department. Assistance was also provided by students enrolled in the University of Wisconsin-Green Bay Dietetics Program. The project's setting was Elmore Elementary School, which has a student population of 275. Forty of those students are in the half-day prekindergarten program and do not participate in the school lunch program. Of the 234 kindergarten through 5th (K-5) grade students, 50.55% are eligible for the free and reduced lunch program, which puts Elmore near the median for elementary schools in the GBAPSD. Twelve of the district's elementary schools have a higher percentage and 14 have a lower percentage of students eligible for free or reduced lunch. The ethnic breakdown of students in grades K-5 is as follows: 8 American Indian or Alaskan Native, 13 Asian/Pacific Islander, 20 black or African American, 12 Hispanic or Latino including Mexican, 181 white/Caucasian.

Through a "Love Your Veggies" grant from Hidden Valley, a salad bar with a child-friendly serving height of 69 cm was purchased and installed in the school cafeteria. During the early weeks of the 2008-2009 school year and prior to the addition of the salad bar, students from the dietetic program at UW-Green Bay visited each classroom for 30 minutes on 2 separate occasions. During the first visit, a lesson focusing on the importance of fruits and vegetables was presented. The second visit focused on salad bar etiquette and food safety.

The salad bar was presented to the students on October 16, 2008, during a "pep rally" that included veggie songs, veggie riddles, and brief talks by the principal and the food service department about the addition of the salad bar to the school cafeteria. It became operational the next day with a limited number of selections available the first few days.

The salad bar was offered as part of the lunch program, allowing access by all students who were served lunch on any particular day. It was positioned so that students passed it while they waited in line for their hot entrée, dessert and milk. Lettuce was always available on the salad bar while other vegetable selections varied from day to day. From previous experience, food service staff knew that carrots were a favorite of the students and carrots were offered most days (82 of 137). Students were able to select what they wanted from the salad bar, or nothing.

To develop a baseline prior to implementing the intervention, food service staff recorded the total weights of each vegetable placed on the salad bar, as well as the amount remaining at the end of the lunch period. The total weight of all vegetables selected that day was divided by the number of students who purchased lunch. This factor, average grams per student, was charted over the course of the project. Plate waste studies were completed twice to determine what percentage of food selected actually was being consumed.

The gardening intervention was introduced on January 12, 2009, approximately 10 weeks (45 actual school days) after the salad bar was implemented. Due to the limited length of the growing season in Green Bay, the gardening portion of this project was conducted by using a microfarm. The microfarm is a portable growing station that contains a light source to stimulate plant growth and flats containing soilless planting medium. Using the microfarm, students grew microgreens, the tender young shoots of vegetable plants. The varieties selected were kohlrabi, carrots, mustard greens, and sunflowers. The planting lesson connected the children's previous experiences with the school salad bar to the concept of growing their own salads. The students then planted the seeds and watered and cared for the plants. At the end of 3 weeks, the teacher and students harvested the microgreens using scissors. After washing the microgreens, students sampled each type of microgreen individually to experience the taste. The microgreens were then combined to create a salad that was shared by the class. The gardening intervention concluded May 8, lasting a total of 73 school days. During this period, each classroom participated in gardening for 3 weeks, although there was a short gap in the gardening project due to spring break. Food service staff continued to collect and record daily salad bar data during and after the intervention period. Throughout the project, periodic checks were made to count the number of students utilizing the salad bar. This number was divided by the number of students who purchased lunch that day so

Table 1. Average Quantity of Vegetables Selected

	Entire Study	Preintervention	Intervention	Postintervention
No. of Days	137	45	73	19
Daily Average (grams/student)	18.30	21.65	16.67	16.85
High (grams/student)	40.55	40.55	32.07	24.77
Low (grams/student)	6.55	6.55	7.45	11.48
Range (grams/student)	34.00	34.00	24.62	13.29

Table 2. Number of Lunches Served

	Entire Study	Preintervention	Intervention	Postintervention
Ave. No. Lunches Served Daily	174.5	174	174.5	176
High	197	186	194	197
Low	141	159	158	141
Range	56	36	36	56

that comparisons could be made on a percentage basis.

RESULTS

A total of 137 days of salad bar data was collected by food service staff. The average amount of vegetables selected throughout the study was 18.30 grams/student. The highest amount was on November 7, 2008, with 40.55 grams/student; the lowest amount was on December 19, 2008 with 6.55 grams/student. Both of these dates were preintervention. The average amount selected during preintervention was 21.65 grams/student. The average amount selected during the intervention period was 16.67 grams/student, with a high of 32.07 and a low of 7.45 grams/student. The average amount selected during postintervention was 16.85 grams/student, with a high of 24.77 grams/student and a low of 11.48 grams/student (Table 1).

Throughout the project period, the number of lunches served ranged from 141 to 197, with a daily average of 174.46 (Table 2). Number of lunches served is primarily influenced by the entrée offered on any given day. During the 2008-2009 school year on days when favorites such as chicken nuggets and pizza were offered, the average number of students served was 186.5 and 179.2, respectively. When chili was served, the daily average was 165.2.

The rate of change in daily salad bar consumption was also calculated. For the preintervention period, the rate of change was -0.4030 (Figure 1). This negative trend was influenced by the high daily values early in the study and lowest values found right before intervention. During the gardening intervention, this trend reversed, with a +0.3940 rate of change (Figure 2). After the intervention was completed, daily consumption rates continued to increase, with a +0.2037 daily rate of change (Figure 3).

Preintervention to intervention comparisons showed a significance (2-tailed) of .001. Intervention to postintervention comparisons showed a significance (2-tailed) of .850. Comparisons of pre to post are statistically significant (.002).

Volunteers collected salad bar participation data 11 times during the study. The average daily participation throughout the study was 39.9%. The highest participation was on November 14, 2008, with 51.1%, while the lowest participation occurred December 17, 2008 with 22.4%. Both of these were during the preintervention period. Average participation during preintervention was 37.6%. Average participation during the intervention period was 46.9% with only 2 data collection dates. Data was collected only once during postintervention and showed a 39.8% participation rate (Table 3).

Plate waste studies for vegetables were conducted by student volunteers during the preintervention period, showing vegetable waste of 35.8% and 29.8%. Due to the lack of available manpower, no additional plate waste studies were conducted the remainder of the school year.

DISCUSSION

The amount of vegetables selected from the salad bar varied considerably day to day throughout the entire study period. This range is most likely attributed to different salad bar food choices offered on any given day, absences by students who typically used the salad bar, and daily school activities (gardening or food lessons that morning) that may have influenced a student's food choice later that day. Additionally, availability of a favorite entrée may have dissuaded students from seeking vegetables.

The range in daily values was greatest before intervention, with both the highest and lowest daily values

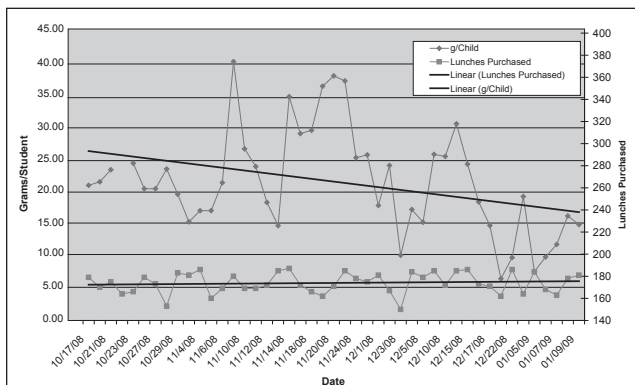


Figure 1. Average grams of vegetables per child, 10/17/08-1/9/09.

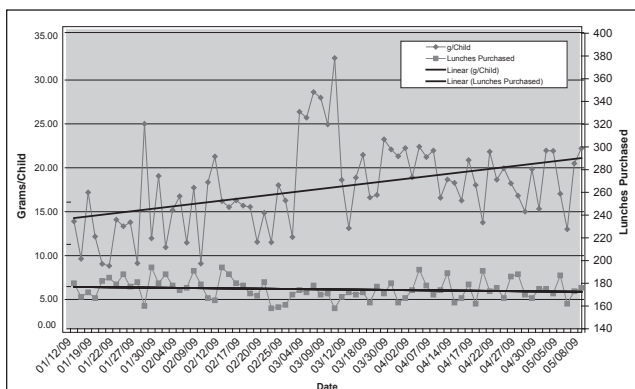


Figure 2. Average grams of vegetables per child, 1/12/09-5/8/09.

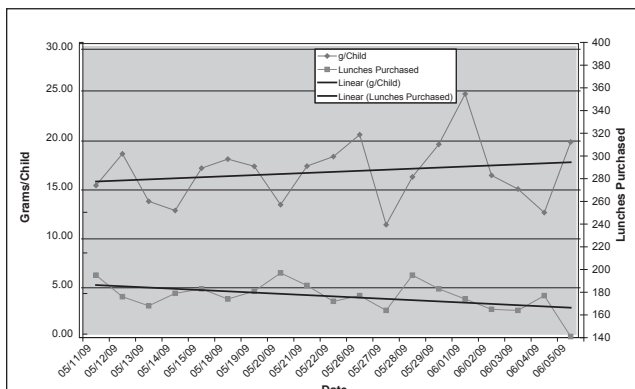


Figure 3. Average grams of vegetables per child, 5/11/09-6/5/09.

of the entire study in this preintervention period. As intervention and then postintervention occurred, the daily range became more consistent. The high daily value for each period decreased while the low daily value increased over time. The highest consumption was seen early in the study when the salad bar was new and many children were curious and eager to learn about it. As the salad bar's novelty diminished so did consumption rates, which raises the question as to whether or

not repeated pep rallies would be effective in rejuvenating salad bar use.

The lowest consumption occurred in late December and early January, immediately before the gardening intervention began. However, the negative trend in daily salad bar selection before intervention was reversed, and a steady increase was seen during the intervention period. This suggests that intervention helped increase the quantity of vegetables selected per student. This increase continued postintervention, although at a lesser rate than during intervention. The average daily value also increased slightly between intervention and postintervention, which showed that gardening intervention lessons and activities were retained by the students after the lessons and activities were completed.

There are some inherent limitations in the analysis method chosen. While we can see that the quantity of vegetables selected from the salad bar increased during the intervention, we do not have sufficient data to determine if this is due to a change in the number of students using the salad bar, the students selecting larger portions, or both.

Due to the limited number of plate waste studies conducted, we are unable to determine if the amount of waste (vegetables selected from the salad bar by students but then discarded) varied throughout the study. Collection of this data in future studies would eliminate another possible variable in our analysis. Another issue is that the observation period is confounded by the introduction of the salad bar, which is itself an intervention. However, a span of several months between the introduction of the salad bar and the gardening intervention appeared to eliminate any novelty factor.

CONCLUSION

Elmore Elementary School was able to keep the salad bar after completion of the grant. However, because the beginning of the 2009-2010 school year was accompanied by concerns with the H1N1 virus, school personnel decided not to utilize the salad bar. Therefore, additional data was not collected during the 2009-2010 school year.

Community-based research presents many information-gathering challenges. This study has provided a sound foundation for moving forward and expanding our efforts. As previously noted, additional plate waste studies would indicate if changes in the quantity of food selected from the salad bar resulted in changes in actual consumption. Additional data collection regarding the number of students who used the salad bar also would be helpful as well as using another school as a

Table 3. Number of Students Using Salad Bar (As a Percentage of Total Purchased Lunches)

	Entire Study	Preintervention	Intervention	Postintervention
No. of Counts	11	8	2	1
Daily Average (%)	40.05	38.36	46.9	39.8
High (%)	51.1	51.1	49.4	39.8
Low (%)	22.4	22.4	44.4	39.8
Range	28.7	28.7	5.0	0

control group. Since this project relied on quantitative data collection, the addition of qualitative data would strengthen the research. While this study's results showed a reverse in the trend line of vegetables selected from the salad bar, additional data collection would provide a clearer picture as to the effectiveness of gardening as an intervention strategy.

Financial Disclosures: None declared.

Funding/Support: None declared.

REFERENCES

- Ogden CL, Carroll MD, McDowell MA, Flegal KM. Obesity among adults in the United States: no change since 2003--2004. Bethesda, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2007.
- CDC. Prevalence of overweight, obesity, and extreme obesity among adults: United States, Trends 1976-80 through 2005-2006. Hyattsville, MD: US Department of Health and Human Services, National Center for Health Statistics, CDC; 2008.
- McCann B. Community design for healthy eating: how land use and transportation solutions can help. Princeton, NJ: Robert Wood Johnson Foundation; 2006.
- Joint Center for Political and Economic Studies and PolicyLink. A place for healthier living: improving access to physical activity and healthy foods. Washington, DC: Joint Center for Political and Economic Studies; 2004.

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