



Evaluation of the Fresh Fruit and Vegetable Program (FFVP)

Executive Summary

Food and Nutrition Service

U.S. Department of Agriculture
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At Abt Associates, Chris Logan played a key role in developing the survey instruments and Don Laliberty and Louise Hadden performed the data analysis. Jodi Foster led on-site data collection activities, with assistance from Jon Schmalz and other Abt-SRBI staff. Jan Nicholson produced the report. Finally, Nancy Burstein, our Project Quality Advisor, provided guidance and insightful commentary.

Executive Summary

The U.S. Department of Agriculture's (USDA) Fresh Fruit and Vegetable Program (FFVP) is designed to improve the overall diet quality of school children by providing healthful foods and helping children learn more healthful eating habits. FFVP reimburses selected elementary schools with high rates of free and reduced-price meal enrollment for providing fresh fruits and vegetables to students during the school day, outside of normal school breakfast and lunch meals.

Under the 2008 Farm Bill (P.L. 110-234), the Richard B. Russell National School Lunch Act (NSLA) was amended to authorize the expansion of FFVP to selected schools nationwide. Initial funding for the program was \$40 million during the 2008–2009 school year, rising to \$65 million in 2009–2010, and then to \$101 million in 2010–2011, the year in which data for this evaluation were collected. Funding rose to \$150 million in the 2011–2012 school year, and continues at that level thereafter, indexed for inflation. Funding is to be allocated “to schools with the highest percentages of low-income students, to the maximum extent practicable” (language is from the legislation), at a level of \$50 to \$75 per student over the school year.

As part of this authorizing legislation, the Secretary of Agriculture was tasked with conducting an evaluation of FFVP. Abt Associates Inc. and its partner, the Dr. Robert C. and Veronica Atkins Center for Weight and Health at the University of California, Berkeley, conducted the evaluation for the USDA Food and Nutrition Service (FNS).

Evaluation Objectives

The FFVP authorizing legislation mandated an evaluation of the program to determine whether children experienced, as a result of participating in the program, increased consumption of fruits and vegetables and other dietary changes, such as decreased consumption of less nutritious foods. In response, FNS developed an evaluation with two components: (1) an impact study to estimate program effects on participating students and schools; and (2) an implementation study to examine how FFVP operates in participating schools.

The *impact component* of the evaluation estimates the effect of FFVP on two primary outcomes among students in participating schools on days when FFVP fruits and/or vegetables were distributed:

- Total quantity of fruits and vegetables consumed.
- Total energy intake (also referred to as total caloric intake), allowing the assessment of whether any additional fruit and vegetable consumption was in addition to or in place of other foods consumed.

In addition to these primary outcomes, FFVP activities are hypothesized to impact a wide array of secondary outcomes at both the student and school level. The study examines the impact of the program on secondary outcomes, including exploratory analysis of impacts on students, including:

- Students' consumption of other foods, including snack foods.
- Nutritional status of students, measured by nutrient intake and total consumption relative to various nutritional standards.

- Student attitudes towards fresh fruits and vegetables.

The study also examines the impact of FFVP on several aspects of the school environment, including:

- Nutrition education provided to students as part of the school curriculum.
- Availability of competitive foods in schools.
- Differences in school meals, as measured by fruits and vegetables served and the number of meals served.

The **implementation component** provides descriptive and contextual information about several aspects of FFVP operations:

- The FFVP application process, including the characteristics of applicant and participating schools.
- Implementation of FFVP, including distribution methods and frequency, types of fruits and vegetables offered, nutrition education provided, partnerships established in support of the program, and perceptions of the program.
- Student participation in FFVP, including self-reported frequency of participation, characteristics of participants vs. nonparticipants, and reasons for not participating.
- Satisfaction with the program as reported by students, parents, and other stakeholders.

Design, Data, and Methods

The evaluation objectives require estimating program impacts on participating students and schools and analyzing the implementation of FFVP. These two evaluation components required separate samples.

Sampling

This evaluation estimates the *impact* of FFVP using regression discontinuity (RD), which is considered the strongest possible design when random assignment is not possible.¹ Random assignment was not feasible for FFVP because, as noted above, the FFVP legislation requires that available FFVP funding be allocated in each State to the poorest schools, where poverty is defined by the percent of students eligible for free or reduced-price school lunch (FRPSL). The RD approach leverages the procedure by which schools are assigned to participate in FFVP, by comparing schools immediately above and below the funding cutoffs in each of the sampled States. Those schools differ in whether they received FFVP, but are likely to be otherwise quite similar. The impact analysis sample included 4,696 students in 214 schools within 2.5 percentage points of the funding cutoff in each State: 2,471 students in 115 FFVP schools just above the funding cutoff, and 2,225 students in 99 non-FFVP schools just below the funding cutoff.

The internal validity of the RD design is highest when the schools included in the RD sample are deliberately sampled to be as close to each State-specific cutoff as possible. As such, these schools

¹ See for example, Cook, 2008; Dinardo and Lee, 2010.

are not representative of all schools operating FFVP. By contrast, the *implementation* study is intended to provide detailed information on how FFVP is implemented in all participating schools across the country. Addressing such implementation questions requires a national probability sample of participating schools. For the implementation study, the impact analysis sample was therefore supplemented with a randomly selected sample of participating schools that were not included in the impact study. Combining the FFVP schools in the impact sample and the random sample of all participating schools yields an implementation analysis sample of 698 FFVP schools in the 16 study States.

Data Collection

Determining impacts on primary outcomes for the impact study required collection of data at the student level on dietary intake. We collected this information using diary-assisted 24-hour recall interviews conducted by trained interviewers, which have been widely and successfully used with elementary school-aged children. Students also completed brief self-administered surveys about their attitudes and preferences for fruits and vegetables as well as their experiences with FFVP. The implementation study required collection of detailed implementation data from a wide variety of sources. Web surveys of State Child Nutrition (CN) Directors, School Food Authority (SFA) directors, and school principals and self-administered surveys of school food service managers, teachers, and parents provided detailed information on FFVP implementation in the sampled schools.

Analysis

For measuring the impacts of FFVP on student and school outcomes, unweighted linear multivariate regression models appropriate for RD design were used. The research objectives of the implementation analysis are descriptive, and were thus addressed using weighted tabulations and cross-tabulations.

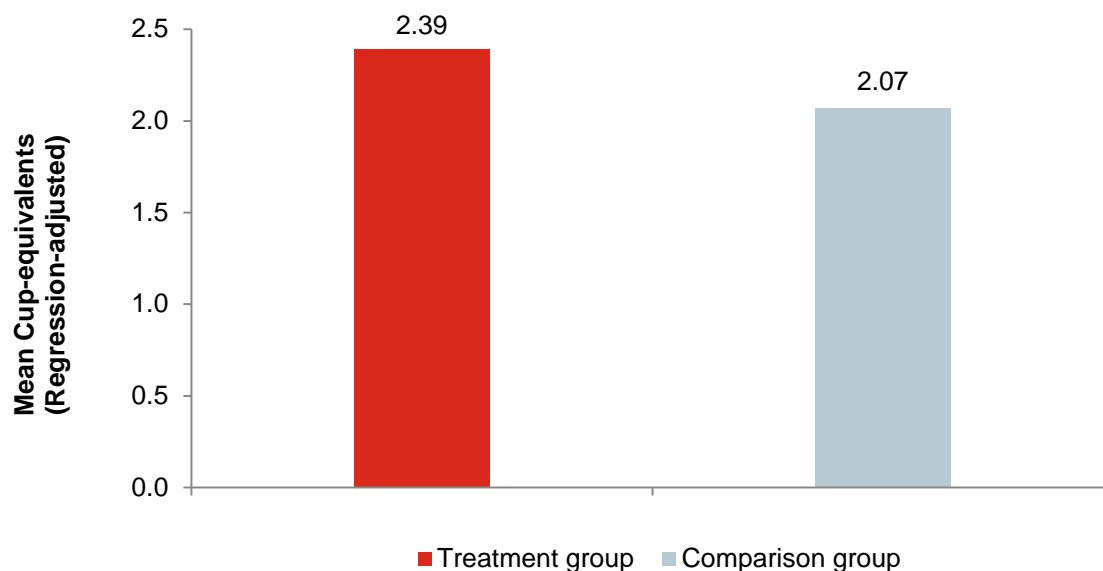
Findings

This section provides an overview of findings from the impact and implementation studies.

Impact Study

We focus the discussion of the impact study findings on our two, pre-specified, primary outcomes: total fruit and vegetable consumption and total energy intake. We also discuss statistically significant results for secondary outcomes which provide a richer characterization of the study results. Unless otherwise noted, in this section only treatment/comparison differences that are statistically significant at conventional significance levels are discussed.

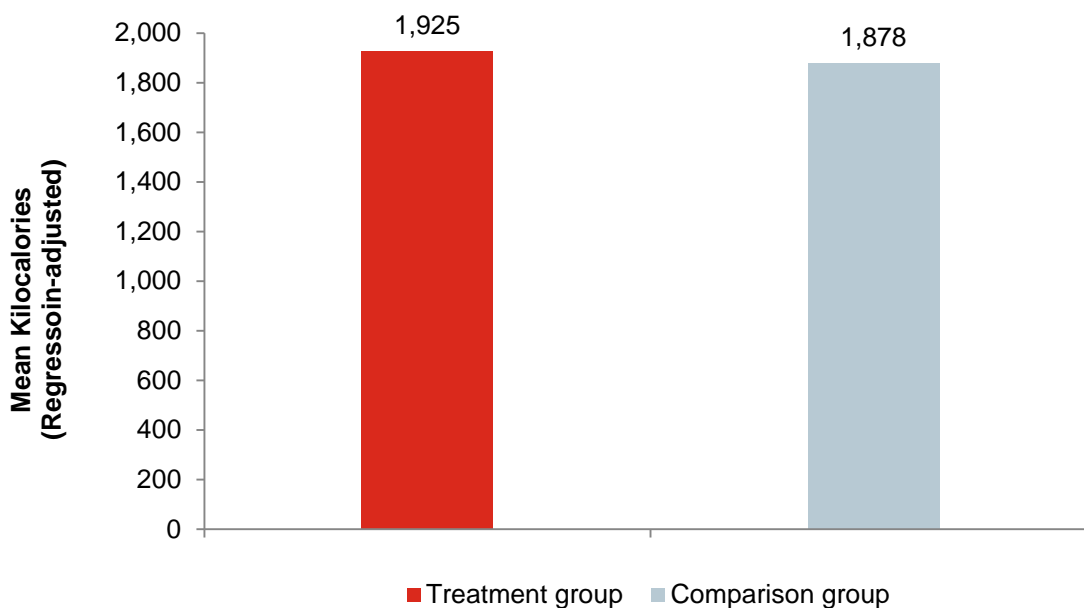
The analysis found strong evidence that fruit and vegetable consumption was higher among students in FFVP schools. Students in FFVP schools consumed approximately one-third of a cup (0.32 cups) more fruits and vegetables on FFVP days than students in comparable schools not participating in the program (Exhibit ES.1). FFVP appears to have been especially effective in improving fruit consumption, with approximately a quarter cup (0.26 cups) of the total impact on fruit and vegetable intake coming from fruits.

Exhibit ES.1: FFVP Increased Consumption of Fruits and Vegetables by 0.32 Cups

Comparing students in FFVP schools and in schools not participating in the program, there was no evidence of a statistically significant difference in total energy intake (Exhibit ES.2). If we had found higher total energy intake among students in FFVP schools, we might have been concerned that FFVP participation could contribute to weight gain. If we had found lower total energy intake, we would have concluded that greater fruit and vegetable consumption displaced consumption of other, more calorie-dense foods. In the absence of a statistically significant finding in either direction, we cannot definitively accept or reject either hypothesis.²

In addition, the secondary analyses found no consistent evidence of differences in intake of foods besides fruits and vegetables between students in FFVP and non-FFVP schools. On balance, these combined findings provide weak evidence that FFVP fruit and vegetable consumption was in addition to, rather than in place of, other foods. Further study of FFVP impacts on total energy consumption with a larger sample size may be warranted to investigate this question.

² The statistical power resulting from the sample size is insufficient to detect an impact on total energy resulting from consuming an additional one-third cup of fresh fruits and vegetables.

Exhibit ES.2: No Evidence that FFVP Affected Total Energy Intake

We hypothesized two general mechanisms by which FFVP might increase fruit and vegetable intake:

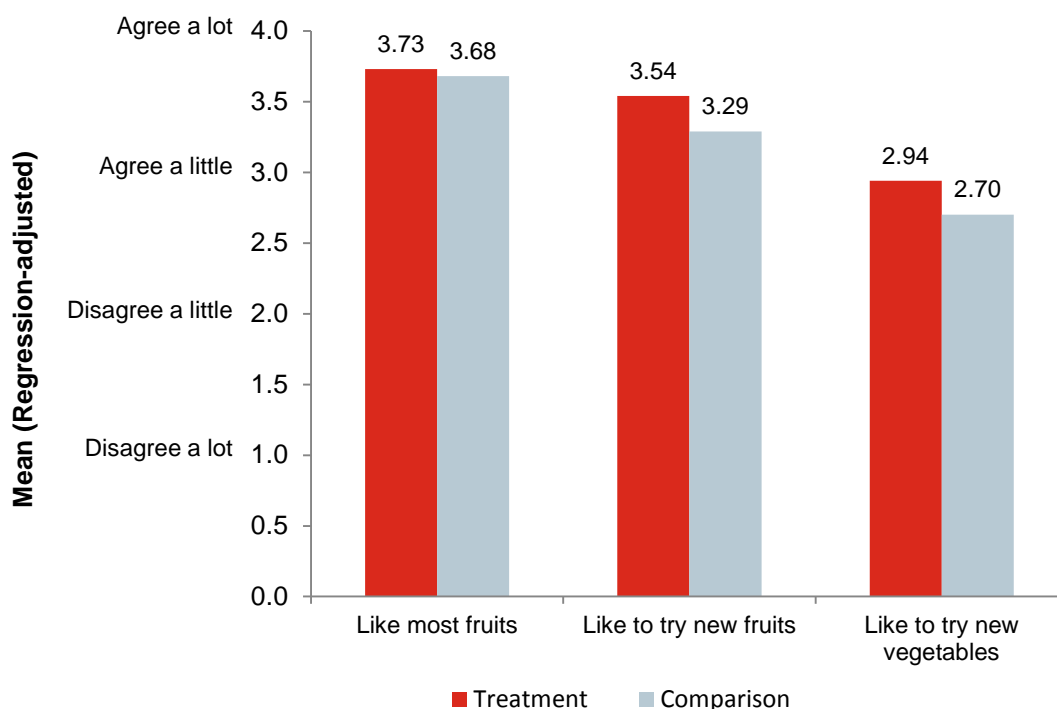
- directly, through student consumption of the FFVP fresh fruit and vegetable snacks provided; and
- indirectly, by influencing student knowledge, attitudes, and perceptions towards fruits and vegetables, thereby leading to increased student consumption in contexts outside of FFVP.

The exploratory analyses suggest that most, but not all, of the observed difference in consumption is attributable to direct effects on intake due to consumption of FFVP snacks. FFVP snacks provided students with approximately one-quarter cup of fresh fruits and vegetables. This represents most (80 percent) of the total observed difference in fruit and vegetable consumption.

Students in FFVP schools also consumed slightly, but statistically significant, more fresh fruits and vegetables outside of school (0.06 cups) than did students in schools not participating in the program, providing some evidence that FFVP may also indirectly increase fruit and vegetable consumption.

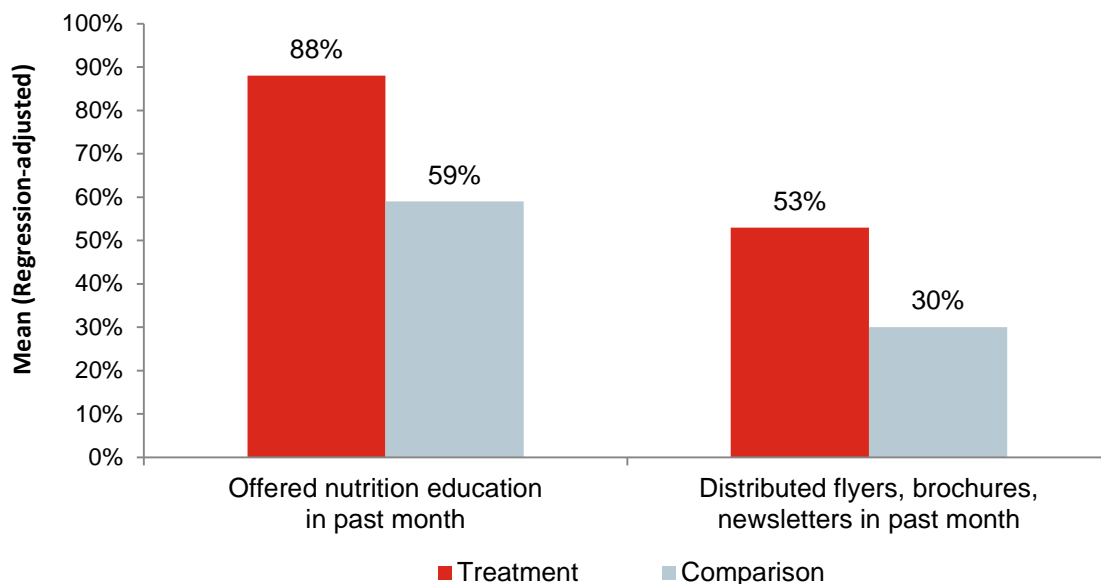
The exploratory analyses also found improvements in knowledge, attitude, and perception measures, consistent with the observed higher levels of out-of-school fruit and vegetable consumption among FFVP students. Students in FFVP schools had more positive general attitudes towards fruits and vegetables (Exhibit ES.3). Specifically, students participating in FFVP were more likely to agree that they “like most fruits” and that they “like to try new fruits and new vegetables.” (There was no difference between FFVP students and students not participating in the program in agreeing that they “like most vegetables.”) In addition, results indicated that FFVP improved student familiarity with a number of specific fruits and vegetables and improved how much they reported liking some specific fruits and vegetables.

Exhibit ES.3: FFVP Participants had More Positive Attitudes towards Fruits and Vegetables



Nutrition education and promotion activities in schools are one potential mechanism through which FFVP may affect student attitudes, leading to increased fruit and vegetable consumption. Nutrition education is considered a critical component of FFVP and schools are strongly encouraged to provide nutrition education along with the FFVP snacks. FFVP schools have markedly greater levels of nutrition education and promotion activities than their non-FFVP counterparts. FFVP schools were more likely to provide nutrition education and to distribute promotional flyers, brochures, and newsletters (Exhibit ES.4).

Exhibit ES.4: FFVP Schools Provided More Nutrition Education and Promotion Activities



On average, FFVP schools offered nutrition education activities 2.4 times per week compared to 0.7 times per week in schools not participating in the program. Additionally, consistent with the primary objectives of FFVP, nutrition education and promotion messages about fruits and vegetables and about trying new kinds of foods were conveyed more frequently in FFVP schools.³

Implementation Study

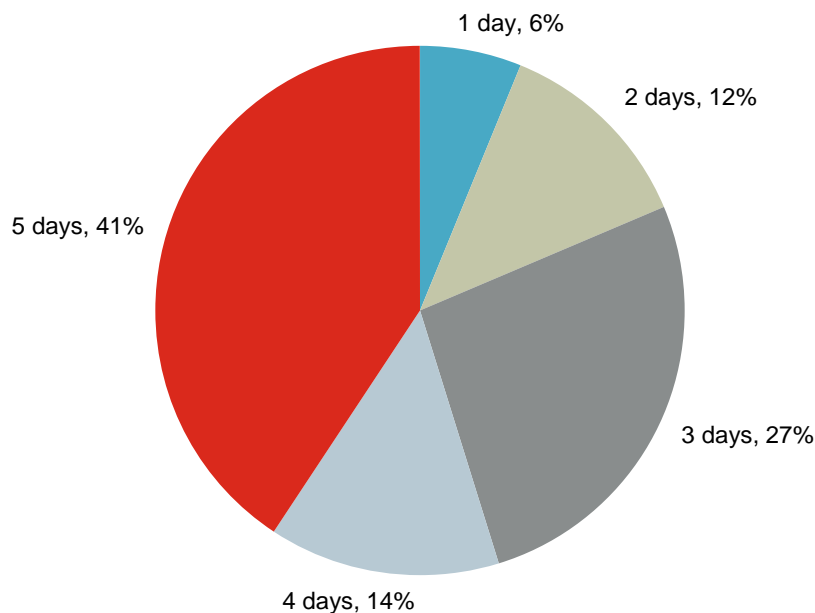
The FFVP legislation and FNS's guidance require States to give priority to the highest need applicant schools, defined as those schools with the highest percent of students eligible for free and reduced-price lunches. Consistent with legislative intent, FFVP is reaching students in the highest need schools. Compared to schools that applied for program funding but did not receive it, FFVP schools had a higher percentage of students eligible for free and reduced-price lunches (85 percent compared to 64 percent), had a higher percentage of non-white students (77 percent compared to 51 percent), and were more likely to be located in urban areas (45 compared to 27 percent) and less likely to be in rural areas (18 compared to 33 percent). Similar patterns are evident when comparing schools participating in FFVP to schools with at least 50 percent of students eligible for free and reduced-price meals (the pool targeted for FFVP) and to all elementary schools in the State.

FFVP implementation appears to be broadly consistent with USDA program guidelines. USDA encourages schools to implement FFVP two or more times per week, and nearly all schools (94 percent) reported doing so (Exhibit ES.5) In fact, 41 percent of FFVP schools chose to provide the free snacks five days a week and another 41 percent of schools offered FFVP snacks three or four

³ Our exploratory analysis did not find differences in FFVP impacts by level of nutrition education and promotion offerings.

times per week. Consistent with the program goal of exposing students to a variety of fresh fruits and vegetables, schools reported serving, on average, six different fruits or vegetables each week.

Exhibit ES.5: Number of Days FFVP Snacks Are Offered Each Week



Serving FFVP snacks in classrooms was to be the preferred method for most schools. Just over half the schools (55 percent) served the snacks exclusively in classrooms, and 89 percent served them in the classroom at least some of the time. Serving from mobile carts, in the cafeteria, and in hallways were other common methods. Almost 90 percent of schools served the FFVP snacks using just one or two distribution methods.

States, school districts, and schools are encouraged to form partnerships with outside organizations to support implementation and operation of FFVP. While most States (82 percent) have established partnerships, relatively few districts (26 percent) and schools (12 percent) have developed such independent relationships, though schools and districts likely benefit directly or indirectly from State partnerships. Partners are most likely to provide support for nutrition education activities, including educational materials, and demonstrations or instruction for students.

Finally, FFVP is a popular program among all its constituencies. Program administrators, including SFA directors, principals, school food service staff, and teachers, all expressed strong support for FFVP. Nearly all respondents (over 95 percent) in each group agreed that their overall opinion of FFVP was favorable and that they would like FFVP to continue at their school. Parents also expressed strong support (98 percent) and would like the program to be offered more frequently (96 percent). Student opinions mirrored those of their parents and the program administrators. Almost all students (97 percent) wanted the program to continue. While the majority of students (86 percent) agreed that the fruit and vegetable snacks “looked and tasted good,” students expressed a decided preference for fruits.

Conclusions

The increase in fruit and vegetable consumption of one-third cup per day among students in schools participating in FFVP is important because population dietary changes are generally small and incremental. While there is no consensus as to what constitutes a meaningful change in fruit and vegetable intake, it is generally accepted that children with the lowest intakes are at greatest risk of poor health outcomes, and that the greatest benefit would be conferred by increasing intakes of fruits and vegetables among this group (USDA & DHHS, 2010). Further, children from socioeconomically disadvantaged families tend to have the lowest intakes of fruits and vegetables.⁴ By focusing on higher need schools, FFVP specifically targets this at-risk group. Thus, increasing fruit and vegetable intakes by this population even by small amounts may confer a health benefit.

Further research on FFVP to understand more about how the program can affect fruit and vegetable consumption would be beneficial. Future investigations could consider exploring how nutrition education can best be used to reinforce the direct impact of providing fresh fruits and vegetables to students. Examining how variations in implementation affect outcomes and providing “best practices” for States and school districts could help maximize program impacts. Investigating ways to specifically increase vegetable intake could be particularly useful. Finally, studying longer term impacts, both over multiple years of FFVP exposure and after students have left elementary school and are no longer participating in FFVP, would provide valuable information to policy makers.

⁴ See, for example, Krebs-Smith et al., 1996; Darmon and Drewnowski, 2008; Dubowitz et al., 2008; Lorson et al., 2009.

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