Preliminary Findings from an Evaluation of the USDA Fresh Fruit and Vegetable Program in Wisconsin Schools

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ABSTRACT

Introduction: In 2002, the US 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 in each participating state to receive a free fresh fruit or vegetable snack daily for an academic year. In November 2005, Wisconsin was added to this program. In this study, we evaluate whether the Wisconsin FFVP resulted in positive changes in children’s attitudes and behavior related to eating fruits and vegetables.

Methods: In 2006, 25 Wisconsin schools were selected by the Wisconsin Department of Public Instruction for FFVP participation. Study measures included a pre-test and post-test survey given to 4th, 7th, and 9th graders in the intervention and controls schools. Post-test data from all 25 intervention schools were not yet available for analysis. Our sample, therefore, consisted of 1127 participants: 784 students in 10 intervention schools and 343 students in 10 control schools. Independent samples t tests and multivariate probit regression analyses were used to examine attitudinal and behavioral program effects.

Results: Compared to controls, intervention students reported an increased willingness to try new fruits (24.8% versus 12.8%, \( P<0.01 \)) and vegetables (25.1% versus 18.4%, \( P=0.01 \)) at school.

Conclusions: Findings indicate positive changes in attitudes and behavior among children participating in the Wisconsin FFVP.

INTRODUCTION

Overweight and obesity is now the most common medical condition of childhood in the United States, with the prevalence more than doubling over the past 20 years.\(^1\) Nationally, 15.3% of 6-11 year olds and 15.5% of 12-19 year olds are at or above the 95th percentile for Body Mass Index-for-Age.\(^2\) In Wisconsin, nearly 24% of high school students are either obese or overweight.\(^3\) The dramatic increase in the prevalence of childhood overweight and obesity and its resultant comorbidities are associated with significant health and financial burdens, thus warranting strong and comprehensive prevention efforts.\(^2\)

Long considered one of the central causes of overweight and obesity, poor nutrition is prevalent among today’s youth. Children and adolescents’ food intake tends to be low in fruits, vegetables, and calcium-rich foods, and high in fat.\(^4\) Current United States Department of Agriculture (USDA) guidelines recommend eating 6-13 servings of fruits and vegetables each day, however US children eat an average of only 3.5 servings daily.\(^5\) Moreover, for the typical American adolescent, half of all vegetables consumed are french fries or other potatoes.\(^5\) In Wisconsin, less than a third of high school students report eating \( \geq 3 \) servings of fruit a day, while only 18% report eating \( \geq 3 \) servings of vegetables.\(^3\) Unhealthy dietary patterns developed during childhood and adolescence may create an increased risk for chronic diseases later in life.\(^6\) Therefore, clearly focused efforts to improve the nutritional health of America’s young people are needed, and schools, with their access to an estimated 95% of children and adolescents nationwide, are regarded as optimum settings for such efforts.\(^7\)

There is a growing body of literature on the effectiveness of nutrition-related programs designed to
Our pre-test sample consisted of 2863 participants: 2287 students from the 25 intervention schools and 576 from the 10 control schools. Post-test data from all 25 intervention schools were not yet available for analysis, but we wished to report on a subset of 10 of the schools because, after interim analyses were performed, significant results emerged. Within this subset, analyses were further limited to only those students who provided both pre-test and post-test responses to the survey sections that are the focus of this study. Therefore, our final sample consisted of 1127 participants: 784 students in 10 intervention schools and 343 students in 10 control schools. Approximately equal numbers of girls (n=577) and boys (n=550) were represented in the sample, and just over 70% of the students were identified as white. Fourth grade students comprised 43.5% of the sample, while 33.8% were in 7th grade and 22.7% were in 9th grade.

**Measures**

The survey instruments used in this study were based on previously validated measures. In addition to demographic items, the survey contained questions on lifestyle, including fast food consumption, physical exercise, parental limits on video game/TV time, and eating family dinners. The next section contained a series of questions measuring participants’ willingness to try new fruits and vegetables at home and school, the frequency with which they ate the fruit or vegetable that came with school breakfast or lunch, and their willingness to choose fruits and vegetables as snacks over less healthy alternatives. Specifically, there were 2 items that asked if participants would try a new fruit offered at school and at home, respectively. There were 2 parallel items for vegetables. Two additional items asked whether participants would choose fruit or a vegetable, respectively, as a snack instead of chips or candy. Response options for all 6 items were 1=would not, 2=might, and 3=would.

The next section of the survey presented a series of pictures of 23 target fruits and vegetables and asked students to demonstrate their knowledge by correctly identifying specific items. Participants were also asked to indicate which items they had tried or would be willing to try. We selected the 23 fruits and vegetables for this section because they were most likely to be served to students in all 25 intervention schools. In the next section, students were given an expanded list of 68 fruits and vegetables and asked to identify the items they had tried and what items they liked. The final section of the survey contained a list of various food items, including 39 fruits and vegetables. Students indicated how many times (from 1 to 5) they had eaten each item in the last

**METHODS**

**Participants**

Students in the 4th, 7th, and 9th grade across 25 intervention schools and 10 matched control schools in Wisconsin participated in this study. A sample of 25 schools were selected as program sites by the Wisconsin Department of Public Instruction based on interest in the FFVP, geographic location, and number of students qualifying for free or reduced lunches. Ten control sites were selected based on characteristics similar to those of the intervention schools, including school size, geographic location, ethnic composition, and numbers of students qualifying for free or reduced lunches. Although these selection processes were not random, both the intervention and control schools were geographically diverse and, in general, reflected the characteristics of students in the state.
24 hours. This dietary recall portion of the survey was administered to students over 3 consecutive days to calculate average daily fruit and vegetable consumption for each student over the 3-day period. The focus of this paper is on 2 sections of the survey: the dietary recall section (behavior) and the section measuring students’ willingness to try new fruits and vegetables at home and school and willingness to choose fruits and vegetables as a snack over less healthy alternatives (attitude).

Procedure
Personnel in both intervention and control schools administered the pre-test to students during a regularly scheduled class period in March 2006 before the program began. All survey materials were approved by the University of Wisconsin-Madison Education Institutional Review Board. In addition, all persons administering the surveys completed the University of Wisconsin on-line tutorial on the use of human subjects in research and were given explicit instructions on how to administer the surveys. The post-test was given 3 months later at the end of the 2005-2006 school year following the same procedure. We surveyed the same students a third time as 5th, 8th, and 10th graders in March 2007 and also conducted teacher and parent surveys for 5th grade students in May 2007. Results from the first 2 sets of surveys, spanning approximately 3 months of program implementation, were analyzed for this study.

To compare changes in attitudes toward fruits and vegetables between the intervention and control schools, we generated an indicator variable =1 for those students with a positive change between the pre-test and post-test and 0 otherwise. A positive change was defined as an increase in student’s average daily fruit and vegetable intake of at least 0.2 times from pre-test to post-test. The mean of this new variable measured the percent of students that increased their average daily fruit and vegetable consumption between the pre-test and post-test.

To investigate attitudinal and behavioral program effects, we first used SPSS 15.0 to calculate independent samples t tests to examine differences in mean responses between intervention and control participants. To explore the robustness of these results to the inclusion of control variables, we used Stata 6.0 to conduct multivariate probit regression analyses.

RESULTS
Pre-test data for the 6 items measuring students’ willingness to eat fruits and vegetables are presented in Table 1. In terms of choosing fruits and vegetables as a snack instead of chips/candy, 40% indicated they would choose a fruit, but only 21% would choose a vegetable. Similarly, 33.8% of students said they would try a new fruit served in school, but only 20.8% would try a new vegetable. At home 55.6% of students indicated they would try a new fruit and 32.9% said they would try a new vegetable. Overall, students were more willing to eat fruits than vegetables and also more willing to try both fruits and vegetables at home versus at school. Of particular importance is that there was significant opportunity for students to move in a positive direction from either “would not” or “might” to “would” for a given item. The mean for each new variable measured the percent of students who increased their willingness to eat fruits and vegetables between the pre-test and post-test.

Table 1 presents the change in student willingness to eat fruits and vegetables between the pre-test and post-test. In terms of trying a new fruit served at school, 24.8% of intervention school students reported an increase in willingness to try both fruits and vegetables at home versus at school. Similarly, 33.8% of students said they would try a new fruit served in school, but only 20.8% would try a new vegetable. At home 55.6% of students indicated they would try a new fruit and 32.9% said they would try a new vegetable. Overall, students were more willing to eat fruits than vegetables and also more willing to try both fruits and vegetables at home versus at school.

Of particular importance is that there was significant opportunity for students to move in a positive direction from either “would not” or “might” to “would” in terms of willingness to eat fruits and vegetables.

Table 2 presents the change in student willingness to eat fruits and vegetables between the pre-test and post-test. In terms of trying a new fruit served at school, 24.8% of intervention school students reported an increase in willingness to try both fruits and vegetables at home versus at school. Similarly, 33.8% of students said they would try a new fruit served in school, but only 20.8% would try a new vegetable. At home 55.6% of students indicated they would try a new fruit and 32.9% said they would try a new vegetable. Overall, students were more willing to eat fruits than vegetables and also more willing to try both fruits and vegetables at home versus at school. Of particular importance is that there was significant opportunity for students to move in a positive direction from either “would not” or “might” to “would” in terms of willingness to eat fruits and vegetables.

Table 1. Pre-test Data—Willingness to Try New Fruits/Vegetables and to Choose Fruits/Vegetables as Snacks

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Willing (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Try new fruit at school</td>
<td>1120</td>
<td>33.8</td>
</tr>
<tr>
<td>Try new vegetable at school</td>
<td>1118</td>
<td>20.8</td>
</tr>
<tr>
<td>Try new fruit at home</td>
<td>1121</td>
<td>55.6</td>
</tr>
<tr>
<td>Try new vegetable at home</td>
<td>1121</td>
<td>32.9</td>
</tr>
<tr>
<td>Choose fruit as snack instead of chips/candy</td>
<td>1122</td>
<td>40.0</td>
</tr>
<tr>
<td>Choose vegetable as snack instead of chips/candy</td>
<td>1120</td>
<td>21.0</td>
</tr>
</tbody>
</table>

Note: The sample size varies due to non-response for some questions.
increased willingness compared to only 12.8% of control school students \((P<0.01)\). Similarly, intervention school students were also more willing to try a new vegetable served at school, with 25.1% reporting an increase compared to 18.4% of control school students \((P=0.01)\). Although no significant differences were found for the other comparisons, results are in the expected direction with intervention students demonstrating greater positive change than control students.

A multivariate probit regression model was used to explore if these simple differences in means were robust to the inclusion of control variables for gender, race/ethnicity, grade level, amount of physical activity, parental TV/video game limits, frequency of family dinners, and fast-food consumption. The model predicted that intervention students were 12.1 percentage points more likely to have experienced an increase in willingness to try a new fruit at school relative to control students \((P<0.01)\), while the difference for a new vegetable was 6.7 percentage points \((P=0.02)\).

We next looked at only 4th grade students’ responses because we believe that school-based programs of this nature have the greatest potential to influence the behavior of younger children. Table 3 shows that the positive program effects were larger when we limited the analysis to just 4th grade students. Specifically, 25.1% of intervention students reported an increase in willingness to try a new fruit served at school compared to only 11.1% of control students \((P<0.01)\). Intervention school 4th graders were also more willing to try a new vegetable at school, with 26.7% reporting an increase compared to 12.2% in control schools \((P<0.01)\). Again, there were no statistically significant differences in willingness to try new fruits and vegetables at home, but the trends are in the expected direction. Unlike results from the full sample comparison, we do see a statistically significant difference in increased willingness to choose a vegetable as a snack instead of chips/candy for intervention students (24.3%) versus control students (14.8%) at \(P=0.02\).

To determine if the FFVP had positively influenced those students most in need, we analyzed fruit and vegetable consumption patterns for students who reported eating these foods an average of \(\leq\) 1 times per day on the pre-test. As shown in Table 4, over 32% of intervention school students with low initial consumption reported an increased willingness to eat both fruits and vegetables compared to only 15% of control students \((P<0.01)\). Intervention school students were also more willing to try a new vegetable served at school, with 25.1% reporting an increase compared to 18.4% of control school students \((P=0.01)\). Although no significant differences were found for the other comparisons, results are in the expected direction with intervention students demonstrating greater positive change than control students.

Table 2. Pre-test/Post-test Comparison—Willingness to Try New Fruits/Vegetables and to Choose Fruits/Vegetables as Snacks

<table>
<thead>
<tr>
<th>Variable</th>
<th>Intervention</th>
<th>Control</th>
<th>(P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Try new fruit at school</td>
<td>741</td>
<td>337</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Try new vegetable at school</td>
<td>736</td>
<td>337</td>
<td>0.01</td>
</tr>
<tr>
<td>Try new fruit at home</td>
<td>741</td>
<td>336</td>
<td>0.31</td>
</tr>
<tr>
<td>Try new vegetable at home</td>
<td>740</td>
<td>339</td>
<td>0.74</td>
</tr>
<tr>
<td>Choose fruit as snack instead of chips/candy</td>
<td>742</td>
<td>339</td>
<td>0.21</td>
</tr>
<tr>
<td>Choose vegetable as snack instead of chips/candy</td>
<td>737</td>
<td>336</td>
<td>0.14</td>
</tr>
</tbody>
</table>

Note: The sample size varies due to missing data for some items.

Table 3. 4th Grade Student Pre-test/Post-test Comparison—Willingness to Try New Fruits/Vegetables and to Choose Fruits/Vegetables as Snacks

<table>
<thead>
<tr>
<th>Variable</th>
<th>Intervention</th>
<th>Control</th>
<th>(P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Try new fruit at school</td>
<td>347</td>
<td>117</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Try new vegetable at school</td>
<td>345</td>
<td>115</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Try new fruit at home</td>
<td>348</td>
<td>115</td>
<td>0.19</td>
</tr>
<tr>
<td>Try new vegetable at home</td>
<td>349</td>
<td>117</td>
<td>0.16</td>
</tr>
<tr>
<td>Choose fruit as snack instead of chips/candy</td>
<td>349</td>
<td>117</td>
<td>0.82</td>
</tr>
<tr>
<td>Choose vegetable as snack instead of chips/candy</td>
<td>346</td>
<td>115</td>
<td>0.02</td>
</tr>
</tbody>
</table>

Note: The sample size varies due to missing data for some items.
students who reported low consumption initially were 19.5 percentage points more likely than control school students to have increased their average daily intake of fruits and vegetables ($P=0.07$). Again, the positive program effect was larger when the analysis was limited to just 4th grade students. Low consuming 4th grade students in intervention schools ($n=40$) were 29.7 percentage points more likely than control students ($n=17$) to have increased their average daily fruit and vegetable intake ($P=0.05$).

**DISCUSSION**

Preventing childhood overweight and obesity is a national public health priority. Childhood appears to be a critical time to target nutritional messages designed to influence food preferences. Children’s preferences for specific foods tend to increase with frequency of exposure to the food. Frequency and exposure is influenced by the availability and accessibility of foods. Moreover, studies show that consumption of fruits and vegetables, as a habit in childhood, is an important predictor of higher fruit and vegetable consumption as adults. Also, lifetime food experiences, such as developing food preparation skills, developing specific preferences for healthy foods, and gardening, have been found to contribute to food choice.

It is essential that the effects of school, district, or state policy changes regarding the school food environment are evaluated. In this study, we determined whether the FFVP is an effective method of introducing school-age children to fresh fruits and vegetables as a healthy food choice. In particular, we examined whether the program resulted in positive changes in attitude and behavior related to fruit and vegetable consumption following 3 months of program implementation. We found that students in the FFVP intervention sites compared to students in the control schools were more willing to try new fruits and vegetables at school, but not at home. It is possible that differences in attitudes toward trying these foods at home will emerge following longer exposure to the program. Certainly, for the program to be considered a success, the effects must reach beyond school and into the home.

We recognize that there are certain limitations to the study. Participants were not selected at random and, although we feel they reflect the average characteristics of students in the state fairly well, it may be that our results are not generalizable to other samples of school-age children. We also recognize the limitations inherent in collecting data of this nature via self-report measures. We believe that the strengths of the study, including a large sample size, pre-test/post-test design, use of control schools, and comprehensive nature of the survey instruments provide informative and useful results.

In conclusion, this study indicates that the Wisconsin FFVP is having some beneficial short-term effects. Continued monitoring of this program will determine if healthier diets are being adopted by the students in the intervention schools and whether this in turn will eventually reduce the prevalence of childhood overweight and obesity.

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**REFERENCES**

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