

REPORT

FINAL EVALUATION REPORT

**Evaluation of the Pilot Project for Canned,
Frozen, or Dried Fruits and Vegetables in the
Fresh Fruit and Vegetable Program (FFVP-
CFD)
Volume I: Report**

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EXECUTIVE SUMMARY

The Fresh Fruit and Vegetable Program (FFVP), administered by the U.S. Department of Agriculture (USDA)'s Food and Nutrition Service (FNS), provides funding for the distribution of free fresh fruit and vegetable snacks to students in selected elementary schools with high rates of free and reduced-price meal enrollment. The goals of the FFVP are to improve children's overall diets and create healthier eating habits that will improve their present and future health.¹

Section 4214(d) of the Agricultural Act of 2014 (P. L. 113-179) called for a pilot project within the FFVP to offer canned, frozen, or dried (CFD) fruits and vegetables as part of the FFVP in school year (SY) 2014–2015. The act included a requirement for an evaluation of the pilot focusing on four key study objectives: (1) impact on students' fruit and vegetable consumption at schools participating in the pilot project, (2) impact of the pilot project on school participation in the FFVP and operation of the program, (3) implementation strategies used by schools participating in the pilot project, and (4) acceptance of the pilot project by key stakeholders (students and parents; State, School Food Authority (SFA), and school staff; and community partners). This report fulfills this directive by describing the results of this evaluation.

Schools selected by State agencies for the pilot included FFVP elementary schools that had difficulty accessing, preparing, or storing fresh produce. Four States (Alaska, Delaware, Kansas, and Maine) applied for and were accepted into the pilot. The pilot study included 58 schools across the four States that met the pilot project criteria and agreed to participate in the evaluation.

A. Study design

The evaluation used a pre/post design, comparing data from the fall of 2014, when the standard FFVP was in place, to data from the spring of 2015, when the FFVP-CFD pilot was in place. Schools had the option to serve canned, frozen, and dried fruits and vegetables beginning January 1, 2015. The evaluation relied on four categories of data to address the research objectives:

1. **Data collected in schools.** Trained field interviewers (FIs) visited the 34 pilot schools containing at least 50 students during one target week in fall 2014 under standard FFVP operations and one in spring 2015 during FFVP-CFD pilot operations.² Data collection occurred over a period of 10 weeks in both the fall and the spring. As a result, the sum total of observations across the schools in the fall and in the spring provide a representative estimate of FFVP service and student consumption across the months and weeks of each period. The on-site data collected by FIs included observation of FFVP snacks and school meals, dietary recall data from sampled students, menu data for FFVP snacks and school meals, and observation of nutrition education and promotional materials. Food service managers (FSMs) provided daily counts of USDA-reimbursable breakfasts and lunches for

¹ <http://www.fns.usda.gov/sites/default/files/FFVPFactSheet.pdf>.

² Thirty-four schools met the criteria for on-site data collection—that is, having an enrollment of at least 50 students. These schools represent 93% of all of the students in the pilot. The remaining 24 small schools participated in all other aspects of the evaluation, including surveys of all respondents except students.

the target week and kept a monthly calendar indicating which days were FFVP program days.

2. **Survey data.** The evaluation drew on data from surveys of Child Nutrition (CN) Directors from all States (pilot and non-pilot); SFA Directors, FSMs, and principals of all pilot schools; sampled teachers and parents in all pilot schools; and sampled students in pilot schools with on-site data collection.
3. **Semi-structured telephone interview data.** The evaluation drew on qualitative data from 39 one-hour telephone interviews with stakeholders, including CN Directors in all four pilot States; SFA Directors, FSMs, principals, teachers, and parents from sampled pilot SFAs and schools; and community partners working with sampled pilot schools.
4. **Administrative cost data.** The evaluation collected FFVP administrative cost data from SFAs participating in the evaluation from fall 2014 and spring 2015 to examine changes in cost patterns before and during pilot conditions.

B. FFVP operations in SY 2014–2015

Overall, FFVP operations remained largely unchanged between fall and spring. The change most frequently cited, by 48% of SFA Directors, was additional training for school staff to incorporate CFD fruits and vegetables. Fewer changes were made to purchasing and transportation arrangements for fruits and vegetables, with 16% and 6%, respectively, of SFA Directors reporting such a change.

Observation data collected during target weeks in schools indicated that schools offered FFVP snacks more frequently under pilot conditions in the spring than under standard conditions in the fall. The mean number of FFVP snack days per week increased from 2.8 days in the fall to 3.4 days in the spring.

No substantial changes occurred in the school food environment related to fruit and vegetable or nutrition promotion and education activities assessed during the FFVP-CFD pilot period. FFVP snack distribution and consumption locations remained fairly consistent between fall and spring. Snacks were distributed and consumed in the classroom more than 90% of the time in both the fall and the spring.

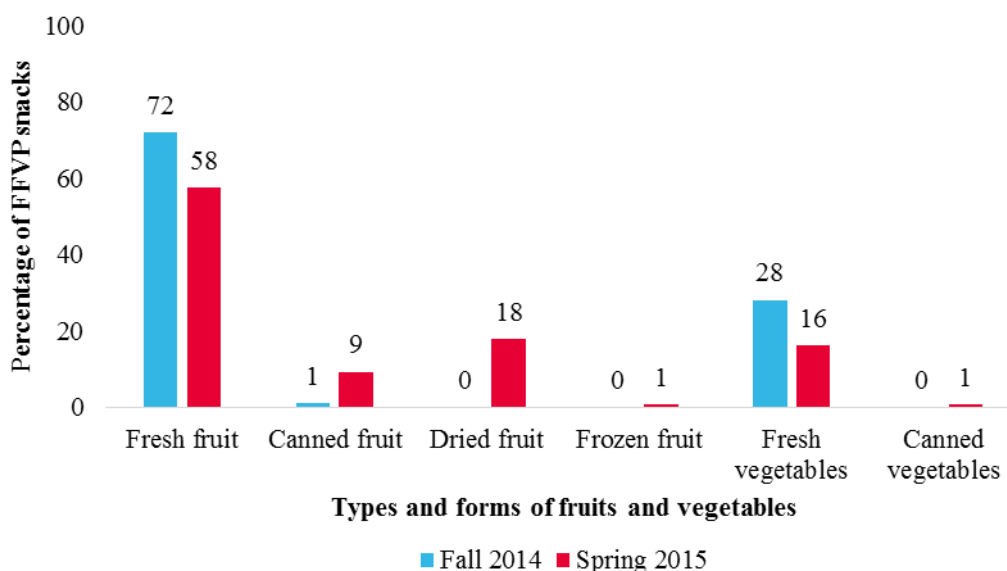
1. Fruits and vegetables offered in FFVP snacks in fall 2014 and spring 2015

The FFVP-CFD pilot allowed but did not require schools to introduce CFD items as the snack offerings beginning January 1, 2015. In an average week in spring 2015, more than half of the schools (56%) did incorporate CFD items into FFVP snacks, 41% offered only fresh produce, and 3% did not offer FFVP snacks. A small proportion of schools (6%), offered only CFD snacks in an average week. The rest—half of all schools in the study—offered a mix of CFD and fresh fruits and vegetables. It is unclear why such a high percentage of schools that participated in the pilot did not offer CFD fruits and vegetables during an average week during the FFVP-CFD pilot.

Schools implementing the pilot did not draw equally from the new forms available: dried and canned fruits were much more common than other CFD items. Together, they represented more than 25% of observed FFVP snacks in spring 2015 (Exhibit ES.1). Dried fruit was the

most common CFD item, representing 18% of snacks in the spring. Canned fruit made up 9% of snacks in the spring. Frozen fruits and canned vegetables each made up less than 1% of snacks under the pilot.

Exhibit ES.1. Types and forms of fruits and vegetables offered in FFVP snacks, changes between FFVP standard in fall 2014 and FFVP pilot in spring 2015



Source: Evaluation of the FFVP-CFD pilot project, Reimbursable Foods Form (fall n = 34; spring n = 34), SY 2014–2015. Tabulations prepared by Mathematica Policy Research.

Note: Excludes three schools in the fall and one school in the spring that did not serve FFVP snacks during its target week for data collection. One school was observed serving canned fruit as an FFVP snack during fall 2014. This snack would not have been reimbursable under the standard program rules in place at that time. Because no sampling of schools was conducted and RFFs were completed by all schools with on-site data collection, statistical tests were not necessary.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; RFF = Reimbursable Foods Form; SY = school year.

The introduction of CFD items displaced a proportion of fresh items, which was the only allowable form during the standard FFVP in fall 2014. Fresh items decreased from virtually all snacks in the fall to 74% of snacks in the spring (Exhibit ES.1). Both fresh fruits and vegetables decreased: fresh fruits from 72% to 58% of snacks and fresh vegetables from 28% to 16% of snacks.

Because CFD items were overwhelmingly fruits and not vegetables, and because they replaced both fresh fruits and fresh vegetables, the pilot caused the ratio of fruits to vegetables offered in snacks to shift toward more fruits and fewer vegetables. Fruits were already more common than vegetables in FFVP snacks in fall 2014 but the difference increased under pilot conditions in spring 2015. The proportion of snacks containing fruit—whether fresh or CFD—increased from 72% to 83%; the proportion containing vegetables fell from 28% to 17%.³

³ In a few cases in the spring, multiple forms of fruit were offered during a single snack. Therefore, the sum of the fruit forms listed in Exhibit ES.1 do not exactly equal 83%.

The types of fresh items offered did not change under the pilot. Apples, oranges, and bananas were the most common fresh fruit items offered in both fall and spring (strawberries were also common in the spring). Celery, salad, cucumbers, carrots, and snow peas were the most common fresh vegetables in both fall and spring. Under the pilot, schools supplemented these fresh snacks with CFD items. The most common were dried cranberries, raisins, and dried fruit mixes. Mandarin oranges were the most common canned item. The only frozen fruit offered was blueberries and the only canned vegetable was corn (both offered in only 1% of FFVP snacks in the spring).

The average portion size of fruit and vegetable snacks offered through the FFVP did not change substantially between fall 2014 and spring 2015, increasing by 0.03 cup equivalents. The average size of FFVP fruit snacks decreased by 0.06 cup equivalents;⁴ the average size of FFVP vegetable snacks offered increased by a little more than one-tenth of a cup equivalent.

Little change occurred in key nutrient content of FFVP snacks. Calories and carbohydrates did increase by 20 calories and 5 grams, respectively. The changes in the type and form of FFVP snacks offered explain some of this increase. Fruits represented a greater proportion of FFVP snacks in the spring compared to the fall and canned fruits were incorporated in the FFVP starting in the spring. Fruits typically are higher in calories and carbohydrates than vegetables and canned fruits may be canned in fruit juice or light syrup that contains extra sugar and calories.

2. Types and forms of fruits and vegetables offered in reimbursable breakfasts and lunches

To examine the relationship between the types and frequency of fruits and vegetables offered in reimbursable school breakfasts and lunches to those offered in FFVP snacks, the amounts, types, and forms of fruits and vegetables offered in reimbursable breakfasts and lunches in fall 2014 and spring 2015 were compared. Offerings of fresh fruits decreased by 5 percentage points at breakfast from fall to spring while offerings of canned fruit increased by 2 percentage points, and fruit juice decreased by 4 percentage points. There were no major differences at breakfast in the type and form of vegetables—typically they were not offered at breakfast, except for hash browns. These changes appear to reflect the introduction of CFD fruit in FFVP pilot snacks in the spring, indicating that schools might have used leftover fresh fruits from the fall FFVP standard snacks and leftover canned fruits from FFVP pilot snacks in the spring to meet the fruit requirement at breakfast.

Changes in the form of fruits offered at lunch were similar. The percentage of lunches containing fresh fruit decreased by one percentage point from fall to spring. The percentage containing canned fruit increased 7 percentage points. Differences in the form of vegetables offered at lunch were minimal and do not show increased use of canned or dried vegetables. The

⁴ The USDA defines a cup equivalent as a comparable amount of various foods used as a standard of comparison within the fruit and vegetable food groups (USDA 2016). The specific conversion between cups and cup equivalents varies by type and form of fruits and vegetables. In general, for fresh fruits and vegetables and 100% juice, one cup equivalent is the amount of food considered equivalent to one cup of a cut-up fruit or vegetable. Two cups of raw leafy greens are considered one cup equivalent of vegetables. For dried fruits, one-half cup generally equals one cup equivalent.

lack of change in vegetable forms is not surprising because schools offered almost no CFD vegetables as FFVP snacks under the pilot. Changes in the forms of fruits offered at lunch might reflect an increased use of canned instead of fresh fruit in FFVP snacks between fall and spring, respectively, indicating that schools used leftover fresh fruits in the fall and leftover CFD fruits from FFVP pilot snacks in the spring to meet the fruit requirement at lunch. Despite changes in the form of fruits and vegetables offered at breakfast and lunch, the overall amounts of fruits and vegetables offered in school meals did not change substantially between fall and spring.

C. FFVP-CFD pilot project impacts

The study addressed the impact of the FFVP-CFD pilot project on student outcomes, including program participation, fruit and vegetable consumption, food and nutrient intake, diet quality, and FFVP snack wastage. All of the food and nutrient findings focus on students' in-school consumption, including school meals, FFVP snacks, and foods and snacks brought from home.

1. Student participation in the FFVP

Student participation in the FFVP did not change significantly from fall to spring and was around 75% in both time periods. Measures of student participation in the FFVP showed no clear change from the standard FFVP in fall 2014 to the FFVP-CFD pilot in spring 2015. Participation was measured through observations of sampled classrooms in schools with on-site data collection. Students were counted as participants in the FFVP if they took a snack when it was offered, regardless of the amount they consumed.⁵ FIs recorded the number of students taking FFVP snacks on a given day using classroom observation forms. These data were used to calculate the participation rates.

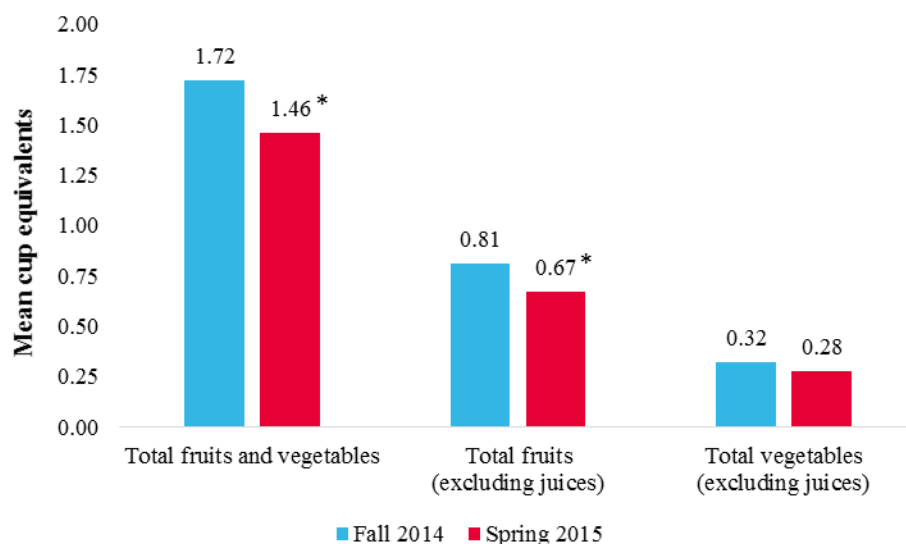
2. Change in fruit and vegetable consumption under the FFVP-CFD pilot project

In-school consumption of fruits and vegetables on FFVP snack days decreased from 1.72 cup equivalents in fall 2014 to 1.46 cup equivalents in spring 2015.⁶ Fruit and vegetable consumption on nonprogram days did not change significantly between fall and spring, making it plausible that the change on program days was related to the FFVP-CFD pilot. The decrease in fruit and vegetable consumption was driven by decreased consumption of fruit. Vegetable consumption did not significantly change from fall 2014 to spring 2015 (Exhibit ES.2).

⁵ If a student did not take the FFVP snack, they were considered a non-participant. If a student took a snack, but did not eat any amount they were considered a participant with 100% plate waste. Plate waste findings are presented later in this summary.

⁶ All statistics on fruit and vegetable consumption in this section are estimates from a statistical model that controls for student gender, grade, primary language spoken at home, free and reduced-price lunch status, race/ethnicity, and whether student usually engages in physical activity before the FFVP snack is served. Holding these characteristics constant provides the best estimate for the changes in consumption associated with the pilot between fall 2014 and spring 2015.

Exhibit ES.2. Mean cup equivalents of fruits and vegetables consumed in school on an FFVP snack day, among all students



Source: FFVP-CFD Pilot Evaluation, Diary-assisted/in-school Dietary Recall (fall n = 858, spring n = 935), SY 2014–2015.

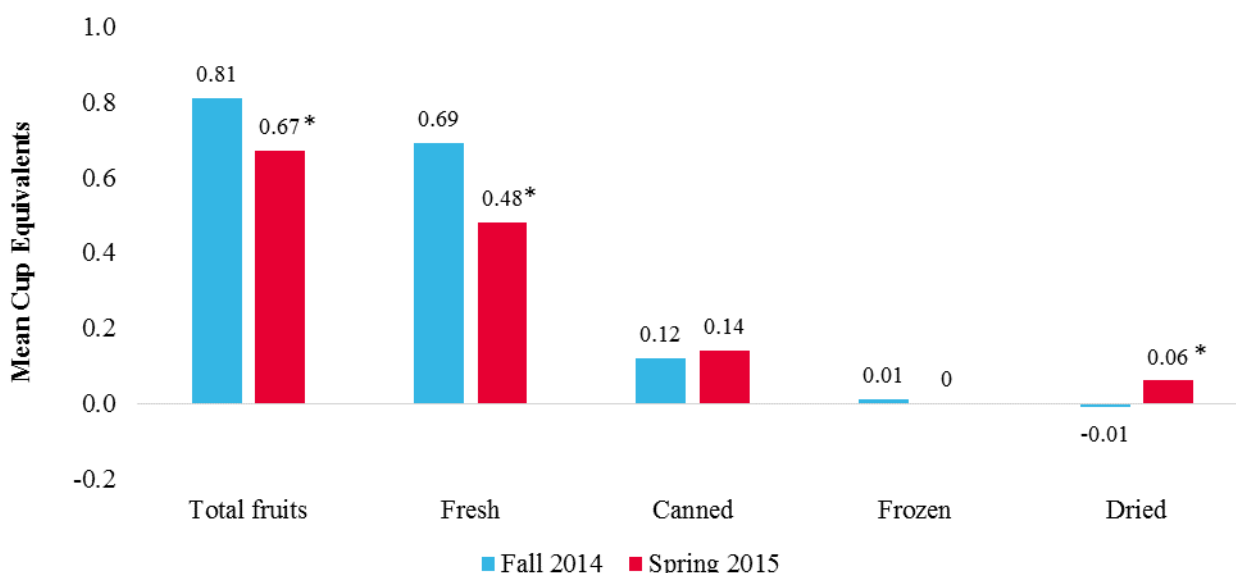
Note: These consumption averages are estimates from a statistical model that controls for student gender, grade, primary language spoken at home, free and reduced-price lunch status, race/ethnicity, and whether students usually engage in physical activity before the FFVP snack is served. Holding these characteristics constant provides the best estimate for the changes in consumption associated with the pilot between fall 2014 and spring 2015.

* Spring mean is significantly different from fall mean at the 0.05 level.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

A substantial decrease in consumption of fresh fruit between fall and spring explains the overall change in fruit consumption. Consumption of fresh fruits on FFVP program days fell more than a fifth of a cup equivalent, from 0.69 cup equivalents under the standard FFVP in the fall to 0.48 cup equivalents under the FFVP-CFD pilot in the spring (Exhibit ES.3). This finding is consistent with changes in snack offerings; schools offered fewer fresh fruit snacks in the spring than in the fall. Dried fruit consumption increased from fall 2014 to spring 2015, but not enough to offset the larger decrease in fresh fruit. The 0.13-cup equivalent decrease in overall fruit consumption was primarily the result of a 0.21-cup equivalent decrease in fresh fruit consumption and a 0.07-cup equivalent increase in dried fruit consumption.

Exhibit ES.3. Mean cup equivalents of fruits consumed in school on an FFVP snack day, by form of fruit, among all students



Source: FFVP-CFD Pilot Evaluation, Diary-assisted/in-school Dietary Recall (fall n = 858, spring n = 935), SY 2014–2015.

Note: The values shown in this exhibit are regression adjusted to hold constant student characteristics. This method provides the best estimate for the change in consumption from fall to spring. However, estimated consumption levels differ slightly from what was actually observed. The actual, unadjusted amount of dried fruit students consumed was 0.02 cup equivalents in the fall and 0.06 cup equivalents in the spring. It is only when student characteristics are controlled for that the consumption level in the fall appears to be negative.

* Spring mean is significantly different from fall mean at the 0.05 level.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

Two factors beyond fruit consumption contributed to the decrease in students' total fruit and vegetable consumption in school on FFVP program days: decreased consumption of juice and decreased consumption of fruits and vegetables incorporated into other foods. Decreased juice consumption is consistent with schools offering juice less frequently at breakfast in the spring compared with the fall. It is not clear why consumption of fruits and vegetables incorporated into other foods decreased. These two changes likely are not related to the FFVP-CFD pilot.

3. Change in student intakes of key nutrients

To see if the reduced consumption of fruits and vegetables in school under the FFVP-CFD led to changes in student nutrition outcomes, an analysis was performed of dietary recall data for food components associated with the dietary guidelines and key nutrients. The FFVP-CFD pilot was associated with a small reduction in total fruit intake and a small increase in empty calories, resulting in a one-point reduction in average overall Healthy Eating Index (HEI)-2010⁷ scores between fall 2014 and spring 2015 (63.9 versus 62.6). With the exception of fruit and empty calories, average HEI-2010 scores were nearly identical between fall 2014 and spring 2015. One source of empty calories was snacks brought from home and consumed during FFVP snack time.

⁷ HEI-2015 was not available at the time of the analysis. A perfect HEI score of 100 indicates adherence to U.S. dietary guidelines (Guenther et al. 2013). For this analysis of student consumption in school, scores are adjusted for total daily calories consumed in school.

Consistent with the small reduction in HEI-2010 scores, students' intakes of key nutrients in school were slightly lower in spring 2015 than in fall 2014. Mean energy intake decreased by 72 calories and mean intake of carbohydrates decreased by 10 grams. The reduction in energy intake led to slight decreases in intake of key nutrients. However, these changes were small in magnitude and do not indicate a substantial decrease in diet quality. Major changes in diet quality would have caused larger changes in HEI-2010 scores.

4. FFVP snack observations and plate waste

Analysis of the percent of FFVP snacks not taken and, among those taken, the percentage not eaten indicate student acceptance of snacks and snack wastage during the pilot. Analysis of the percent of snacks not taken uses classroom-level observation data. Analysis of plate waste uses data from individual students sampled for the in-school dietary recall. The FIs reported whether each sampled student took a snack and the percentage of the snack not eaten (plate waste).

a. Classroom observations of FFVP snacks

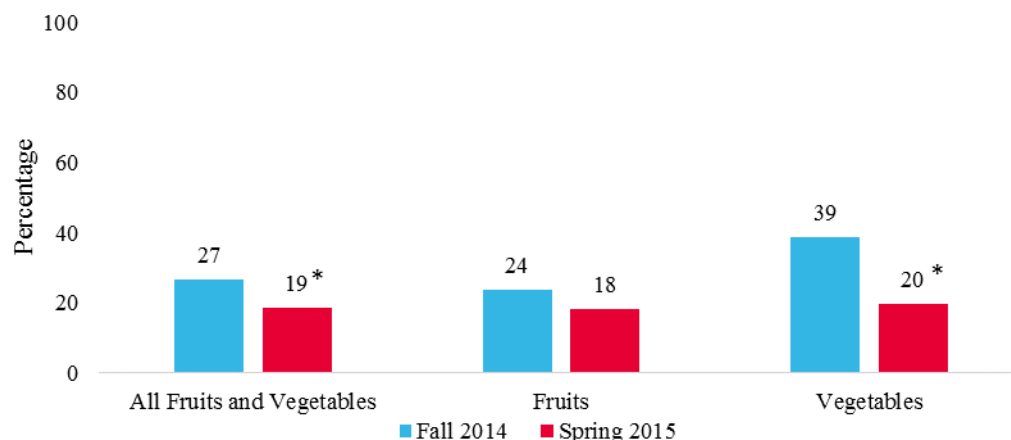
Both before and during the pilot, the average number of students taking fruit was greater than the number taking vegetables, and the portions left over were higher for vegetables than for fruit. In the fall, 25% of fruit snacks and 37% of vegetable snacks were left over (not taken) in classrooms. Under pilot conditions in the spring, this difference narrowed to 21% of fruit snacks left over compared to 25% of vegetable snacks.

Acceptance of CFD snacks offered during the pilot can be measured using differences in the mean percentage of portions left over at the classroom level during the spring, as well as in the consumption data shown above in section C.2. Lower rates of leftovers likely indicate higher rates of student acceptance. Using this approach, student acceptance of canned fruit (16% left over) appeared greater than that of fresh fruit (21% left over) or dried fruit (22% left over).

b. Observations of student plate waste

FIs collected data to assess plate waste of the individual students sampled for the in-school dietary recall. For each sampled student, FIs used visual estimation methods to observe and record the number of portions of the specific fruit and vegetable items initially served to (or selected by) the student and the number of additional portions received (if any). After snack eating time ended, the FIs used the observation form to record the amount of food left uneaten as a percentage of the total amount received between 0% (all consumed) to 100% (none consumed).

Exhibit ES.4 shows the mean proportion of FFVP snacks wasted in fall and spring, measured in cup equivalents. Cup equivalents provide a volume measure of snacks served and wasted. Overall, plate waste for FFVP snacks decreased eight percentage points from 27% in the fall to 19% in the spring. This change was driven by a reduction in the proportion of snacks that contained vegetables as well as decreased plate waste of vegetable snacks taken. Plate waste of vegetable snacks decreased from 39% to 20%. The decrease in vegetable waste is associated with changes in the types of vegetables offered between the fall and the spring and students' acceptance of those items. The decline in waste of FFVP vegetable snacks was not due to introduction of CFD vegetables; CFD vegetables were only offered in 3 classrooms out of a total of 66 classrooms where vegetables were observed to be offered in the spring.

Exhibit ES.4. Plate waste in FFVP snacks, percentage of cup equivalents wasted

Source: Evaluation of the FFVP-CFD pilot project, Classroom and Student Fruit and Vegetable Snacks Observation Form (fall n = 535, spring n = 548), SY 2014–2015. Tabulations prepared by Mathematica Policy Research are weighted to be representative of all 4th to 6th grade classrooms in pilot schools with a total enrollment of 50 or more students.

* Spring mean is significantly different from fall mean at the 0.05 level.

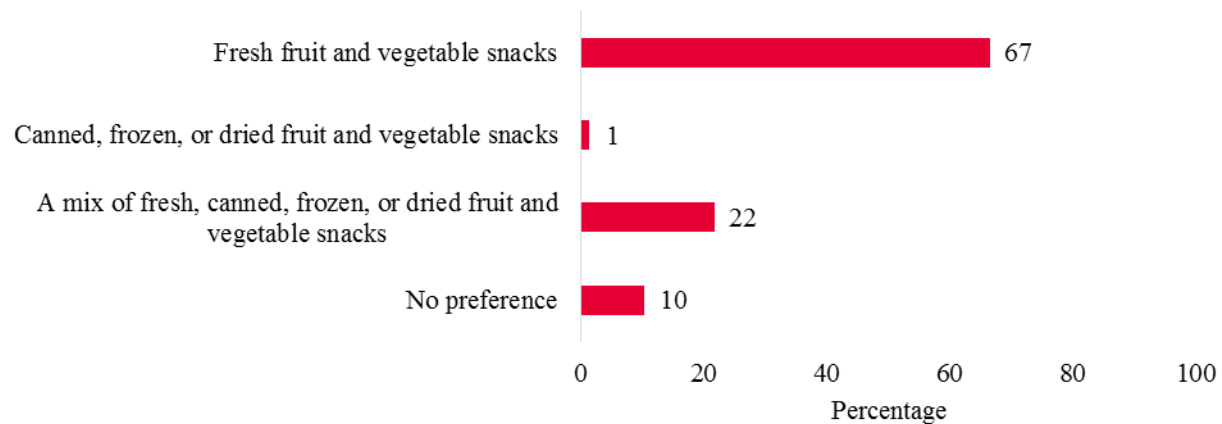
CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

D. Stakeholder acceptance of the FFVP-CFD pilot project

Incorporating CFD items into the FFVP affected a wide range of stakeholders, including students, parents, State, SFA, and school staff, and community partners. This section contains descriptions of these stakeholders' diverse reactions to the pilot as well as specific operational advantages staff cited when implementing the pilot.

Respondents across all stakeholder groups uniformly praised and appreciated the FFVP overall. However, these groups each had distinct views about the FFVP-CFD pilot. In the spring, an increased proportion (five percentage points) of students wished their school would serve different kinds of fruits and vegetables in the snack program, and a smaller proportion (five percentage points) of students agreed strongly that they hoped the FFVP would continue in their school compared to the fall. These findings suggest that acceptance of the program decreased slightly under pilot conditions.

Parent acceptance of the pilot was mixed. Parent survey responses showed that satisfaction with the FFVP increased from fall 2014 to spring 2015. The percentage of parents agreeing strongly that the FFVP was a good program increased from 71% to 81%, whereas the percentage disagreeing strongly fell from 13% to 2%. The percentage of parents reported encouraging their children to eat the snacks increased from 81% in the fall to 91% in the spring. On the other hand, when asked which types of fruit and vegetable snacks they preferred their children be served in schools, two-thirds of parents chose fresh only (Exhibit ES.5).

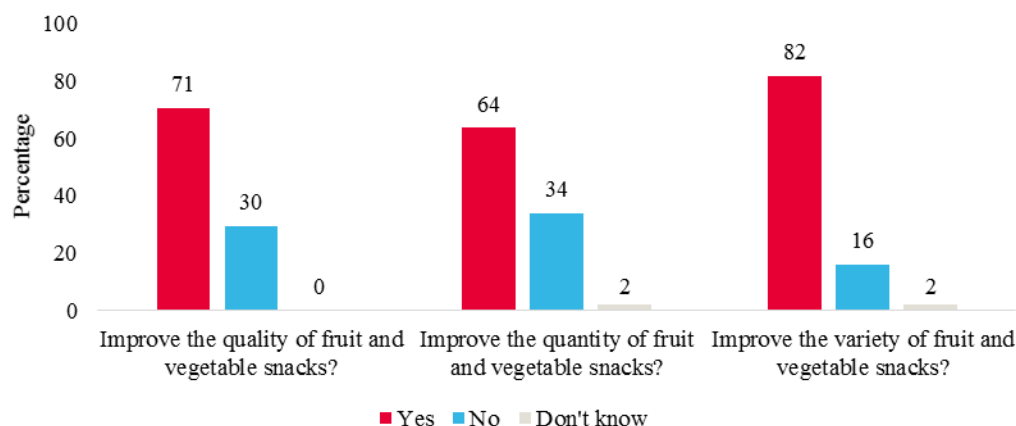
Exhibit ES.5. Parent responses to “Which of the following types of fruit and vegetable snacks do you prefer for your child to be served in school?”, spring 2015

Source: Evaluation of the FFVP-CFD pilot project, Parent Survey (n = 1,020), SY 2014–2015. Tabulations prepared by Mathematica Policy Research are weighted to be representative of parents of 4th–6th grade students in the pilot schools.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

Large majorities of staff in pilot schools expressed strong support for the FFVP under both standard and pilot conditions. Most measures of staff acceptance of the FFVP remained unchanged from fall 2014 to spring 2015. Although measures of staff acceptance of the FFVP did not change after the pilot was introduced, survey respondents identified several benefits of the pilot over the standard program. Most FSMs and principals reported that they thought the FFVP-CFD pilot improved the overall FFVP. Specific benefits FSMs identified include improved snack quality, quantity, and variety (Exhibit ES.6).

Exhibit ES.6. FSM views on fruit and vegetable snack quality and variety under the FFVP-CFD pilot, spring 2015



Sources: Evaluation of the FFVP-CFD pilot project, FSM Survey (n = 44), SY 2014–2015. Tabulations prepared by Mathematica Policy Research.

Note: Totals may not sum to 100% due to rounding.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

SFA Directors also reported benefits of the FFVP-CFD pilot. Almost two-thirds said increased snack variety was a major benefit of the pilot. Smaller but still substantial proportions cited reduced waste and improved snack quality as benefits. SFA Directors discussed these same features as benefits of the pilot during qualitative interviews. These views are representative of SFA Directors from districts that applied for the pilot and they do not represent others around the country.

State CN Directors also expressed appreciation for the pilot during qualitative interviews. They said the pilot made snacks more reliable—in particular, that CFD items can serve as a back-up option when fresh snacks are not available. They also appreciated that it increased the potential variety of snack items.

Strong pre-existing satisfaction with the FFVP among all levels of staff explains why program acceptance did not increase after the FFVP-CFD pilot was introduced, despite the many benefits staff perceived in the pilot. Over 90% of SFA Directors, principals, food service managers, teachers, parents, and students expressed satisfaction with the program in the fall 2014 survey, leaving limited scope for improvement in the spring.

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1. INTRODUCTION

This report fulfills the directive contained in section 4214(d) of the Agricultural Act of 2014 for the Secretary of Agriculture to submit to Congress a final report of the evaluation of the pilot project that allowed schools participating in the Fresh Fruit and Vegetable Program (FFVP) to offer canned, frozen, or dried (CFD) fruits and vegetables as part of the FFVP in school year (SY) 2014–2015. The report describes the results of the evaluation in terms of the four key study objectives: (1) impact on fruit and vegetable consumption at schools participating in the pilot project, (2) impact of the pilot project on school participation in the FFVP and operation of the program, (3) implementation strategies used by schools participating in the pilot project, and (4) acceptance of the pilot project by key stakeholders.

A. Background of the FFVP

The Fresh Fruit and Vegetable Program, administered by the U.S. Department of Agriculture (USDA)'s Food and Nutrition Service (FNS), provides funding for the distribution of free fresh fruit and vegetable snacks to students in selected elementary schools with high rates of free and reduced-price meal enrollment. The goals of FFVP are to improve children's overall diets and create healthier eating habits that will impact their present and future health (FNS 2016a).

The FFVP was established in 2002 as a limited pilot program to provide fresh fruits and vegetables as free snacks during school hours. After a series of pilot programs and expansions by FNS, the FFVP was converted into a nationwide program in the Food, Conservation, and Energy Act of 2008 (Public Law 110-234), also known as the Farm Bill, under Section 19 of the National School Lunch Act.

FFVP participation is limited, to the maximum extent practical, to schools with at least 50% of students approved for free or reduced-price (FRP) meal benefits. Also, elementary schools with the highest percentages of low-income students receive the highest priority for funding. Schools have considerable flexibility in how they operate the program, with a funding level of \$50 to \$75 per student per school year. The only requirements are that schools (1) agree to make fresh fruits and vegetables available to all enrolled children; (2) provide fresh fruits and vegetables to children as between-meal snacks; (3) demonstrate the documented support of the school food service manager (FSM), principal, and district superintendent; and (4) widely publicize the availability of fresh fruits and vegetables within the school. USDA suggests that schools use a variety of mechanisms to distribute fresh fruits and vegetables to children and recommends (but does not require) that schools provide complementary nutrition education and build State and local partnerships to support FFVP activities.

In 2013, USDA released a report based on an evaluation of the FFVP five years after it was implemented nationwide. The study found that students in FFVP schools consumed about one-third of a cup equivalent (0.32) more daily fruits and vegetables on average than students in schools that did not participate in the program.⁸ Most of the impact was due to changes in fruit

⁸ Student fruit and vegetable outcomes for the previous FFVP evaluation are regression-adjusted cup equivalents for a total 24-hour day when FFVP snacks were served (Bartlett et. al 2013). The national evaluation in SY 2011-2012 sampled from the 48 contiguous States and Washington, D.C.

consumption, which increased approximately a quarter cup equivalent (0.26). In addition to consuming more fruits and vegetables in school (0.26 cup equivalents), there was a small increase in fresh fruit and vegetable consumption outside of school (0.06 cup equivalents) (Bartlett et al. 2013; Olsho et al. 2015). The study also showed that FFVP participants had more positive attitudes toward fruit and vegetables than nonparticipants. Exploratory analyses on secondary outcomes, student attitudes and perceptions of fruits and vegetables, suggested that the increased nutrition education and promotion activities in FFVP schools might have improved attitudes toward fruits and vegetables, leading to increased consumption of FFVP snacks and these foods outside of FFVP. Finally, the study found no statistically significant difference in total daily energy intake between students at FFVP and non-FFVP schools (Bartlett et al. 2013).

B. Overview of the FFVP-CFD pilot and evaluation

The Agricultural Act of 2014 notes that the FFVP-CFD pilot project should be carried out in “not less than five States” in school year 2014–2015. In the summer of 2014, States submitted applications on behalf of schools who expressed interest in their respective State. Schools selected for the pilot included FFVP elementary schools that had difficulty accessing, preparing, or storing fresh produce. FNS encouraged State agencies to apply by June 15, 2014 (FNS 2014a). Four States (Alaska, Delaware, Kansas, and Maine) applied and were accepted into the pilot. FNS extended the application deadline to July 19, 2014, but no more States applied (FNS 2014b). The pilot study originally included 65 schools from four States that met the pilot project criteria and agreed to participate in the evaluation. All schools approved by FNS to participate in the pilot were in the evaluation. However, seven schools opted out of the pilot in the fall due to the perceived data collection burden on schools and students, leaving 58 schools in the pilot evaluation: 32 in Alaska, 3 in Delaware, 6 in Kansas, and 17 from Maine.

The evaluation used a pre/post design, comparing data from the fall of 2014, when the standard FFVP was in place, to data from the spring of 2015, when the FFVP-CFD pilot was in place. Schools had the option to begin serving canned, frozen, and dried fruits and vegetables beginning January 1, 2015. Schools that participated in the pilot were required to adhere to the Smart Snacks in School standards and participate in the pilot evaluation (FNS 2016b).

The evaluation included multiple research questions to fully address the study objectives outlined in the legislation (Exhibit 1.1). The evaluation measured the impact of the pilot on students’ consumption and participation in FFVP, and described pilot implementation strategies used by SFAs and schools. In addition, the study assessed pilot acceptance by gathering feedback from students, parents, State and school staff, and community partners.

Exhibit 1.1. Research objectives and questions for the FFVP-CFD pilot study

Study objective	Research questions	Chapter in this report
Study Objective 1: Examine the impacts on students' fruit and vegetable consumption (and plate waste) at the schools participating in the pilot project	1a. Do students eat comparable amounts of fruits and vegetables under the standard FFVP compared to the CFD pilot conditions (on an FFVP program day, over a typical school week)?	5
	1b. How do the foods (fruits and vegetables) offered in the pilot compare to those offered under standard FFVP conditions—what is offered; what is the nutrient profile of the average fruit/vegetable; how do fruit and vegetable selections in a typical week compare between the standard and pilot conditions for variety and nutritional value?	4
	1c. How does what is offered compare with what is taken and consumed?	5
	1d. What is the impact of the pilot on plate waste of FFVP fruits and vegetables?	5
Study Objective 2: Describe the impacts of the pilot project on school participation in FFVP	2. What is the impact of the CFD pilot on FFVP participation levels?	5
Study Objective 3: Describe the implementation strategies used by the schools participating in the pilot project	3a. <i>Under the pilot conditions:</i> i. Are CFD options offered alone or in combination with each other? ii. Are CFD options offered alone or in combination with fresh options? iii. Is the number of items, variety, and/or nutrients available/offered affected? iv. What is offered, and what is the combination of <i>CFD and fresh</i> (all canned, all frozen, all dried, all fresh, mostly one or the other, another combination)? v. When are CFD items offered (regularly, only close to weekends and/or holidays, other), and how are schools making these decisions (price, convenience, school schedule, student preference, delivery schedule, storage, other)? vi. What is offered, and what is the combination if only CFD items are offered (all canned, all frozen, all dried, mostly one or the other, or another combination)?	4
	3b. <i>Comparing standard and pilot conditions:</i> i. What is the average number of days FFVP snacks are offered per week? ii. How are fruits and vegetables prepared? iii. Are condiments added or offered with FFVP snacks? iv. What is the MyPlate cup equivalent serving size (on serving days)?	4, 5

Exhibit 1.1. (continued)

Study objective	Research questions	Chapter in this report
Study Objective 4: Measure and describe the acceptance of the pilot project by key stakeholders ^a	4a. What is the level of acceptance of the pilot?	6

Source: Evaluation of the FFVP-CFD pilot project, SY 2014–2015.

^aCN Directors, SFA Directors, students, school food service staff, school education staff, parents, and community partners.

CFD = Canned, frozen, or dried; CN = Child Nutrition; FFVP = Fresh Fruit and Vegetable Program; SFA = School Food Authority; SY = school year.

C. Overview of the report

This report (Volume 1) presents the findings for the FFVP-CFD pilot evaluation. Chapter 2 summarizes the methods for the study design, data collection, and analyses. Chapter 3 describes the States and schools that participated in the pilot project and Chapter 4 describes how they operated the FFVP and the pilot during SY 2014–2015. Chapter 5 contains key findings on the impacts of the pilot project on FFVP participation, student consumption of fruits and vegetables, and fruit and vegetable waste. Chapter 6 describes stakeholder acceptance of the pilot project, including the views of staff, students, parents, and partner organizations. Chapter 7 summarizes study findings and considerations for the FFVP. The report appendices include additional details on the study methodology and supplemental data tables. Volume 2 of the report includes the data collection instruments.

2. STUDY DESIGN

This chapter provides an overview of the design and methods for the evaluation of the FFVP-CFD pilot project in SY 2014–2015, including methods for (1) sampling classrooms and students in grades 4 to 6; (2) collecting and analyzing data at the State, SFA, school, classroom, and student levels; and (3) interviewing stakeholders about their experiences with the pilot project. Appendices A and B provide technical details on the data sources, measures, and analytic methods used to address the study objectives, and the creation of weights for statistical analysis, respectively. Appendix C provides additional details on the on-site data collection in schools and the nutrition coding methods used for the food and nutrient analyses of data from school menus, student dietary recalls, and plate waste observations. It also provides information on the change in reported FFVP snack offerings in a calendar month for the small schools that did not have on-site observations.

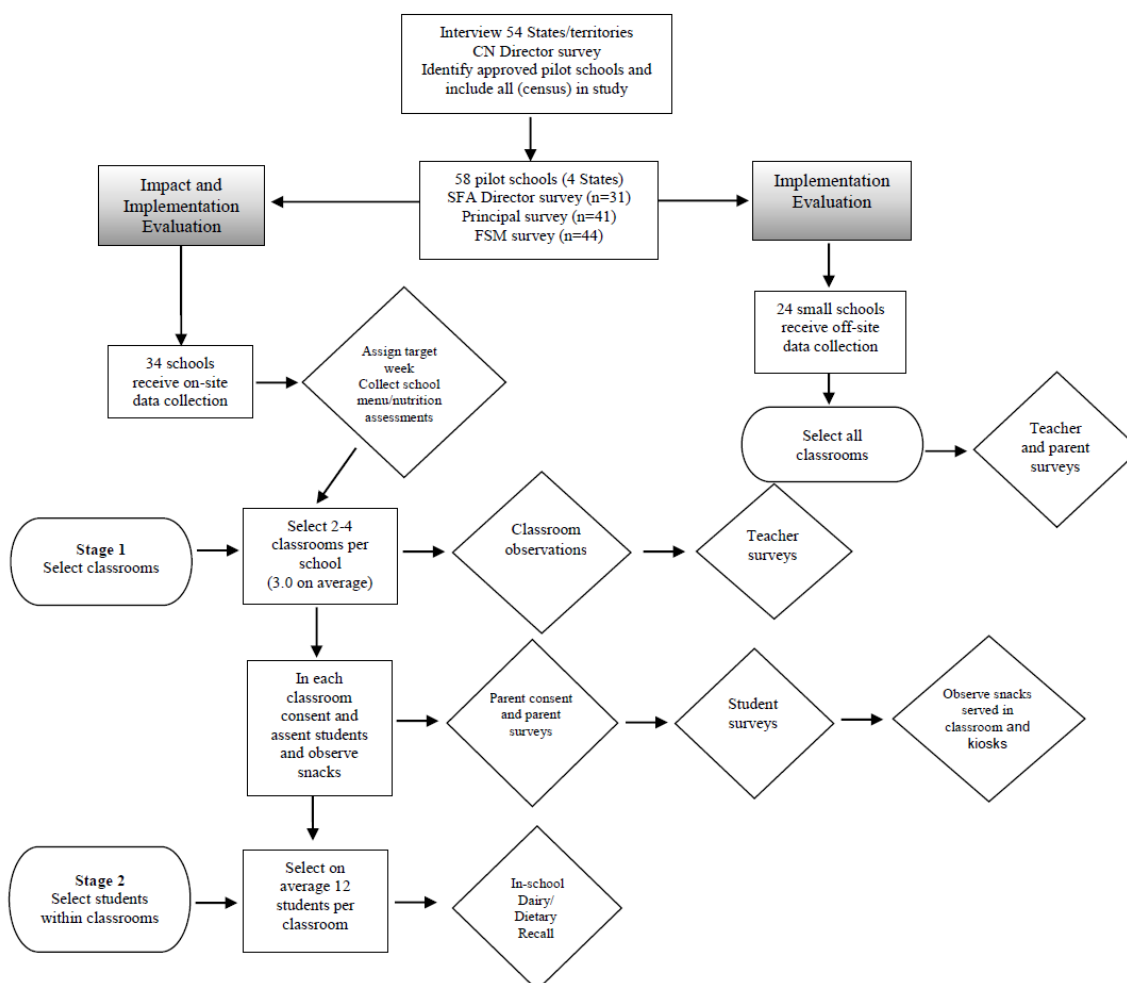
A. Overview of the design and evaluation approach

Because all 58 schools in the four States implementing the pilot were included in the evaluation, sampling was not needed at the SFA or school level (Exhibit 2.1). The only sampling frames needed consisted of lists of classrooms eligible to be selected for on-site visits to schools and lists of students in the selected classrooms obtained from the classroom teacher on day one of the target (or reference) week. The student sample included 2,275 randomly selected students in grades 4 through 6. These grade levels were chosen for the evaluation because research shows that most children are old enough to complete surveys and answer dietary questions by ages 9–10 years (that is, 4th grade). The evaluation utilized a two-stage sample design:

1. Stage one: the evaluation team randomly selected between two and four classrooms⁹ (serving students in grades 4, 5, or 6) from each on-site school to observe the FFVP snacks served (101 classrooms in the fall). Given the small size of many of the pilot schools, most of the students in the classroom were selected to yield 12 completed snack observations, on average, per class.
2. Stage two: the evaluation team randomly selected up to 15 students from each classroom to complete dietary recalls. The field interviewers (FI) observed the same students for FFVP snack plate waste (on a program day).

The evaluation team spread dietary data collection for students over the entire target week (as feasible, based on the days the school was open) to capture the variability in the types of foods served each day, so that dietary recalls were collected from students on each day of the target week. On a program day, the designated field interviewer (FI) also observed the FFVP snack offerings in the classroom (or in halls or kiosks), and recorded the plate waste of the students selected for in-school recalls that same day. On a nonprogram day, the interviewer conducted the dietary recall with the students assigned to that day.

⁹ Because FFVP snacks are generally served in the classroom (or outside of it, but to the children on a classroom basis), the design included a classroom selection stage to limit the need for observers in multiple places throughout the school—similar to the sampling procedures used in the previous FFVP evaluation (Bartlett et al. 2013).

Exhibit 2.1. Summary of the sample design for the FFVP-CFD evaluation

Source: Evaluation of the FFVP-CFD pilot project, SY 2014–2015.

Note: Classrooms are 4th to 6th grades.

CFD = Canned, frozen, or dried; CN = Child Nutrition; FFVP = Fresh Fruit and Vegetable Program; FSM = Food service manager; SFA = School Food Authority; SY = school year.

B. Data collection activities

Data collection in pilot schools occurred over a period of 10 weeks in both the fall (October 13, 2014 through December 19, 2014) and the spring (March 2, 2015 to May 15, 2015), excluding Thanksgiving week and spring break.¹⁰ As a result, the collective surveys and observations across the schools in the fall and in the spring provide a representative estimate of FFVP service and student consumption across the months and weeks of the full fall period (and

¹⁰ The study was approved by the Office of Management and Budget on September 25, 2014 and by the New England Institutional Review Board on August 29, 2014.

the full spring period), and not just a one-week estimate. Schools needed to have an enrollment of at least 50 students (total for all grades) to warrant the burden and travel costs associated with on-site data collection. Of the 58 pilot schools, 34 met this threshold, and included approximately 93% of all students in the pilot. The on-site data collection consisted of classroom FFVP snack observations, teacher surveys, student surveys, parent surveys, in-school food diaries and dietary recalls, plate waste observations of FFVP snacks, and school meal and FFVP menu collection. The 24 small schools received teacher and parent surveys. Twenty-two of the small schools were located in Alaska; two were in Maine.¹¹ All 58 schools received a food service manager survey and a principal survey. The 31 SFA Directors from the 58 participating schools received surveys in fall 2014 and spring 2015 that explored implementation strategies and challenges at the SFA and school levels, acceptability of the pilot measures, and perceived barriers to implementing the FFVP. In addition, all 54 State Child Nutrition (CN) Directors received a survey regarding their views of the FFVP and their reasons for applying, or not, to the FFVP-CFD pilot project.

1. On-site data collection

The evaluation team visited each pilot school for a target week in both the fall and the spring. Site visits to schools generally lasted one full week, barring closures for bad weather. A small number of Alaska and Kansas schools routinely had a four-day week, from Monday to Thursday, due to transportation distances. Exhibit 2.2 describes the on-site data collection activities at schools.

Exhibit 2.2. On-site data collection activities at schools

Activity (data source)	Level of data collection	Description of activity
Parent consent (prior to target week)	Students	Before the site visit, classroom teachers in sampled 4th to 6th grade classrooms sent home study information and information on how to contact the school, call a toll-free number, or email the study team if parents wished their child not to be in the study
School data collection		
School-level reimbursable foods form (RFF)	Schools	On-site observation by field staff; partially completed by field staff, remainder completed by FSM
Nutrition education and promotion material and menu collection form	Schools	On-site observation by field staff
Daily Meal Counts Form	Schools	Completed by FSM ^a
Classroom data collection		
Classroom and Student-level FFVP Snack Form	Classroom and students	On-site observation by field staff

¹¹ One small school in each of these two States did not have a 4th–6th grade classroom and so did not receive parent or teacher surveys.

Exhibit 2.2 (*continued*)

Activity (data source)	Level of data collection	Description of activity
Teacher Survey	Classrooms	Self-administered by teachers in sampled classrooms ^a
Student Survey	Students	Self-administered in sampled classrooms ^{a,b}
“Foods Eaten at School Today” (FEST) booklet	Students	Self-administered hard-copy record of foods consumed at school ^{a,b}
In-school Dietary Recall using ASA24 software ^c	Students	In-person, diary-assisted (FEST) dietary recall for consumption at school only ^b

Source: Evaluation of the FFVP-CFD pilot project, SY 2014–2015.

Note: All of the data collection forms and survey instruments will be included in a separate volume in the final report and cross-referenced in the report chapters. See Appendix C.1 for a description of interviewers’ data collection tasks and schedule in schools.

^a Field staff distributed and collected the form or survey and answered any respondent questions about the data collection activity.

^b Conducted by field staff following parent consent and student assent.

^c Automated Self-Administered 24—Adult Version, 2014. Available at: <https://asa24.nci.nih.gov/>.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; FNS = Food and Nutrition Service; FSM = Food service manager; SY = school year.

1.1. Data collection involving the FSM

One assigned team member met with the FSM throughout the target week to complete sections of the **Reimbursable Foods Form** (RFF). The FSM recorded information about portion sizes for the menu items offered over the week. In some cases, the portion sizes varied by grade level; the FSM recorded these data to facilitate later food and nutrient coding of menus and foods reported in students’ dietary recalls (Appendix C.2). Researchers also requested from the FSM weekly school menus for breakfast, lunch, and FFVP snacks for reference in later menu coding.

The FSMs completed the hard-copy **Daily Meal Counts Form** to report the number of USDA-reimbursable breakfasts and lunches offered each day of the target week through the NSLP and SBP, as well as the number of FFVP snacks offered each day.¹² The form also listed total student enrollment, which the researchers used to measure program participation rates.

In addition to the on-site data collection activities conducted by FIs, researchers asked the FSMs to complete a survey. They also gave the FSMs a four-week **FFVP Calendar** and asked them to mark the days they offered the fruit and vegetable snacks.¹³ Researchers used this information to confirm FFVP program days and determine whether the target week observation of FFVP snack frequency was typical to a longer period of a month.

¹² The researchers instructed the FSMs to exclude meals for which they do not claim reimbursement; for example, second lunches sold to students on an à la carte basis.

¹³ This also was reported by SFA Directors for the small schools so that the change in FFVP snack frequency between fall and spring could be reported for schools that did not have on-site observations (see Appendix C.3 for details).

1.2. Dietary data collection with students

Following parental consent and student assent protocols, the FIs launched the classroom randomization task on their laptops for their assigned classrooms. This randomization generated the names of the students selected for a dietary recall interview for each day of the target week. Typically, the FIs selected and interviewed four students per classroom on each day about the foods and beverages consumed at school (that is, during official school hours). They instructed the students they selected for the dietary interview in the early morning about how to use a simple form (Foods Eaten in School Today diary—see Volume II) to record each food and drink they had consumed during the school day, the time they ate it, a brief description, and where they obtained the food (school, home, somewhere else).

The students brought their completed Foods Eaten in School Today diaries to their meeting with the FI near the end of the school day so the FI could conduct the dietary recall interview. The Automated Self-Administered 24—Adult Version, 2014 (ASA24-2014)¹⁴ software developed by the National Cancer Institute (NCI) was used as an in-person, interviewer-administered tool (Subar et al. 2012; NCI 2015). The students were not required to record in their diaries the amounts of food consumed; instead, the FI reviewed the completed form with the student and recorded food amounts during the ASA24 interview. For foods the student obtained at school and described on the school meal and FFVP RFFs, the interviewer probed for the number of portions the student received or selected and the proportion he or she actually ate. For foods brought from home, the FI probed for food details and amounts. Researchers used the electronic ASA24 records to analyze students' consumption of foods and nutrients in school, and consulted the FEST forms, if needed. See Appendix C.2 for a description of food and nutrient coding for dietary recalls.

Of the students selected for the in-school dietary recall, approximately 17% in the fall and 14% in the spring completed a second day's recall for the estimation of usual in-school intake of energy and key nutrients. FIs used the same methods for both recall interviews, including distributing the FEST forms to selected students in the morning. This information was used to estimate the day-to-day variation in students' consumption of fruits and vegetables across program and nonprogram days.

1.3. Observations of FFVP snacks and plate waste

For each FFVP program day of the target week, FIs used the **Classroom and Student-Level Fruit and Vegetable Snacks Observation Form** to record the time of day FFVP snacks were served, the distribution location, and the place where students consumed the FFVP snack (classroom, hallway, cafeteria, playground, or other location). The form was then used to document the specific fruits and vegetables offered; easily-observed characteristics such as whether fresh fruits were whole or cut-up and whether vegetables were served raw/fresh or with a condiment; and, if feasible the total number of portions actually served to (taken by) students (that is, the total number of portions provided to the class and the number of portions left over). For the four to five students selected for dietary recalls each day per selected classroom, the FI

¹⁴ The FFVP-CFD study was registered for the ASA24 software and arranged to have the food source probe changed to be project specific—that is, cafeteria/school food source, FFVP snack, other school sources, home, store, and other (specify).

observed and recorded whether the student took the snack (and condiments, if offered), the number of portions, and the portion left over (0%, 25%, 50%, 75%, 100%, or other). Plate waste was measured by calculating the amount of the snack left over based on the known portion size offered and the portion size left over.

1.4. Other school data collection

In addition to meeting with the FSM, conducting dietary interviews with students, and observing FFVP snacks and plate waste, FIs completed the **Nutrition Education, Promotional Material, and Menu Collection Form**. Researchers used this form to document the presence of any nutrition education activities and nutrition promotion materials in the cafeteria and other food service areas, and whether they were specifically related to fruits and/or vegetables. Examples of these activities included nutrition posters and displays, newsletters, announcements, and taste tests. The form also instructed the FIs to request a school menu for the target week from the FSM, if available. FIs recorded similar information on nutrition education and promotion activities for the classroom using the **Classroom and Student-Level Fruit and Vegetable Snacks Observation Form** discussed above.

2. Surveys

Surveys of a wide range of stakeholders provided information on the pilot project's implementation and stakeholders' acceptance of it, including fall 2014 surveys of the State CN Directors, and fall 2014 and spring 2015 surveys of the SFA Directors, principals, FSMs, teachers, parents, and students (see Volume II for all surveys and data collection forms).

The State CN Agency Directors from each of the 54 States¹⁵ and territories completed the **State CN Director Survey** to gather information on FFVP costs at the State level, the application and selection process for the FFVP, and State oversight. This survey asked States whether they applied for the FFVP-CFD pilot and the reasons for their decision. For those that did apply, researchers gathered information about the application process, such as stakeholder involvement in the decision and criteria States considered when selecting pilot schools.

The **SFA Director Survey**, collected in fall of 2014 and spring of 2015, explored implementation strategies and challenges at the SFA and school levels, acceptance measures, and perceived barriers to implementing the FFVP. SFA Directors for small schools also reported the frequency and form (fresh, CFD) of FFVP snacks offered for a calendar month in fall and in spring, so that information on the frequency of snacks was captured for all schools, regardless of whether they had on-site data collection.

The **FSM Survey** provided information on the standard FFVP in the fall, and on the pilot implementation in their schools, the perceptions of students and staff of the pilot, and any new nutrition education and promotion activities associated with the pilot.

¹⁵ In 2008 the Food, Conservation and Energy Act of 2008 established the FFVP as a permanent program and also expanded the FFVP nationwide to all 50 States, the District of Columbia, and the territories of Guam, Puerto Rico and the Virgin Islands (Public Law [P.L.] 110–234, H.R. 2419).

The **Principal Survey** asked principals about the school environment (for example, presence of a school garden), cost and implementation of the FFVP, perceived challenges in implementing the FFVP, outside partnerships, and how the CFD pilot was coordinated with the school's nutrition education.

The **Teacher Survey** measured teachers' opinions about the FFVP and the pilot, and their perceptions of students' attitudes toward each. Teachers generally completed the survey while students were completing theirs. Researchers reminded both groups to base their responses on their experiences in the current part of the school year (fall or spring of SY 2014–2015).

The **Student Survey** was completed by students with parent consent and student assent. FIs reminded students that the survey was not a test, and there was no right or wrong answer to each question. The survey gathered information on the student's frequency of consuming fruit and vegetable snacks in school, as well as attitudes and behaviors related to their consumption. Each student who participated in the student survey received a \$5 gift card.¹⁶

The **Parent Survey**, available in English and in Spanish, was a self-administered survey that collected information about (1) parent and student attitudes toward the standard FFVP and FFVP-CFD, and (2) the student's participation in school meals. School liaisons distributed and collected hard-copy English/Spanish surveys to parents (along with a \$5 gift card), in cooperation with teachers in classrooms selected for the study. About 60% of parents responded to the parent survey in either fall or spring. A nonresponse bias analysis found observed differences between students with and without a parent survey in gender, primary language, appeal of fruits and vegetables served during snacks, fondness for vegetables, and frequency of consumption of the school breakfast and lunch. The parent survey weights were calibrated to account for these characteristics in analyses of parent knowledge and acceptance of the FFVP pilot project (see Supplement B.2.1 in Appendix B for details of the nonresponse assessment for parent surveys).

C. Data collection outcomes

Response rates, with the exception of the parent surveys, were high—93% of State CN Directors completed the survey, including all four in the pilot. Response rates for surveys of SFA Directors, FSMs, school principals, and teachers ranged from 83% to 100% across the fall and spring periods in the schools with on-site data collection. Response rates for student surveys and dietary recalls ranged from 85% to 95%. Observations of classroom FFVP snacks had a completion rate of 80% in the fall and 73% in the spring. Missing FFVP snack and plate waste observations sometimes were caused by FFVP snack operations (for example, snacks served as children left for recess). Response rates for parent surveys were approximately 60% in schools with on-site data collection.¹⁷ Response rates were lower for teachers and parents surveyed in schools with off-site data collection. However, this lower response had little effect on the overall

¹⁶ No additional incentive was provided for the first dietary recall.

¹⁷ A nonresponse bias study was conducted since student survey responses were available for many of the parents that did not complete the parent survey. Based on the results of the nonresponse bias study, the parent survey results were weighted to account for the observed differences between the responding and nonresponding parents based on their student responses to reduce the potential for bias in the parent survey findings (see Appendix B, supplement B.2.1 for details).

findings because such a small proportion of students were in the very small schools. Information on the number of completed surveys and interviews and response rates is shown in Exhibit 2.3.

Exhibit 2.3. Unweighted final response rates for the study components

Study component	Location	Subgroup	Number of units completed	Response rate (%)
CN Director Surveys	Overall	Fall	50	92.6
		Spring	n.a.	n.a.
SFA Director Surveys	Overall	Fall	27	87.1
		Spring	31	100.0
FSM Surveys	Overall	Fall	38	86.4
		Spring	44	100.0
Principal Surveys	Overall	Fall	34	82.9
		Spring	41	100.0
Teacher Surveys ^a	Overall	Fall	116	91.9
		Spring	115	90.3
Parent Surveys	Overall	Fall	1,109	60.1
		Spring	1,047	58.4
Student Surveys	On-Site	Fall	1,586	92.6
		Spring	1,576	95.4
Classroom Snack Observation Forms ^b	On-Site	Fall	243	79.9
		Spring	257	73.0
Student Day 1 Recalls	On-Site	Fall	1,255	85.4
		Spring	1,236	90.6
Student Plate Waste Observations ^c	On-Site	Fall	535	69.1
		Spring	548	68.2

Source: Evaluation of the FFVP-CFD pilot project, SY 2014–2015. Tabulations prepared by Mathematica Policy Research.

Note: Unweighted response rates.

^a Counting completed teacher surveys on a classroom basis (for example, two completed teacher surveys from the same classroom were counted as one complete).

^b Completion rate; Observations are complete if data were available for all three measures of (1) the number of snacks offered, (2) the number of snacks leftover, and (3) the number of students in the class at the time the snack was served. See related information in Appendix C.3.

^c Conditional among completed day one recalls on a program day. See Appendix C.4.

CFD = Canned, frozen, or dried; CN = Child Nutrition; FFVP = Fresh Fruit and Vegetable Program; FSM = Food service manager; n.a. = not applicable; SFA = School Food Authority; SY = school year.

D. Qualitative interviews with stakeholders

To assess the level of acceptance of the pilot project, in late spring 2015 researchers conducted semi-structured qualitative interviews of State CN Directors, SFA Directors, principals, FSMs, teachers, and community partners. Researchers conducted 39 one-hour, semi-structured telephone interviews. Those interviewed included State CN Directors from all four States participating in the pilot as planned respondents. A multiphase stratified process was used to select the remaining 35 interviewees, based on the responses in the spring SFA Director

Survey about the level of challenges in their SFA of offering fresh snacks and the benefits of incorporating canned, frozen, or dried fruits and vegetables. Within each SFA selected for interviews, school-level respondents from a single school were contacted. For SFAs containing more than one school implementing the pilot, a single school was randomly selected for participation in the interviews. Three or four individual respondents were selected within each target SFA, using the following guidelines:

- Each SFA's respondents should include at least one nutrition staff member (either an SFA Director or an FSM) and at least one education staff member (either a principal or a teacher).
- If the SFA Director reported on the spring survey that the SFA used a community partner in the FFVP, an attempt was made to include that partner.

The final selection of interview respondents included the 4 State CN Directors, 7 SFA Directors, 5 FSMs, 5 principals, 10 teachers, 4 parents/parent representatives, and 4 FFVP partners in the community, for a total of 39 interviews. All four States and 11 of the 31 SFAs were represented in the interviews. Researchers conducted the qualitative interviews between mid-May and mid-June using two-person teams consisting of an interviewer and a note taker. A \$50 gift card incentive was provided to respondents who were allowed to accept it.

E. Analysis approach

To answer the study's research questions, the research team conducted descriptive and multivariate analyses. These analyses included descriptive statistics (frequencies, rates, means, and totals) for each period (fall and spring), and for the differences between the periods, using recall data weighted to account for the sample design and any nonresponse.¹⁸ The research team used statistical tests to compare differences between the fall and spring results for classroom observations, for student subgroups (grade and gender), and for other respondent groups where surveys were conducted (teachers, parents, principals, and food service staff).¹⁹ Researchers performed the analyses using SAS²⁰ to compute standard errors that adjust for the complex sample design.

¹⁸ Appendix B presents additional details about the sample weighting methodology to account for the sampling procedures and adjust for nonresponse. The weights produce estimates that are representative of the group of schools participating in the pilot across the four States. Due to the unique character and self-selecting nature of the participating schools, creating nationally representative results was neither feasible nor a study objective.

¹⁹ For school menu data, significance tests were not needed because a census was assessed and all results would be statistically significant, but not necessarily meaningful (Binder and Roberts 2003; Lohr 2010).

²⁰ SAS SURVEYFREQ, SURVEYMEANS, and SURVEYREG procedures were used, supplying the procedures with the required information on the sample stratification by school, classroom sampling within each school and, as appropriate, the sampling of students within each classroom to create the estimates and their standard errors. Given that the research team often sampled all or the majority of classrooms and students within classrooms in each school, the sampling precision associated with the reported estimates is high, so as to yield statistically significant results for the comparisons. Although the results may be statistically significant, one must consider whether the differences observed are meaningful. For example, a difference in the total daily in-school consumption of fruits and vegetables of 0.06 cup equivalents (less than a tablespoon) could be statistically significant but is not very meaningful to a student's overall dietary intake.

The dietary analysis to address study objectives 1 and 3 included calculating values for means of calories, key nutrients, and cup equivalents of fruits and vegetables consumed and wasted per FFVP day in school. The USDA defines a cup equivalent as a comparable amount of various foods used as a standard of comparison within the fruit and vegetable food groups (USDA 2016). The specific conversion between cups and cup equivalents varies by type and form of fruits and vegetables. In general, for fresh fruits and vegetables and 100% juice, one cup equivalent is the amount of food considered equivalent to one cup of a cut-up fruit or vegetable. Two cups of raw leafy greens are considered one cup equivalent of vegetables. For dried fruits, one-half cup generally equals one cup equivalent. In addition, study outcomes included the distribution of cup equivalents of fruits and vegetables consumed in school by type and form (fresh, canned, frozen, or dried). The research team used regression analysis to estimate changes in cup equivalents of fruits and vegetables consumed from fall to spring, holding other factors constant, such as student characteristics (for example, grade and gender), whether the students (classroom) engaged in a physical activity before or after the snack, and the portion of the FFVP snack offered.

Other key dietary outcomes examined included students' usual energy and nutrient intakes and the mean Healthy Eating Index (HEI)-2010 scores (total and for each component) for in-school consumption. The HEI, aligned with the 2010 Dietary Guidelines for Americans, provides a measure of the overall diet quality of students' consumption in school (USDA and U.S. Department of Health and Human Services 2010; Guenther et al. 2013). Nutrient data was analyzed using special statistical methods to estimate the distribution of usual energy and nutrient intake in school, using two days of intake for a subsample of students (NCI 2015).

To address the impact of the CFD pilot on FFVP participation levels (study objective 2), data gathered at the classroom level from snack observations were used to calculate the proportion of snacks offered that were consumed by students, consumed by teachers/aides, and left over in each classroom sampled. To further understand students' participation levels, information from the student-level dietary recalls and observations of FFVP snacks selected by the students in the recall sample was used to measure the percentage of students who took a fruit or vegetable snack when it was offered. Finally, school participation outcomes were adjusted by assessing the number of days that schools offered a FFVP snack before and after CFD implementation.

For study objective 3, regarding approaches to implementation of the pilot, researchers used the FFVP snack menus to measure, at the school level, the types and form of snacks offered, availability of choices, and timing and locations where snacks were offered, among other aspects of implementation. They also studied the mean calories and the distribution of key nutrients from fruits and vegetables offered by the FFVP among the pilot schools.

To satisfy study objective 4, researchers measured and described the acceptance of the pilot project by key stakeholders, using the surveys of school district and school staff as well as of parents and students. The analytical tables present the distribution of survey responses by respondent type for fall and spring and the difference between these periods. The second source of data on stakeholder acceptance from the FFVP-CFD pilot is the qualitative data collected in semi-structured interviews in spring 2015. These interviews provide valuable context and descriptive information that augments the survey responses. A systematic analysis of these

topics was conducted in order to identify the main analytical themes within and across respondent types.

The data analysis uses the analysis weights appropriate for the data source and level (classroom, parent, student, teacher, and so on) (Appendix B). Weights were unnecessary for the SFA and school-level analysis because these study components were a census of the pilot schools. Findings were considered statistically significant at the 0.05 level of significance. In general, means are provided for sample sizes of 30 cases or more; however, at times estimates for smaller sample sizes are provided if the data are useful for understanding the overall fruit and vegetable menu, consumption, or plate waste findings. In cases of small sample sizes, described in the table or figure notes, caution should be applied, as the results may be less reliable than those for much larger sample sizes.

F. Strengths and limitations of study methodology

There are five main strengths of the pre-post design that support comparing data for fall 2014 and spring 2015 in SY 2014–2015. First, inclusion of a census (or universe) of all States, SFAs, and schools in the pilot project eliminates error associated with sampling SFAs or schools within States (Binder and Roberts 2003; Lohr 2010).²¹ Second, collection of data in school visits across 10 weeks in both fall and spring provides a representative profile of the snacks served across semesters, broadens information on the types of fruits and vegetables offered to students, improves statistical precision, and strengthens the comparisons. Third, collection of students' fruit and vegetable intakes in school in both fall and spring, on program and nonprogram days, provides measures of the pilot impacts for both types of days and for an average week during the fall and spring. Fourth, selection of the same students for both fall and spring data collections controls for differences in food preferences, and body size in conjunction with race, ethnicity, gender, and grade level. Finally, use of statistical procedures (regression-based adjustments) to control for the differences in students' characteristics, physical activity before or after the snack, and portion size of the snack served between fall and spring provides a rigorous estimate of the impact of the pilot on FFVP participation and student fruit and vegetable consumption in school.

Despite using regression adjustment, the reported impact may be confounded with other factors and should not be considered causal. Researchers have controlled for the effects of student tastes, physical activity, and portion sizes of fruits and vegetables served between the fall and spring measurements. Nonetheless, the changes observed in the fall to spring measurements may be in part due to changes in the school climate, changes in the fruit or vegetable offered, in addition to the form of the fruit or vegetable (e.g., fresh grapes to raisins, vs. fresh apples to sliced apples or applesauce), and the student's food preferences, and other unobserved differences in program implementation that are not directly related to the transition to the pilot project.

²¹ In addition, the small size of most of the schools limited the need for sampling, as in many schools all of the classrooms with 4th–6th grade students were selected, and interviews were attempted with all of the students in these classrooms. In the absence of sampling, referred to as conducting a census of classrooms and/or students, or with limited sampling, a near census situation, the impact estimates have a small degree of statistical sampling error and even small impacts can be declared statistically significant. Readers are cautioned to evaluate whether a difference is meaningful (for example, a change of intake of a teaspoon or less for a fruit or vegetable) even if is statistically significant.

Another methods issue is that the classroom and student observation data cover visited schools only. Off-site schools constituted a very small proportion of the student population, but because the research team did not visit these schools, there could be unique characteristics of small schools that were not observed. The use of surveys, which were sent to all schools in the pilot, minimizes but does not eliminate this possibility. Further, asking the target population—students—directly about their experience with the FFVP and their perceptions of fruits and vegetables provides important information for strategies to promote FFVP participation and to plan to offer items that many students are not familiar with or would enjoy.

Differences in findings across data sources may be the results of using different methodologies and differences in respondent perceptions. For example, observations of FFVP snacks and data on school meals and FFVP snacks reflect a target week for each school in the fall and spring, whereas survey questions generally asked about the entire fall and spring semesters. Within survey data, the types of respondents indicate different perspectives of the FFVP-CFD pilot project. This is advantageous to the evaluation because it provides a more complete picture of snack operations and how the program and pilot is perceived by those involved. When respondents were asked questions about what they wish would change or take place regarding the FFVP, their role in the school or district may be particularly relevant, as each type of respondent answers such questions through the lens of their own perspectives and goals. The survey findings are enhanced by the qualitative interview data collected with a variety of stakeholder types. These interviews provided a deeper understanding of the challenges faced by some schools and school staff in offering FFVP snacks, and their perceptions of the pilot.

Survey and observation data are enhanced by qualitative interview data collected from a wide range of program stakeholders. Qualitative data provide a valuable point of reference and backdrop for interpreting findings from other data sources. They convey the experiences of those interacting with the program more specifically and with fewer constraints than survey data. Semi-structured interviews keep respondents on topic but allow them to articulate the important aspects of the pilot based on their experiences. Finally, qualitative data provide concrete examples of broader patterns detected by survey and observation data.

Administrative cost data were collected for descriptive purposes but limited by the level of detail and variability in data elements across the four States. Administrative cost data were collected from States for all SFAs participating in the pilot. These included aggregate FFVP program costs for both fall 2014 and spring 2015. Specific data elements varied across States but included aggregate dollars spent on the program, number of program days, number of program months, and, for some States, costs by fruits and vegetables by form. These data do not support solid analytical conclusions for three reasons; (1) The FFVP-CFD pilot did not alter the funding available or the administrative requirements for the program, making it difficult to detect cost implications of the pilot by reviewing aggregate spending; (2) high variability within and between States in the administrative cost data makes it difficult to identify clear associations between the pilot and program costs; and (3) some data elements contained in the administrative cost data—such as number of program days—exist more consistently and systematically in survey and classroom observation data and are best analyzed using those data sources.

3. FFVP-CFD PILOT APPLICATION PROCESS AND CHARACTERISTICS OF PILOT PARTICIPANTS

This chapter describes the application process States and schools used to apply for the FFVP-CFD pilot project, and the reasons that States did not apply. This chapter also describes the characteristics of the SFAs and schools that participated in the pilot project in the four participating States (Alaska, Delaware, Kansas, and Maine), and the students randomly selected for the evaluation.

A. Pilot State applications process and reasons for applying

The application process varied from State to State relative to the level of local school staff involved in the process and whether all or some schools in the SFA were included in the application. CN Directors notified SFAs about the pilot and encouraged eligible SFAs and schools to apply, and were ultimately responsible for submitting the application. As shown in Exhibit 3.1, all States had stakeholders at multiple levels involved in the decision to apply for the pilot. Although only Alaska explicitly involved principals in the application decisions, principals and other school and district officials signed off on many of the applications and thus were aware of the pilot during the application stage. In some cases, all schools within an SFA applied to the pilot; in others, only some schools participated. An SFA may have applied on behalf of all schools, or individual schools may have submitted applications to their SFA or CN Directors. CN Directors then forwarded the applications to FNS.

Exhibit 3.1. Stakeholders contributing to the decision to apply for the FFVP-CFD pilot

	States that applied to FFVP-CFD			
	Alaska	Delaware	Kansas	Maine
State Child Nutrition agency	✓	✓	✓	✓
SFA Director or other SFA-level staff	✓	✓	✓	✓
School superintendent or other school district administrator	✓	✓		
Food service managers	✓			✓
Principals	✓			
Outside partners				✓

Source: Evaluation of the FFVP-CFD pilot project, State Child Nutrition Director Survey (n=4), SY 2014–2015. Tabulations prepared by Mathematica Policy Research.

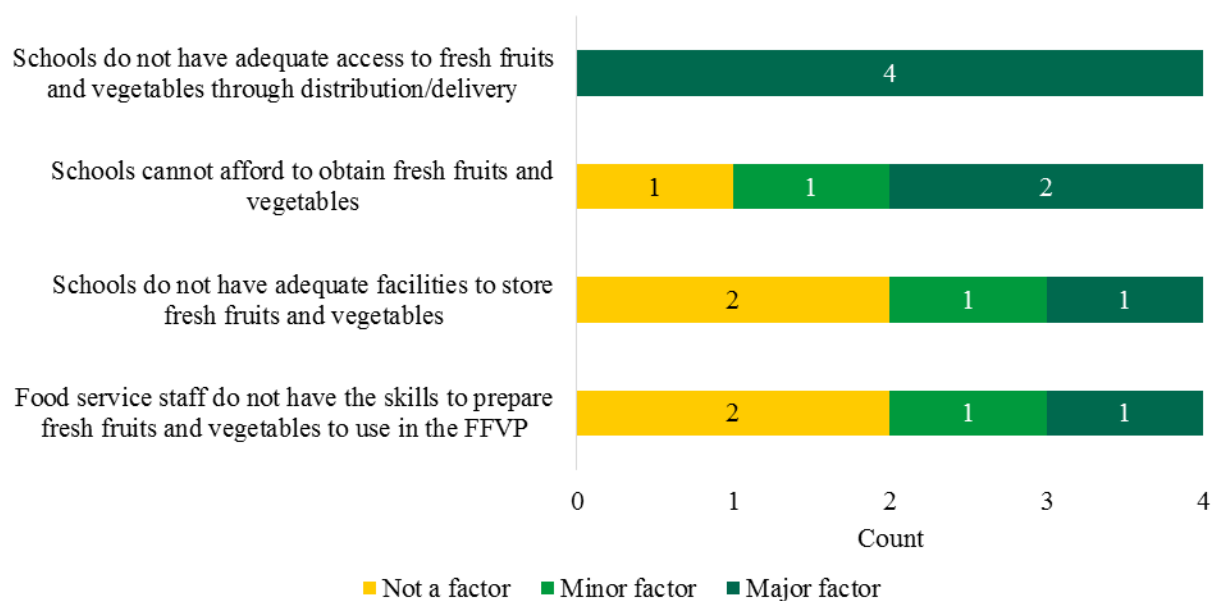
Note: Multiple responses were allowed. No States reported the involvement of teachers or parents/parent groups in the application decision.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SFA = School Food Authority; SY = school year.

According to SFA applications, overall reasons for applying to the pilot were similar among all schools or SFAs within a State. CN Directors from all four pilot States cited access as the most important reason (Exhibit 3.2). Affordability of fresh fruits and vegetables was the second most important factor, reported by three out of four CN Directors as influencing their decision to apply. Storage capacity and staff skills were less important; only one CN Director cited storage and another cited staff skills as major factors. Other specific reasons for applying to the pilot included long shipping times or expensive shipping costs for fresh fruits and vegetables, products arriving in poor condition, desire for increased variety, lack of storage facilities for fresh produce, and high fruit and vegetable costs. These reasons are consistent with those given during stakeholder interviews conducted in spring 2015, after CFD was implemented. For example, school staff and SFA Directors in some States described expensive and time-consuming processes for getting fresh produce to the schools, and produce arriving spoiled, unripe, or frozen.

Among the four States that participated in the FFVP-CFD pilot, difficulty in accessing fresh fruits and vegetables was the most important factor driving application decisions.

Exhibit 3.2. Factors influencing CN Director decisions to apply to the FFVP-CFD pilot



Source: Evaluation of the FFVP-CFD pilot project, State Child Nutrition Director Survey (n = 4), SY 2014–2015. Tabulations prepared by Mathematica Policy Research. For full data, see Appendix D Exhibit D.1.

CN = Child Nutrition; CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

Challenges around fresh produce transportation came up frequently during stakeholder interviews. A respondent from Kansas said, “Our school district is in a remote, rural area with no grocery stores in any of the four towns in our district. All our fresh fruit and vegetable items are trucked in to our school and we must rely on one vendor for most of our fresh items.” Additionally, a respondent in Maine mentioned how that incorporating CFD products in to the FFVP could ameliorate transportation difficulties as well as increase the State’s ability to serve local products, saying “fresh local products are only available for a short time in the fall. Some

products such as berries often come in spoiled so if we were allowed to use frozen or dried [local products] there would not be as much waste.”

Among the pilot States, the greatest transportation challenges likely exist in Alaska. As one Alaska respondent explained, “fresh fruit is best to be shipped at the beginning and end of the school year because of the warmer temperatures and the fresh fruit don’t get spoiled as fast. The only way to ship fresh fruit is to send as freight through the airlines, which is costly and depending on weather sometimes there are no daily flights. So the fruit sits at the airport until they do fly...and there have been several instances where it sits at the runway because some of our villages do not have buildings for storage at the airports. Our schools are short staffed, and to get someone to pick up and deliver the fruits can be a challenging task before the fruits freeze while on delivery.” These challenges have been well documented through other research. The Alaska Farm Service Agency estimated that in 2014, 95% of food purchased within the State was imported (Neyman 2012). This fact combined with Alaska’s climate and remoteness make transporting fresh food relatively more complicated than in other parts of the United States. As the stakeholder in Alaska mentioned, cold weather can freeze fresh produce, but unexpected warm weather also increases the risk of spoilage, especially when foods must travel long distances to reach their destination (Hodges Snyder and Meter 2015).

B. Characteristics of pilot SFAs, schools, and students

Exhibit 3.3 shows important characteristics of the SFAs and schools that applied to and participated in the pilot project. The majority of SFAs (84%) were located in rural areas, and more than half (62%) of the pilot schools with on-site data collection were small, defined as having a total enrollment of 250 students or less. Average participation rates in FRP meals were high (78% over all schools using data from the Common Core of Data (CCD), data not shown), as would be expected, since the FFVP operates in elementary schools with a high proportion of low-income families. Of the 24 schools with an enrollment of less than 50 total students and off-site data collection, 22 were located in Alaska and two were in Maine.

About 41% of the sampled students in the evaluation were in the 4th grade, 39% in the 5th grade, and the remaining 20% in the 6th grade²² (Exhibit 3.4). About three-fourths of students (76%) received FRP meals, and one-fourth (27%) reported that they primarily spoke to their parents in another language besides English. About half (54%) of the student sample was non-Hispanic white, about 17% was Hispanic, and about 11% each was American Indian/Alaska Native, or non-Hispanic black.

²² In general, most elementary schools were kindergarten through grade 5, but some included grade 6. The sample represents students in grades 4–6 in the pilot schools.

Exhibit 3.3. Characteristics of SFAs and schools in the FFVP-CFD pilot project

Characteristic	On-site data collection	Off-site data collection	Total
SFA characteristic (percentage)			
Urban	12.5	0.0	9.7
Suburban	8.3	0.0	6.5
Rural	79.2	100.0	83.9
Number of SFAs	24	7	31
School enrollment size (percentage)			
Small (fewer than 250 students)	61.8	100.0	77.6
Medium (250 to 499 students)	29.4	0.0	17.2
Large (500 or more students)	8.8	0.0	5.2
Average number of students per school	250	20	n.a.
Number of schools	34	24	58

Source: Evaluation of the FFVP-CFD pilot project, SY 2014–2015. Data on urbanicity are from the 2013–2014 Common Core of Data (CCD). Data on school enrollment size are from the Daily Meals Count form for schools with on-site data collection and the 2013–2014 CCD for schools with off-site data collection. Tabulations prepared by Mathematica Policy Research.

Notes: On-site data collection was conducted in pilot schools with a total student enrollment of 50 or higher and off-site data collection in pilot schools with a total student enrollment below 50.

CCD = Common Core of Data; CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; n.a. = not applicable; SFA = School Food Authority; SY = school year.

Exhibit 3.4. Characteristics of students in the FFVP-CFD pilot project

Characteristic	Percentage
Gender	
Girls	50.8
Boys	49.2
Grade	
4th	40.9
5th	38.6
6th	20.4
Race/ethnicity	
Non-Hispanic white	54.1
Hispanic	16.9
American Indian or Alaska Native	11.4
Non-Hispanic black	10.8
Multiracial/other	5.5
Asian	1.1
Native Hawaiian or other Pacific Islander	0.1
Average participation in FRP school meals	75.9
Primary language spoken with parents was not English	27.4

Source: Evaluation of the FFVP-CFD pilot project, SY 2014–2015. Gender and grade are from classroom rosters (n=1,304 students). Data on student's race/ethnicity and FRP school meals are from the fall parent survey (or the spring if the fall survey was not completed) (n=1,358). Data on student's primary language spoken with parents are from the student survey (n=1,282). Tabulations prepared by Mathematica Policy Research are weighted to be representative of all 4th–6th grade students in all pilot schools.

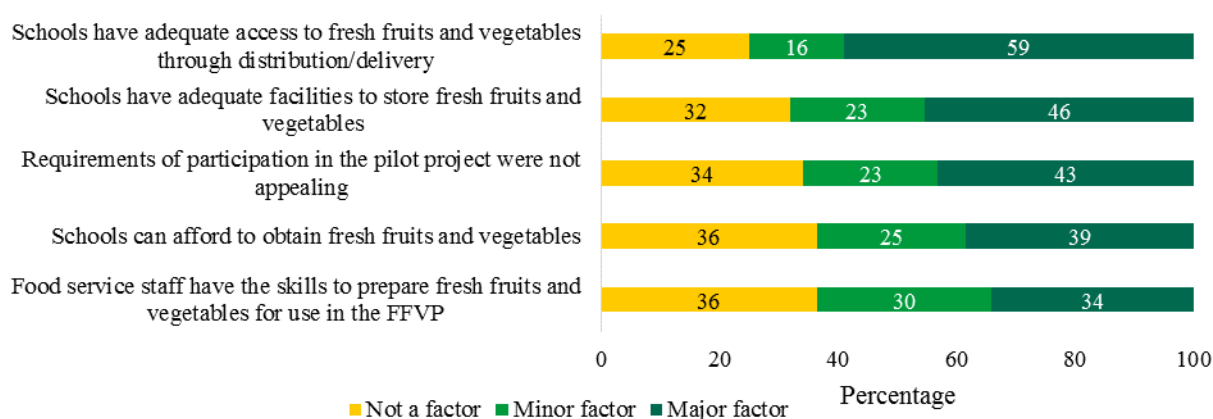
Note: Totals may not sum to 100% due to rounding.

CFD = Canned, frozen, or dried; FES = Foods Eaten in School Today; FFVP = Fresh Fruit and Vegetable Program; FRP = free or reduced-price; SY = school year.

C. Non-pilot States

Reasons for States not applying to the FFVP-CFD pilot can be grouped into two categories: reasons pertaining to the pilot itself and reasons pertaining to the application process. Based on the responses of CN Directors, 59% of CN Directors in nonpilot States said that schools have adequate access to fresh fruits and vegetables throughout the distribution and delivery chain, so this was a major reason they did not apply to the pilot; 46% cited schools having adequate facilities to store fresh fruits and vegetables as a major factor in the decision not to apply (Exhibit 3.5). A third major factor was unappealing participation requirements, listed by 43% of CN Directors.

Exhibit 3.5. CN Director reasons for not applying to the FFVP-CFD pilot: Reasons related to the requirements of the pilot project



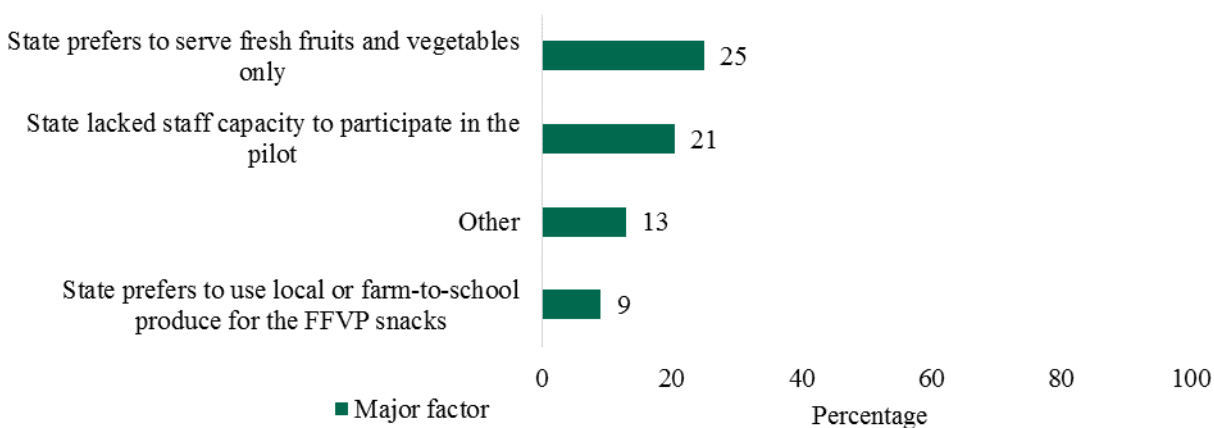
Source: Evaluation of the FFVP-CFD pilot project, State Child Nutrition Director Survey, nonpilot States (n=44), SY 2014–2015. Tabulations prepared by Mathematica Policy Research. For full data, see Appendix D Exhibit D.2.

Note: Totals may not sum to 100% due to rounding.

CFD = Canned, frozen, or dried; CN = Child Nutrition; FFVP = Fresh Fruit and Vegetable Program; SFA = School Food Authority; SY = school year.

CN Directors in many nonpilot States expressed a preference for fresh fruits and vegetables over CFD. This choice was not listed as an option in the survey, but 25% of CN Directors wrote it in as a major factor in their decision not to apply for the pilot project (Exhibit 3.6). These CN Directors pointed out in their written comments that exposure to fresh produce was a major aspect of the FFVP that they appreciated. Examples of such responses include: “Our State is committed to ‘fresh’ being the goal of the FFVP” and “We feel the purpose of the Fresh Fruit and Vegetable Program is to serve as many ‘fresh’ items as possible.” Additionally, 9% of write-in responses at the end of the survey mentioned the FFVP as one of the few ways some of their students gain access to fresh fruits and vegetables. For example, one CN Director wrote, “Many students don’t experience different fresh fruits and vegetables and this program is a way for all to experience this.” They expressed great appreciation for the program overall but some strongly opposed incorporating CFD items.

Exhibit 3.6. CN Director reasons for not applying to the FFVP-CFD pilot: Other specified reasons related to requirements of the pilot project



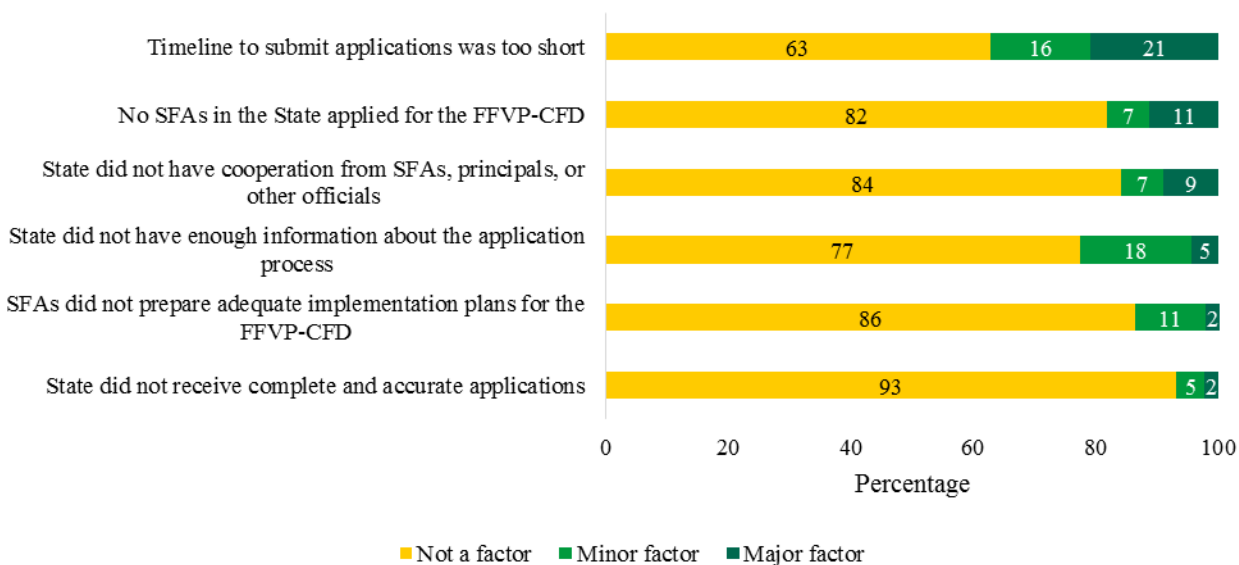
Source: Evaluation of the FFVP-CFD pilot project, State Child Nutrition Director Survey, nonpilot States (n=44), SY 2014–2015. Tabulations prepared by Mathematica Policy Research. For full data, see Appendix D Exhibit D.2.

Note: Other responses include lack of interest among SFAs, uncertainty about the availability of vendors for CFD items, and concern about causing confusion among staff regarding what items would be allowable under the pilot.

CFD = Canned, frozen, or dried; CN = Child Nutrition; FFVP = Fresh Fruit and Vegetable Program; SFA = School Food Authority; SY = school year.

Although less important overall than factors related to the pilot itself, some CN Directors cited aspects of the application process as affecting their decision not to apply. Exhibit 3.7 shows that the most commonly cited factor regarding the application process in the decision not to apply was the application timeline, a major factor for 21% of CN Directors. However, the fact that the deadline was extended and no additional States applied suggests this factor was not a primary one in States' decisions not to apply.

Exhibit 3.7. CN Director reasons for not applying to the FFVP-CFD pilot: reasons related to the application process



Source: Evaluation of the FFVP-CFD pilot project, State Child Nutrition Director Survey, nonpilot States (n = 44), SY 2014–2015. Tabulations prepared by Mathematica Policy Research. For full data, see Appendix D Exhibit D.2.

Note: Totals may not sum to 100% due to rounding.

CFD = Canned, frozen, or dried; CN = Child Nutrition; FFVP = Fresh Fruit and Vegetable Program; SFA = School Food Authority; SY = school year.

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4. IMPLEMENTATION OUTCOMES OF THE FFVP-CFD PILOT

This chapter includes findings on the changes in fruit and vegetable menu offerings in the FFVP and reimbursable school breakfasts and lunches from fall 2014 to spring 2015. Additionally, various aspects of the program are detailed, such as fruit and vegetable transportation and delivery; preparation and serving; the daily and weekly snack schedules, including timing and location; and nutrition education and promotion activities. Although some changes occurred within these categories, respondents in the majority of schools and SFAs did not report making any operational or environmental changes during the pilot period.

A. SFA and school changes to FFVP implementation during the pilot

Overall, FFVP operations remained about the same between fall and spring. As shown in Exhibit 4.1, the most frequently cited change was additional training for school staff to incorporate CFD fruits and vegetables. Just under half (48%) of SFA Directors reported needing additional training for FSMs or head cooks. However, most other school staff did not need additional training.

Fewer changes were made to fruit and vegetable purchasing and transportation arrangements, with 16% and 6%, respectively of SFA Directors reporting changes in these areas (Exhibit 4.1). Only about 10% of SFA Directors reported adding new vendors to incorporate CFD foods and none reported dropping existing vendors. During stakeholder interviews, two FSMs reported adding new vendors to obtain CFD items for the pilot. One SFA Director reported shifting funding away from a produce vendor toward the SFA's main food vendor to obtain CFD items for FFVP snacks. Overall, only about 6% of SFAs reported changes in deliveries, but they were evenly split between increasing and decreasing the frequency (Exhibit 4.1). No SFA Directors reported a change from fall to spring in the location where FFVP snacks were distributed.

The small schools with fewer than 50 total students that did not receive school visits reported their FFVP offerings over a calendar month in the fall and in the spring, making it possible to compare their monthly reports to similar monthly calendar data reported by the FSMs in schools with on-site data collection. The frequency of offering FFVP snacks in the 24 small schools ranged from none to all days in both fall and spring over a calendar month. Seventy-one percent of the small off-site schools made no changes while the remaining 29% reported a change (increase or decrease) in snack frequency from fall to spring. One off-site school increased their frequency and two off-site schools decreased the frequency with which they offered FFVP snacks in the spring (see Appendix C.3 for additional details). Among schools with on-site data collection, most (82%) reported a change in the frequency of snack offerings based on a month's reporting: 24% reported a decrease, 58% reported an increase, and 18% reported no change in the frequency of snack offerings over the month. The average change in the snack frequency between fall and spring was an 8.5% increase, compared to a 1.6% increase in the small off-site schools.

Exhibit 4.1. SFA Director-reported changes in FFVP operations to incorporate CFD in pilot schools

	Percentage
Did you make any changes in FFVP purchasing arrangements or specifications?	
Yes (multiple responses allowed)	16.1
Needed to add new vendors	9.7
Had to drop existing vendors	0.0
Had to increase orders for USDA-donated foods	3.2
Had to write new purchasing specifications	3.2
No	87.1
To incorporate CFD in the pilot schools, did you have to change any transportation arrangements for the FFVP? (multiple responses allowed)	
Yes, needed to increase frequency of deliveries	3.2
Yes, needed to decrease frequency of deliveries	3.2
No	93.6
Which of the following school staff required additional training to incorporate CFD into the FFVP at pilot schools? (multiple responses allowed)	
School food service manager/head cook	48.4
Teachers	12.9
Principals or other administrators	16.1
No training of school staff was necessary	51.6
Did any of the CFD pilot schools within your district change where fruit and vegetable snacks are distributed (e.g., classroom or kiosk) when incorporating CFD?	
Yes	0.0
No	100.0
Total n	31

Source: Evaluation of the FFVP-CFD pilot project, SFA Director Spring Survey (n=31), SY 2014–2015. Tabulations prepared by Mathematica Policy Research.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SFA = School Food Authority; SY = school year.

FSMs also reported very little change in how the FFVP was implemented in their schools from fall to spring. Exhibit 4.2 shows that only 16% of FSMs reported any changes in FFVP operations during the pilot period. This mirrors findings on the SFA level, which showed that, other than food service staff training, minimal changes were needed to incorporate CFD foods into the FFVP. The most common change FSMs reported was an increase in the number of days per week the FFVP snack was offered. Among the 16% of FSMs who made any change, about 86% reported this increase; however, this percentage constitutes only 6 FSMs out of the entire sample of 44 respondents.²³

²³ Due to some FSMs overseeing multiple schools, there were a total of 44 FSMs responsible for the 58 pilot schools (Exhibit 2.1).

Exhibit 4.2. FSM-reported changes in FFVP operations to incorporate CFD in pilot schools

	Percentage
Have there been any changes in FFVP operations in your schools since CFD implementation? (n = 44)	
Yes	15.9
No	84.1
[If yes above] Has the number of days per week FFVP is offered changed? (n = 7)	
More days	85.7
Fewer days	14.3
No change	0.0
[If yes above] Has the number of times per day FFVP is offered changed? (n = 7)	
More times per day	0.0
Fewer times per day	14.3
No change	85.7

Source: Evaluation of the FFVP-CFD pilot project, FSM Spring Survey (n = 44), SY 2014–2015. Tabulations prepared by Mathematica Policy Research.

Note: Totals may not sum to 100% due to rounding.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; FSM = Food service manager; SY = school year.

Observation data collected during target weeks in on-site schools also indicate that these schools offered FFVP snacks more frequently under pilot conditions in the spring than under standard conditions in the fall. The mean number of FFVP snack days per week increased from an average of 2.8 days in the fall to 3.4 days in the spring (Exhibit 4.3).²⁴ The percentage of schools serving snacks more than three days a week increased from 24% to 41%.

²⁴ The distribution of the FFVP snack observations is shown in Appendix C Exhibit C.3.a. For the 102 sampled classrooms in the pilot schools with on-site data collection, the number of program days during the target week observations varied from none (8% of classrooms in fall and 3% in spring) to five (11% of classrooms in fall and 25% in spring).

Exhibit 4.3. Number of days per week schools offered any form of fruits or vegetables in FFVP snacks

	Percentage of schools		Change
	Fall 2014	Spring 2015	
Number of days per week in FFVP snacks			
None ^a	8.8	2.9	-5.9
1 to 2	20.6	17.6	-2.9
3	47.1	38.2	-8.8
4	14.7	17.6	2.9
5	8.8	23.5	14.7
Mean days per week	2.8	3.4	0.6
Median days per week	3.0	3.0	0.0
Number of schools	34	34	

Source: Evaluation of the FFVP-CFD pilot project, Reimbursable Foods Form, SY 2014–2015. Tabulations prepared by Mathematica Policy Research.

Note: Number of days per week schools offered fruits or vegetables is based on a target (typical) week for each school during fall and spring. Findings are for schools with a total enrollment of at least 50 students. Exhibit includes whole fruits and vegetables and salads offered as FFVP snacks. Percentages may not add to 100 due to rounding. Numbers in the Change column may not match the subtracted values for spring minus fall due to rounding. Because no sampling of schools was conducted and RFFs were completed by all schools with on-site data collection, statistical tests were not necessary.

^a Three schools in the fall and one school in the spring did not serve FFVP snacks during their target week for data collection.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; RFF = Reimbursable Foods Form; SY = school year.

B. Changes to the school food environment during the FFVP-CFD pilot

No substantial changes occurred in the aspects of the school food environment assessed during the FFVP-CFD pilot period. FFVP snack distribution and consumption locations remained fairly consistent between fall and spring. Snacks were distributed in the classroom more than 90% of the time in both fall and spring and eaten there 95% of the time (Exhibit 4.4). Snacks were occasionally distributed in the cafeteria (between 3% and 4% of the time) or from a kiosk or cart in the hallway (6% of the time in the fall and 1% of the time in the spring). In a few instances, students consumed snacks at the playground (2% of the time in the fall and 4% in the spring) or the cafeteria (2% in the fall and 1% in the spring).

Exhibit 4.4. Locations where FFVP snacks are distributed and consumed

Location	Fall		Spring		Change	
	Offered	Consumed	Offered	Consumed	Offered	Consumed
Classroom	90.4	95.9	92.8	94.7	2.4	-1.2
Cafeteria	3.2	1.6	3.9	1.2	0.7	-0.4
Kiosk or cart in hallway	5.6	0.6	1.4	0.5	-4.2	-0.1*
Library	0.3	0.3	0.9	0.5	0.7*	0.2*
Playground	1.3	2.3	0.9	3.7	-0.4	1.4
Other	0.5	1.0	0.2	0.5	-0.3	-0.5
Total	281	260	323	306		

Source: Evaluation of the FFVP-CFD pilot project, School-Level Nutrition Education and Promotion Material and Menu Collection Form, SY 2014–2015. Tabulations prepared by Mathematica Policy Research.

* Difference between fall and spring is statistically significant at the 0.05 level.

CFD = Canned, Frozen, Dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

C. Nutrition education and promotion activities during the FFVP pilot

Most principals and FSMs reported nutrition education and promotion activities occurring in their schools, although there were no significant changes in the frequency of reported activities occurring from fall 2014 to spring 2015. As shown in Appendix D Exhibit D.5, in both the spring and fall, slightly more than half of principals reported that their schools had conducted nutrition education or promotion activities about fruits and vegetables within the previous four weeks. According to principals, classroom teachers were the most likely staff to lead nutrition education and promotion activities in both the fall and spring. FSMs also conducted nutrition education and promotion activities. Their most commonly reported activity was verbally encouraging students to try fruits and vegetables, with 87% of FSMs in the fall and 84% in the spring encouraging students. Additionally, 62% of FSMs in the fall and 55% in the spring reported providing promotional information related to fruits and vegetables to teachers.

No significant changes occurred from fall to spring in the proportion of students who reported having seen educational materials about the FFVP snacks (Appendix D Exhibit D.8). Students reported that the most common sources of information about the FFVP snacks were school cafeteria staff and teachers or other classroom staff. This information is consistent with other survey data that indicate teachers and FSMs are the primary sources of information on the FFVP.

Classroom observation data also showed no change in nutrition education and promotional activities. No significant change occurred in the percentage of classroom staff observed encouraging consumption of nutritious foods, with encouragement occurring in 22% of observations in an average week in the fall and 19% in an average week in the spring (Appendix F Exhibit F.7)

Nutrition education posters or displays could be placed in a variety of locations throughout a school and were commonly located in food service areas, cafeterias, or classrooms. Classroom observation data indicated no significant change in the number of nutrition education displays seen in classrooms between the fall and spring semesters (Appendix F Exhibit F.8). A small percentage of classrooms (14% in the fall and 8% in the spring) had any nutrition education displays.

Although there were no changes in the frequency or overall types of nutrition education activities associated with the FFVP-CFD pilot, qualitative interview respondents described some ways schools adapted their activities while implementing the pilot. One respondent said a community partner providing nutrition education used CFD snacks to describe different processes for preserving fresh fruits, such as canning or dehydration. Another respondent described how nutrition education activities used the labels on CFD snack items to demonstrate to students how to read nutrition labels.

D. FFVP partner organizations

Partner organizations can play a variety of roles in the FFVP. Some schools partner with local stores or farms that provide a source of fresh produce schools can purchase. Other organizations involved in the FFVP offer nutrition education and promotion, such as cooperative extension services or health care organizations. One stakeholder interviewed worked for

cooperative extension and explained how she worked with a pilot school to deliver occasional nutrition education classes. As shown in Exhibit 4.5, non-Federal partners were fairly uncommon in pilot SFAs and schools. Of the SFA Directors, 33% in the fall and 29% in the spring reported working with non-Federal partners; even fewer principals said their schools worked with such partners (less than 15%). Food wholesalers and retailers were the most common type of partner reported. No significant changes occurred in the frequency of reported partners from fall to spring. Furthermore, the sample of respondents reporting partners was too small to analyze changes in the type of partners involved in the FFVP at pilot schools.

Exhibit 4.5. SFA Director and principal reports of FFVP non-Federal partners

FFVP partnerships with district/school n	SFA Director			Principal		
	Fall 2014 (percentage)	Spring 2015 (percentage)	Change	Fall 2014 (percentage)	Spring 2015 (percentage)	Change
Any outside partner	33.3	29.0	-4.3	11.8	12.8	1.1
n	27	31	-	34	39	-

Sources: Evaluation of the FFVP-CFD pilot project, SFA Director Survey (fall n = 27, spring n=31) and Principal Survey (fall n = 34, spring n=41), SY 2014–2015. Tabulations prepared by Mathematica Policy Research.

* Change between fall and spring is significantly different at the 0.05 level.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SFA = School Food Authority; SY = school year.

E. Fruits and vegetables offered in FFVP snacks, changes between standard FFVP snacks offered in fall 2014 and pilot FFVP snacks offered in spring 2015

In this section, the differences in amounts, type, form, calories, and nutrient content of fruits and vegetables offered in FFVP snacks in pilot sites in fall 2014 and spring 2015 are described. Reported values reflect the average FFVP snacks over one school week. There were variations by school in the number of days per week FFVP snacks were offered. Information on the average number of days that sampled schools offered FFVP snacks throughout the week can be found in Exhibit 4.3 and Appendix E Exhibit E.15.

In an average week in spring 2015, 50% of schools offered a mix of fresh and CFD items, 41% offered only fresh items, 6% offered only CFD items, and 3% did not offer any FFVP snacks.

All findings are based on analysis from the menu survey, which FIs completed in both fall 2014, when the standard FFVP was in place, and spring 2015, when the pilot FFVP was in place. Information collected in the menu survey included the type, form, and portion size of each fruit or vegetable snack. Data tables presenting the underlying data for the exhibits in this section can be found in Appendix E Exhibits E.1 and E.2.

1. Types and forms of fruits and vegetables offered in FFVP snacks

The FFVP-CFD pilot allowed but did not require schools to introduce CFD items into the snack offerings beginning January 1, 2015. In an average week in spring 2015, more than half of the schools (56%) did incorporate CFD items into FFVP snacks; 50% offered a combination of fresh and CFD items and 6% offered only CFD snacks (Exhibit 4.6). ‘Fresh only’ was the most

common category of FFVP snacks offered in an average week in the pilot at 41%, followed by a combination of ‘fresh and dried’ at 21% (Exhibit 4.6).

Exhibit 4.6. Percentage of schools offering various combinations of fresh, canned, frozen, or dried fruits and vegetables as FFVP snacks, spring 2015

Form	Percentage of schools			
	CFD only	CFD and fresh	Fresh only	All schools
All fresh	--	--	100.0	41.2
All canned	50.0	--	--	2.9
All dried	50.0	--	--	2.9
Fresh and canned	--	29.4	--	14.7
Fresh and frozen	--	5.9	--	2.9
Fresh and dried	--	41.2	--	20.6
Canned, dried, and fresh	--	23.5	--	11.8
No FFVP snacks	--	--	--	2.9 ^a
Number of schools	2	17	14	33^a
Percentage of schools	5.9	50.0	41.2	100.0

Source: Evaluation of the FFVP-CFD pilot project, Reimbursable Foods Form (spring n = 34), SY 2014–2015. Tabulations prepared by Mathematica Policy Research.

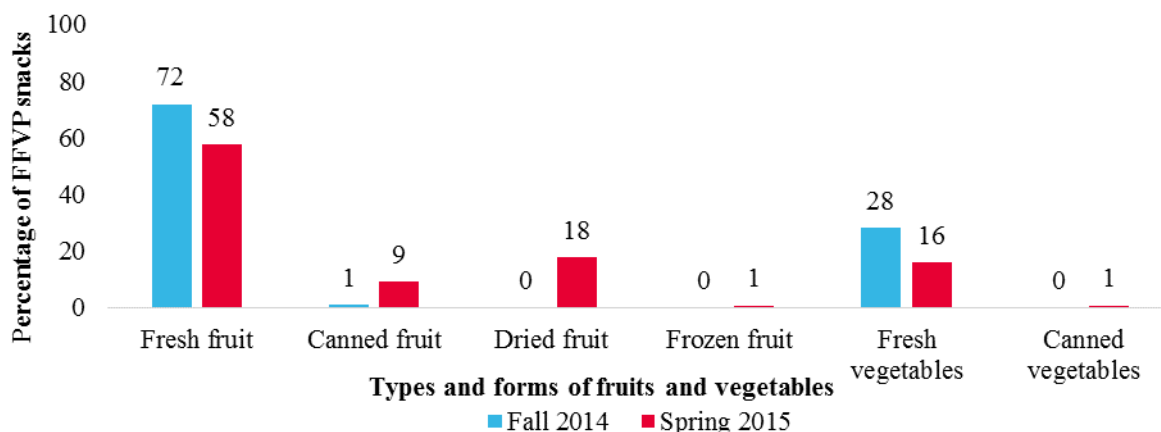
Note: Combinations of fresh and CFD foods not observed are not included in this exhibit. Percentages may not sum to 100% due to rounding. Because no sampling of schools was conducted and RFFs were completed by all schools with on-site data collection, statistical tests were not necessary.

^a One school did not serve FFVP snacks during its target week for data collection.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; RFF = Reimbursable Foods Form; SY = school year.

Pilot schools did not draw equally from the new forms available: dried and canned fruits were much more common than other CFD items. Together, they represented more than 25% of observed FFVP snacks in spring 2015 (Exhibit 4.7). Dried fruits were the most common CFD items, representing 18% of snacks in the spring. Frozen fruits and canned vegetables each made up less than 1% of snacks in the spring.

Exhibit 4.7. Types and forms of fruits and vegetables offered in FFVP snacks, changes between FFVP standard in fall 2014 and FFVP pilot in spring 2015



Source: Evaluation of the FFVP-CFD pilot project, Reimbursable Foods Form (fall n = 34; spring n = 34), SY 2014–2015. Tabulations prepared by Mathematica Policy Research. For full data, see Appendix E Exhibit E.1.

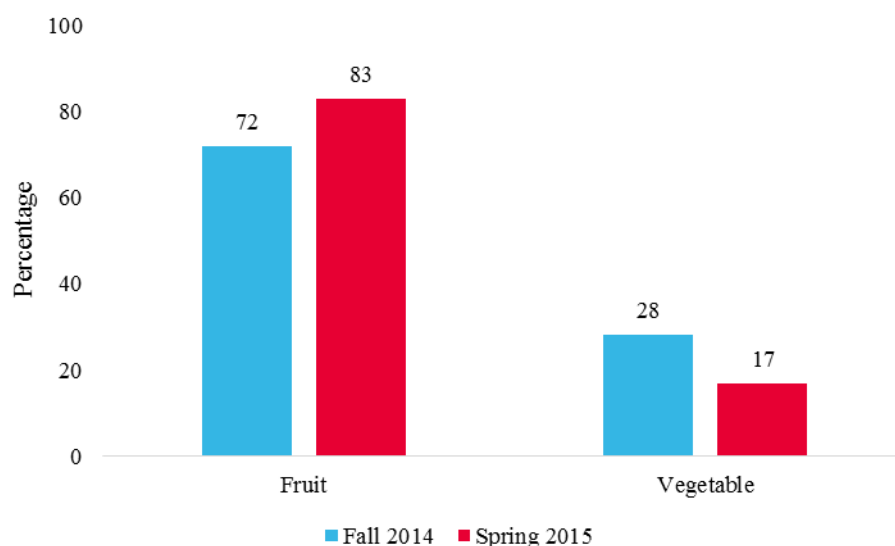
Note: Excludes three schools in the fall and one school in the spring that did not offer FFVP snacks during its target week for data collection. Canned peaches were offered as an FFVP snack in one school during fall 2014. This snack would not have been reimbursable under the standard program rules in place at that time. Because no sampling of schools was conducted and RFFs were completed by all schools with on-site data collection, statistical tests were not necessary.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; RFF = Reimbursable Foods Form; SY = school year.

Increases in CFD items displaced a proportion of fresh items, which were the only allowable forms during the standard FFVP in fall 2014. Fresh items decreased from virtually all snacks in the fall to 74% of snacks in the spring. Both fresh fruits and vegetables decreased: fresh fruits from 72% to 58% of snacks and fresh vegetables from 28% to 16% of snacks.

Because CFD items were overwhelmingly fruits and not vegetables, and because they replaced both fresh fruits and vegetables, the pilot caused the ratio of fruits to vegetables offered in snacks to shift toward more fruits. Fruits were already more common than vegetables in FFVP snacks in fall 2014 but the difference increased under pilot conditions in spring 2015 (Exhibit 4.8). The proportion of snacks containing fruits—whether fresh or CFD—increased from 72% to 83%; the proportion containing vegetables fell from 28% to 17%.²⁵

²⁵ In a few cases in the spring, multiple forms of fruit were served during a single snack. Therefore, the sum of the spring fruit forms listed in Exhibit 4.7 does not exactly equal the 83% shown in Exhibit 4.8. The sum of spring fruit snacks in Exhibit 4.8 is the percentage of snacks for all schools with no vegetables served, displayed in Appendix E Exhibit E.3.

Exhibit 4.8. Percentage of fruit and vegetable snacks offered

Source: Evaluation of the FFVP-CFD pilot project, Reimbursable Foods Form (fall n = 34; spring n = 34), SY 2014–2015. Tabulations prepared by Mathematica Policy Research. See Exhibit 4.9.

Note: Excludes three schools in the fall and one school in the spring that did not offer FFVP snacks during their target week for data collection. Excludes one observation of canned peaches offered as an FFVP snack in one school during fall 2014. This snack would not have been reimbursable under the standard program rules in place at that time. Because no sampling of schools was conducted and RFFs were completed by all schools with on-site data collection, statistical tests were not necessary.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; Reimbursable Foods Form; SY = school year.

2. Number and variety of FFVP snacks offered

To examine whether the introduction of CFD fruits and vegetables in the FFVP pilot snacks altered the number and variety of fruits and vegetables offered between fall 2014 and spring 2015, the differences in the number of items offered per snack and per week were compared. Most FFVP snacks consisted of a single item—either one fruit or one vegetable—rather than multiple components, such as carrots and celery served together. As shown in Exhibit 4.9, there was little change in the number of fruits or vegetables offered per snack between fall 2014 and spring 2015 and snacks were more likely to be a fruit than a vegetable.

The bottom panels of Exhibit 4.9 shows the average number of different items offered over the course of a week. The mean number of different fruits and vegetables offered over the course of a week was 3.4 in the fall and 3.6 in the spring. This increase of 0.2 is small and consists of a mean increase of 0.6 different fruits and a mean decrease of 0.4 different vegetables over a week. Schools offered a greater variety of fruits than vegetables in both time periods and this difference increased under the FFVP-CFD pilot (Exhibits 4.8 and 4.9).

Exhibit 4.9. Number and variety of fruits and vegetables offered in FFVP snacks

	Percentage of FFVP snacks		Change
	Fall 2014	Spring 2015	
Number of fruits or vegetables per snack ^a			
1	86.5	89.0	2.5
2	8.3	8.5	0.1
3	5.2	2.5	-2.7
Mean number of different items	1.2	1.1	-0.1
Median number of different items	1.0	1.0	0.0
Number of fruits per snack ^a			
None	28.1	16.9	-11.2
1	62.5	73.7	11.2
2	7.3	6.8	-0.5
3	2.1	2.5	0.5
Mean number of different items	0.8	0.9	0.1
Median number of different items	1.0	1.0	0.0
Number of vegetables per snack ^a			
None	71.9	83.1	11.2
1	24.0	15.3	-8.7
2	1.0	1.7	0.7
3	3.1	0.0	-3.1
Mean number of different items	0.4	0.2	-0.2
Median number of different items	0.0	0.0	0.0
Number of FFVP snacks	96	118	-
Variety of FFVP fruits or vegetables per week ^b			
Mean	3.4	3.6	0.2
Median	3.0	4.0	1.0
Number of different FFVP fruits per week ^b			
Mean	2.4	2.9	0.6
Median	2.0	3.0	1.0
Number of different FFVP vegetables per week ^b			
Mean	1.1	0.7	-0.4
Median	1.0	1.0	0.0
Number of schools	31	33	-

Source: Evaluation of the FFVP-CFD pilot project, Reimbursable Foods Form (fall n = 34; spring n = 34), SY 2014–2015. Tabulations prepared by Mathematica Policy Research.

Note: Excludes three schools in the fall and one school in the spring that did not offer FFVP snacks during their target week for data collection. Because no sampling of schools was conducted and RFFs were completed by all schools with on-site data collection, statistical tests were not necessary.

^a Calculations are based on FFVP snack occasions in classrooms across the target week.

^b Calculations are based on counts of different fruits or vegetables offered as FFVP snacks in schools across the target week.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; Reimbursable Foods Form; SY = school year.

The top five most frequently offered fruits and vegetables by form in fall 2014 and spring 2015 are shown in Exhibit 4.10. Apples, oranges, and bananas were the most common fresh fruit items offered in both fall and spring (strawberries tied with bananas in the spring). Schools offered a greater variety of fresh vegetables in the fall compared with the spring, although celery, salad, cucumber, carrots, and snow peas were common in both time periods. More than five vegetables are shown in the table because six items were offered for equal percentages of snacks and thus tied for third place. For a full list of the types and forms of fruits and vegetables offered in FFVP snacks between fall 2014 and spring 2015, see Appendix E Exhibit E.1.

Exhibit 4.10. Most frequently offered fresh FFVP snacks

Food group	Fall 2014		Spring 2015	
	Item	Percentage	Item	Percentage
Fresh fruits	Apples	20.8	Apples	13.6
	Oranges	13.5	Oranges	10.2
	Bananas	10.4	Bananas	6.8
	Grapes	9.4	Strawberries	6.8
	Pears	5.2	Grapes	5.9
Fresh vegetables	Carrots	10.4	Celery	5.1
	Peppers	4.2	Salad ^a	3.4
	Green peas	2.1	Cucumber	2.5
	Summer squash	2.1	Carrots	2.5
	Snow peas	2.1	Snow peas	1.7
	Cucumber	2.1		
	Salad ^a	2.1		
	Celery	2.1		

Source: Evaluation of the FFVP-CFD pilot project, Reimbursable Foods Form (fall n = 34; spring n = 34), SY 2014–2015. Tabulations prepared by Mathematica Policy Research. For full data, see Appendix E Exhibit E.1.

Note: Excludes three schools in the fall and one school in the spring that did not offer FFVP snacks during their target weeks for data collection.

^aSalad includes tossed salad and raw mixed vegetables with or without lettuce.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

Among the canned, frozen, and dried items schools were permitted to offer in spring 2015, dried cranberries, raisins, and dried fruit mixes were the most commonly offered. Mandarin oranges were the most common canned item. The only frozen fruit offered was blueberries and the only canned vegetable was corn (both were offered in only 1% of FFVP snacks). The most frequently offered for each form are shown in Exhibit 4.11.

Exhibit 4.11. Most frequently offered CFD FFVP snacks, spring 2015

Food group	Item	Percentage
Canned fruit	Mandarin oranges	3.4
	Applesauce	1.7
	Cranberries	1.7
	Mixed fruit salad	1.7
	Apricots	0.8
Frozen fruit	Blueberries	0.8
Dried fruit	Cranberries	6.8
	Raisins	4.2
	Mixtures ^a	4.2
	Mangoes	2.5
	Papayas	2.5
Canned vegetables	Corn	0.8

Source: Evaluation of the FFVP-CFD pilot project, Reimbursable Foods Form (spring n = 34), SY 2014–2015. Tabulations prepared by Mathematica Policy Research. For full data, see Appendix E Exhibit E.1.

Note: Excludes one school that did not offer FFVP snacks during its target week for data collection.

^aDried fruit mixtures include mixtures of three or more types of dried fruits.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

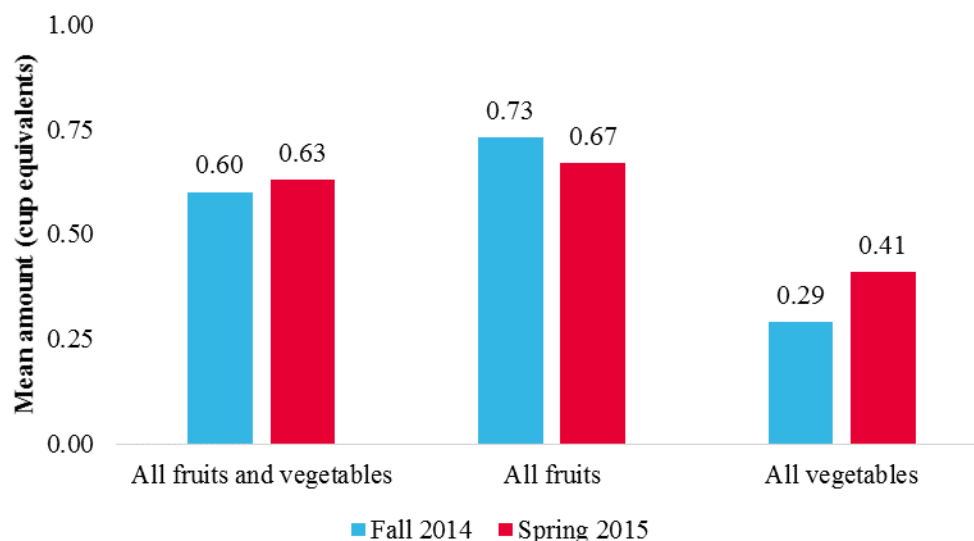
No school was observed to offer frozen or dried vegetables in spring 2015. One possible reason is that FFVP snacks are required to meet the Smart Snacks in School standards, which do not allow dried vegetables that contain added ingredients. Many commercially produced dried vegetables contain added fat, salt, and/or seasonings to increase palatability and shelf life (Perera 2007; Institute of Medicine 2010). For example, a typical one-ounce, single serving bag of vegetable chips contains 6.5 grams of fat and 100 mg of sodium, whereas a serving of fresh vegetables contains a negligible amount of fat and sodium (USDA 2014).

3. Amounts of fruits and vegetables offered in FFVP snacks

The average size of fruit and vegetable snacks offered through the FFVP did not change substantially between fall 2014 and spring 2015 (Exhibit 4.12).²⁶ The average size of FFVP fruit snacks decreased by 0.06 cup equivalents; the average size of FFVP vegetable snacks offered saw a larger change, increasing by a little more than one-tenth of a cup equivalent. However, because fruit snacks were more common than vegetable snacks, the overall size of FFVP snacks between fall 2014 and spring 2015 remained largely unchanged, increasing by only 0.03 cup equivalents.

²⁶ The values for the average size of fruit and vegetable snacks are presented in cup equivalents, which allow for comparisons across different types and forms of foods.

Exhibit 4.12. Amount of fruits and vegetables offered in FFVP snacks, changes between fall 2014 and spring 2015



Source: Evaluation of the FFVP-CFD pilot project, Reimbursable Foods Form (fall n = 31; spring n = 33), SY 2014–2015. Data on cup equivalents of fruits and vegetables were obtained from the Food Patterns Equivalents Database 2011–12. Tabulations prepared by Mathematica Policy Research. For full data, see Appendix E Exhibit E.4.

Notes: Exhibit includes whole fruits and vegetables offered at FFVP snacks. Excludes three schools in the fall and one school in the spring that did not offer FFVP snacks during their target weeks for data collection. Because no sampling of schools was conducted and RFFs were completed by all schools with on-site data collection, statistical tests were not necessary.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; RFF = Reimbursable Foods Form; SY = school year.

4. Mean energy and nutrients of FFVP snacks

The FFVP is intended to improve students' overall diets. Fruits and vegetables are important sources of key nutrients such as vitamin A, vitamin C, potassium, and fiber. When no other ingredients are added, they are nutrient dense and low in calories. It is conceivable that substituting CFD items for fresh items could alter the energy and nutrient content of the snacks. The mean energy and nutrient content of average FFVP snacks offered in the standard fall FFVP and the pilot spring FFVP were compared to identify differences associated with the pilot. For the majority of the nutrients, there were no substantive or meaningful changes observed (Appendix E Exhibit E.7). Calories and carbohydrates increased by 20 calories and 5 grams, respectively between the fall and spring (Exhibit 4.13).

Exhibit 4.13. Mean energy and key nutrient content of FFVP snacks

Dietary component	Fall 2014		Spring 2015		Change
	Mean	SE	Mean	SE	
Calories	45	3.2	65	5.0	20
Macronutrients					
Total fat (g)	0^	0.0^	0^	0.2	0^
Carbohydrate (g)	11	0.8	16	1.2	5
Protein (g)	1	0.0^	1	0.1	0^
Vitamins					
Vitamin A (mcg RAE)	31	7.6	27	6.9	-4
Vitamin C (mg)	16	1.9	15	1.6	-1
Vitamin D (mcg)	0	0.0	0	0.0	0
Vitamin E (mg AT)	0^	0.0^	0^	0.0^	0^
Vitamin B ₆ (mg)	0.1	0.01	0.1	0.01	-0.0^
Vitamin B ₁₂ (mcg)	0.0	0.00	0.0	0.00	0.0
Folate (mcg DFE)	12.7	1.14	12.5	1.10	-0.2
Niacin (mg)	0.3	0.02	0.4	0.03	0.1
Riboflavin (mg)	0.0^	0.00^	0.0^	0.00^	0.0^
Thiamin (mg)	0.0^	0.00^	0.0^	0.00^	0.0^
Minerals					
Calcium (mg)	13	1.1	15	1.2	2
Iron (mg)	0.2	0.02	0.3	0.03	0.1
Magnesium (mg)	9	0.7	11	1.0	2
Phosphorus (mg)	15	0.9	18	2.4	3
Potassium (mg)	153	9.8	166	10.9	13
Sodium (mg)	7	2.4	10	2.6	3
Zinc (mg)	0.1	0.01	0.1	0.02	0.0^
Other dietary components					
Cholesterol (mg)	0	0.0	0	0.0	0
Dietary fiber (g)	2	0.1	2	0.1	0^
Added sugar (teaspoons)	0.0^	0.02	0.6	0.17	0.6
Number of FFVP snack items	114		134		
Number of schools^a	31	-	33	-	-

Source: Evaluation of the FFVP-CFD pilot project, Reimbursable Foods Form (fall n = 34; spring n = 34), SY 2014–2015. Tabulations prepared by Mathematica Policy Research. Nutrient data for CFD snacks are shown in Appendix E Exhibit E.7.

Notes: The estimates exclude spreads and condiments, such as peanut butter and “light” ranch dressing. Approximately 18% (n = 17) and 8% (n = 10) of FFVP snacks (snack occasions) were offered with a spread/condiment in the fall and spring, respectively. Nutrient estimates reflect FFVP snack items offered at 96 fall and 118 snack occasions. The mean calories in the condiments offered with an FFVP snack were 53 in the fall and 92 in the spring. Because no sampling of schools was conducted and RFFs were completed by all schools with on-site data collection, statistical tests were not necessary.

^ Rounds to, but different from, zero.

^a Excludes three schools in the fall and one school in the spring that did not offer FFVP snacks during their target weeks for data collection.

AT = Alpha-tocopherol; CFD = Canned, frozen, or dried; DFE = Dietary folate equivalents; FFVP = Fresh Fruit and Vegetable Program; RE = Retinol equivalents; RAE = Retinol activity equivalents; RFF = Reimbursable Foods Form; SE = Standard error; SY = school year.

Changes in the type and form of FFVP snacks likely explain some of the increase in calories and carbohydrates. As described earlier, fruits represented a greater proportion of FFVP snacks in spring 2015 compared with fall 2014. Fruits generally contain more calories and carbohydrates than non-fried vegetables. The introduction of canned and dried fruits into FFVP snacks also likely contributed. Canned fruits typically are canned in fruit juice or light syrup containing sugar and calories. Some dried fruits also contain added sugar—permissible under the Smart Snacks in School standards if necessary for processing and/or palatability (FNS 2016b). These types of snacks would contain more calories and carbohydrates than fresh fruits or vegetables.

The energy and nutrient content shown in Exhibit 4.13 excludes spreads and condiments, such as peanut butter and “light” ranch dressing. Spreads and condiments were more commonly offered with snacks in the fall than in the spring (18% compared to 8%) because they were most commonly paired with vegetables. Condiments served with FFVP snacks contributed a wide range of calories. Almond and peanut butter contributed between 63 to 250 calories per serving (two-thirds of a tablespoon to 1.5 weight ounces). Ranch dressing contributed between 8 and 180 calories per serving (one teaspoon to 1.5 weight ounces).²⁷

F. Types and amounts of fruits and vegetables offered in reimbursable breakfasts and lunches, changes between fall 2014 and spring 2015

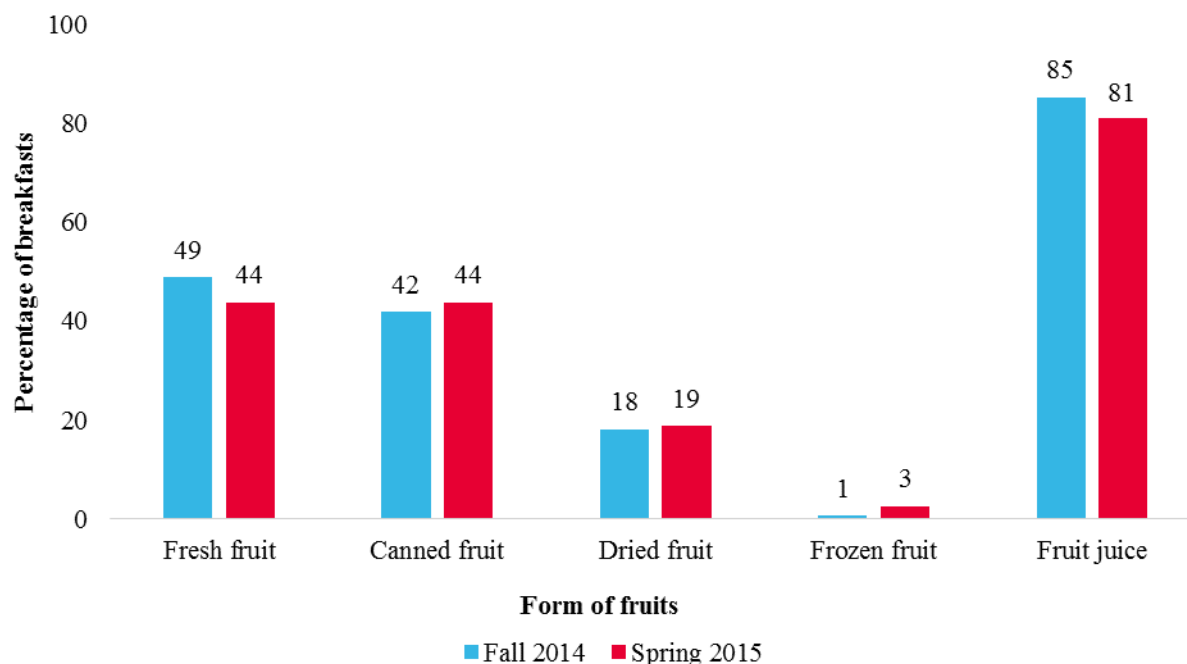
To see if the pilot might have affected fruit and vegetable offerings in reimbursable breakfasts and lunches, an analysis was performed on the types and frequency of fruits and vegetables offered in reimbursable school meals between fall 2014 and spring 2015. This analysis included an examination of the amounts, types, and forms of fruits and vegetables offered in reimbursable breakfasts and lunches in both time periods. All findings are based on analysis from the menu survey, which FIs completed for breakfast and lunch during fall 2014 and spring 2015. Reported values reflect average statistics for reimbursable breakfast and lunches offered over the fall and the spring. Information collected in the menu survey included the type, form, and portion size of foods and beverages offered. Data tables providing more detail can be found in Appendix E.

1. Types and forms of fruits and vegetables offered in reimbursable breakfasts and lunches

Changes in the form of fruits offered at breakfast appear to reflect the introduction of CFD fruits in FFVP pilot snacks in the spring, indicating that schools might have used leftover fresh fruits in the fall FFVP standard snacks and leftover canned fruits from FFVP pilot snacks in the spring to meet the fruit requirement at breakfast.

The majority of changes at breakfast occurred within the fruit category (Exhibit 4.14). Fresh fruits decreased by 5 percentage points at breakfast from fall to spring. Canned fruits increased by 2 percentage points, and fruit juice decreased by 4 percentage points. There were no major differences at breakfast in the type and form of vegetables—typically they were not offered at breakfast, except for hash browns.

²⁷ FFVP allows condiments/spreads/dips to be served with vegetables, but they have to be low-fat or non-fat dips and offered in the appropriate serving size (FNS 2010).

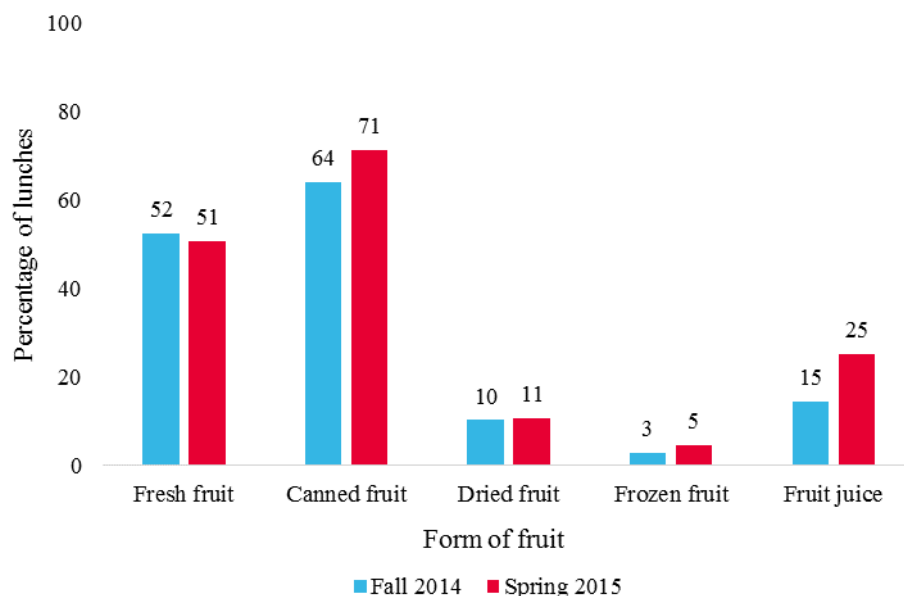
Exhibit 4.14. Form of fruits offered in reimbursable breakfasts, changes between fall 2014 and spring 2015

Source: Evaluation of the FFVP-CFD pilot project, Reimbursable Foods Form (fall n = 34; spring n = 34), SY 2014–2015. Tabulations prepared by Mathematica Policy Research. For full data, see Appendix E Exhibit E.12.

Note: Tabulations exclude fruit that was part of a mixed dish/entrée or a baked good or dessert (e.g., blueberry muffin, apple pie). Because no sampling of schools was conducted and RFFs were completed by all schools with on-site data collection, statistical tests were not necessary.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; RFF = Reimbursable Foods Form; SY = school year.

Changes in the forms of fruits offered at lunch might reflect an increased use of canned instead of fresh fruits in FFVP standard and pilot snacks between fall and spring, suggesting that schools used leftover fresh fruits in the fall and leftover CFD fruits from FFVP pilot snacks in the spring to meet the fruit requirement at lunch (Exhibit 4.15). The changes at lunch are similar to those observed in fruit at breakfast, with a decrease in fresh fruit (one percentage point) and an increase in canned fruit (7 percentage points). There also was a large increase in fruit juice at lunch—10 percentage points between fall and spring. It is possible that some schools offered juice at lunch instead of breakfast in the spring. This change would explain the decrease in fruit juice at breakfast and its increase at lunch. However, it is not clear that this shift was related to the FFVP-CFD pilot.

Exhibit 4.15. Form of fruits offered in reimbursable lunches, changes between fall 2014 and spring 2015


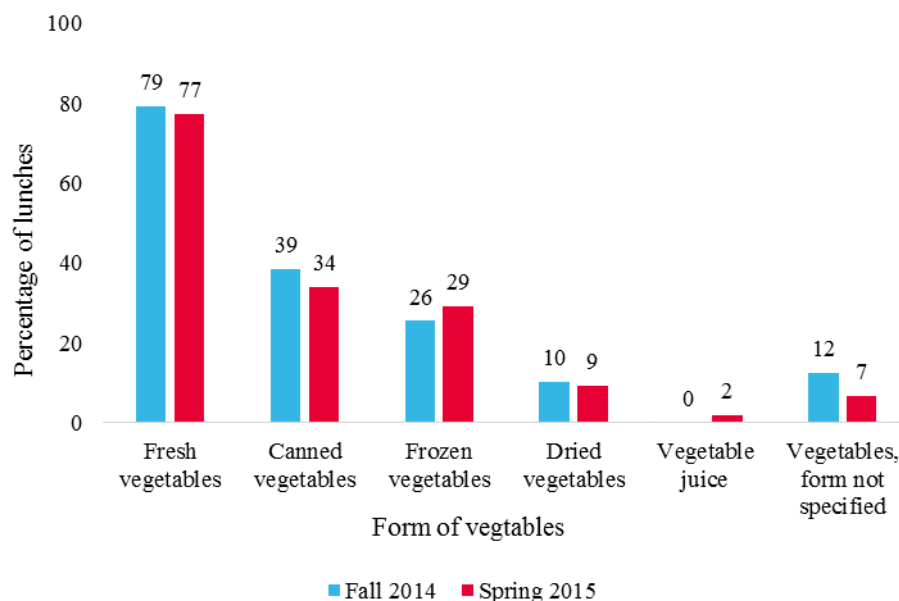
Source: Evaluation of the FFVP-CFD pilot project, Reimbursable Foods Form (fall n = 34; spring n = 34), SY 2014–2015. Tabulations prepared by Mathematica Policy Research. For full data, see Appendix E Exhibit E.12.

Note: Exhibit includes whole fruit offered at lunch and excludes fruit that was part of a mixed dish/entrée or a baked good or dessert (e.g., blueberry muffin, apple pie). Because no sampling of schools was conducted and RFFs were completed by all schools with on-site data collection, statistical tests were not necessary.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; RFF = Reimbursable Foods Form; SY = school year.

Differences in the form of vegetables offered at lunch were minimal and do not show increased use of canned or dried vegetables. Changes in vegetable subgroups were minimal overall, with a slight decrease in canned vegetables (5 percentage points) and increase in frozen vegetables (3 percentage points, Exhibit 4.16). The lack of change in vegetable forms is not surprising because schools offered almost no CFD vegetables as FFVP snacks under the pilot.

Exhibit 4.16. Form of vegetables offered in reimbursable lunches, changes between fall 2014 and spring 2015



Source: Evaluation of the FFVP-CFD pilot project, Reimbursable Foods Form (fall n = 34; spring n = 34), SY 2014–2015. Tabulations prepared by Mathematica Policy Research. For full data, see Appendix E Exhibit E.12.

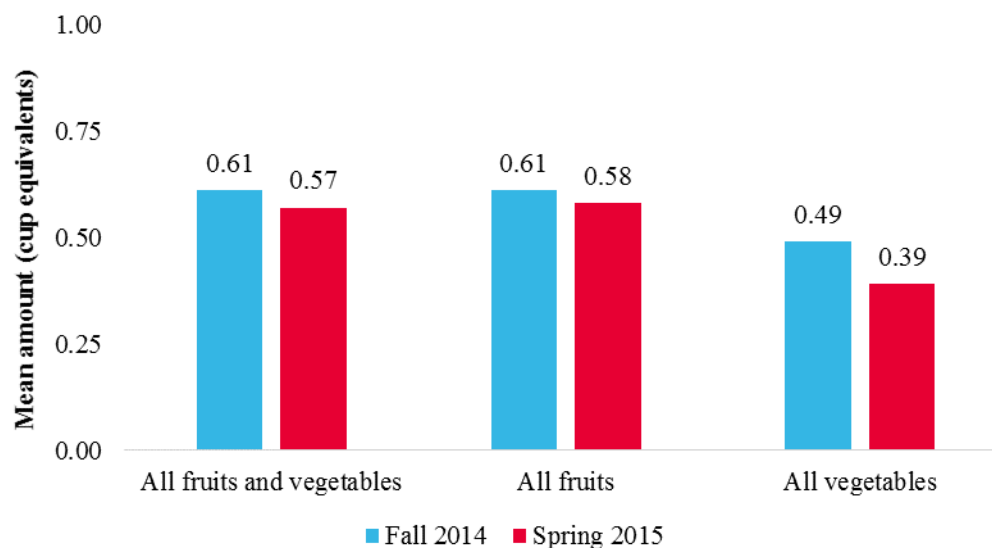
Note: Exhibit includes whole vegetables and salads offered at lunch and excludes vegetables that were part of a mixed dish/entrée (e.g., beef stew). Dried vegetables include instant mashed potatoes and dried peas and beans. Excludes string bean salad offered by a small share of schools in the fall and spring for which neither form nor preparation method was reported. Because no sampling of schools was conducted and RFFs were completed by all schools with on-site data collection, statistical tests were not necessary.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; RFF = Reimbursable Foods Form; SY = school year.

2. Amounts of fruits and vegetables offered in reimbursable breakfasts and lunches

Despite changes in the form of fruits and vegetables offered at breakfast and lunch, the amounts of fruits and vegetables offered did not change substantially between fall and spring (Exhibits 4.17 and 4.18). Differences in the amounts of fruits and vegetables offered between fall and spring at lunch and breakfast were minor. Vegetables decreased by one-tenth of a cup equivalent at breakfast but were not often incorporated into breakfasts. The total amount of fruits and vegetables offered at lunch stayed essentially the same between fall and spring, with a small decrease in the average amount of fruit offered per meal (0.06 cup equivalents).

Exhibit 4.17. Mean amount of fruits and vegetables offered in reimbursable breakfasts, changes between fall 2014 and spring 2015

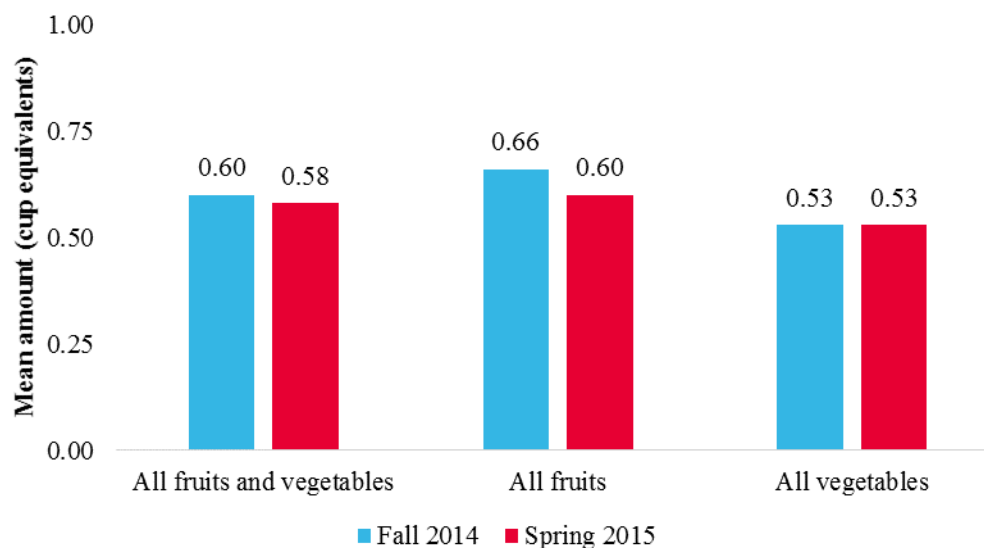


Source: Evaluation of the FFVP-CFD pilot project, Reimbursable Foods Form (fall n = 34; spring n = 34), SY 2014–2015. Data on cup equivalents of fruits and vegetables were obtained from the Food Patterns Equivalents Database 2011–12. Tabulations prepared by Mathematica Policy Research. For full data, see Appendix E Exhibit E.4.

Notes: Exhibit includes whole fruits and vegetables offered at breakfast. Excludes fruits and vegetables that were part of a mixed dish/entrée (e.g., beef stew) or a baked good or dessert (e.g., blueberry muffin, apple pie) and 100% fruit and vegetable juices. Because no sampling of schools was conducted and RFFs were completed by all schools with on-site data collection, statistical tests were not necessary.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; RFF = Reimbursable Foods Form; SY = school year.

Exhibit 4.18. Mean amount of fruits and vegetables offered in reimbursable lunches, changes between fall 2014 and spring 2015



Source: Evaluation of the FFVP-CFD pilot project, Reimbursable Foods Form (fall n = 34; spring n = 34), SY 2014–2015. Data on cup equivalents of fruits and vegetables were obtained from the Food Patterns Equivalents Database 2011–12. Tabulations prepared by Mathematica Policy Research. For full data, see Appendix E Exhibit E.4.

Notes: Exhibit includes whole fruits and vegetables offered at lunch. Excludes fruits and vegetables that were part of a mixed dish/entrée (e.g., beef stew) or a baked good or dessert (e.g., blueberry muffin, apple pie) and 100% fruit and vegetable juices. Excludes three schools in the fall and one school in the spring that did not offer FFVP snacks during their target week for data collection. Because no sampling of schools was conducted and RFFs were completed by all schools with on-site data collection, statistical tests were not necessary.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; RFF = Reimbursable Foods Form; SY = school year.

5. IMPACTS OF THE FFVP-CFD PILOT ON STUDENT OUTCOMES

This chapter addresses the impact of the FFVP-CFD pilot project on student outcomes: (1) FFVP participation, (2) fruit and vegetable consumption, (3) food and nutrient intake, (4) diet quality, and (5) FFVP snack wastage. All of the food and nutrient findings focus on students' in-school consumption, including school meals, FFVP snacks, and foods and snacks brought from home. Data collected over 10 weeks each in the fall and spring reflect students' consumption under the standard FFVP and the pilot, respectively. Other factors in interpreting fruit and vegetable consumption patterns are student attitudes toward types and forms of fruits and vegetables, and the amount of FFVP snacks wasted (defined as taking an FFVP item but wasting or not consuming some portion of it).

A. FFVP-CFD pilot impact on student participation

Student participation in the FFVP was measured using classroom snack observations on program days across pilot schools during the fall and the spring data collection. These measures showed no statistically significant difference from fall to spring, described in section 1. Section 2 contains information on student, parent, and staff perception of student participation in the FFVP both under standard conditions in the fall and pilot conditions in the spring.

1. Classroom observations of FFVP snacks

Classroom observation data showed a small, yet not statistically significant increase in student participation from fall to spring. Students were counted as participants in the FFVP if they took a snack when it was offered, regardless of the amount they consumed.²⁸ FIs recorded the number of students taking FFVP snacks on a given day using classroom observation forms. These data were used to calculate the participation rate. As shown in Exhibit 5.1, there was no statistically significant difference between the average FFVP participation rate in the fall (73%) compared with the spring (77%).

²⁸ If a student did not take the FFVP snack, they are a non-participant. If a student took a snack, but did not eat any amount they are a participant with 100% plate waste. Later in the chapter, dietary findings for consumers only, and for all students (consumers plus nonconsumers of the FFVP snack), are reported.

Exhibit 5.1. Estimated impact of CFD pilot on FFVP student participation

	Fall 2014	Spring 2015	Change
Average participation rate ^a	72.9	77.3	4.4
Number of FFVP program days across all sample classrooms	243	257	-

Source: Evaluation of the FFVP-CFD pilot project, Classroom and Student Fruit and Vegetable Snacks Observation Form, SY 2014–2015.

Note: FFVP participation is based on observations of FFVP snacks offered and taken by students in selected 4th–6th grade classrooms across all 34 pilot schools. Three schools in the fall and one in the spring did not offer FFVP snacks in the target week of observations. These schools were excluded from the analysis.

* Change between fall and spring is significantly different at the 0.05 level.

^a The average participation rate is calculated using weighted classroom-level data. The formula is the sum of all students who took a snack divided by the sum of all students present in classes when snacks were offered, across all schools and classrooms for all FFVP program days observed. The unit of analysis is each program day per classroom. Thus, a given school with four observed classrooms with three program days each would contribute 12 observations.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

2. Survey measures of student participation

Survey responses to questions on student participation in the FFVP in fall 2014 and spring 2015 varied by respondent type. Students reported slightly lower participation in the spring compared with the fall. Parents reported no change in perceived student participation. Staff surveys on the amount of snacks students took and consumed varied across FSMs and teachers.

Students reported taking FFVP snacks less often under the FFVP-CFD pilot in spring 2015 than they did under the standard FFVP in fall 2014. The survey data displayed in Exhibit 5.2 show significant changes in the frequency with which students reported taking FFVP fruit or vegetable snacks. A smaller percentage of students reported taking the snacks every time they were offered in the spring. For fruit, the percentage of students who took the snack every time it was offered decreased from 35% to 27%, whereas the percentage of students reporting that they took it less frequently increased. The trend for vegetables was similar. The proportion of students who said they took FFVP vegetable snacks every time they were offered fell from 20% in the fall to 17% in the spring. The proportion saying they took vegetable snacks most times they were offered also decreased, from 37% to 35%. The proportion taking vegetables occasionally and the proportion who reported never taking the snack both increased.

Exhibit 5.2. Student participation in FFVP, usual proportion of fruit and vegetable snacks consumed, and reasons for nonparticipation, by student report

	Response	Fall 2014 (Percentage)	Spring 2015 (Percentage)	Change
When they are offered, how often do you usually take the free fruit snack?	Every time offered	34.6	27.4	-7.3
	Most times offered	43.8	47.9	4.1
	Occasionally	17.4	19.9	2.6
	Never	3.5	4.0	0.5
	Haven't seen it offered	0.7	0.8	0.1
	n	1,578	1,568	-
Significance				†
When they are offered, how often do you usually take the free vegetable snack?	Every time offered	19.5	16.8	-2.7
	Most times offered	37.2	34.9	-2.3
	Occasionally	25.9	32.1	6.2
	Never	14.7	14.8	0.1
	Haven't seen it offered	2.7	1.5	-1.2
	n	1,581	1,568	-
Significance				†

Source: Evaluation of the FFVP-CFD pilot project, Student Survey (fall n = 1,586, spring n = 1,576), SY 2014–2015. Tabulations prepared by Mathematica Policy Research are weighted to be representative of 4th–6th grade students in pilot schools with a total enrollment of 50 or more students. See Appendix D Exhibit D.9.

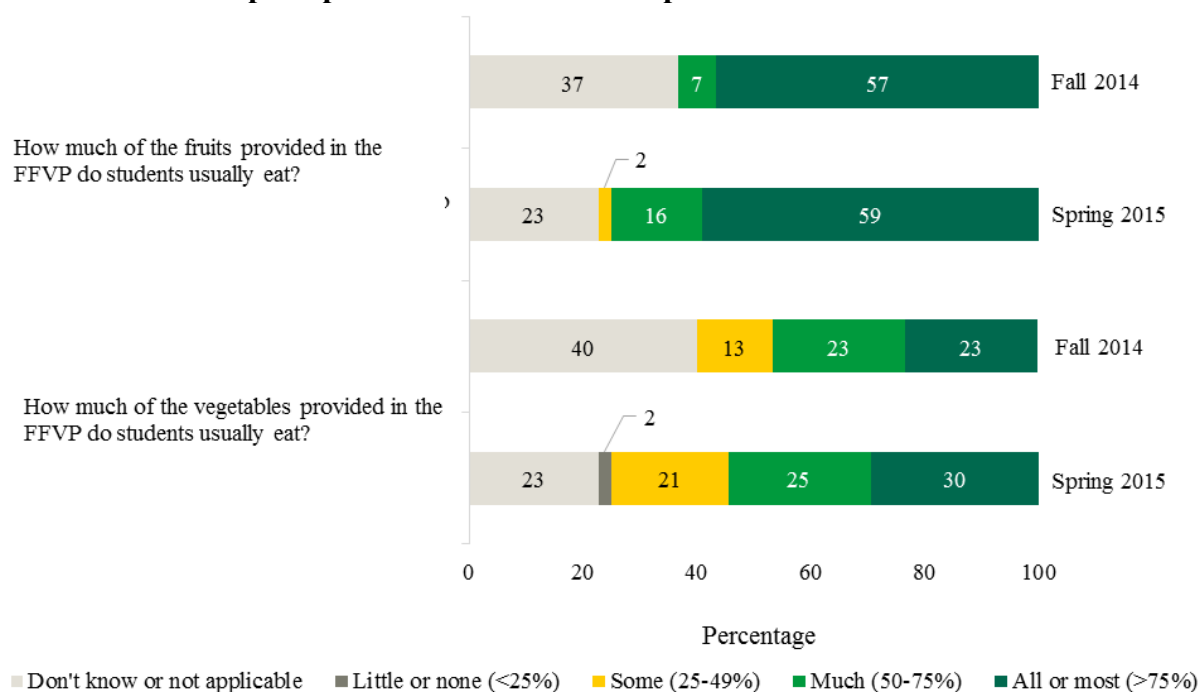
Note: Totals may not sum to 100% due to rounding. Change column may not equal the difference between fall and spring exactly due to rounding.

†Shift in responses from fall to spring is significantly different at the 0.05 level.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

Student survey results in Exhibit 5.2 show a lower frequency of students taking FFVP snacks than the observation data displayed in Exhibit 5.1. The survey data also differ from the observation data in that they show a significant decrease from fall to spring for both fruits and vegetables among students who report always taking the FFVP snack.

As shown in Exhibits 5.3 and 5.4, both FSMs and teachers perceived no change in the amount of fruit snacks students consumed from fall to spring. Most FSMs and teachers believed that students usually ate most of the FFVP fruit snacks, although the percentage was quite a bit higher for teachers than FSMs in this category. FSMs and teachers differed from each other in their responses about changes in vegetable snack consumption from fall to spring (Exhibits 5.3 and 5.4). FSMs perceived no change from fall to spring, but teachers reported a substantial increase in the amount of vegetable snacks students ate. Since snacks are most commonly distributed in classrooms, teachers have a greater likelihood of directly observing snacks than FSMs.

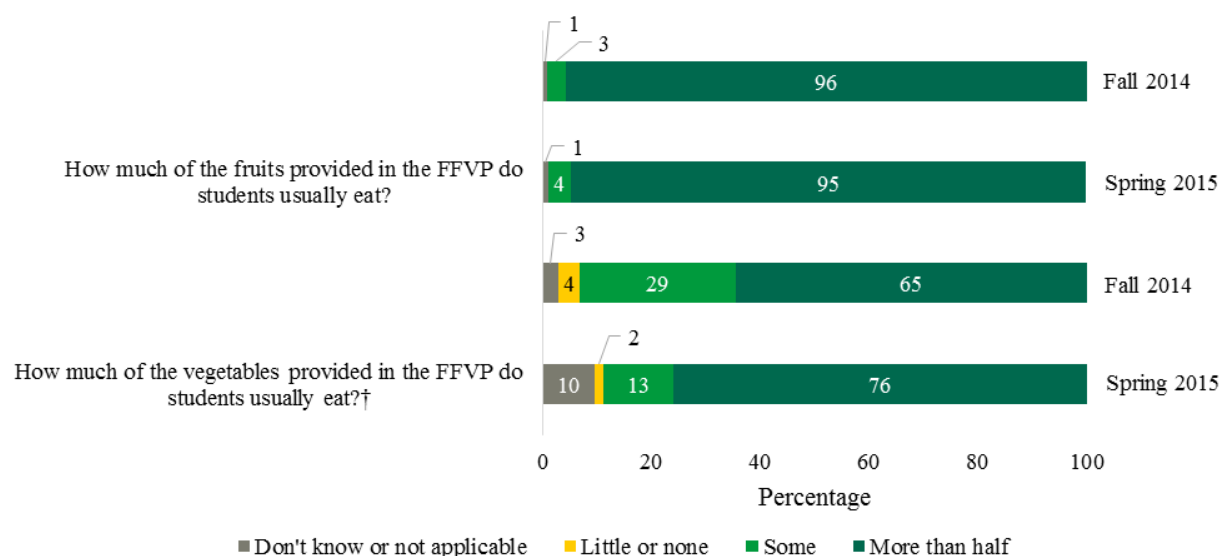
Exhibit 5.3. FSMs' perceptions of student consumption of FFVP snacks

Source: Evaluation of the FFVP-CFD pilot project, FSM Survey (fall n = 30, spring n = 44), SY 2014–2015. Tabulations prepared by Mathematica Policy Research. See Appendix D Exhibit D.11.

Note: Totals may not sum to 100% due to rounding.

†Shift in responses from fall to spring is significantly different at the 0.05 level.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; FSM = Food service manager; SY = school year.

Exhibit 5.4. Teachers' perceptions of student consumption of FFVP snacks

Source: Evaluation of the FFVP-CFD pilot project, Teacher Survey (fall n = 87, spring n = 118), SY 2014–2015. Tabulations prepared by Mathematica Policy Research are weighted to be representative of 4th–6th grade classrooms in the pilot schools. See Appendix D Exhibit D.12.

Note: Totals may not sum to 100% due to rounding.

†Shift in responses from fall to spring is significantly different at the 0.05 level.

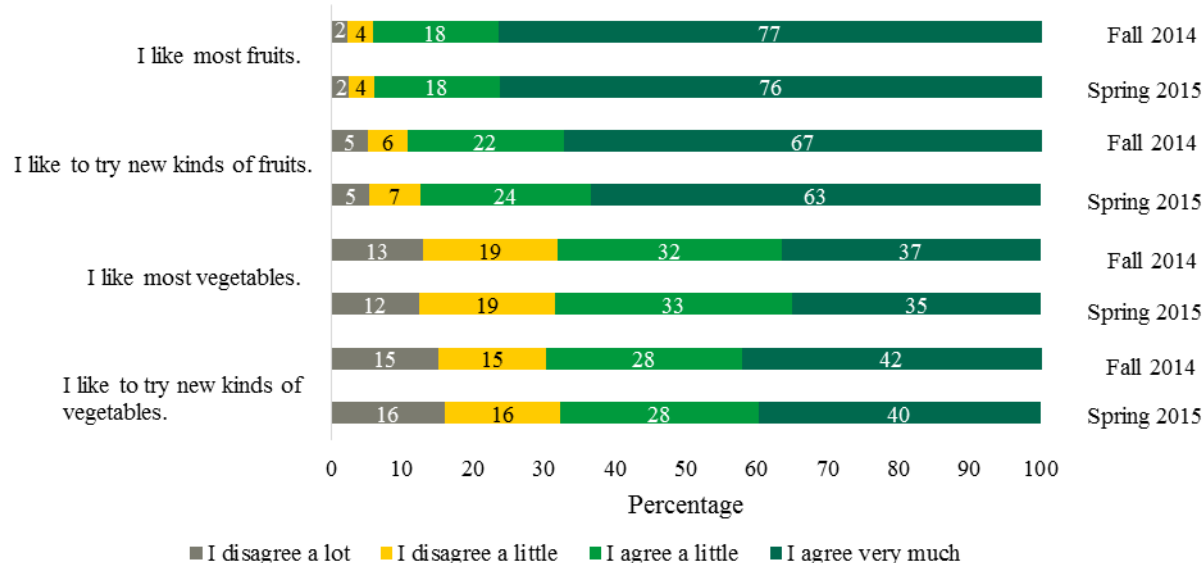
CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; FSM = Food service manager; SY = school year.

Overall, both FSMs and teachers reported higher perceived consumption of fruits than vegetables, with 64% of FSMs in the fall and 75% in the spring believing that students usually consumed much, all, or most of the FFVP fruit snacks; only 46% of FSMs in the fall and 55% in the spring believed that students usually consumed much, all, or most of the vegetable snacks (Exhibit 5.3). Virtually all teachers in both the fall and spring believed that students usually consumed more than half of the fruit snack, whereas only 65% in the fall and 76% in the spring believed that students usually consumed more than half of the vegetable snack (Exhibit 5.4). The response categories for the FSM and teacher survey questions differed from one another, with the two highest consumption categories in the FSM survey being similar to the highest consumption category in the teacher survey. Thus, here the highest consumption categories in the FSM survey are reported together.

Changes in staff perceptions of whether students ate more fruits and vegetables on FFVP snack days differed by type of staff. As shown in Appendix D Exhibits D.14 and D.15, there was no change in how FSMs perceived students' acceptance of the FFVP, whereas the percentage of teachers who believed students ate more fruits and vegetables on FFVP snack days decreased from the fall to the spring. About 58% of teachers still agreed strongly that students ate more fruits and vegetables, but this is a decrease from the fall (68%). SFA Directors, FSMs, principals, and teachers all wished that more students took the FFVP snacks; there was no change in these reports from fall to spring.

B. Students' perceptions of fruits and vegetables

The FFVP-CFD pilot project did not appear to change student attitudes toward fruits and vegetables. This is consistent across student, teacher, and FSM surveys, and can be seen in Exhibit 5.5 and Appendix D Exhibit D.16. The majority of students (over 75%) agreed strongly that they liked most fruits both semesters, and about 37% of students in fall and 35% in spring agreed strongly that they liked most vegetables. Also, no change occurred from fall to spring in the percentage of students who said they like to try new fruits or vegetables. The majority of students agreed with these statements in both fall and spring. Exhibit 5.5 also shows that more than three-quarters of students reported liking most fruits; less than half said the same of vegetables. In a similar vein, about two-thirds of students agreed very much that they like to try new fruits, whereas less than half said the same for vegetables.

Exhibit 5.5. Students' reported interest in fruits and vegetables

Source: Evaluation of the FFVP-CFD pilot project, Student Survey (fall n = 1,575, spring n = 1,565), SY 2014–2015. Tabulations prepared by Mathematica Policy Research are weighted to be representative of 4th–6th grade students in the pilot schools. See Appendix D Exhibit D.15.

Note: Totals may not sum to 100% due to rounding.

†Shift in responses from fall to spring is significantly different at the 0.05 level.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

Similar to students' reported perceptions of fruits and vegetables in the FFVP, FSM and teacher perceptions of the effect FFVP has on students' perceptions did not change from fall to spring. As Appendix D Exhibit D.16 shows, the majority of FSMs and teachers thought students were more willing to try new foods as a result of the FFVP and that this was a major benefit of the program, but there was no significant change in the percentage of FSMs and teachers who responded this way in the spring compared with the fall. The majority of FSMs and teachers saw students learning about healthy foods as a major benefit of FFVP; this finding also did not change from fall to spring.

Other survey data reinforce the finding that students prefer fruits to vegetables. Exhibit 5.6 shows students' attitudes toward 39 different items, including 24 fruits and 15 vegetables.²⁹ The items are ranked by the percentage of students who reported liking each item "a lot." The graphic also shows the percentage who said they did not like each item. The top 10 most liked items were all fruits. The top-ranking vegetable was carrots, ranked at number 11. Vegetables clustered near the bottom of the chart. The most disliked item was tomatoes; 43% of students said they did not like them.

Students reported preferring fruits to vegetables, fresh items to CFD, and raw vegetables to cooked. However, a large percentage of students had either never tasted or did not know if they liked certain CFD fruits or cooked vegetables.

²⁹ Students were asked about fresh fruits and vegetables in the fall survey, and about CFD fruits and cooked vegetables in the spring survey.

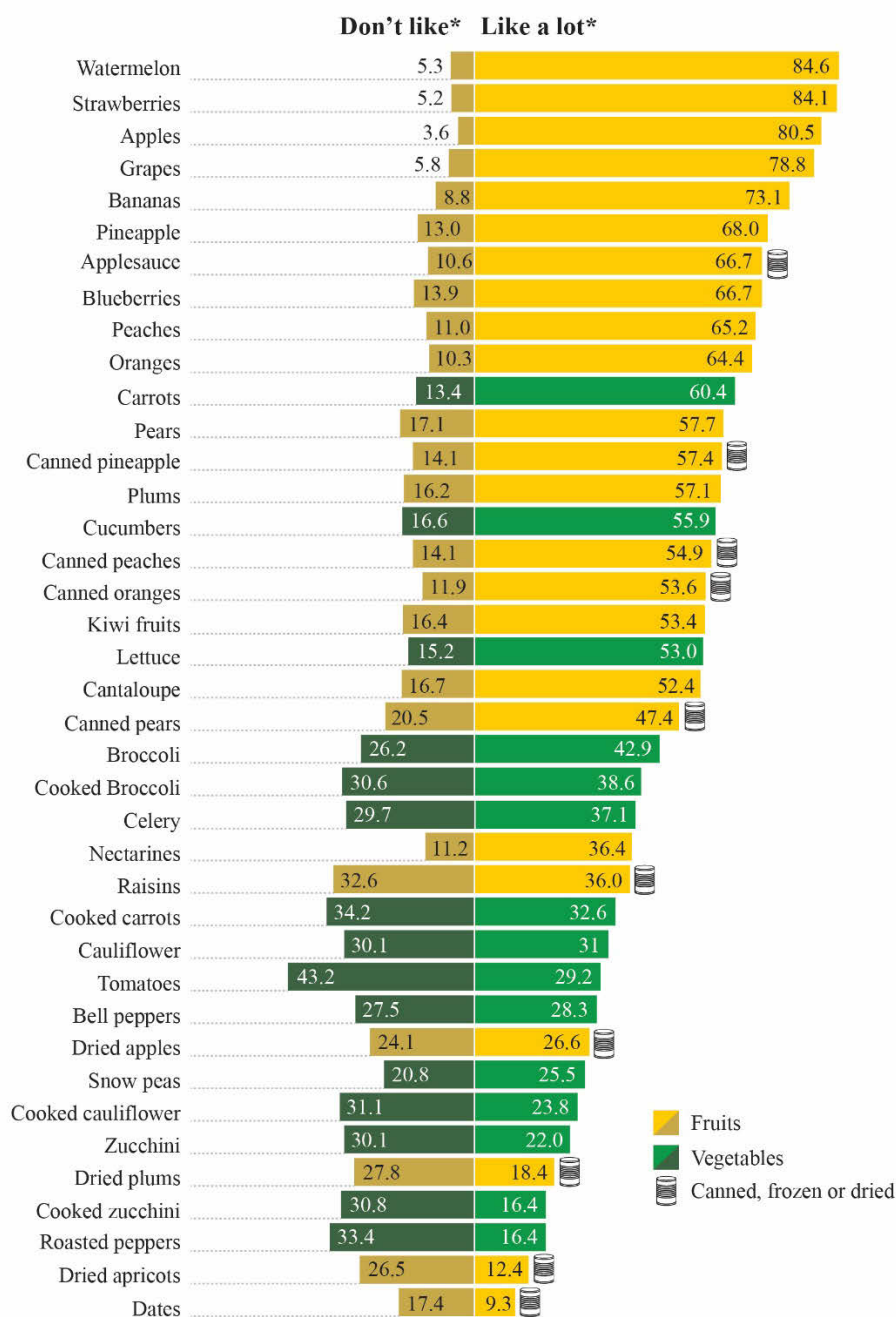
The only CFD item in the top 10 was applesauce. Students favored fresh oranges over canned, fresh pears over canned, and fresh apples over dried apples or applesauce. The five fruits that the lowest proportion of students reported liking were all CFD fruits. When asked about a vegetable generally and then about the cooked version (for example, zucchini versus cooked zucchini), they consistently scored cooked vegetables lower.

Comparing menu data with Exhibit 5.6 shows schools frequently offering fresh fruits that students highly prefer for FFVP snacks. The frequency of offering highly preferred vegetables and CFD snacks was mixed. Students' preferences shown in Exhibit 5.6 are based on general attitudes and not specifically the items consumed at school. Exhibit 4.10 in Chapter 4 shows the most frequently offered FFVP fresh snacks and Exhibit 4.11 shows the most frequently offered CFD FFVP snacks. When compared with Exhibit 5.6, all but one (pears) of the top five most frequently offered fresh snacks in fall 2015 are in the top 10 most-liked items. All of the top five most frequently offered fruit snacks in spring 2016 are listed in the top 10 most liked items.

The most frequently offered fresh vegetables are more widely dispersed across the ranking of students' preferences. Although carrots were the most frequently offered fresh FFVP vegetable in the fall and the most well-liked vegetable, celery was the most frequently offered fresh vegetable in the spring, but students did not like it nearly as well. For CFD FFVP snacks, not all of the most frequently offered items in Exhibit 4.11 also appear in Exhibit 5.6, but those listed are also widely dispersed.³⁰

For the same set of fruits and vegetables as those shown in Exhibit 5.6, students were asked if they had ever tasted the item or did not know whether they liked it or not. A larger percentage of students had never tasted cooked vegetables and CFD fruits and vegetables than raw or fresh items. For example, three of the top five fruits and vegetables students said they had never tasted were dried fruits; another was a cooked vegetable. Nine out of the 10 fruits and vegetables at the bottom of Exhibit 5.7—those with which the highest proportion of students were familiar—were fresh items.

³⁰ Due to the list of specific fruits and vegetables used to assess student preferences being developed before the most frequently offered fruits and vegetables were determined, student preferences for some of the most commonly offered fruits and vegetables are unknown. (Items that fall in this category were offered at 2% or less of the snacks.)

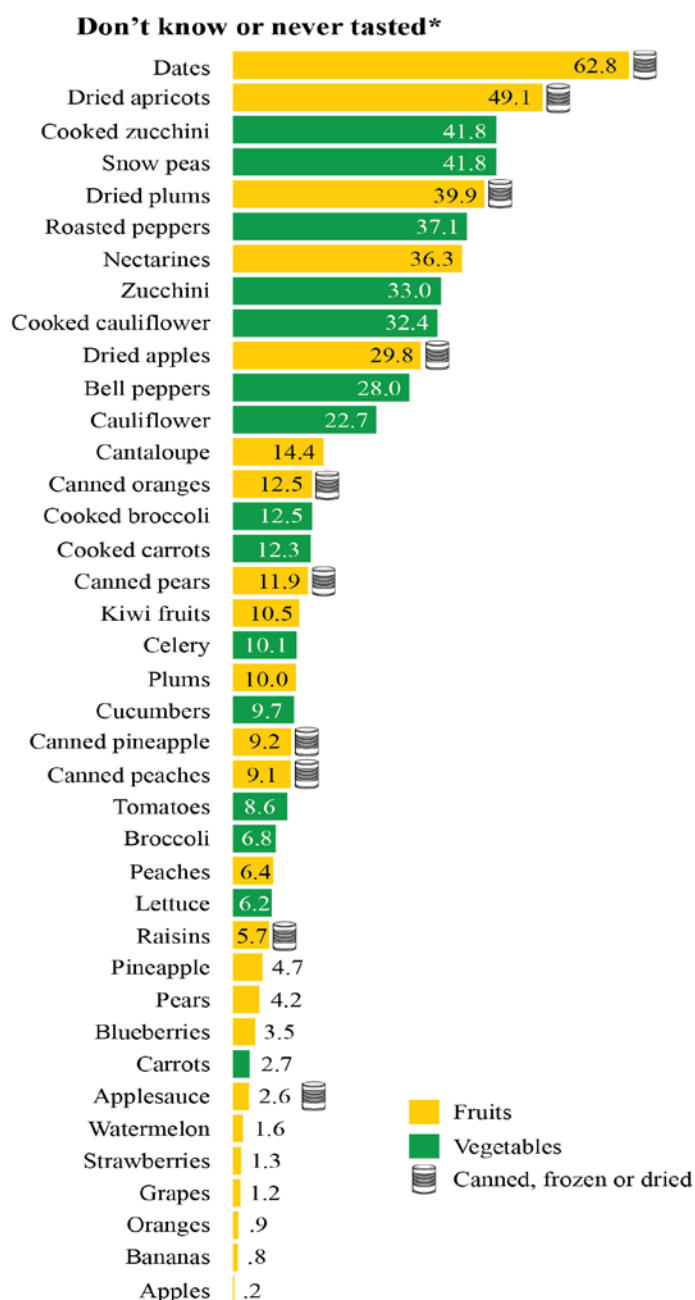
Exhibit 5.6. Student preferences for fruits and vegetables

*Percentage of students

Source: Evaluation of the FFVP-CFD pilot project, Student Survey (fall n = 1,575, spring n = 1,557), SY 2014–2015. Tabulations prepared by Mathematica Policy Research are weighted to be representative of 4th–6th grade classrooms in the pilot schools. See Appendix D Exhibits D.33 and D.34.

Note: Other survey options included “like a little” and “don’t know/never tasted”. The fall survey included questions on fresh items only; the spring survey included CFD fruits and cooked vegetables only. This provides a comparison of student preferences by fruit and vegetable form, not an estimate of the change in acceptance of fresh items between the fall and the spring.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

Exhibit 5.7. Student experience with fruits and vegetables

*Percentage of students

Source: Evaluation of the FFVP-CFD pilot project, Student Survey (fall n = 1,575, spring n = 1,557), SY 2014–2015. Tabulations prepared by Mathematica Policy Research are weighted to be representative of 4th–6th grade classrooms in the pilot schools. See Appendix D Exhibits D.33 and D.34.

Note: ‘Don’t know/never tasted’ responses were a single response option for the survey question. Other options included “like a lot”, “like a little”, and ‘don’t like’. The fall survey included questions on fresh items only; the spring survey included CFD fruits and cooked vegetables only. This provides a comparison of student preferences by fruit and vegetable form, not an estimate of the change in acceptance of fresh items between the fall and the spring.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

C. Impacts on consumption of fresh and CFD fruit and vegetables at school

In this section, changes in students' total fruit and vegetable consumption in school on FFVP snack days between fall 2014 and spring 2015 are described. There is a comparison of differences in cup equivalents of fruits and vegetables consumed by form, average HEI-2010 scores for student intakes in school, and mean intakes of energy and key nutrients on all FFVP snacks days. As mentioned in previous sections, the number of days each school served FFVP snacks during the week varied. Information on the average number of days schools' sampled classrooms served FFVP snacks throughout the week can be found in Chapter 4. Differences during a typical week in fall 2014 and spring 2015 were also calculated. These exhibits can be found in Appendix E.

All findings are based on analysis from dietary recalls that FIs collected during the standard FFVP in fall 2014 and the FFVP-CFD pilot in spring 2015. Information collected in the dietary recalls includes details regarding the type and form of foods and beverages as well as the amount consumed during the school day. Information about foods or beverages consumed outside of school (including those consumed at home) was not collected. Detailed data tables presenting the underlying dietary data for the exhibits in this section can be found in Appendix E.

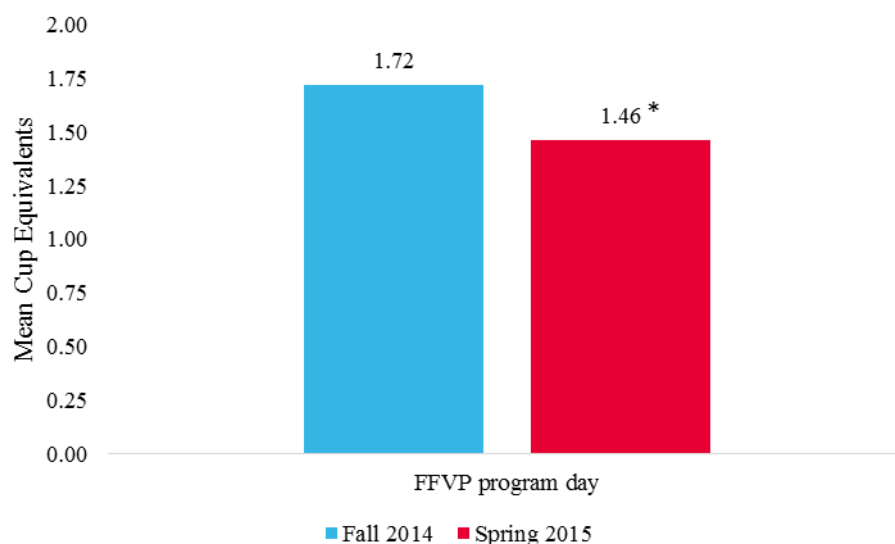
1. Overall fruit and vegetable consumption

Exhibit 5.8 shows the impact of the pilot on in-school consumption of fruits and vegetables on FFVP snack days.³¹ In-school consumption of fruits and vegetables on FFVP snack days decreased from 1.72 cup equivalents in fall 2014 to 1.46 cup equivalents in spring 2015. Fruit and vegetable consumption on nonprogram days did not change significantly between fall and spring, making it plausible that the change on program days was related to the FFVP-CFD pilot.³²

In-school consumption of fruits and vegetables on FFVP snack days decreased from 1.72 cup equivalents in fall 2014 to 1.46 cup equivalents in spring 2015.

³¹ All statistics on fruit and vegetable consumption in this chapter are presented as mean cup equivalents. The USDA defines a cup equivalent as a comparable amount of various foods used as a standard of comparison within the fruit and vegetable food groups (USDA 2016). The specific conversion between cups and cup equivalents varies by type and form of fruits and vegetables. In general, for fresh fruits and vegetables and 100% juice, one cup equivalent is the amount of food considered equivalent to one cup of a cut-up fruit or vegetable. Two cups of raw leafy greens are considered one cup equivalent of vegetables. For dried fruits, one-half cup generally equals one cup equivalent. Average amounts are estimates from a statistical model that controls for student gender, grade, primary language spoken at home, free and reduced-price lunch status, race/ethnicity, and whether students usually engage in physical activity before the FFVP snack is served. Holding these characteristics constant provides the best estimate for the changes in consumption associated with the pilot between fall 2014 and spring 2015.

³² The adjusted mean cup equivalents of total fruits and vegetables consumed in school on a nonprogram day was 1.53 in fall and 1.56 in spring.

Exhibit 5.8. Mean cup equivalents of all fruits and vegetables consumed in school on an FFVP program day

Source: FFVP-CFD Pilot Evaluation, Diary-assisted/in-school Dietary Recall (fall n = 858, spring n = 935), SY 2014–2015. For full data, see Exhibit 5.10.

Note: These consumption averages are estimates from a statistical model that controls for student gender, grade, primary language spoken at home, free and reduced-price lunch status, race/ethnicity, and whether students usually engage in physical activity before the FFVP snack is served. Holding these characteristics constant provides the best estimate for the changes in consumption associated with the pilot between fall 2014 and spring 2015.

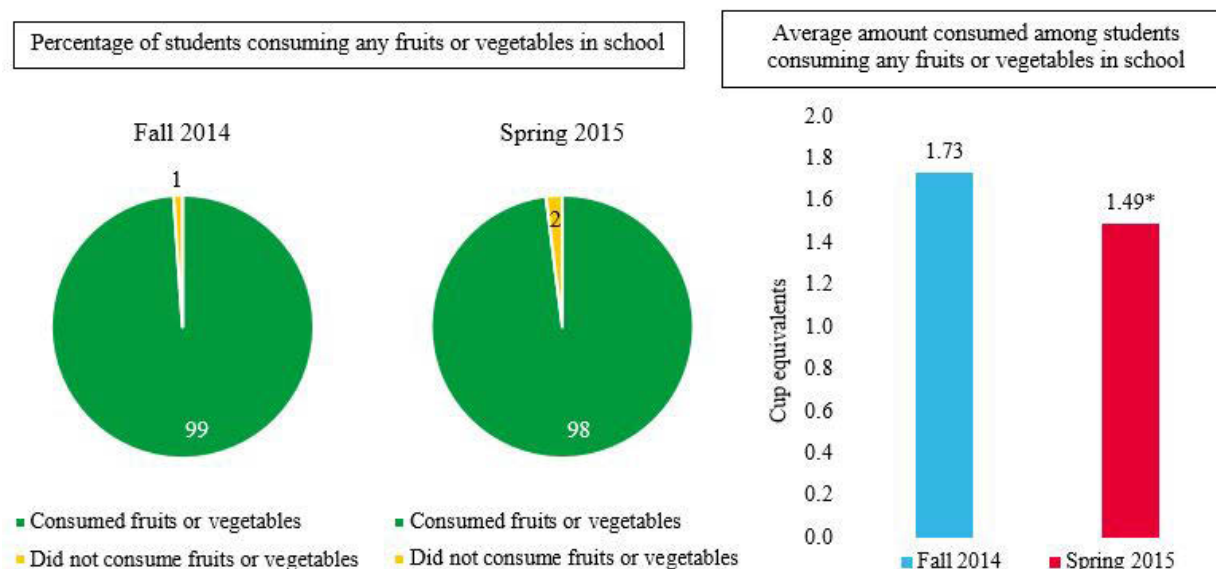
* Change between fall and spring is significantly different at the 0.05 level.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

Because fruit and vegetable consumption did not change on nonprogram days, all changes in consumption during a typical school week were the result of changes on program days. Thus, the discussion of fruit and vegetable consumption in the rest of this section focuses on FFVP program day results. Complete findings for consumption over a typical school week are located in Appendix E.

Virtually all students consumed fruits and vegetables on an FFVP snack day in an average week—99% in the fall compared with 98% in the spring (Exhibit 5.9). This small decline contributed only slightly to the decrease in fruit and vegetable consumption. However, when students ate fruits and vegetables in the spring, on average they ate less of them—1.49 cup equivalents compared with 1.73 cup equivalents in the fall.³³

³³ Exhibit 5.8 shows a mean amount of cup equivalents across all students, including those who did not consume any fruits or vegetables during the school day, whereas Exhibit 5.9 shows the mean consumption among those who consumed at least some fruits and vegetables at school.

Exhibit 5.9. Mean cup equivalents of fruits and vegetables consumed in school on an FFVP snack day, among students consuming any fruits or vegetables


Source: FFVP-CFD Pilot Evaluation, Diary-assisted/in-school Dietary Recall (fall n = 858, spring n = 935), SY 2014–2015. See Appendix E Exhibit E.23.

* Spring mean is significantly different from fall mean at the 0.05 level.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

The change in fruit and vegetable consumption was driven by decreased consumption of fruit—particularly fresh fruit—as well as fruit and vegetable juice, and fruits and vegetables incorporated into other food items. Vegetable consumption did not change from fall 2014 to spring 2015. Exhibit 5.10 shows changes in overall fruit and vegetable consumption by type and form. A description of these changes and some of the mechanisms driving them follows.

Exhibit 5.10. Mean cup equivalents of fruits and vegetables consumed in school on an FFVP program day

Food group	Fall 2014	Spring 2015	
	Mean amount (cup equivalents) ^a	Mean amount (cup equivalents) ^a	Regression-adjusted change
Total fruits and vegetables	1.72	1.46	-0.26*
100% fruit and vegetable juices	0.33	0.28	-0.05*
Fresh	0.89	0.64	-0.24*
Canned	0.16	0.17	0.02
Frozen	0.05	0.04	-0.01
Dried	0.02	0.09	0.07*
Unknown form ^b	0.01	0.00 [^]	-0.01*

EXHIBIT 5.10. *(continued)*

Food group	Fall 2014	Spring 2015	
	Mean amount (cup equivalents) ^a	Mean amount (cup equivalents) ^a	Regression-adjusted change
Fruits and vegetables incorporated into other foods	0.27	0.23	-0.04*
Total fruits^c	0.81	0.67	-0.13*
Fresh	0.69	0.48	-0.21*
Canned	0.12	0.14	0.02
Frozen	0.01	-0.00 [^]	-0.01
Dried ^d	-0.01	0.06	0.07*
Unknown form ^b	0.00 [^]	0.00 [^]	-0.00 [^]
Total vegetables^c	0.32	0.28	-0.04
Fresh	0.19	0.16	-0.03
Canned	0.04	0.04	-0.00 [^]
Frozen	0.04	0.04	0.00 [^]
Dried	0.03	0.04	0.00 [^]
Unknown form ^b	0.01	0.00 [^]	-0.01*
Number of students	858	935	

Source: FFVP-CFD Pilot Evaluation, Diary-assisted/in-school Dietary Recall, SY 2014–2015.

* Change between fall and spring is significantly different at the 0.05 level. Some change values may differ from the subtraction of the spring value from the fall value due to rounding.

[^] Rounds to, but different from, zero.

^a These consumption averages are estimates from a statistical model that controls for student gender, grade, primary language spoken at home, free and reduced-price lunch status, race/ethnicity, and whether students usually engage in physical activity before the FFVP snack is served. Holding these characteristics constant provides the best estimate for the changes in consumption associated with the pilot between fall 2014 and spring 2015.

^b There were a few foods from home reported on recalls where the student could not report the form (e.g., soup with vegetables, fruit used as an ingredient in a recipe) and a few foods on school menus where cooked vegetables were reported but it was not known if they were cooked from fresh, frozen, or canned. The ‘unknown form’ category is reported so that all single and combination foods that contained fruits or vegetables are included in the estimates.

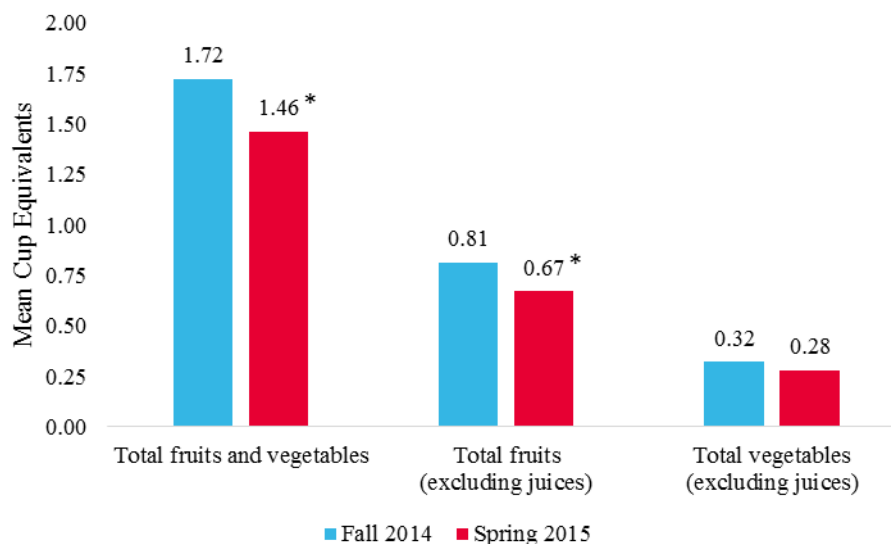
^c Excludes juices and fruits and vegetables incorporated into other foods.

^d The values shown in this exhibit are regression adjusted to hold constant student characteristics. These estimated consumption levels differ slightly from what was actually observed. The actual, unadjusted amount of dried fruit students consumed was 0.02 cup equivalents in the fall and 0.06 cup equivalents in the spring. It is only when student characteristics are controlled for that the consumption level in the fall appears to be negative.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

Decreased fruit consumption was the primary cause of the change in overall fruit and vegetable consumption. Consumption of fruits, excluding juices and fruits incorporated into other foods, fell by 0.13 cup equivalents—half of the 0.26-cup equivalent decrease in overall fruit and vegetable consumption (Exhibit 5.11).³⁴ No significant change occurred in consumption of vegetables.

³⁴ The change is 0.133 (calculated from 0.8080 minus 0.6748). Bar values are rounded.

Exhibit 5.11. Mean cup equivalents of fruits and vegetables consumed in school on an FFVP snack day, among all students

Source: FFVP-CFD Pilot Evaluation, Diary-assisted/in-school Dietary Recall (fall n = 858, spring n = 935), 2014–2015 school year. See Exhibit 5.10.

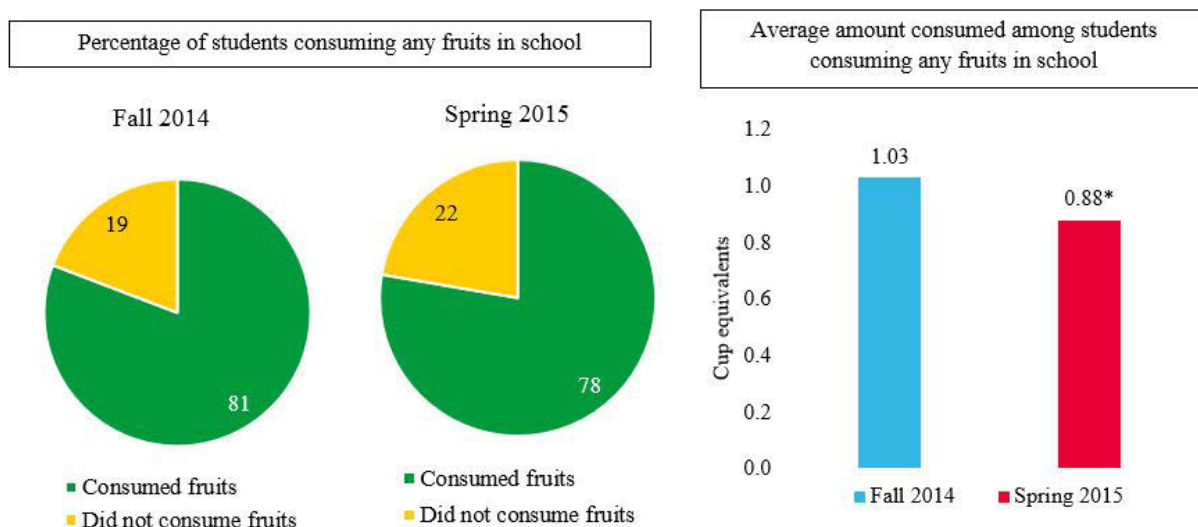
Note: These consumption averages are estimates from a statistical model that controls for student gender, grade, primary language spoken at home, free and reduced-price lunch status, race/ethnicity, and whether students usually engage in physical activity before the FFVP snack is served. Holding these characteristics constant provides the best estimate for the changes in consumption associated with the pilot between fall 2014 and spring 2015.

* Change between fall and spring is significantly different at the 0.05 level.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program.

Fruit consumption decreased because a smaller proportion of students ate fruit on an FFVP program day—81% in the fall compared with 78% in the spring (Exhibit 5.12). The students who did not consume any fruits or vegetables during the school day were included in the average amount consumed across all students (shown in Exhibits 5.8 and 5.11). Therefore, the decrease in the proportion of students consuming any fruit in the spring contributed to the decrease in total consumption amounts. In addition, the amount of fruit students ate when they did consume it decreased from 1.03 cup equivalents to 0.88 cup equivalents, which also contributed to the decrease in the amount of fruit consumed in the spring. Differences in consumption patterns by form of fruit—fresh versus dried, for example—provide more detail on why fruit consumption changed.

Exhibit 5.12. Mean cup equivalents of fruits consumed in school on an FFVP snack day, among students consuming any fruits

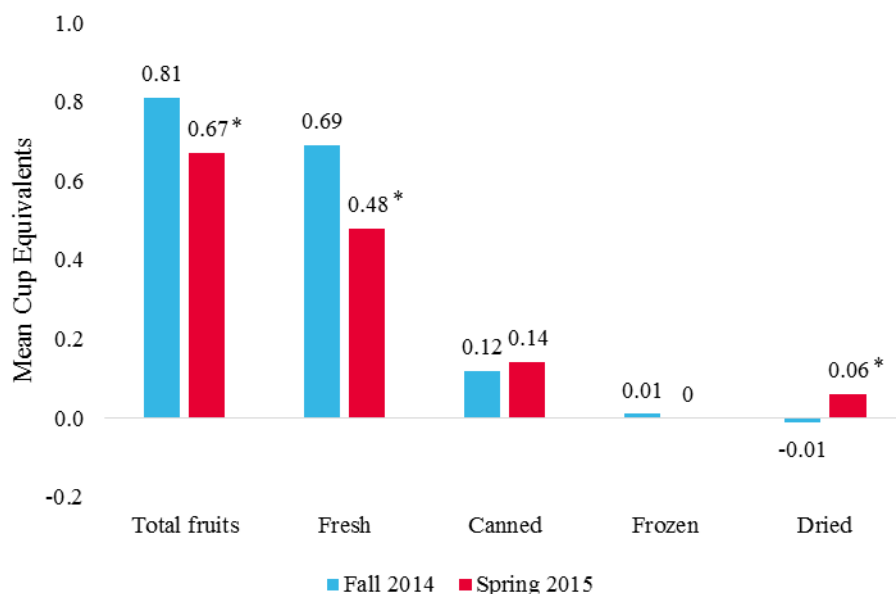


Source: FFVP-CFD Pilot Evaluation, Diary-assisted/in-school Dietary Recall (fall n = 858, spring n = 935), SY 2014–2015. See Appendix E Exhibit E.23.

* Spring mean is significantly different from fall mean at the 0.05 level.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

A substantial decrease in consumption of fresh fruit was the largest single cause of the overall change in fruit consumption from fall to spring. Consumption of fresh fruits on FFVP program days fell more than a fifth of a cup equivalent, from 0.69 cup equivalents under the standard FFVP in the fall to 0.48 cup equivalents under the FFVP-CFD pilot in the spring (Exhibit 5.13). This finding is consistent with changes in snack offerings described in Chapter 4; schools offered fewer fresh fruit snacks in the spring than in the fall.

Exhibit 5.13. Mean cup equivalents of fruits consumed in school on an FFVP snack day, by form of fruit, among all students

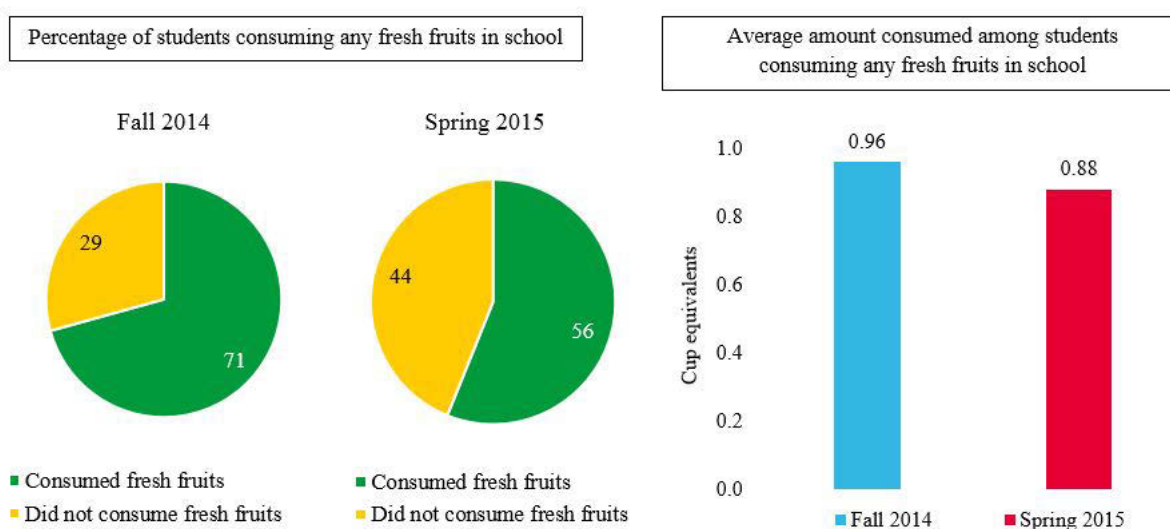
Source: FFVP-CFD Pilot Evaluation, Diary-assisted/in-school Dietary Recall (fall n = 858, spring n = 935), SY 2014–2015. For full data, see Exhibit 5.10.

Note: The values shown in this exhibit are regression adjusted to hold constant student characteristics. This method provides the best estimate for the change in consumption from fall to spring. However, estimated consumption levels differ slightly from what was actually observed. The actual, unadjusted amount of dried fruit students consumed was 0.02 cup equivalents in the fall and 0.06 cup equivalents in the spring. It is only when student characteristics are controlled for that the consumption level in the fall appears to be negative.

* Change between fall and spring is significantly different at the 0.05 level.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

Fresh fruit consumption decreased because a smaller proportion of students ate fresh fruit on FFVP program days—not because students who did eat it ate less of it. Exhibit 5.14 shows the percentage of students consuming any fresh fruit on FFVP snack days and—for those consuming any—how much they ate. It shows that 71% of students consumed fresh fruit on FFVP snack days in fall 2014 compared with 56% in spring 2015. Among students consuming any fresh fruit, the amount they ate did not change (the slight decrease shown in Exhibit 5.14 was not statistically significant).

Exhibit 5.14. Mean cup equivalents of fresh fruits consumed in school on an FFVP snack day, among students consuming any fresh fruit


Source: FFVP-CFD Pilot Evaluation, Diary-assisted/in-school Dietary Recall (fall n = 858, spring n = 935), SY 2014–2015. See Appendix E Exhibit E.23.

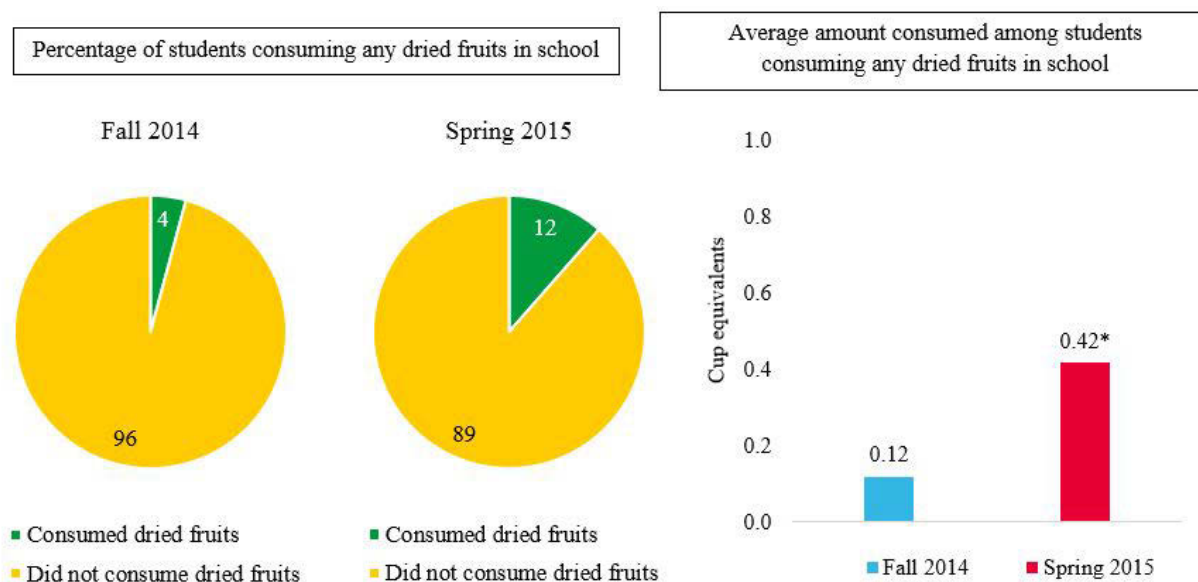
* Spring mean is significantly different from fall mean at the 0.05 level.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

Dried fruit consumption increased from fall 2014 to spring 2015, but not enough to offset the larger decrease in fresh fruit. The 0.13-cup equivalent decrease in overall fruit was the result of a 0.21-cup equivalent decrease in fresh fruit consumption and a 0.07-cup equivalent increase in dried fruit consumption (Exhibit 5.13).³⁵

Increased dried fruit consumption was the result of a greater proportion of students eating dried fruit as well as students eating more dried fruit when they did eat it. Exhibit 5.15 shows the proportion of students eating dried fruit on FFVP snack days increasing from 4% under the standard FFVP in the fall to 12% under the FFVP-CFD pilot in the spring. The amount students consumed when eating dried fruit also increased substantially, from 0.12 cup equivalents in the fall to 0.42 cup equivalents in the spring.

³⁵ The difference in overall fruit consumption in Exhibits 5.11 and 5.13 appears to be 0.14 (0.81 – 0.67), however, this is due to rounding. The actual decrease rounds to a 0.13-cup equivalent change.

Exhibit 5.15. Mean cup equivalents of dried fruits consumed in school on an FFVP snack day, among students consuming any dried fruit


Source: FFVP-CFD Pilot Evaluation, Diary-assisted/in-school Dietary Recall (fall n = 858, spring n = 935), SY 2014–2015. See Appendix E Exhibit E.23.

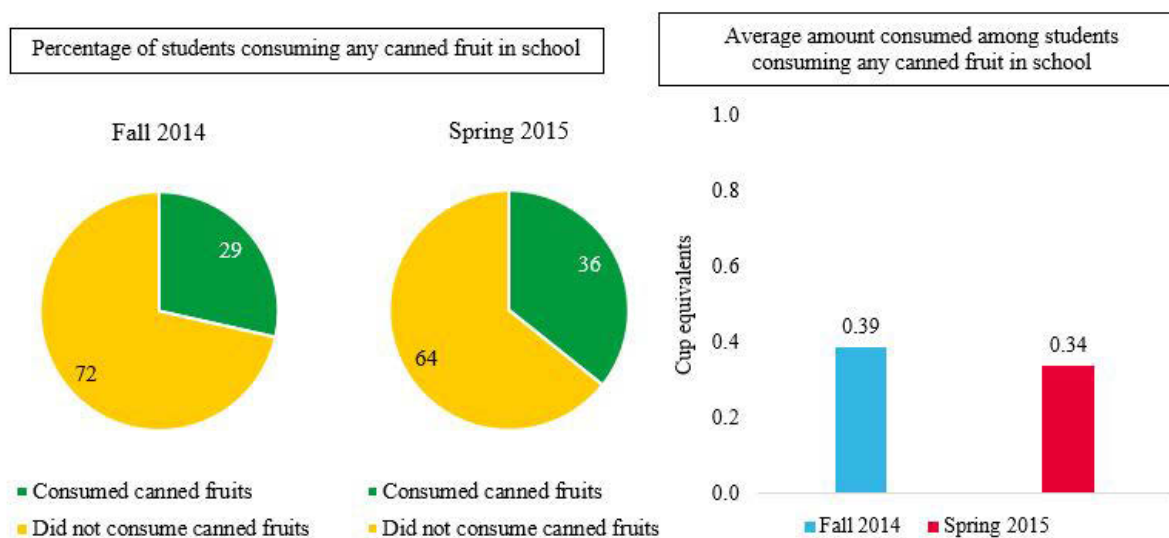
Note: Totals may not sum to 100% due to rounding.

* Spring mean is significantly different from fall mean at the 0.05 level.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

Overall canned fruit consumption on program days did not change from fall 2014 to spring 2015 but patterns of consumption did. Students ate a little more than a tenth of a cup equivalent of canned fruit on FFVP snack days in both time periods (Exhibit 5.13). The proportion of students eating canned fruit increased from 29% in the fall to 36% in the spring (Exhibit 5.16). However, the average amount they consumed when they did eat it fell slightly (by 0.05 cup equivalents), leaving the overall average consumption level unchanged.

Exhibit 5.16. Mean cup equivalents of canned fruits consumed in school on an FFVP snack day, among students consuming any canned fruit



Source: FFVP-CFD Pilot Evaluation, Diary-assisted/in-school Dietary Recall (fall n = 858, spring n = 935), SY 2014–2015. See Appendix E Exhibit E.23.

Note: Totals may not sum to 100% due to rounding.

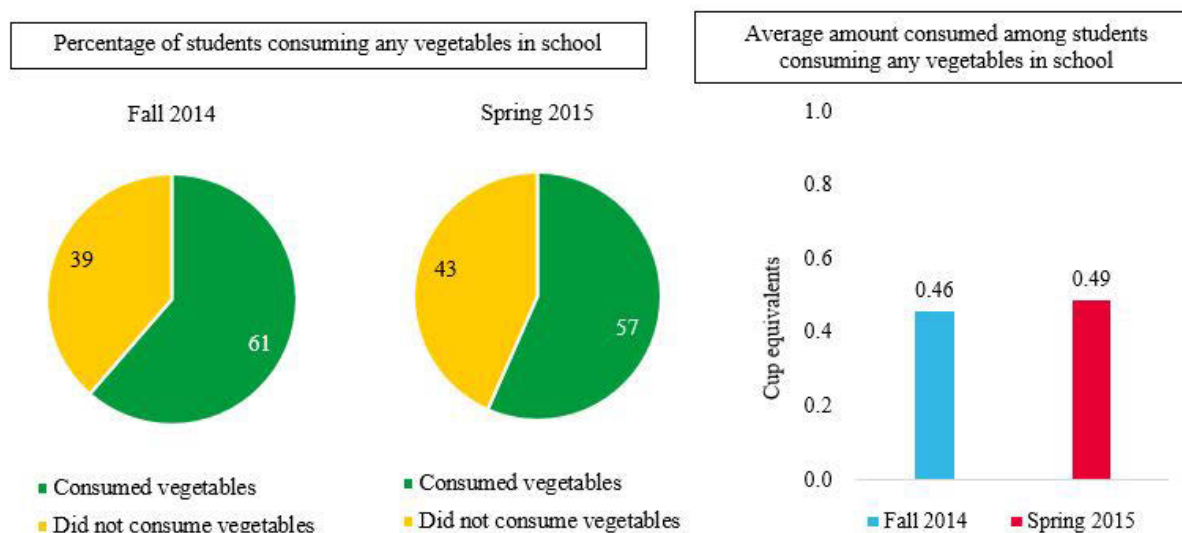
* Spring mean is significantly different from fall mean at the 0.05 level.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

Vegetable consumption did not change, on average, with the introduction of the pilot. Average vegetable consumption was slightly less than a third of a cup equivalent on program days in both fall 2014 and spring 2015 (Exhibit 5.11). Also, no substantial changes occurred in the amount of vegetables consumed by form (Exhibit 5.10). The decrease in consumption of vegetables of unknown form was statistically significant but not substantively meaningful—it did not affect overall vegetable consumption.

Changes in vegetable consumption patterns were minor. The percentage of students consuming vegetables decreased somewhat, from 61% in the fall to 57% in the spring (Exhibit 5.17). The average amount of vegetables consumed did not change significantly. The slight decrease shown in Exhibit 5.11 was not statistically significant. Consumption patterns for fresh vegetables mirrored those for vegetables overall. Fresh vegetables were the most common type of vegetables consumed—more than half of the total in both time periods—so, it is not surprising that the patterns are similar to vegetables overall.

Exhibit 5.17. Mean cup equivalents of vegetables consumed in school on an FFVP snack day, among students consuming any vegetables



Source: FFVP-CFD Pilot Evaluation, Diary-assisted/in-school Dietary Recall (fall n = 858, spring n = 935), SY 2014–2015. See Appendix E Exhibit E.23.

* Spring mean is significantly different from fall mean at the 0.05 level.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

2. Other factors contributing to change in fruit and vegetable consumption under the FFVP-CFD pilot project

Two factors beyond fruit consumption contributed to the decrease in total fruit and vegetable consumption on program days: decreased consumption of juice³⁶ and decreased consumption of fruits and vegetables incorporated in to other foods. Decreased fruit consumption accounted for slightly more than half of the 0.26-cup equivalent reduction in fruit and vegetable consumption. The rest of the change was due to decreased consumption of juice and fruits and vegetables incorporated into other foods (Exhibit 5.10). Decreased juice consumption is consistent with schools offering juice less frequently at breakfast in the spring compared with the fall, as discussed in Chapter 4. Schools offered juice more often at lunch, but it is possible that students are less likely to consume it at lunch than at breakfast. These two changes are not likely to be related to the FFVP-CFD pilot.

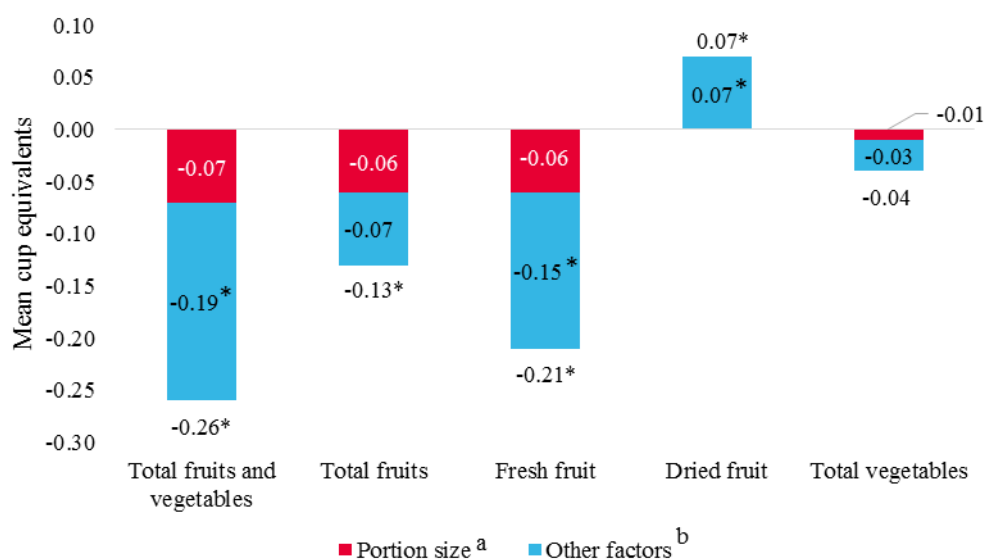
Part of the overall change in fruit and vegetable consumption on program days was due to smaller portions of FFVP snacks served. In a separate analysis, FFVP snack portion size was held constant to isolate its role in the change in fruits and vegetables consumed throughout the school day.³⁷ Exhibit 5.18 shows the total change in fruit and vegetable consumption in school

³⁶ Juice is not allowed in the FFVP, but is allowed in school meals.

³⁷ Appendix E Exhibit E.24 contains the details of this analysis.

during program days by type and form including the share of the change explained by changes in FFVP snack portion size. For fruits and vegetables overall, changes in portion size explain 27% of the total change in consumption (0.07 of the total 0.26-cup equivalent decrease). FFVP snack portion size had the greatest effect on student consumption of fruit. Portion size explained nearly half of the change in fruit consumption, and the decrease in fruit consumption was no longer statistically significant when portion size was held constant. This reflects the incorporation of canned and dried fruits into FFVP snacks in the spring—these items were served in smaller portions than fresh fruit snacks (Appendix E Exhibit E.4). FFVP snack portion size had a moderate role in the decrease of fresh fruit consumption, explaining 0.06 of the 0.21-cup equivalent decrease. FFVP snack portion size did not explain any of the increase in consumption of dried fruit.

Exhibit 5.18. The role of FFVP snack portion size and other factors in change in mean cup equivalents of fruits and vegetables consumed in school on an FFVP snack day



Source: FFVP-CFD Pilot Evaluation, Diary-assisted/in-school Dietary Recall (fall $n = 858$, spring $n = 935$), SY 2014–2015. See Appendix E Exhibit E.24.

Note: Changes in consumption levels are regression-adjusted to hold constant gender, grade, primary language spoken at home, free and reduced-price lunch status, race/ethnicity, and whether students usually engage in physical activity before the FFVP snack is served.

* Change between fall and spring is significantly different at the 0.05 level.

^aThis portion of each bar shows the share of the overall change in consumption explained by changes in FFVP snack portion size from fall 2014 to spring 2015.

^bThis portion of each bar shows the share of the overall change in consumption explained by factors other than portion size and its correlates. Other factors include anything not controlled for in the regression or correlated with portion size. This could include student appetite, preference for specific snack items, time allotted to consume snacks, and many other factors.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

D. Changes in HEI scores and intake of key nutrients

To see if the reduced consumption of fruits and vegetables in school under the FFVP-CFD led to changes in other student nutrition outcomes, an analysis was performed of dietary recall

data for food components associated with the dietary guidelines and key nutrients.³⁸ The FFVP-CFD pilot was associated with a small but significant reduction in total fruit intake and an increase in empty calories, resulting in a significantly one-point lower overall HEI-2010 score between fall 2014 and spring 2015 (63.9 versus 62.6, Exhibit 5.19). A perfect HEI score of 100 indicates adherence to U.S. dietary guidelines (Guenther et al. 2013).

Exhibit 5.19. Mean Healthy Eating Index (HEI)-2010 scores for in-school dietary intakes on an FFVP snack day

HEI Component	Maximum score	Fall 2014		Spring 2015		Change
		Mean score	SE	Mean score	SE	
Adequacy						
Total fruit ^a	5	4.1	0.04	4.0	0.06	-0.2*
Whole fruit ^b	5	4.3	0.05	4.2	0.05	-0.1
Total vegetables	5	2.3	0.05	2.3	0.06	-0.0^
Greens and beans ^c	5	0.9	0.08	0.8	0.05	-0.1
Whole grains	10	5.8	0.14	5.5	0.16	-0.3
Dairy ^d	10	8.3	0.09	8.3	0.12	-0.0^
Total protein foods	5	3.2	0.06	3.3	0.06	0.1
Seafood and plant proteins ^e	5	1.0	0.05	1.1	0.05	0.1
Fatty acids ^f	10	5.5	0.14	5.5	0.11	-0.0^
Moderation						
Refined grains	10	7.4	0.11	7.5	0.10	0.1
Sodium	10	5.4	0.10	5.3	0.12	-0.1
Empty calories ^g	20	15.6	0.18	15.0	0.16	-0.6 *
Total	100	63.9	0.48	62.6	0.34	-1.3 *
Number of students	-	858	-	935	-	-

Source: Evaluation of the FFVP-CFD pilot project, Diary-assisted/in-school Dietary Recall, SY 2014–2015. HEI components were calculated using the HEI-2010. Tabulations prepared by Mathematica Policy Research are weighted to be representative of all 4th–6th grade students at pilot schools with a total enrollment of 50 or more students. See Appendix E Exhibit E.25 for tabulations during a typical school week.

Note: Table reflects total in-school intake on an average FFVP day in the fall (standard FFVP) and in the spring (FFVP-CFD pilot).

* Change between fall and spring is significantly different at the 0.05 level.

^aIncludes fruit juice.

^bIncludes all forms except juice.

^cIncludes any beans and peas not counted as total protein foods.

^dIncludes all milk products, such as fluid milk, yogurt, cheese, and fortified soy beverages.

^eIncludes seafood, nuts, seeds, soy products, and beans and peas counted as total protein foods.

^fRatio of poly- and monounsaturated fatty acids to saturated fatty acids.

^gCalories from solid fats and added sugars only; alcohol consumption is assumed to be 0 grams for school-age children.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; HEI = Healthy Eating Index; SE = Standard error; SY = school year.

³⁸ HEI-2015 was not available at the time of the analysis.

With the exception of fruit and empty calories, average HEI-2010 scores were nearly identical between fall 2014 and spring 2015 (Exhibit 5.19). One source of empty calories was snacks brought from home or other sources and consumed during FFVP snack time.³⁹ In both fall and spring, the mean HEI-2010 scores for total fruit, whole fruit, and dairy components were close to the maximum scores. This indicates that, although students consumed a smaller volume of fruit in the spring compared with the fall, they still consumed enough per 1,000 calories to achieve a high score in each category.

The mean HEI scores for total vegetables, protein, and sodium also did not change under the pilot. These scores fell well below the maximum score (less than 50% of the maximum) in both fall and spring. It is logical that HEI vegetable scores did not change, as there was no change in vegetable consumption across the two time periods.

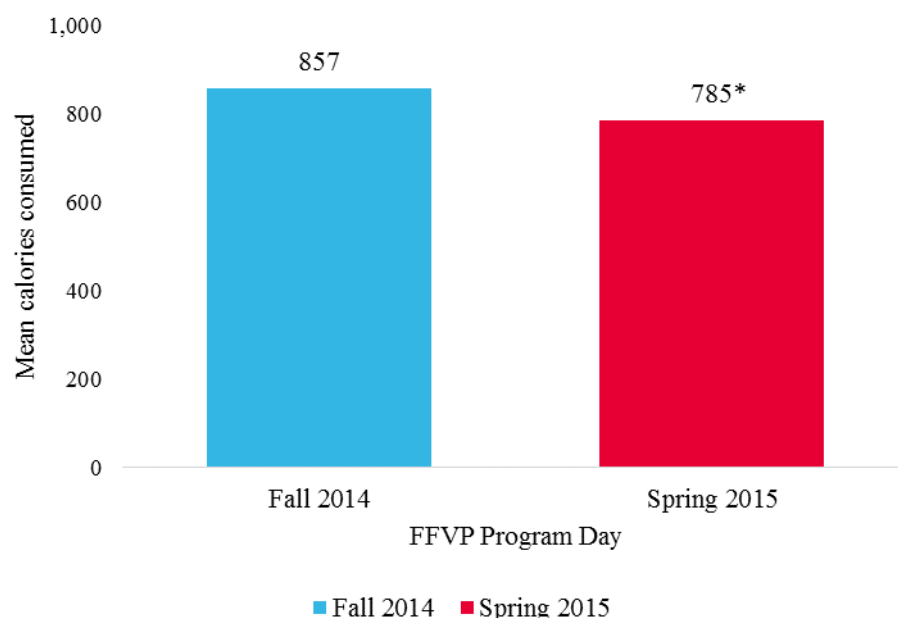
The mean HEI-2010 scores shown in Exhibit 5.19 are much higher than mean HEI-2005 scores provided in the previous evaluation of FFVP completed in 2013 (Bartlett et al. 2013). This is consistent with the large difference in data collection methodology between the two reports. The mean HEI-2005 scores in the 2013 evaluation were estimated using dietary recalls of student intakes over 24 hours, whereas the dietary recalls collected in the current study include only in-school intakes. The HEI-2010 scores are intended to measure diet quality over a range of periods, but are most commonly used to assess 24-hour intakes. However, they are appropriate to use for in-school intakes because they assess intake relative to the calories consumed in-school. The HEI-2010 scores calculated for the current study were based on in-school intakes only and did not take into account any foods or beverages consumed at home or elsewhere outside of school. It is unlikely that the switch from the HEI-2005 to the HEI-2010 version would have a meaningful impact on the results, or that there would be large differences using the HEI-2015.

A study conducted in 2009 using nationally representative cross-sectional data from the 2004–2005 third School Nutrition Dietary Assessment Study (SNDA-III) found that 38% of calories consumed away from school and home were from low-nutrient and energy-dense items such as sugar-sweetened beverages, salty/high-fat chips, high-fat baked goods, and desserts (Briefel et al. 2009). The study also found that the energy density of foods consumed away from school and home was higher than that of foods consumed at school or home. The HEI-2005 scores estimated in the 2013 FFVP evaluation, which took into account foods consumed away from school, thus may have included a higher percentage of low-nutrient and energy-dense items, resulting in lower HEI-2005 scores relative to the HEI-2010 scores from in-school consumption only in the current study.

³⁹ FIs observed some teachers allowing students to eat snacks brought from home during FFVP snack time. These snacks included predominantly less healthful items such as salty snacks, cookies, sugary drinks, and candy (other items reported included water and fruit). Consumption of these items are included in the students' in-school dietary recall findings. About one-third of students reported eating a non-FFVP snack on any given school day, regardless of it being a program or a non-program day (in the fall, 38% consumed a non-FFVP snack on a program day and 31% did so on a nonprogram day; in the spring 35% of students consumed a non-FFVP snack on both program and nonprogram days). Snacks from home accounted for about two-thirds of the non-FFVP snacks consumed in school; 25% of students brought snacks from home that they consumed at school.

Consistent with the small reductions in HEI-2010 scores, students' intakes of key nutrients in school were slightly lower in spring 2015 than in fall 2014. Mean energy intake decreased between fall 2014 and spring 2015 by 72 calories on average (Exhibit 5.20). The mean intake of carbohydrates also decreased by 10 grams on average. The reduction in energy intake led to slight decreases in intake of key nutrients. The small magnitude of these changes suggests they resulted from slightly reduced food intake and not from a substantial decrease in diet quality. Major changes in diet quality would have caused larger changes in HEI-2010 component scores. Exhibit 5.21 shows these small changes in energy and nutrients.

Exhibit 5.20. Mean in-school intakes of energy on FFVP snack days



Source: FFVP-CFD Pilot Evaluation, Diary-assisted/in-school Dietary Recall (fall n = 858, spring n = 935), SY 2014–2015. See Appendix E Exhibit E.26.

Note: These consumption averages are estimates from a statistical model that controls for student gender, grade, primary language spoken at home, free and reduced-price lunch status, race/ethnicity, and whether students usually engage in physical activity before the FFVP snack is served. Holding these characteristics constant provides the best estimate for the changes in consumption associated with the pilot between fall 2014 and spring 2015.

* Spring mean is significantly different from fall mean at the 0.05 level.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

Exhibit 5.21. Mean in-school intakes of energy and key nutrients on FFVP snack days

Dietary component	Fall 2014		Spring 2015		Change
	Mean	SE	Mean	SE	
Calories	857	12.3	785	10.8	-72*
Macronutrients					
Total fat (g)	28	0.5	25	0.4	-3*
Carbohydrate (g)	126	1.8	116	1.7	-9*
Protein (g)	33	0.6	31	0.5	-2*
Percentage of calories from:	.	.	.	.	.
Total fat	28.3	0.31	27.6	0.22	-0.8*
Saturated fat	8.9	0.14	8.6	0.09	-0.2
Vitamins					
Vitamin A (mcg RAE)	232	5.9	219	5.7	-13
Vitamin C (mg)	46	1.6	43	1.2	-3
Vitamin D (mcg)	3	0.1	3	0.1	0
Vitamin E (mg AT)	3	0.1	3	0.1	-0^*
Vitamin B ₆ (mg)	0.8	0.01	0.7	0.01	-0.1*
Vitamin B ₁₂ (mcg)	2.3	0.05	2.1	0.05	-0.2*
Folate (mcg DFE)	175.4	3.46	155.9	2.56	-19.5*
Niacin (mg)	8.5	0.12	7.5	0.11	-1.0*
Riboflavin (mg)	1.0	0.02	0.9	0.02	-0.1
Thiamin (mg)	0.6	0.01	0.6	0.01	-0.1*
Minerals					
Calcium (mg)	590	12.6	575	13.9	-15
Iron (mg)	5.7	0.10	5.1	0.09	-0.6*
Magnesium (mg)	139	2.0	129	2.2	-10*
Phosphorus (mg)	692	12.4	651	12.6	-42*
Potassium (mg)	1,320	17.6	1,239	20	-81*
Sodium (mg)	1,313	25.6	1,222	21.3	-91*
Zinc (mg)	4.8	0.09	4.5	0.07	-0.3*
Other dietary components					
Cholesterol (mg)	69	2.6	70	1.9	1
Dietary fiber (g)	10	0.2	9	0.1	-1*
Added sugar (teaspoons)	6.6	0.17	6.6	0.16	0.0^
Number of students	858		935		

Source: Evaluation of the FFVP-CFD pilot project, Diary-assisted/in-school Dietary Recall (fall day 1 recalls (n = 858), spring day 1 recalls (n = 935)), SY 2014–2015. Tabulations prepared by Mathematica Policy Research are weighted to be representative of all 4th–6th grade students in pilot schools with a total enrollment of 50 or more students. See Appendix E Exhibit E.29 for tabulations during a typical school week.

Note: Means and SEs are based on one-day means. Difference column may not equal the difference between fall and spring due to rounding.

* Change between fall and spring is significantly different at the 0.05 level.

^ Rounds to, but different from, zero.

AT = Alpha-tocopherol; CFD = Canned, frozen, or dried; DFE = Dietary folate equivalents; FFVP = Fresh Fruit and Vegetable Program; RAE = Retinol activity equivalents; SE = Standard error; SY = school year.

E. FFVP snack observations and plate waste

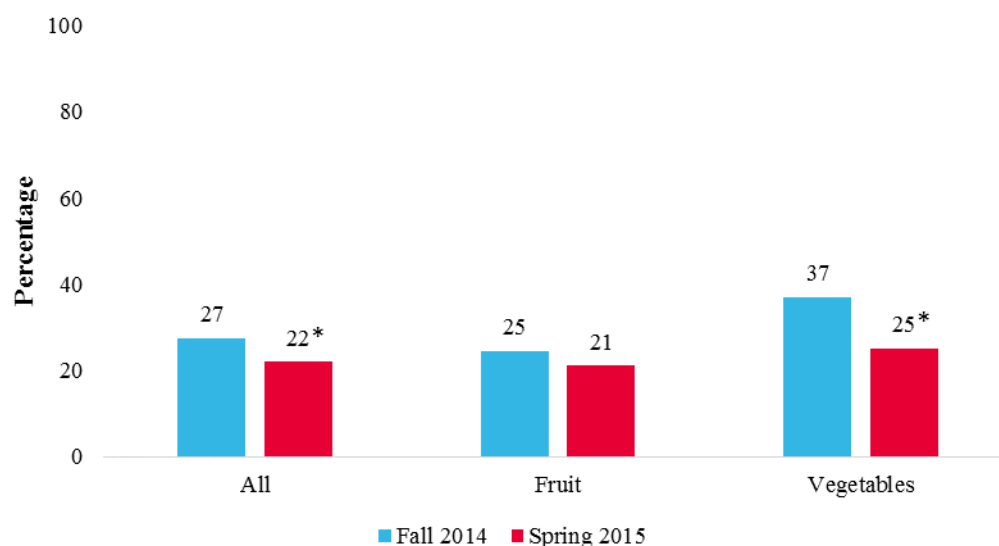
In addition to the classroom-level observations of FFVP snacks described in Section 5A, the FIs collected data to assess plate waste of the individual students sampled for the in-school dietary recall. The FIs reported whether each sampled student took a snack and the percentage of the snack left over (plate waste).

1. Classroom observations of FFVP snacks

Appendix C Exhibits C.3.c and C.3.d summarize the classroom-level observation data from fall and spring, respectively. The exhibits shows the total number of FFVP snacks offered and left over in classrooms on a program day, both overall and by the type of snack offered.⁴⁰ The average number of snacks taken by students per classroom did not significantly change between the fall and the spring. There was a decrease in the percentage of snacks left over per classroom, from 27% before the pilot to 22% during the pilot (Exhibit 5.22). This finding is consistent with the slight (but non-significant) increase in FFVP participation shown in Exhibit 5.1.

Both before and during the pilot, the mean number of students taking fruit was greater than the number taking vegetables; the portions left over (not taken by students) were correspondingly higher for vegetables. On average, 21% of fruit snacks and 25% of vegetable snacks were left over (not taken) in classrooms during the pilot (Exhibit 5.22). Before the pilot in the fall, 25% of fruit snacks and 37% of vegetable snacks were left over in classrooms. The differences between fruits and vegetables narrowed during the pilot, when fewer vegetables were offered.

⁴⁰ The data on classroom snacks left over provides another dimension of potential food wastage at the classroom-level, and differs from plate waste data which is calculated among students who took a snack (student-level).

Exhibit 5.22. Classroom FFVP snack portions left over

Source: Evaluation of the FFVP-CFD pilot project, Classroom and Student Fruit and Vegetable Snacks Observation Form (fall n= 304, spring n = 352), SY 2014–2015. Tabulations prepared by Mathematica Policy Research are weighted to be representative of all 4th to 6th grade classrooms in pilot schools with a total enrollment of 50 or more students. See Appendix C Exhibits C.3.c and C.3.d.

* Change between fall and spring is significantly different at the 0.05 level.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

The mean percentage of portions left over at the classroom level is one way to assess acceptance of CFD snacks offered during the pilot. Canned fruit had a lower mean percentage left over than fruit overall (16% versus 21%), whereas dried fruit had approximately the same mean percentage left over as fruit overall (22% versus 21%) (Appendix C Exhibit C.3.d, column 6). The one school that offered frozen fruit obtained an advance count of the number of students who wanted a snack, so the number left over was zero. The one school that offered canned vegetables (corn) had 78% of the vegetable left over; however, due to the limited sample size this finding is not representative of canned vegetables in general and should be interpreted with caution.

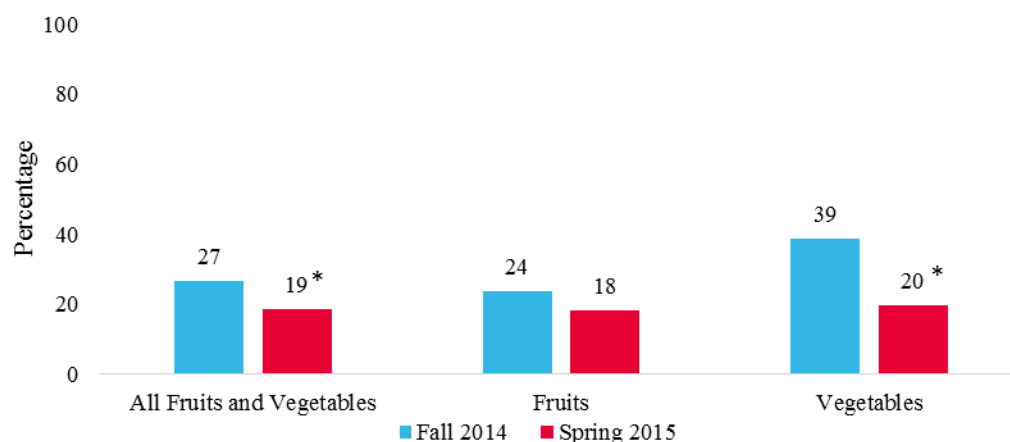
2. Observations of student plate waste

The FIs collected data to assess plate waste of the individual students sampled for the in-school dietary recall. Each FI was assigned up to four students at each snack period. FIs observed the same students in the fall and spring (to the extent possible). For each sampled student, FIs used visual estimation methods to observe and record the number of portions of the specific fruit and vegetable items initially served to (or selected by) the student and the number of additional portions received (if any). After snack eating time ended, the FIs used the observation form to record the amount of food left uneaten as a percentage of the total amount received between 0% (all consumed) to 100% (none consumed). Additional details regarding the plate waste sample and analyses are located in Appendix C.

a. Plate waste in FFVP snacks

Exhibit 5.23 shows the mean proportion of FFVP snacks wasted by students in fall and spring, measured in terms of cup equivalents. Cup equivalents provide a volume measure of snacks served and wasted. Overall, plate waste for FFVP snacks decreased eight percentage points from 27% in the fall to 19% in the spring. This change was driven by a reduction in the proportion of snacks that contained vegetables as well as decreased plate waste of vegetable snacks taken. The mean cup equivalents of FFVP fruit snacks wasted did not change significantly from fall to spring. Plate waste of vegetable snacks decreased from 39% to 20%. The decrease in vegetable waste is associated with changes in the types of vegetables offered between the fall and the spring and students' acceptance of those items.⁴¹ The decline in waste of FFVP vegetable snacks was not due to introduction of CFD vegetables; CFD vegetables were only offered in 3 classrooms out of a total of 66 classrooms where vegetables were observed to be offered in the spring.

Exhibit 5.23. Plate waste in FFVP snacks, percentage of cup equivalents wasted



Source: Evaluation of the FFVP-CFD pilot project, Classroom and Student Fruit and Vegetable Snacks Observation Form (fall n = 535, spring n = 548), SY 2014–2015. Tabulations prepared by Mathematica Policy Research are weighted to be representative of all 4th to 6th grade classrooms in pilot schools with a total enrollment of 50 or more students. See Appendix F Exhibit F.1.

* Spring mean is significantly different from the fall mean at the 0.05 level.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

Appendix F Exhibit F.1 provides information about amounts served and wasted, measured in terms of calories, macronutrients, micronutrients, minerals, other dietary components (cholesterol, dietary fiber, and added sugar), and cup equivalents. These statistics are shown for

⁴¹ Of the 17 fresh vegetables that were offered as FFVP snacks in an average week in the fall, only 8 were offered again in the spring. No new vegetables were offered in the spring (Appendix E Exhibit E.1). This contrasts with FFVP fruit snacks, which had similar variety across the fall and the spring (described in Chapter 4 and Appendix E Exhibit E.1).

fresh fruits and fresh vegetables.⁴² For nutrients and dietary components, the mean percentage wasted is calculated only if the mean amount served was greater than or equal to one unit of measure (one gram, milligram (mg), or microgram (mcg)).

As shown in Appendix F Exhibit F.1, all FFVP snacks observed for the plate waste analysis provided a mean amount of 54 calories in fall and 70 calories in spring. On average, 18% of calories were wasted in spring—a change of 6 percentage points from the fall. This change is not statistically significant, however.

The macronutrient content of FFVP snacks is primarily carbohydrates but also includes an average of one gram of protein and a small amount of fat from components such as seeds. The percentage of carbohydrates wasted decreased from fall to spring (5 percentage points) but is not statistically significant. The change in plate waste, measured in protein and calories from fat, is statistically significant, with decreases of 9 and 13 percentage points, respectively.

The primary micronutrients provided by FFVP snacks are vitamins A and C and folate. Plate waste declined, as measured in these micronutrients, with statistically significant changes for vitamin C (a 7 percentage-point decline) and folate (an 8 percentage-point decline). Plate waste measured in minerals declined, with statistically significant declines for calcium, magnesium, phosphorus, and potassium (7, 8, 10, and 7 percentage-point decreases, respectively). Other dietary components shown in Appendix F Exhibit F.1 include cholesterol and added sugar (not found in FFVP snacks), and dietary fiber. Dietary fiber waste declined from 25% of the amount provided before the pilot to 19% during the pilot.

b. Ranking of FFVP snacks by cup equivalents wasted

Exhibits 5.22 and Appendix F Exhibits F.3 and F.2 provide rankings of FFVP snacks by the percentage of cup equivalents wasted in spring and fall, respectively. These exhibits show the number of plates observed, the mean amount of cup equivalents served, the mean amount of cup equivalents wasted, and the percentage of cup equivalents wasted. Estimates are shown for the types of fruits and vegetables with at least five observed plates.

Before the pilot, 24% of fruit cup equivalents were wasted (Exhibit 5.23). The types of fresh fruits with the highest percentages wasted in fall were pineapple (45%), grapefruit (40%), and pears (39%). For all other fruits with at least five observed plates, less than 25% of cup equivalents were wasted. During the pilot (Exhibit 5.23), 18% of all fruits were wasted. The types of fruits with at least 25% wasted were fresh pears (48%) and kiwis (28%), and two types of CFD snacks—dried apples (57% wasted) and frozen blueberries (46% wasted). The introduction of CFD during the pilot displaced some fresh fruits previously observed as having high rates of plate waste.

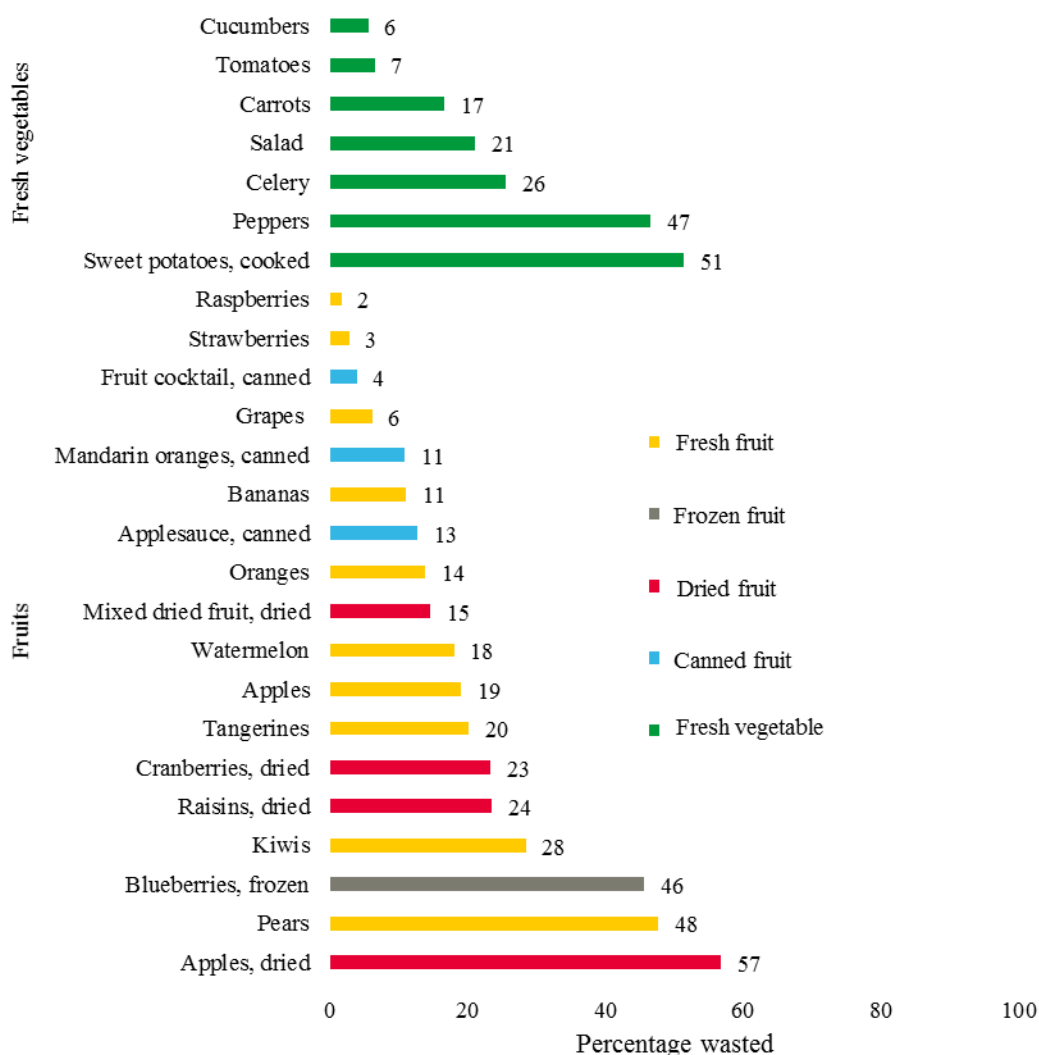
Before the pilot, 7 of 11 fresh vegetables had more than 25% of the cup equivalents were wasted (Appendix F Exhibit F.2). The fresh vegetables with 50% or more wasted were summer squash (77%), broccoli (69%), and jicama (50%). During the pilot, only 3 of 7 fresh vegetables had more than 25% of the cup equivalents observed as waste: sweet potatoes (51%), peppers

⁴² CFD snacks are not shown because they were not provided in fall and the change in percentage wasted cannot be calculated. Appendix F Exhibit F.3 shows the cup equivalents wasted for CFD snacks in spring.

(47%), and celery (26%) (Appendix F Exhibit F.3). Only one CFD vegetable was provided in spring; it is not shown in the exhibit because only two plates were observed.

Exhibit 5.24 shows the ranking of FFVP snacks by plate waste during the pilot for snacks with at least 5 observed plates. Snacks are color coded by form: all vegetables were provided fresh; fruits were provided fresh and CFD. This exhibit shows that both CFD and fresh fruits vary in plate waste depending on the type of fruits and vegetables, with canned fruit having low plate waste for the varieties provided.

Exhibit 5.24. Ranking of FFVP snacks by plate waste, spring 2015



Source: Evaluation of the FFVP-CFD pilot project, Classroom and Student Fruit and Vegetable Snacks Observation Form (n = 548), SY 2014–2015. Tabulations prepared by Mathematica Policy Research are weighted to be representative of all 4th to 6th grade students at pilot schools with a total enrollment of 50 or more students. See Appendix F Exhibit F.3.

Note: Calculated among items with at least 5 plate observations. The only CFD vegetables observed in the spring was canned corn, however, corn is not shown due to limited sample size (two plates observed).

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

c. Changes in plate waste for individual FFVP snacks served

Many types of fresh fruits and vegetables were offered and served both before and during the pilot. Appendix F Exhibit F.4 shows the change from fall to spring in the percentage of cup equivalents wasted for types of snacks observed for at least five plates in both time periods. These changes may indicate changes in student preferences for snacks, although readers are cautioned to consider the number of plate waste observations when drawing conclusions.

FIs observed seven types of fresh fruit FFVP snacks for at least five plates in both fall and spring. Among those types, two fruits exhibited statistically significant changes in the percentage of cup equivalents wasted from fall to spring: grapes (15 percentage-point (0.08 cup equivalents) decline in waste) and kiwis (26 percentage-point (0.06 cup equivalents) increase in waste). Among the three fresh vegetables offered as FFVP snacks in both fall and spring, only carrots exhibited significant changes in the percentage of cup equivalents wasted with a 29 percentage-point (0.04 cup equivalents) decline in waste. All other changes in plate waste for fresh fruits and vegetables, measured in cup equivalents, were not statistically significant. Caution should be applied when considering these individual items, due to small sample sizes. In addition, even though a significant difference is observed, it may not indicate a meaningful change in dietary consumption.

d. Changes in plate waste of FFVP snacks by time of day

Plate waste also was measured by time of day (Appendix F Exhibit F.5). In fall, the percentage wasted was 30% for snacks served before lunch and 21% for snacks served after lunch. The percentage wasted of before-lunch snacks declined significantly in spring from 30% to 17%, while there was only a small nonsignificant increase in waste of less than one percentage point for after-lunch snacks. Appendix F Exhibit F.6 shows the percentage wasted for snacks in spring by time of day and form (fresh, canned, frozen, or dried). These findings should be interpreted with caution due to limited sample sizes for some categories (especially frozen). In general, there were no large differences in patterns of plate waste before- and after-lunch with the exception of the frozen blueberries, noted earlier and observed for only 11 plates.

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6. STAKEHOLDER ACCEPTANCE

The CFD pilot affected a wide range of stakeholders. Students and their parents have strong opinions on the types of foods schools serve. SFA and school staff who administer the FFVP also care about what students eat, and program rules affect their daily professional responsibilities. Taking into account these stakeholders' views is a critical component of this evaluation. This chapter describes stakeholders' diverse reactions to the pilot as well as specific operational advantages staff cited when implementing the pilot.

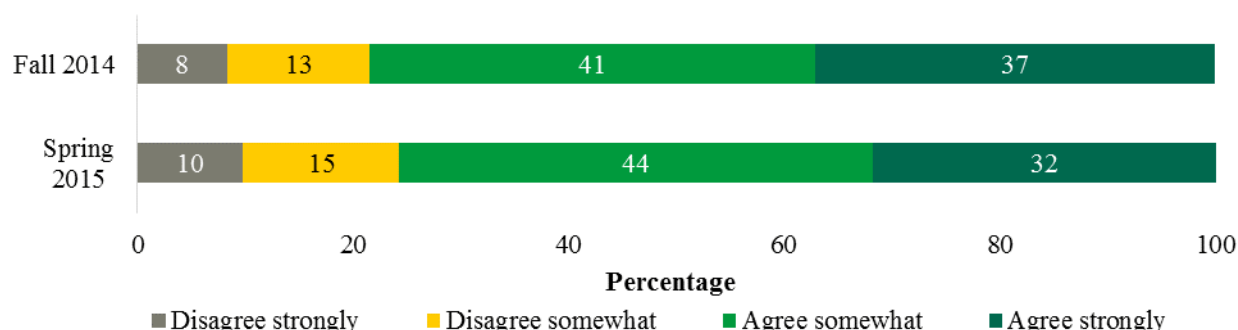
A. Views of the FFVP-CFD pilot by respondent type

Respondents across all stakeholder groups uniformly praised and appreciated the FFVP overall. However, these groups each had distinct views about the FFVP-CFD pilot. Student acceptance of the program decreased slightly under pilot conditions. In particular, they expressed less enthusiasm for the specific snack items served. Parents were largely unaware of the pilot and reported mixed views. Their appreciation for the FFVP increased during the pilot period but they also reported preferring that their children be served fresh fruits and vegetables rather than CFD items. Staff at all levels in pilot SFAs and schools expressed very high satisfaction with the FFVP in both standard and pilot conditions. Their satisfaction did not increase under the pilot, likely because it started at such a high level in the fall that there was little room for improvement.

1. Changes in student acceptance of the FFVP from fall to spring

Although students reported strong satisfaction with the FFVP in both time periods, some measures of satisfaction decreased from fall 2014 to spring 2015. These changes pertained both to student consumption of fruits and vegetables on FFVP snack days and their views of the particular snack items served. A smaller proportion of students agreed strongly with the statement that they ate more fruits and vegetables on program days in the spring compared with the fall (Exhibit 6.1). This finding is consistent with those in Chapter 5 showing reduced measures of student-reported participation in the FFVP and reduced consumption of fruits on FFVP snack days under the pilot compared with the standard FFVP.

Exhibit 6.1. Student-reported agreement with “I eat more fruits and vegetables on days when free fruit and vegetable snacks are given at school than on other days.”†



Sources: Evaluation of the FFVP-CFD pilot project, Student Survey (fall n = 1,575, spring n = 1,565), SY 2014–2015. Tabulations prepared by Mathematica Policy Research are weighted to be representative of 4th–6th grade students in the pilot schools. See Appendix D Exhibit D.15.

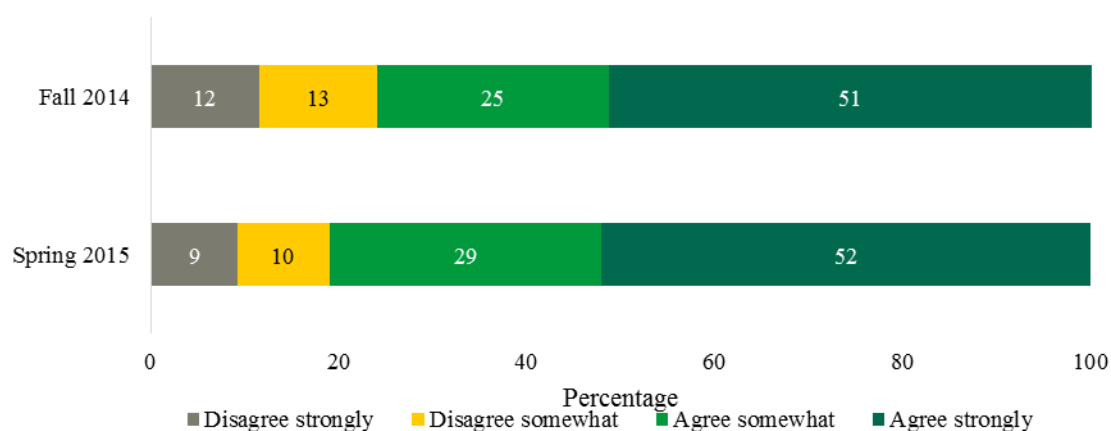
Note: Totals may not sum to 100% due to rounding.

†Shift in responses from fall to spring is significantly different at the 0.05 level.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

Students also voiced decreased satisfaction with the specific snack items offered in spring 2015 compared with fall 2014. An increased proportion (four percentage points) agreed somewhat that they wished their school would serve different kinds of fruits and vegetables in the snack program (Exhibit 6.2). A smaller share of students (seven percentage points) agreed that they don’t eat other kinds of snacks on program days (Exhibit 6.3). These small decreases in satisfaction might indicate that students were less satisfied with the particular snack items offered under the FFVP-CFD pilot.

Exhibit 6.2. Student-reported agreement with “I wish they would give us different kinds of fruits and vegetables to eat for school snacks.” †



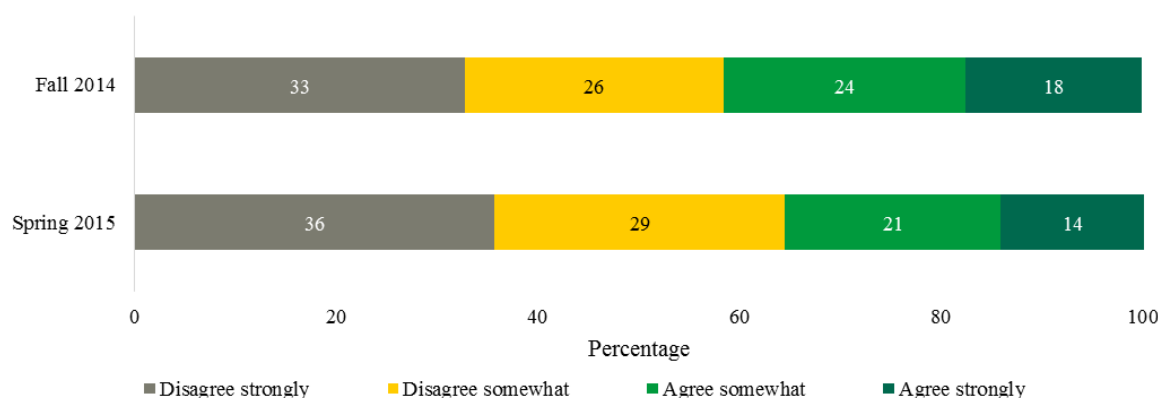
Source: Evaluation of the FFVP-CFD pilot project, Student Survey (fall n = 1,575, spring n = 1,565), SY 2014–2015. Tabulations prepared by Mathematica Policy Research are weighted to be representative of 4th–6th grade students in the pilot schools. See Appendix D Exhibit D.15.

Note: Totals may not sum to 100% due to rounding.

†Shift in responses from fall to spring is significantly different at the 0.05 level.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

Exhibit 6.3. Student-reported agreement with “On days when I eat a free fruit or vegetable snack at school, I don’t eat other kinds of snacks.” †



Source: Evaluation of the FFVP-CFD pilot project, Student Survey (fall n = 1,575, spring n = 1,565), SY 2014–2015. Tabulations prepared by Mathematica Policy Research are weighted to be representative of 4th–6th grade students in the pilot schools. See Appendix D Exhibit D.15.

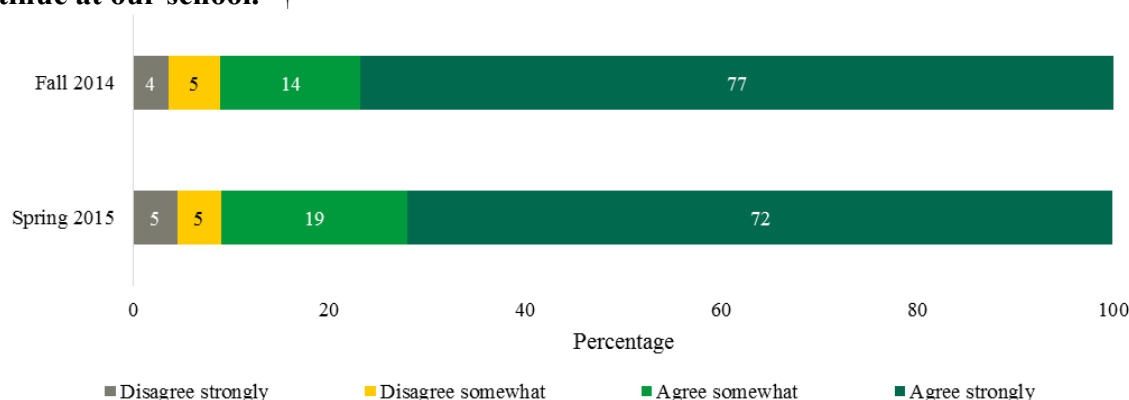
Note: Totals may not sum to 100% due to rounding.

†Shift in responses from fall to spring is significantly different at the 0.05 level.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

Finally, a smaller proportion of students agreed strongly in spring 2015 compared with fall 2014 that they hoped the FFVP would continue in their school (Exhibit 6.4). Support for the FFVP remained very strong under both standard and pilot conditions: 91% of students either agreed strongly or agreed somewhat during both fall and spring. The small shift from agreeing strongly to agreeing somewhat represents a slight reduction in enthusiasm for the program under pilot conditions that could reflect students’ weaker preferences for CFD foods compared with fresh, as discussed in Chapter 4.

Exhibit 6.4. Student-reported agreement with “I hope the free fruit and vegetable snacks continue at our school.” †



Source: Evaluation of the FFVP-CFD pilot project, Student Survey (fall n = 1,575, spring n = 1,565), SY 2014–2015. Tabulations prepared by Mathematica Policy Research are weighted to be representative of 4th–6th grade students in the pilot schools. See Appendix D Exhibit D.15.

Note: Totals may not sum to 100% due to rounding.

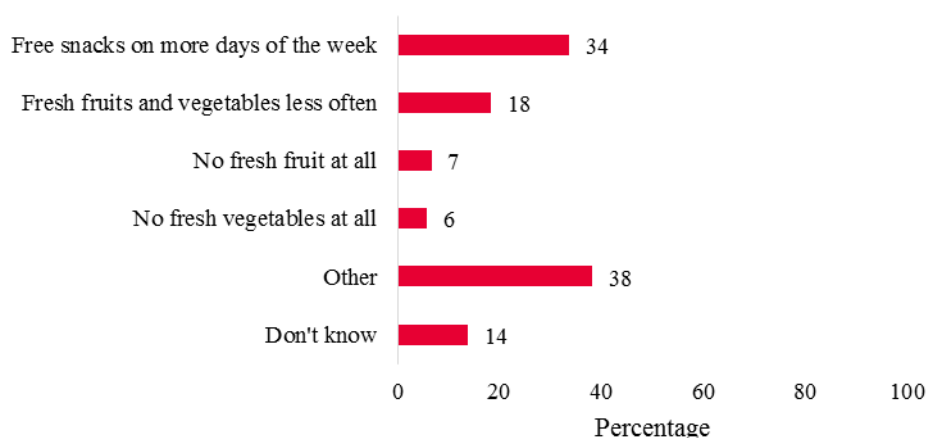
†Shift in responses from fall to spring is significantly different at the 0.05 level.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

2. Parent attitudes toward the FFVP-CFD pilot

Most parents were unaware of changes made to the FFVP in spring 2015. Only one-fifth of parents believed the FFVP had changed in the spring term (Appendix D Exhibit D.18). When asked what changed, the most common response among those parents who perceived a change was increased snack frequency, reported by about one-third of them (Exhibit 6.5). This finding is consistent with some schools reporting serving snacks more frequently in spring 2015 compared with fall 2014, as described in Chapter 4. A substantial proportion of parents provided written responses describing changes consistent with the FFVP-CFD pilot. The most common change parents wrote in was that different fruit and vegetable snack offerings in the spring compared with the fall (Appendix D Exhibit D.18). A few parents specifically wrote in that CFD items had been added.

Exhibit 6.5. Parent responses to “What has changed in the free fruit and vegetable snack program?” (multiple answers allowed), among parents who reported a change, spring 2015



Source: Evaluation of the FFVP-CFD pilot project, Parent Survey (spring $n = 204$), SY 2014–2015. Tabulations prepared by Mathematica Policy Research are weighted to be representative of parents of 4th–6th grade students in the pilot schools. See Appendix D Exhibit D.18.

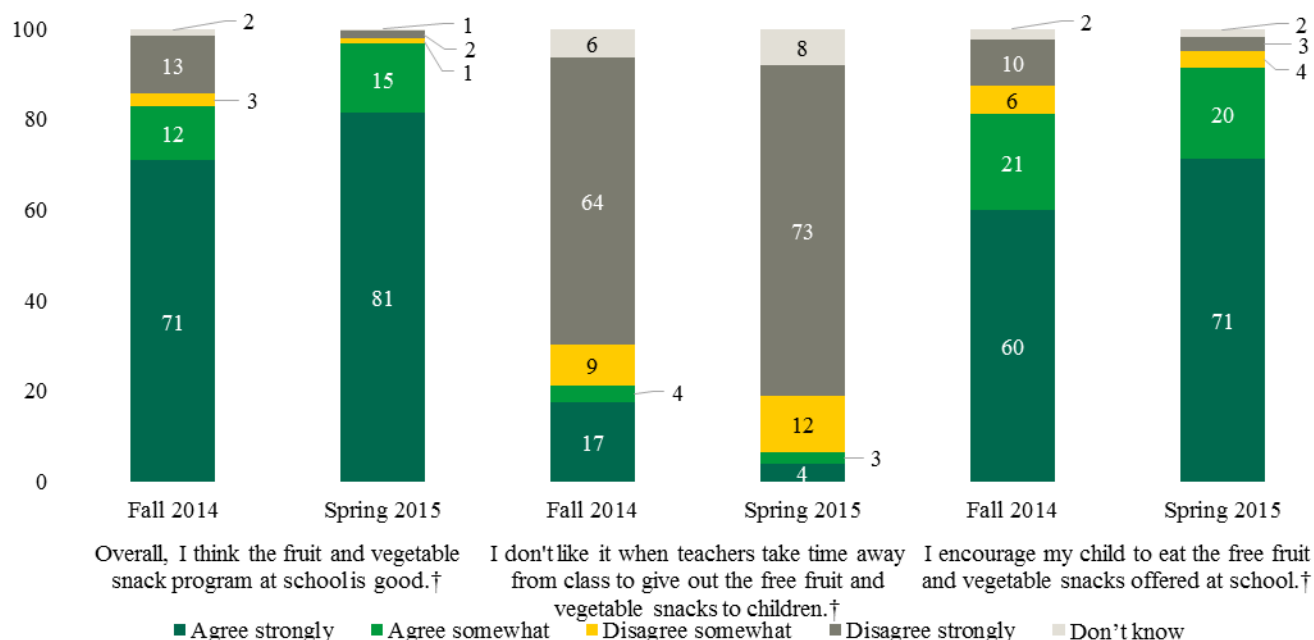
CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

Several factors pertaining to FFVP implementation—described in Chapter 4—likely explain the lack of parent familiarity with the pilot. First, some schools might not have made changes under the pilot. In an average week during the spring, about 40% of schools continued to serve only fresh FFVP snacks. Second, FFVP promotional activities were not common. Parents might not have seen information describing the changes schools planned to make under the pilot. Parents participating in the qualitative interviews reflected this range in familiarity. One had not heard of the FFVP, whereas another knew about the FFVP but had not heard of the CFD pilot. The other two were familiar with both the FFVP and the CFD pilot.

Parent acceptance of the pilot was mixed. Parent survey responses showed that satisfaction increased from fall 2014 to spring 2015. The percentage of parents agreeing strongly that the FFVP was a good program increased from 71% to 81% from fall to spring, whereas the percentage disagreeing strongly fell from 13% to 2% (Exhibit 6.6). A lower percentage of parents objected to teachers taking time away from class to distribute snacks, and a higher

percentage reported encouraging their children to eat the snacks. On the other hand, when asked which types of fruit and vegetable snacks they preferred their children be served in schools, two-thirds of parents chose fresh only (Exhibit 6.7).

Exhibit 6.6. Parent-reported views of the FFVP



Source: Evaluation of the FFVP-CFD pilot project, Parent Survey (fall n = 1,103, spring n = 1,046), SY 2014–2015.

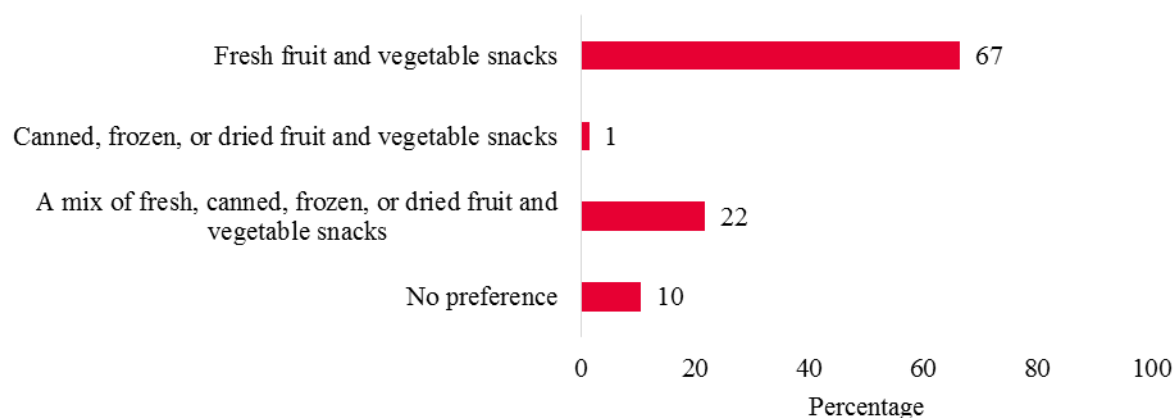
Tabulations prepared by Mathematica Policy Research are weighted to be representative of parents of 4th–6th grade students in the pilot schools. See Appendix D Exhibit D.19.

Note: Totals may not sum to 100% due to rounding.

†Shift in responses from fall to spring is significantly different at the 0.05 level.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

Exhibit 6.7. Parent responses to “Which of the following types of fruit and vegetable snacks do you prefer for your child be served in school?” spring 2015



Source: Evaluation of the FFVP-CFD pilot project, Parent Survey (spring n = 1,020), SY 2014–2015. Tabulations prepared by Mathematica Policy Research are weighted to be representative of parents of 4th–6th grade students in the pilot schools. See Appendix D Exhibit D.18.

Note: Totals may not sum to 100% due to rounding.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

Several factors could explain why parents—who on the whole prefer fresh snacks—reported increased satisfaction under the pilot. First, as described in Chapter 4, some schools did not appear to incorporate CFD into FFVP snacks—in an average week, 40% continued to serve fresh snacks only. Among schools that did incorporate CFD into snacks in the spring, most continued to serve fresh snacks as well. Many of the parents reporting increased satisfaction in the spring—while also preferring fresh snacks only—might have had children in those schools where fresh snacks still were served commonly or exclusively. Second, many parents of students in schools that served CFD snacks in the spring might not have known about the change. As described earlier, parent awareness of the FFVP-CFD pilot was low. Finally, the pilot might have enabled schools to improve other aspects of the FFVP—such as the reliability or frequency of snacks—that in turn could have improved parent satisfaction.

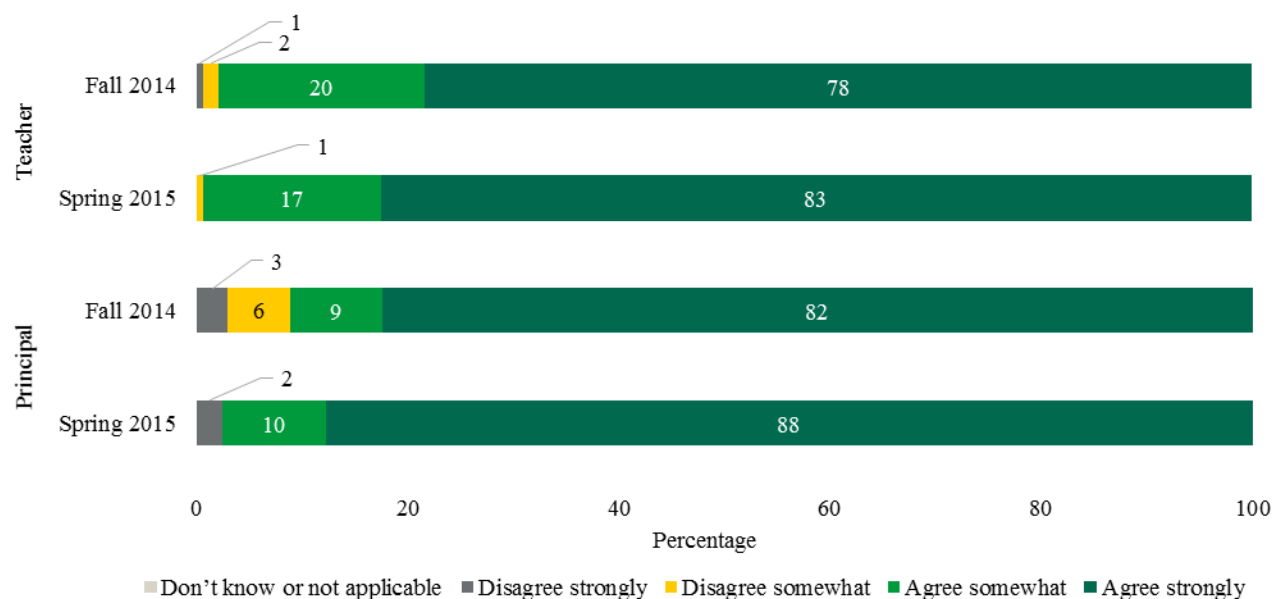
Qualitative interview data reinforced the picture of mixed parent reactions to the pilot. Among parents familiar with the FFVP, all strongly approved of the program. A few of the parents interviewed approved of incorporating CFD snacks, citing the increased flexibility and reliability those items afford schools. One parent did not approve of serving CFD items in the FFVP and hoped the pilot would not continue.

3. Changes in staff acceptance of the FFVP from fall to spring

Large majorities of staff in pilot schools expressed strong support for the FFVP under both standard and pilot conditions. Most measures of staff acceptance of the FFVP remained unchanged from fall 2014 to spring 2015. There was no change in teachers’ or principals’ overall opinions of the FFVP (Exhibit 6.8). Large majorities strongly approved of the FFVP in both fall 2014 and spring 2015. Only a very small fraction disapproved of the program in either time period. In both the fall and spring, teachers, principals, and FSMs overwhelmingly reported

that they wanted the program to continue. Virtually all principals and teachers in both time periods believed that students benefitted from the program (Appendix D Exhibit D.23).

Exhibit 6.8. Teacher and principal responses to “My overall opinion of FFVP is favorable.”



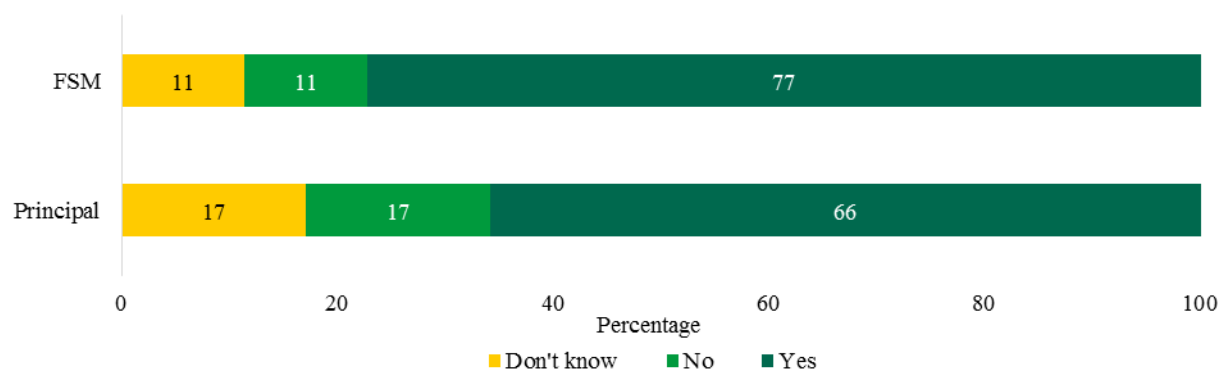
Sources: Evaluation of the FFVP-CFD pilot project, Principal Survey (fall n = 34, spring n = 41) and Teacher Survey (fall n = 122, spring n = 118), SY 2014–2015. Tabulations prepared by Mathematica Policy Research. Teacher responses are weighted to be representative of 4th–6th grade classrooms in the pilot schools. See Appendix D Exhibit D.23.

Note: Totals may not sum to 100% due to rounding.

†Shift in responses from fall to spring is significantly different at the 0.05 level.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

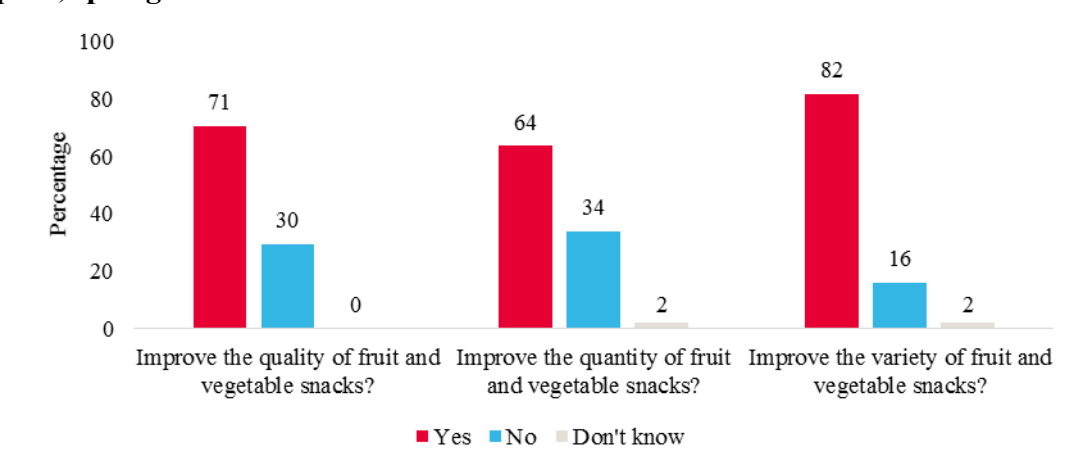
Although measures of staff acceptance of the FFVP did not change after the pilot was introduced, survey respondents identified many benefits of the pilot over the standard program. Most FSMs and principals reported that they thought the FFVP-CFD pilot improved the overall FFVP (Exhibit 6.9). A higher proportion of FSMs than principals made this statement. FSMs oversee the FFVP and likely have a clearer understanding of what effects incorporating CFD items had on program operations. They identified specific benefits of the pilot: a majority of FSMs said the pilot improved snack quality, quantity, and variety (Exhibit 6.10). School nutrition staff in pilot schools applied for the FFVP-CFD pilot, so it is not surprising that they appreciated the additional flexibility.

Exhibit 6.9. FSM and principal responses to “Did the FFVP-CFD pilot help improve the overall FFVP program?”, spring 2015


Sources: Evaluation of the FFVP-CFD pilot project, FSM Survey (n=44) and Principal Survey (n = 41), SY 2014–2015. Tabulations prepared by Mathematica Policy Research. See Appendix D Exhibit D.17.

Note: Totals may not sum to 100% due to rounding.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; FSM = Food service manager; SY = school year.

Exhibit 6.10. FSM views on fruit and vegetable snack quality and variety under the FFVP-CFD pilot, spring 2015


Sources: Evaluation of the FFVP-CFD pilot project, FSM Survey (n = 44), SY 2014–2015. Tabulations prepared by Mathematica Policy Research. See Appendix D Exhibit D.17.

Note: Totals may not sum to 100% due to rounding.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; FSM = Food service manager; SY = school year.

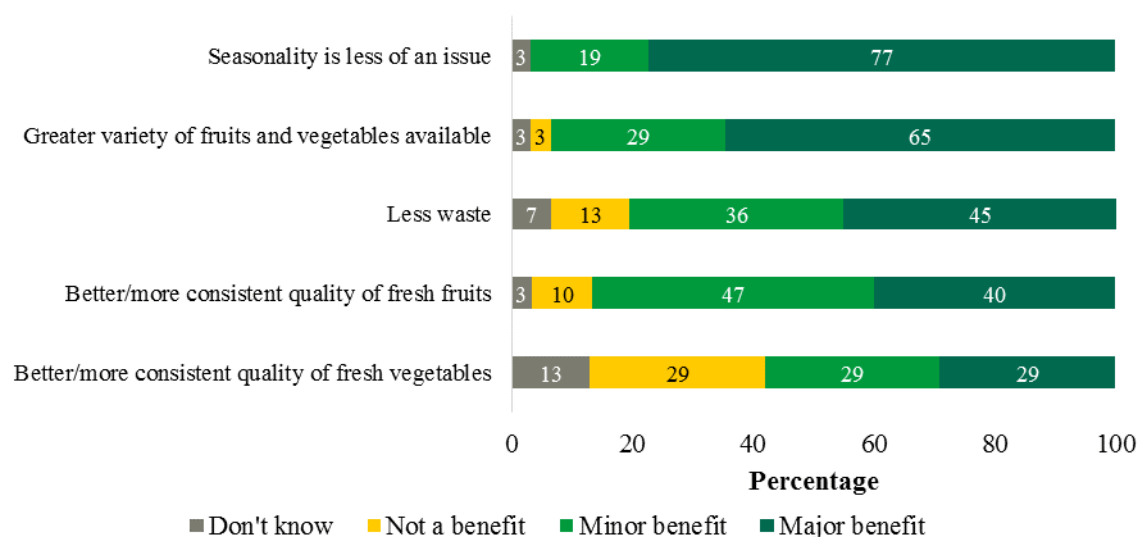
SFA Directors also reported benefits of the FFVP-CFD pilot (Exhibit 6.11). A large majority said removing seasonality concerns was a major benefit of implementing the pilot. Snack menu data taken from a typical week in fall 2014 and another typical week in spring 2015—described in Chapter 4—did not indicate substantial seasonality in the snacks offered. However, it is possible that seasonality is a particular concern during certain times of the year outside of the menu data collection windows for this study. Almost two-thirds of SFA Directors said increased snack variety was a major benefit of the pilot. For example, in most places, it is much easier for schools to find canned pineapple than fresh. Smaller but still substantial

proportions cited reduced waste and improved snack quality as benefits. They discussed these same features as benefits of the pilot during qualitative interviews. These views are representative of SFA Directors from districts that applied for the pilot, and do not represent others around the country.

CN Directors also expressed appreciation for the pilot during qualitative interviews. They said the pilot made snacks more reliable—in particular, that CFD items can serve as a back-up option when fresh snacks are not available. They also appreciated that it increased the potential variety of snack items.

Strong pre-existing satisfaction with the FFVP among all levels of staff explains why program acceptance did not increase after the FFVP-CFD pilot was introduced, despite the many benefits staff perceived in the pilot. Large majorities of staff expressed the highest level of satisfaction with the program in the fall 2014 survey, leaving limited scope for improvement in the spring. The additional flexibility the pilot afforded did not appear to improve program acceptance among the small number of staff who reported low satisfaction with the FFVP in the fall. The fact that some schools did not incorporate CFD items into the FFVP in spring 2015 might also explain why the views of some staff did not change.

Exhibit 6.11. SFA Director reports on the benefits of incorporating CFD items into FFVP snacks, spring 2015



Sources: Evaluation of the FFVP-CFD pilot project, SFA Director Survey (n = 31), SY 2014–2015. Tabulations prepared by Mathematica Policy Research are weighted to be representative of 4th–6th grade classrooms in the pilot schools. See Appendix D Exhibit D.26.

Note: Totals may not sum to 100% due to rounding.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SFA = School Food Authority; SY = school year.

B. Staff views of FFVP-CFD pilot operations

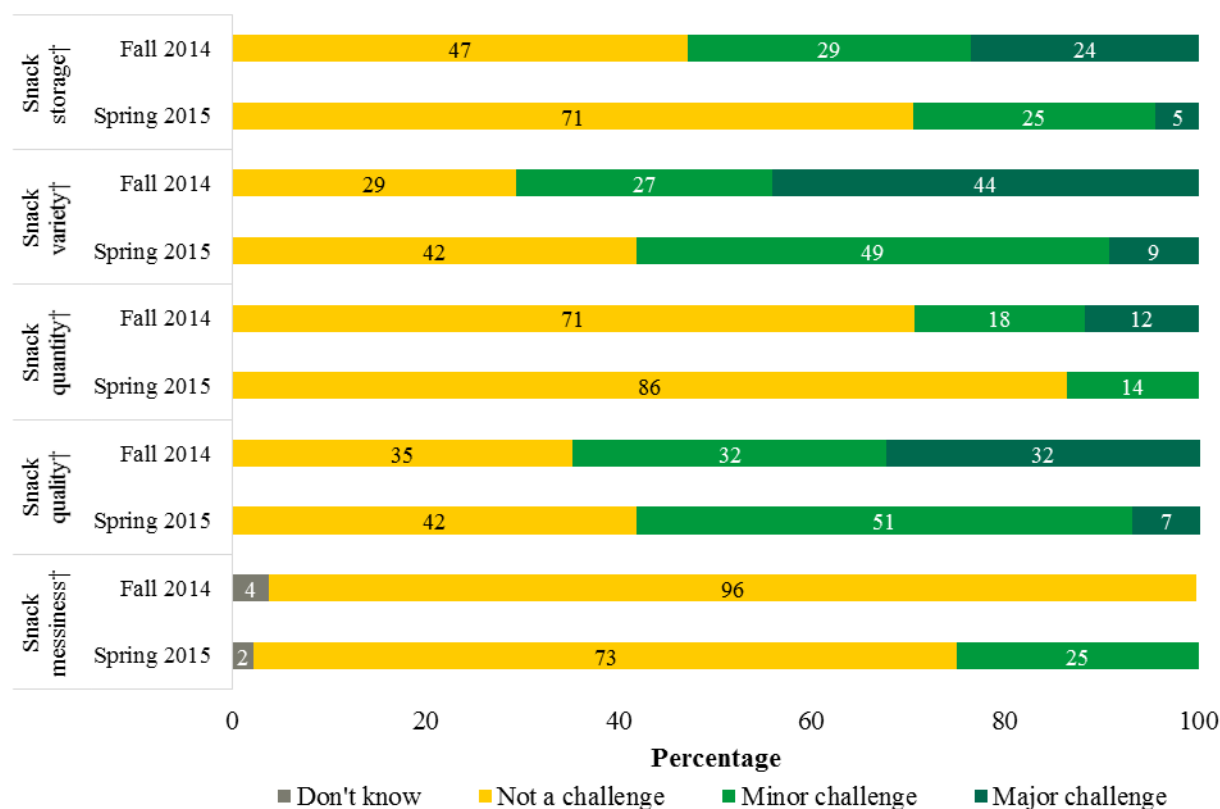
Staff in pilot SFAs identified operational advantages of the pilot, but their overall views of FFVP operations did not change. The most common operational advantage respondents cited in

qualitative interviews was the increased flexibility CFD items afforded schools. FSMs explained that the durability of shelf-stable dried and canned items made snacks more reliable. Even in schools that planned to serve fresh snacks all or most of the time, having CFD items on the shelf enabled them to serve snacks when using fresh items was not possible. If fresh snacks were rotten or unripe when delivered, or adverse weather or other circumstances made delivery impossible, schools could draw on stored CFD items. They also pointed out that CFD items were less likely than fresh items to become damaged during shipping or spoil in harsh conditions. Other operational advantages of the pilot that staff described were increased ease of storage and preparation and increased snack frequency.

Despite these advantages, survey results did not show significant changes in staff views of FFVP operations in spring 2015 compared with fall 2014. Staff responses on questions about the frequency of snack offerings saw mixed, statistically insignificant changes. Reported staff satisfaction with how snacks were distributed did not change significantly.

C. FFVP-CFD pilot impact on challenges identified by FSMs

FSMs were less likely to report certain FFVP challenges under FFVP-CFD pilot conditions in the spring compared with standard FFVP conditions in the fall. A smaller proportion of FSMs reported storage problems related to the FFVP under the pilot. In fall 2014, 24% listed storage as a major problem, compared with only 5% in spring 2015 (Exhibit 6.12). Shelf stability is a clear advantage of canned and dried foods over fresh produce. The ability to store large quantities of CFD foods might be particularly useful in locations where food deliveries are infrequent due to remoteness or harsh weather. A smaller share of FSMs reported problems with snack variety under the pilot as well: 44% cited it as a major challenge in the fall compared with just 9% in the spring. The proportion of FSMs citing snack quantity as a major challenge fell from 12% of respondents in the fall to zero in the spring. The proportion citing snack quality as a major challenge fell as well: 32% of FSMs saw this as a major challenge in the fall and 7% did in the spring. The only reported challenge that increased under the pilot was snack messiness. No FSMs reported this issue as a challenge in the fall; in the spring, a quarter of them said it was a minor challenge.

Exhibit 6.12. FSM reports of FFVP challenges under standard and pilot conditions

Sources: Evaluation of the FFVP-CFD pilot project, FSM Survey (fall n = 34, spring n = 44), SY 2014–2015. Tabulations prepared by Mathematica Policy Research are weighted to be representative of 4th–6th grade classrooms in the pilot schools. See Appendix D Exhibit D.27.

Note: Totals may not sum to 100% due to rounding.

†Shift in responses from fall to spring is significantly different at the 0.05 level.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; FSM = Food service manager; SY = school year.

The reduction in perceived challenges in the spring compared with the fall could be partially explained by changes in school nutrition standards for Smart Snacks at the beginning SY 2014–2015 (FNS 2016b).⁴³ This change might have caused some disruption in school nutrition operations at the beginning of the year, as schools adapted to the new standards. By spring, schools were more likely to have adapted to them, so these operations might have been running more smoothly for reasons unrelated to the FFVP-CFD pilot.

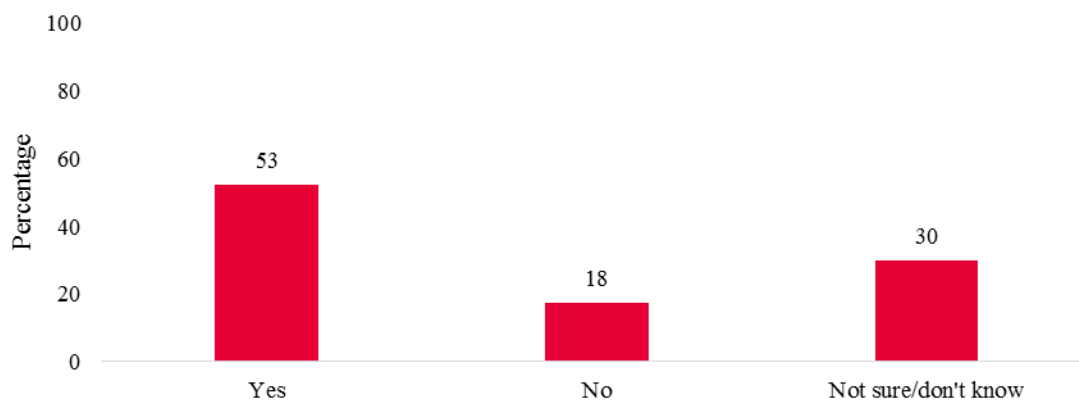
Nevertheless, the substantial reduction in program challenges reported by the staff who manage it in the schools was a clear advantage of the pilot. Other staff types did not report significant changes in FFVP challenges; however, FSMs directly oversee FFVP operations and are likely to be in the best position to gauge these types of challenges.

⁴³ The 2014–2015 school year also represented the end of the three-year phase-in of improved nutrition standards (FNS 2015a) (unless there were requests for exemptions from specific requirements (FNS 2015b)).

D. Reported changes in cost

About half of principals said the pilot helped reduce costs in their schools (Exhibit 6.13); 30% of principals did not know whether it had done so or not. On the other hand, no significant change occurred in the proportion of principals' views on the FFVP per student allotment level (\$50–\$75) (Exhibit 6.14). Most principals in both fall and spring thought the level was about right.

Exhibit 6.13. Principal responses to “Do you think the CFD pilot has helped reduce school costs?” spring 2015

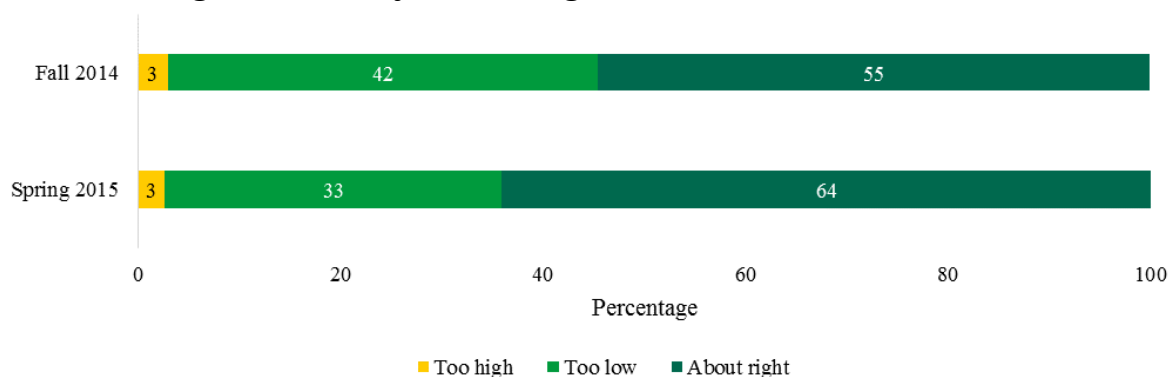


Source: Evaluation of the FFVP-CFD pilot project, Principal Survey (n = 40), SY 2014–2015. Tabulations prepared by Mathematica Policy Research are weighted to be representative of 4th–6th grade classrooms in the pilot schools. See Appendix D Exhibit D.32.

Note: Totals may not sum to 100% due to rounding.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

Exhibit 6.14. Principal responses to “Do you think the \$50–\$75 per student allotment for the FFVP is too high, too low, or just about right?”



Sources: Evaluation of the FFVP-CFD pilot project, Principal Survey (fall n = 34, spring n = 40), SY 2014–2015. Tabulations prepared by Mathematica Policy Research are weighted to be representative of 4th–6th grade classrooms in the pilot schools. See Appendix D Exhibit D.32.

†Shift in responses from fall to spring is significantly different at the 0.05 level.

CFD = Canned, frozen, or dried; FFVP = Fresh Fruit and Vegetable Program; SY = school year.

There were no significant changes in the proportion of SFA Directors reporting major cost challenges to FFVP operations in the spring compared with the fall (Appendix D Exhibit D.31). The most common cost challenge was high prices for fruits and vegetables: more than half of SFA Directors cited this factor as a major challenge in both fall 2014 and spring 2015. The staff time and effort required to prepare FFVP snacks and the cost of non-food items needed for the snack program were frequently cited as minor challenges. Few SFA directors cited these as major challenges, and there were no significant changes to these response patterns between the standard FFVP in the fall and FFVP-CFD pilot in the spring.

Findings from administrative cost data suggest that the pilot might not have resulted in cost savings for pilot SFAs and schools.⁴⁴ Food costs increased from fall to spring for three of the four States—all except for Kansas (Appendix G Exhibits G.4, G.6, G.7, and G.8). This could have resulted from cost increases associated with the FFVP-CFD pilot or other factors such as increased program days. The relationship between food and non-food costs (such as labor and administration) varied across States. One potential advantage of CFD foods is that they might require less staff preparation time; however, there was no clear pattern showing decreased labor costs from fall to spring. Overall, monthly costs changed only slightly in three of the four States (Appendix G Exhibit G.2) but increased substantially in Alaska, from \$1,999 per SFA to \$3,029 (Appendix G Exhibit G.3). This change likely resulted from an increased number of program days in the spring as well as possible seasonal effects on the cost of produce and shipping. Within Alaska, during spring 2015, SFAs fresh produce costs exceeded those of CFD items (Appendix G Exhibit G.5). This highlights the high cost of fresh items in rural areas of the State as well as uneven implementation—not all SFAs incorporated CFD items during the pilot.

⁴⁴ Data limitations, described in Chapter 2, preclude strong analytical conclusions about the relationship between the pilot and program costs.

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7. CONCLUSIONS

Since the FFVP began as a pilot program in 2002 and then expanded nationwide in 2008 under the Farm Bill (P. L. 110-234), it has provided fresh produce to low-income elementary schools⁴⁵ across the U.S. The program provides fresh fruits and vegetables in school as between-meal snacks, and exposes children to healthful foods to which they may not have access at home. The FFVP-CFD evaluation in the 2014–2015 school year, mandated under the 2014 Farm Bill (P. L. 113-179), looks specifically at the *in-school* consumption of elementary students in pilot schools. SFAs and schools were eligible to apply to the FFVP-CFD pilot if they could demonstrate barriers to accessing or storing FFVP fresh snacks.

The FFVP-CFD offered a unique opportunity to study the FFVP and implementation of the CFD pilot in four States located in different areas of the country (Alaska, Delaware, Kansas, and Maine). The evaluation included a comprehensive assessment of the pilot by surveying staff at the State, district and school levels along with surveying students and their parents. In addition, nearly all (93%) CN Directors in the U.S., the District of Columbia, and territories completed surveys dealing with reasons for not applying for the pilot. Dietary recalls with pilot students also were conducted to produce a reliable estimate of students' fruit and vegetable consumption. Lastly, the evaluation measured the impacts of the pilot by comparing spring data (under the CFD pilot) to fall data (under the standard FFVP, fresh fruits and vegetables only) in the same SFAs, schools, and students. This approach enabled FNS to fully address the four study objectives:

1. Examine impacts on students' fruit and vegetable consumption in pilot schools
2. Describe impacts on school participation in FFVP
3. Describe implementation strategies used by pilot schools
4. Describe acceptance of the pilot project by key stakeholders

A. Summary of main findings

1. Impacts on students' fruit and vegetable consumption in pilot schools

The pilot was associated with a decrease of 0.26 cup equivalents of in-school fruit and vegetable consumption with students consuming 1.72 cups in the fall and 1.46 cups in the spring. Total fruit consumed in school decreased under the pilot by 0.13 cup equivalents: a 0.21 decrease from fresh fruit and a 0.07 increase from dried fruit.⁴⁶ Because fruit and vegetable consumption did not change on nonprogram days, all changes during a typical school week were the result of changes on program days.

Waste in school meals and snacks is an important issue for school food service. Student observations indicate that, for all FFVP snacks combined, plate waste, defined as the proportion of a snack wasted or left over on the plate, decreased during the pilot across nearly all measures

⁴⁵ Elementary schools with high rates of FRP meal enrollment.

⁴⁶ The difference in overall fruit consumption is 0.133 (not 0.14 based on rounding of the estimates).

for which the change could be calculated.⁴⁷ Overall plate waste declined by 8 percentage points in the pilot from 27% in the fall to 19% in the spring for fruits and vegetables combined. The mean proportion of fruit wasted by students was not significantly different (24% in the fall and 18% in the spring), but the proportion of vegetables wasted by students declined in the pilot (39% in the fall and 20% in the spring). There was a shift toward more fruits (72% in the fall and 83% in the spring) and less vegetables (28% in the fall and 17% in the spring) offered in the spring versus the fall.

Other research on student plate waste shows higher rates than those observed for FFVP snacks in this study. Cohen et al. (2014) collected plate waste data among approximately 1,000 students in four schools in an urban, low-income school district both before (fall 2011) and after (fall 2012) the new school nutrition standards went into effect. Students discarded roughly 60% of vegetables and 40% of fruits after the USDA school meal standards went into effect, an improvement from the previous school year before the standards were implemented. Food quality and palatability were noted as important factors in reducing waste. In another study of elementary school students in Colorado in 2010, 37% of canned fruit, fresh fruit, and vegetables were wasted by elementary school students at school lunch (Smith and Cunningham-Sabo 2013).

2. Impacts on school participation in the FFVP

FFVP participation, based on classroom observations of snacks served, was high—approximately 75%—in both fall and spring, although students reported taking the snacks less often in the spring. SFA Directors, FSMs, principals, and teachers all wished that more students had taken fruit and vegetable snacks, but overall perceived little change in students' participation in FFVP during the pilot. Similarly, students' perceptions of fruits and vegetables did not change during the pilot. Most students still reported liking most fruits; a much smaller proportion said the same about vegetables. There were no changes in the percentage of students who said they liked to try new fruits and vegetables, and more students were interested in trying new fruits than new vegetables.

On average, schools offered FFVP snacks 2.8 days in the fall compared to 3.4 days in the spring. The percentage of schools offering FFVP snacks more than three days a week increased from 24% in the fall to 41% in the spring. Few schools in the pilot offered snacks more than once a day. If they offered FFVP snacks more than once, it was usually because they served the snack to different grades at a different time of day.

3. Implementation strategies used by pilot schools

SFAs and schools were allowed to serve CFD FFVP snacks beginning January 1, 2015 as long as they met Smart Snacks in School nutrition standards (FNS 2016b). However, SFAs and schools were not required to serve CFD snacks. In an average school week in the FFVP-CFD pilot, 41% of schools offered only fresh fruits and vegetables, 50% offered both CFD and fresh snacks, 6% offered only CFD snacks, and 3% did not offer any snacks.

⁴⁷ In addition to plate waste assessed at the student level, classroom observations showed that FFVP portions leftover at the classroom level (that is, not taken by students) decreased from 27% in the fall to 22% in the spring for fruits and vegetables combined (all snacks).

A large majority of SFA Directors reported that helping alleviate seasonality issues was a major benefit of the pilot, but the evaluation results did not show much evidence of seasonality in menu offerings. Almost two-thirds of SFA Directors said increased variety was a major benefit. There were modest variety changes in form (from fresh to CFD)⁴⁸ but less variety in the types of fruits and vegetables, perhaps due to limited supplies or costs of dried fruit. There were few options for dried vegetables and none were offered for snacks. Only one canned vegetable (corn) was offered; no “cooked from frozen” vegetables were offered.

The study also assessed the effect of the pilot on the forms of fruits and vegetables served in school meals during the pilot. Changes in fruits and vegetable offered at breakfast and in vegetables offered at lunch were minimal (5 percentage points or less). Larger changes occurred with fruit at lunch—an increase in canned fruit (7 percentage points) and fruit juice (11 percentage points).⁴⁹ These changes indicate that schools may have used leftover fresh fruits in the fall and leftover CFD fruits from FFVP pilot snacks in the spring to meet the fruit requirement at lunch.

Overall, little change occurred in the types of fresh items offered—apples, oranges, celery, and mixed salad greens were the most common fresh items offered during the pilot. The most frequently offered canned fruits in the pilot were mandarin oranges and applesauce; for dried fruit, cranberries and raisins were the most popular. An average FFVP snack contained 65 calories in the spring, slightly more than the 45 average calories in the fall, and substantially lower in calories than many other types of high-fat or high-sugar snacks that students could eat.

4. Acceptance of the pilot project by key stakeholders

There is high acceptance of the FFVP by food service and school staff, students, and parents. FSMs and principals reported that the pilot improved the FFVP overall by improving snack quality, quantity, and variety. This finding from the survey data is mirrored in the qualitative findings from one-on-one interviews. However, not all schools introduced CFD, likely weakening the effect the pilot had on overall staff acceptance. Because staff acceptance of the FFVP was already high in the fall, there was limited scope to improve their views. Many respondents who pointed out benefits of the pilot likely had already selected the highest level of overall satisfaction with the FFVP in the fall survey.

FSMs reported decreases in some FFVP barriers in the spring compared with the fall, including fewer problems with snack quality, quantity, and variety, and fewer storage problems. It also is possible that FSMs were focused more on meeting school meal standards and start-up activities in the fall—all of which would have been more of a routine by spring—and thus reported fewer problems with implementation.

B. Implications of the CFD study findings for the FFVP

This congressionally mandated pilot project aimed to give States, SFAs, and schools more flexibility in offering fruits and vegetables under the FFVP to help overcome barriers to

⁴⁸ These changes involved, for example, canned applesauce or dried apples in place of fresh apples, and canned mandarin oranges instead of fresh oranges.

⁴⁹ Juice is not allowed as an FFVP snack, but is offered in school meals.

accessing fresh produce. The evaluation reflects the experiences and perceptions of the 58 pilot schools in the four States that applied for the pilot, many of which were small and rural, and thus the findings are not generalizable to FFVP schools or elementary schools nationwide. The evaluation provides an opportunity to assess implementation obstacles and strategies used by schools that reported having issues with access to fresh produce. The study highlights information in four areas of potential interest to the FFVP:

1. Food service operations and staff support

The FFVP-CFD pilot study offers an opportunity to identify the obstacles faced by schools that want to provide FFVP snacks but need flexibility and support in developing strategies for planning and offering them in their schools. States' and SFAs' reasons for applying included the following: lengthy shipping time and high costs, poor quality of the product once it arrived, a desire for increased variety, lack of storage space, and the higher cost of fresh fruits and vegetables. In particular, Alaska SFAs and schools reported great difficulty in securing and storing fresh produce and high food costs due to transportation and shipping foods to schools. These reports are supported by research showing that Alaska schools have higher food costs in general and an unusually high share in dollar value of fruits and juices due to the higher prices of these products in the State, compared with other regions in the 48 conterminous States and D.C. (Young et al. 2012; Rein 2014).

Fresh items continued to be offered by nine out of 10 pilot schools in an average week in the spring; CFD items were readily available for school meals but less likely to be offered instead of fresh FFVP snacks even though CFD items were allowed. School food service staff did not mention lack of training or support as a reason for not offering CFD items more frequently. However, the qualitative interviews and implementation analysis identified some training topics that could be considered if CFD items were to be allowed in the future FFVP—or that are relevant to the standard FFVP:

- Specific information on what fruits and vegetables can be served as CFD items
- Suggestions for low-cost CFD items children might like (for example, they reported higher acceptance of canned fruit than dried)
- Specific ways to incorporate CFD snacks with fresh snacks over a week or month of menu planning
- Suggestions on how best to plan school meals in conjunction with FFVP snacks to maximize variety and reduce cost
- Alternative solutions to storage problems for fresh produce
- Additional materials and ideas for nutrition education on fruits and vegetables.

2. The role of teachers in the FFVP

No substantial changes to distribution of FFVP snacks in schools occurred during the pilot; classrooms were the predominant place for serving snacks—over 90% of the time in both fall and spring—reinforcing the role that teachers play in implementing the FFVP (Prelip et al. 2012; Snelling et al. 2013). In site visits to schools, staff saw the important role teachers play in encouraging students to try the fruit or vegetable, planning a lesson to coincide with the specific

item offered, being flexible about the academic schedule to allow time for snacks, and making sure students have a positive overall experience with the FFVP.

3. Student and parent views

A highlight of the FFVP-CFD study is the wealth of information from students themselves. Much can be learned about fruit and vegetable consumption by asking students what fruits and vegetables they have tried, not tried, liked, or disliked. Most students said that they wished their school would serve different kinds of fruits and vegetables in the snack program, and this proportion increased under the pilot (76% in the fall and 81% in the spring). Despite schools' efforts, a high proportion of students still have not tried or do not like some or many fruits and vegetables (shown in Exhibits 5.6 and 5.7). Other research shows that acceptance of new foods requires multiple attempts and must be acceptable in taste and texture (Cooke 2007; Korinek et al. 2015). Therefore, variety, quality and presentation are important factors to address when trying to increase students' consumption of fruits and vegetables. This information can be helpful to school food service staff in tailoring the types of fruits and vegetables offered in FFVP according to students' preferences or lack of exposure, and helping them avoid overexposure, especially if the students see the same items at school breakfast and lunch.

Parents had limited knowledge of the pilot—only one-fifth of them believed the program had changed in spring 2015 compared with the previous fall. However, parents generally were aware of the FFVP and viewed it positively—more than 70% in both spring and fall agreed strongly that the FFVP was a good program. Two-thirds of parents reported preferring fresh fruits and vegetable snacks only, although it is difficult to ascertain the intensity of this preference. About 25% of students brought snacks from home; the snacks were predominantly less healthful snacks such as salty snacks, cookies, sugary drinks, and candy. Increased parent awareness of the availability and healthfulness of FFVP snacks could help increase the occurrence of children consuming the FFVP snacks versus less nutritious snacks brought from home.⁵⁰

C. Summary

This congressionally mandated study assessed the impact of the pilot on students' fruit and vegetable consumption and wastage, FFVP participation, and schools' implementation strategies. Most pilot schools offered fresh fruit and vegetable snacks or a mix of fresh and CFD snacks, indicating that there was not a major shift from fresh to CFD items during the pilot. The pilot was associated with a 0.26-cup equivalent decrease in students' total fruit and vegetable consumption in school, slightly lower wastage of FFVP snacks, and no change in FFVP participation. Stakeholders overall reported acceptance of the pilot and high appreciation for the FFVP. Some stakeholders preferred to continue with fresh only FFVP snacks, while others preferred the option to serve CFD items for flexibility when fresh was unavailable or could not be stored. Although FFVP-CFD study findings are not generalizable to other schools in the FFVP nationwide, they do provide important information on students' attitudes and preferences

⁵⁰ In about half of classrooms observed (59% in the fall and 53% in the spring), students reported consuming a non-FFVP snack on a program day. This consumption of snacks from home or other sources could reduce student consumption of FFVP snacks.

for specific fruits and vegetables in selected small and rural schools in four pilot States, including Alaska, which is often excluded from national school nutrition evaluations.

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