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 ($r = -0.403$) during the first $2\frac{1}{2}$ months of the study. During the intervention period, selection increased ($r = 0.3940$) and continued to show a slight rise postintervention ($r = 0.2037$).

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 living3,4 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
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 à la carte and vending sales in the GBAPSD com-
ply 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) proj-
et 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 prekind-
ergarten 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 caf-
eteria. 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 impor-
tance 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 prin-
cipal and the food service department about the addi-
tion of the salad bar to the school cafeteria. It became
operational the next day with a limited number of selec-
tions available the first few days.

The salad bar was offered as part of the lunch pro-
gram, 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 ser-
vice staff knew that carrots were a favorite of the stu-
dents 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 pur-
chased lunch. This factor, average grams per student,
was charted over the course of the project. Plate waste
studies were completed twice to determine what per-
centage 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 grow-
ing 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 har-
ested 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, peri-
odic 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
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

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<th>Table 1. Average Quantity of Vegetables Selected</th>
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<td>No. of Days</td>
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<th>Table 2. Number of Lunches Served</th>
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<tr>
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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
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

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

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