



An Evaluation of the USDA Fresh Fruit and Vegetable Program in Eau Claire Schools

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Introduction

Overweight and obesity is the most common medical condition of children in the United States with the prevalence more than doubling over the past 20 years.¹ Poor nutrition, especially low intake of fruits and vegetables, has long been considered one of the central causes of overweight and obesity in children.²

In 2002, the U.S. Department of Agriculture (USDA) created the Fresh Fruit and Vegetable Program (FFVP) to improve nutrition and help reduce the prevalence of childhood overweight and obesity. The FFVP provides funding for students from selected schools to receive a free fruit or vegetable (FV) snack daily for an academic year. In November 2005, Wisconsin was added to this program.

We heard many stories of the success of the FFVP from schools in several states at the 2006 USDA FFVP Conference, but these stories only provided anecdotal evidence of the program impact rather than quantitative proof. A published study looking at the Mississippi FFVP during 2004-05 showed only modest results regarding the impact on the willingness to eat FV and the FV intake of participating students. This analysis also did not include any control schools for comparison.³

Similarly, our earlier published research evaluating the FFVP in Wisconsin schools during 2006-07 found some evidence of an increased willingness to try new FV served in school for intervention students compared to control students. However, data limitations prevented us from accurately assessing the program impact on student FV consumption. These limitations stemmed from both the large scale of our study (40 schools across WI) and a flawed survey design (food frequency tables).⁴

The FFVP was extended to all 50 states beginning in 2008-09 as part of the 2007 U.S. Farm Bill. This significant commitment of government resources makes it more important than ever for researchers to quantitatively assess the effects of the FFVP. Consequently, we improved our research design by narrowing our analysis to four Eau Claire elementary schools and using the A Day in the Life Questionnaire as our main survey instrument.

Our current study examines changes in student attitudes and behavior resulting from the FFVP during 2008-09 school year. Specifically, we analyze student willingness to try FV in various settings, the number of FV tried and liked by students, and student FV intake.

Method

Participants

Fourth and fifth grade students at four Eau Claire elementary schools (two intervention, two control) participated in this study. The two program schools were selected because they had the highest percentage of students receiving free/reduced lunch in the area (75% and 55%). The two control schools were selected because they also had high percentages in this category (46% and 42%) and were willing to work with us.

Our final sample consisted of 362 participants: 178 students in two intervention schools and 184 students in two control schools. Approximately equal numbers of girls (n=178) and boys (n=184) were represented in the sample. Nearly all of students self-identified as white (76%) or Asian American (13.5%) while the remaining students were equally distributed between Hispanic/Latino, African American and Native American. Fourth grade students comprised 47.2% of the sample, while 52.8% were in fifth grade.

Student Survey

The survey contained a series of questions asking students about fast food consumption, physical exercise, and eating family dinners. Other questions measured willingness to try new FV at home and school, and willingness to choose FV as snacks over less healthy alternatives. Students were also questioned on the number of FV items they had ever tried and which items they liked.

Additional student consumption data was measured by the A Day in the Life Questionnaire (DILQ). The DILQ takes the students step-by-step through their previous day's activities. They were asked what they ate/drank for breakfast at home, on the way to school, and at school. This line of questioning continues through the rest of the day asking what they ate/drank during morning break, lunch, afternoon break, after school snack, dinner, and night time snack. This allowed us to count the incidences of FV intake for each child at key times throughout the day.

This method does not give the number of servings of FV eaten, nor does it give nutrient content. However, the DILQ has been tested and validated for measuring the incidence of FV intake for children of elementary school age.⁵

Procedure

Faculty advisors, Eric Jamelske and Lori Bica, along with student volunteers and school personnel, administered the pre-test to fourth and fifth grade students during regularly scheduled class periods in October 2008. The post-test was administered in December 2009 to the same students, following the same procedure. Surveys were administered on three consecutive days. On Day 2 and Day 3, only the DILQ was given to students. A third student survey was conducted in April 2009 and a parent survey is planned for May 2009, but this data is not part of the current analysis for this presentation.

References and Acknowledgements

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Pre-Test Willingness

Table 1 shows the pre-test results for a series of six questions asked to students about their willingness to try new FV at home and school and their willingness to choose FV as snacks over chips/cookies/candy (CCC). The response options for each of these questions were *Would Not* (shown in Column 2), *Might* (not shown), or *Would* (shown in Column 1). Column 2 shows that less than one-third of all students reported that they *Would Not* try a new FV or choose FV over CCC. This was especially true for trying new FV at home and choosing fruit instead of CCC. However, in Column 1 we see that the number of children reporting that they *Would* try a new FV or choose FV over CCC never exceeds 50% indicating that there is a substantial room for positive change.

Table 1: Pre-Test Data (N=381)

Willingness to Try New Fruits/Vegetables and to Choose Fruits/Vegetables as Snacks

Variable	% Would	% Would Not
Try new fruit at school	39.3%	23.4%
Try new vegetable at school	22.2%	30.3%
Try new fruit at home	49.0%	6.0%
Try new vegetable at home	32.5%	17.7%
Choose fruit as snack instead of chips/cookies/candy	47.6%	10.5%
Choose vegetable as snack instead of chips/cookies/candy	24.5%	25.9%

Note: The sample sizes listed in this table are $\neq 381$ because some students were not present on the day of this pre-test survey or when these questions were asked.

Post-Test Willingness

We next investigated if the FFVP had a positive impact on students in these areas by examining only those students who answered they *Might* or *Would Not* for each question. We asked the following question: Of the students with room for improvement, what percent reported a positive change in willingness compared across intervention and control schools? Table 2 presents the results from this analysis.

All schools show positive change in student willingness for each category, but the only category where we see a significant difference between intervention and control students is in willingness to try a new vegetable at school. Specifically, intervention school students were 18.2 percentage points more likely to show a positive change in their willingness to try a new vegetable in school (p<0.01).

As a robustness check we ran a multivariate Probit regression with controls for gender, race, grade, fast food intake, and the frequency of physical activity and family dinners. The results of this regression (not shown) show intervention students are 15.9 percentage points more likely to have experienced a positive change. This is consistent with the simple comparison of means.

While a nice result, measurement error in the responses to this question certainly lessens the claim we can make regarding a positive program effect. In particular, some students moved backward in their response, but we only examined the positive changes.

We can, however, say that there is some evidence that the FFVP had a positive influence on student willingness to try new vegetables served in the school setting. Despite the limitations of this claim, it is still important because this area had the highest percentage of students who said they *Would Not* (30.5%) and the lowest percentage of students who said they *Would* (22.2%) on the pre-test (see Table 1).

Table 2: Pre-Test Post-Test Comparison: Intervention Schools vs. Control Schools Change in Willingness to Try New Fruits/Vegetables and Fruits/Vegetables as Snacks

Variable	Intervention		Control		p-value
	N	% Positive Change	N	% Positive Change	
Try new fruit at school	101	33.7%	124	29.1%	0.459
Try new vegetable at school	128	36.2%	138	17.0%	<0.01**
Try new fruit at home	77	33.8%	95	37.9%	0.577
Try new vegetable at home	105	33.3%	121	24.8%	0.161
Choose fruit as snack instead of chips/candy	86	31.4%	92	29.3%	0.768
Choose vegetable as snack instead of chips/candy	119	26.1%	126	23.5%	0.644

Note: Students who said they *would not* on the pre-test were dropped for each category. Because this is a dichotomous variable, the number of observations in each category is different.

Conclusion and Future Research

The results presented here are quite significant in the context of child health and nutrition.

The FFVP works!

We found minor evidence of increased willingness to try new vegetables served in school. We also found a slight increase in the overall number of FV tried among participating students. However, our most significant results show that the FFVP has been extremely effective in increasing the FV intake of participating students by providing free access to FV during the morning snack period. If students are provided with free fruits and vegetables they **WILL** eat them.

In contrast, we found no evidence that the FFVP positively influenced student food choices outside of school for after school snack, dinner, or night time snack. Students at FV in school if these items were provided and their other choices were limited, but when students were at home they did not eat FV.

This is possibly because of the lack of availability of FV or because they have other choices. Additionally, the intervention schools have reported constraints in their ability to incorporate any substantial educational activities to enhance the program experience for their students. Similarly, they reported little to no parental involvement. These two factors could also play a role in the limited FFVP effect found beyond the school environment.

Results

FV Tried and Liked

Another part of the student survey listed 69 different FV ranging from apples to zucchini. Students were asked to indicate what items they had tried and what items they liked. We analyzed a subset of twelve fruits and ten vegetables that had been served in the intervention schools as part of the FFVP between October and December 2009. The results of this analysis are not here due to space limitations.

On average students had tried just under nine of the twelve fruits and liked nearly eight. The story is very similar for vegetables, however the numbers are slightly lower (tried=6.7, liked=4.2).

The post-test results show a larger increase in the number of FV tried and liked for intervention students, but this difference was not statistically significant. We next eliminated students with above average (>9) fruits tried on the pre-test, leaving the students with the most to gain from the program. With this reduced sample, average fruits tried increased by more than two-and-a-half items for intervention students (6.4 to 9.0) compared to an increase of less than one-and-a-half for control students (6.6 to 8.0). This difference is statistically significant (p=0.025).

As was the case with our analysis of student willingness to try new FV and to choose FV as snacks over CCC, these results do not prove a positive program effect. However, this analysis suggests that the FFVP has had some success in getting children to try more FV by serving them free as part of the program.

Pre-Test FV Consumption

The results presented so far point to some success for the FFVP and are therefore encouraging. However, the ultimate success of the FFVP depends on whether or not students in the program schools are actually eating more FV. We address this issue by introducing the data collected using the DILQ.

Table 3 shows the average daily FV intake for our sample based on three consecutive days of surveying. Students are eating just over 1.5 FV items daily with about 95% of the sample having a daily FV intake between zero and 3.5 items. Nearly three-quarters of average daily FV intake among students (1,121/56 = 71.8%) occurred from fruits (0.494) and vegetables (0.406) at school lunch and vegetables at dinner (0.215). However, FV intake is very low throughout the morning and also after school and night time snacks.

Table 3: Pre-Test Data: Baseline Incidence of Daily Fruit and Vegetable Intake: Average Across Three Days, N = 361

Variable	Average Intake	Standard Deviation
Fruit breakfast at home	0.064	0.181
Vegetable breakfast at home	0.003	0.030
Fruit breakfast at school	0.015	0.089
Vegetable breakfast at school	0.001	0.017
Fruit breakfast at school	0.047	0.174
Vegetable breakfast at school	0.000	0.000
Fruit am snack at school	0.036	0.133
Vegetable am snack at school	0.003	0.039
Fruit lunch at school	0.484	0.381
Vegetable lunch at school	0.406	0.478
Fruit pm snack at school	0.016	0.101
Vegetable pm snack at school	0.002	0.032
Fruit after school snack	0.117	0.248
Vegetable after school snack	0.010	0.076
Fruit dinner	0.073	0.192
Vegetable dinner	0.210	0.311
Fruit night snack	0.051	0.184
Vegetable night snack	0.003	0.044
Total	1.56	1.08

Although we do not show it here, there are only minor differences in baseline FV intake across intervention and control students with almost all differences being attributable to FV items available on the school lunch menu.

Lunch served in school typically offers 2-3 FV items each day. With 80% of students in our sample eating the school lunch (as opposed to bringing lunch from home) it is clear that providing hot lunch FV options leads to increased FV consumption.

We ran a multivariate OLS regression with average daily FV intake as the dependent variable to explore the determinants of FV consumption prior to the beginning of the FFVP. The results (not shown) reveal that students who got hot lunch in school ate 0.74 more FV items on average than students who bring lunch from home (p<0.01). We also found lower FV intake among males and students that reported eating at least 2-3 fast-food meals per week, while FV intake was higher for students that reported eating at least 4-6 family dinners per week.

Post-Test FV Consumption Determinants

Using post-test data we again ran a multivariate OLS regression with average daily FV intake as the dependent variable to explore the determinants of FV consumption. The results of this regression (not shown) are similar to those from the pre-test and confirm the positive impact of hot lunch on student FV consumption (p<0.01). In addition, we now see a positive effect on FV intake from the FFVP (p<0.01).

This supports the conclusion that providing students with FV options through the school lunch program and the FFVP is a driving force behind student FV intake.

FV Intake: Morning Snack

Because we know the FV snacks were given to students during their morning break, we examined whether intervention students exhibited an increase in FV intake during morning snack compared to control students.

Our baseline data shows less than one out of twenty students reported eating a FV during morning snack at school (fruit = 0.036, vegetable = 0.003, see Table 3) with no significant difference between intervention and control students.

The first row in Table 4 shows post-test data that compares the average fruit intake at morning snack for intervention and control students.

The addition of the FFVP significantly increased FV consumption by students at morning snack. In particular, on a day when both intervention schools offered fruit as a morning snack (orange and pineapple respectively) we see that nearly 80% of these children ate the fruit, while the number of children eating fruit as a morning snack among control students remained very low (0.06).

Table 4: Post-Test Data: Intervention and Control School Comparison Incidence of Daily Fruit and Vegetable Intake (day 1)

Variable	Average Intake	Control Average Intake	Difference (I-C)	p-value
Fruit am snack at school	0.79	0.06	0.73	<0.01**
Fruit after school snack	0.09	0.03	0.04	0.13
Vegetable after school snack	0.01	0.01	0.00	0.97
Fruit dinner	0.05	0.05	0.00	0.96
Vegetable dinner	0.16	0.22	-0.06	0.22
N	170	176	-	-

Program Effect

This increased fruit intake for intervention students suggests that serving fruit as a free snack for morning break at school is a successful method of increasing fruit consumption among children.

However, we do not find any evidence that the FFVP has positively influenced FV intake for students beyond the effect described above (see Rows 2-5 of Table 4). This is further illustrated by an examination of the morning snack in the two intervention schools on a day when one school served cauliflower as a snack, while the other school did not serve a FV snack.

Row 1 of Table 5 compares the average vegetable intake during morning snack for the two schools on this day. Almost 50% of students at the cauliflower provided school as part of the FFVP on this day, while almost no students in the other intervention school reported eating a vegetable during morning snack. Additionally, when leftover cauliflower from the morning snack was offered in the afternoon, some students also chose to eat for an afternoon snack as shown in Row 2.

Table 5: Post-Test Data: Intervention School Comparison (with/without snack) Incidence of Daily Fruit and Vegetable Intake (day 1)

Variable	Intervention Average Intake	Intervention (no snack) Average Intake	(I - Int)	p-value
Vegetable am snack at school	0.49	0.01	0.48	<0.01
Vegetable pm snack at school	0.11	0.00	0.11	<0.01
N	73	96	-	-

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We have just finished conducting this round of surveys and have not yet analyzed the data. This analysis will be forthcoming as we continue our research efforts.