



WISCONSIN PREVENTION OF OBESITY AND DIABETES
UNIVERSITY OF WISCONSIN – MADISON

Wisconsin Farm to School: One year evaluation report

Tara L. LaRowe^{1,2}, Andrea B. Bontrager Yoder^{1,3}, Amanda Knitter⁴, Amy Meinen^{1,4},
Janice L. Liebhart^{1,4}, and Dale Schoeller^{1,3}

University of Wisconsin – Madison ¹Wisconsin Prevention of Obesity and Diabetes, Departments of ²Family Medicine and ³Nutritional Sciences, and ⁴Wisconsin Department of Health Services, Nutrition, Physical Activity, and Obesity Program.

ACKNOWLEDGEMENTS: This analysis and report are based on data collected by the staff and members of the AmeriCorps Farm to School programs in Wisconsin. The UW-Madison Wisconsin Prevention of Obesity and Diabetes is a contractor of the Wisconsin Department of Health Services under which this report was issued. The Wisconsin Farm to School evaluation was developed, in part, by the authors as well as many others including: Sara Tedeschi, Dan McCarty, Sarah Combs, and Alicia Dill. Thank you to Camilla Vargas, Wisconsin Department of Trade, Agriculture, and Consumer Protection, the Wisconsin AmeriCorps members, and Doug Wubben for assistance in coordinating data collection, site visits, and school Memorandum of Agreements. Additionally, thank you to Julia Thorsen and Laura Vian for their assistance in data entry and data analysis.

EXECUTIVE SUMMARY

With obesity rates increasing in large proportions among US children, it is necessary to identify effective strategies that create supportive environments to improve healthy lifestyle behaviors. The Centers for Disease Control and Prevention (CDC) has identified improvement of fruit and vegetable (FV) consumption as a key obesity prevention strategy. A school meal is a prime opportunity to establish this supportive environment for healthy eating through increased access to and consumption of fresh FV. Comprehensive Farm to School (F2S) programs aim to further develop children's understanding of nutrition and agriculture through educational activities such as school gardening, produce taste-testing, and farm field trips.

The purpose of this research is to report on the first evaluations from the state-wide Wisconsin AmeriCorps F2S program. The aims of this report are to describe: 1) baseline overweight and obesity prevalence, 2) changes in knowledge and attitudes pertaining to food, nutrition, agriculture and FV consumption, and 3) FV availability and consumption during school lunch meals. 1,191 students participated in evaluation for the academic year of 2010-2011 at the nine Wisconsin AmeriCorps F2S program sites. Of these schools, two schools were new to F2S and others had one (n=2), two (n=4) or three (n=4) previous year(s) of F2S programming. Baseline evaluations took place in Fall 2010 and follow-up evaluations in Spring 2011.

At baseline, the combined prevalence of overweight and obesity was 39.1%, almost 4% higher than the national average for children this age. Students' knowledge and attitudes on food, nutrition and agriculture generally increased over the year. Schools with previous F2S programming showed higher scores, compared to schools new to F2S, both at baseline and at follow-up. Results from the lunch tray photo observations (LTPO) showed little or no FV on students' lunch trays at schools new to F2S and the highest number of FV on trays at schools with more than one year of F2S programming. Results from this first report show that F2S increases knowledge and attitudes as well as consumption of FV among children through improved access to FV in school lunches. Improvements in student behaviors tended to increase incrementally with more years of F2S programming. This implies that F2S programs may have gradual, yet sustaining positive impacts on student health behaviors.

Future analysis will expand on these conclusions and delve deeper to identify what additional factors positively impact student health. Further coding of stakeholder interviews and self-reported challenges and opportunities will help inform recommendations for best F2S program practices and policies. Upcoming reports will better capture school, community and economic benefits of these programs.

BACKGROUND

The Problem. Recent statistics (2007-2008) indicate that 12.5 million children (17%) between the ages of 2 and 17 are obese with an additional 15% classified as overweight.¹ Among children between ages of 6 and 11 years, 19.8% were obese in 2008 compared to 4.2% in 1963. The growing concern regarding this trend has resulted in many nationally recognized campaigns, such as the Let's Move campaign, rolled out by First Lady Michelle Obama, and National Football League's Play 60.

Obesity rates among Wisconsin children are slightly better than those nationally, but the differences are generally not large. In 2009, approximately 23% of Wisconsin high school students were overweight or obese.² 13.8% of children ages 2 to 4 participating in the Women, Infants and Children (WIC) are obese and 16.7% are overweight.³ Childhood obesity has been linked to the development of chronic diseases including cardiovascular disease, hypertension, cancer, and type II diabetes at an increased rate and at an earlier age.⁴ Because childhood obesity predicts obesity in adulthood,⁵⁻⁸ the risk for obesity-related health problems and diseases also increases later in life.

With obesity rates occurring among all aged children, it is evident that obesity prevention efforts must start early. The causes of excess weight in children are multi-factorial, but most consider poor nutrition and lack of physical activity as major causes. During early childhood, adequate nutrition is important for growth and development, but excess nutrition is linked to obesity.⁹ In general, US children are not meeting national dietary and physical activity recommendations.^{10,11} In this regard, the Centers for Disease Control and Prevention (CDC) has identified increasing fruit and vegetable (FV) consumption as a key obesity prevention strategy.¹² In Wisconsin, only 20% of high school students eat the recommended daily amounts of FV, while sugar intakes and consumption of high energy density snack foods are high.² With children spending a large proportion of the day in school, the school setting provides an important opportunity to improve children's health and nutrition environment.

Background. Farm to School (F2S) programs have been identified by the CDC as one of the recommended strategies to prevent obesity in the United States.¹³ F2S programs incorporate

locally grown foods into school meal and snack programs by encouraging schools to buy directly from local growers. Implementation of these programs varies widely, but most comprehensive F2S programs include the following components in addition to local procurement: 1) nutrition and agriculture education 2) school gardening and 3) student engagement activities such as food taste-testing and farm field trips.

Although the primary aim for F2S is to improve student health and eating behaviors, F2S may have additional benefits that can impact schools, local producers and communities. Schools report a 3 – 16% increase in meal participation when farm-fresh food is served that can help support diminishing school meal budgets.¹⁴ Farmers may have better income stability and may even see increased revenues as schools are a guaranteed market. Overall, more dollars spent locally could provide opportunities for community economic development.

In Wisconsin, a coalition of state agencies, non-profit organizations and local partners have been dedicated to establishing the F2S concept. The establishment of the AmeriCorps Farm to School Program in 2008 was a major benchmark, as it was the first funded initiative within the Wisconsin F2S movement. This program provides direct training and technical assistance for F2S implementation by pairing AmeriCorps members at school sites interested in starting or maintaining a F2S program. The popularity of this program exceeds its funding capacity. Each year there are many more schools that apply than can be funded.

In 2010, the Wisconsin legislature passed a statewide F2S Bill (Assembly Bill 746) that laid infrastructure to further support the growth of F2S across the state. This legislation created a statewide position for a F2S Coordinator and established a F2S Advisory Council. This council is a formal body of state and local partners charged with the responsibility to expand and improve F2S policy. The Wisconsin F2S movement continues to expand and gain momentum.

While a growing number of Wisconsin farmers and school districts are implementing F2S, there is only limited evaluations of the effectiveness and impact of such programs in relation to improved health and economic benefits. Specifically, little is known about the direct relationship of strategies that increase access to FV and their ability to increase consumption. Therefore, this evaluation aims to bridge this assessment gap through an extensive evaluation

of nine Wisconsin AmeriCorps F2S sites. In this first-year report, we present findings on the prevalence of overweight and obesity, the impact of F2S on students' knowledge of food/nutrition and agriculture, their exposure to and liking of various FV, and observed consumption of FV during school lunches. Reported FV within students' total diet as well as local economic impact of F2S programs will also be evaluated along with qualitative assessment of the barriers and opportunities for F2S implementation.

METHODS

The aims of the WI F2S evaluation are to examine the effectiveness of F2S programs on students' knowledge, attitudes, and behaviors with respect to nutrition, health, and food systems, while simultaneously increasing understanding the dynamics surrounding F2S program implementation. Secondary aims are to document current rates of overweight and obesity and dietary behaviors in a cohort of school-aged children living in Wisconsin, as there is little state-level data available for children ages 6-12 years. Objectives for the Wisconsin F2S evaluation reports are to: 1) describe current program activities, 2) assess student health indicators, 3) describe challenges and opportunities, and 4) assess the potential economic impact on local communities. In this first F2S report, student demographic and health behaviors are reported.

Participating Schools. Nine AmeriCorps F2S sites participated in the statewide F2S evaluation. Two schools are new to F2S while others have one (n=2), two (n=4), or three (n=1) previous years of F2S programming. From these schools, a total of 1,191 children with an average age of 9.6 years participated in the evaluation at baseline. Of these children, 53.1% were male and 80.9% were white/Caucasian. Detailed F2S student and site characteristics are found in *Appendix A (Table 1)*. Prior to participation, each school site signed a Memorandum of Understanding (*Appendix B*) that outlined expectations and responsibilities for the school's participation in the evaluation, for which they received an incentive honorarium.

Design. Baseline and follow-up measures were collected in participating F2S sites in the academic year of 2010-2011. Baseline measures were conducted in September 2010 prior to F2S programming activities and follow-up measures were collected in May and June of 2011.

Measures and Tools. Measures and resources used in the Wisconsin F2S evaluation were largely adapted and modified from the Farm to School Evaluation Toolkit, developed by the Center for Health Promotion and Disease Prevention at the University of North Carolina at Chapel Hill.¹⁵

Data Collection. Data collection was conducted by AmeriCorps members at each site. AmeriCorps members received one, four-hour training on measurement protocols prior to baseline data collection (September 2010). These members received ongoing technical assistance from the F2S evaluation team and were provided with a timeline for implementation of evaluation activities. When needed, AmeriCorps members enlisted and trained community volunteers to assist in data collection. Actual implementation among sites varied due to scheduling and/or technical difficulties.

Student Measures. Student health behaviors and attitudes were assessed at baseline (Fall 2010), prior to F2S activities, and at follow-up, or the end of the academic year (Spring 2011). For student measures, all individual information was de-identified by AmeriCorps members by assigning a unique identification number to be used throughout the evaluation. See *Appendix A, Table 2* for a summary of student physical and health behavior measures collected from each participating F2S site.

Height, Weight, and Body Mass Index (BMI)

Six schools participated in measuring student heights and weights. Schools were instructed to measure heights and weights according to *To Weigh and Measure*, created by the Wisconsin Department of Health Services (WI DHS) (*Appendix C*). BMI percentiles and classifications for overweight and obesity were calculated using CDC guidelines.¹⁶

Knowledge, Attitudes, and Beliefs

The Knowledge and Attitudes Survey (KA) assesses children's knowledge of nutrition and food systems, exposure to FV, liking and willingness to try FV. This survey was adapted and modified from previous survey instruments evaluating the United States Department of Agriculture's (USDA) Fresh Fruit and Vegetables Snack Program.^{17,18} Six constructs were identified in the 60-item questionnaire and composite scores were calculated. These

constructs included: 1) Knowledge of food, nutrition and agriculture, 2) Attitudes toward liking and trying new FV, 3) Perception and self-efficacy for eating healthy, 4) Exposure to previously tasted FV, 5) Liking of the FV that they reported having tasted, and 6) Willingness to try the FV that they reported not having tasted. The survey, along with construct scoring details, is found in *Appendix D*. This survey was administered by AmeriCorps members to children in grades three, four, and five. Eight schools completed the survey via computer and one school completed the survey in paper format.

Diet Behaviors

Student diet behaviors were assessed through a Lunch Tray Photo Observation (LTPO). Eight schools participated in the LTPO. Four days of observations (consecutive days, when possible) were conducted at baseline and at follow-up. Digital photos were taken of students' numbered lunch trays before and after students consumed their meal. Side-by-side paired trays were assessed for: 1) FV selection and variety of different FV, 2) amount of FV on student's trays (reported as cups of FV), and 3) consumption of FV (as a percentage of FV on tray that disappeared). For the latter, the fraction of each FV item consumed was visually categorized by one evaluator as 100, 75, 50, 25 or 0%. FV identified from the photographs were verified against the schools' menus. Estimated serving sizes were provided by food service directors through a brief phone interview at the start of the school year. Trays that could not be paired or were too blurry were excluded from the analysis ($n \sim 238$, estimated). A complete protocol of the LTPO is described in *Appendix E*.

Data Analysis. All analyses were performed with SAS software (version 9.2, SAS Inc., Cary, NC). Descriptive statistics (mean and SD) were used to assess baseline and follow-up student measures. All variables were examined with regard to their distributional properties by visual inspection and assessment of kurtosis and skew.

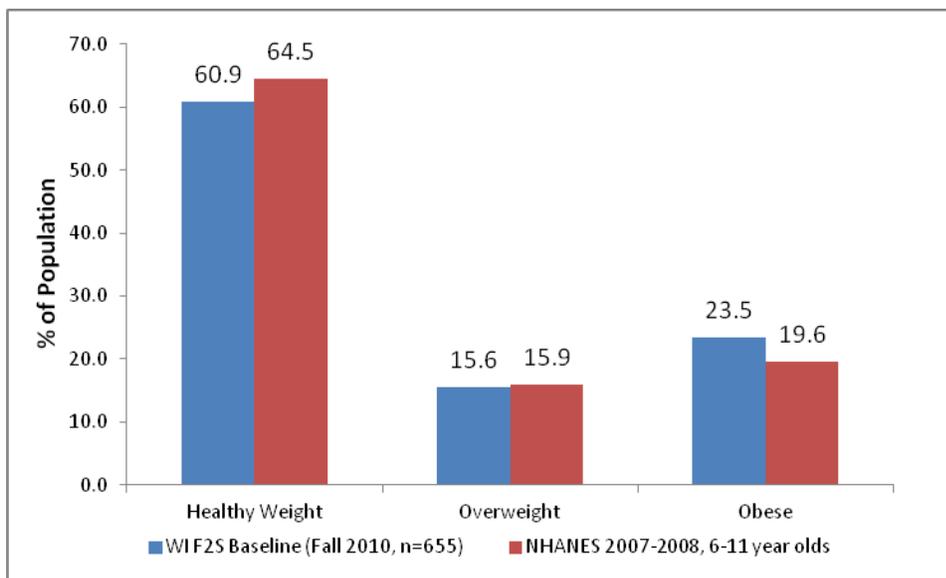
Differences in student outcomes between baseline and follow-up measures were evaluated using mean difference t tests, matched pairs t tests ($n=894$ student pairs), and Tukey's test using general linear modeling (GLM). The GLM procedure uses least square means to fit general linear model and was used to determine partial correlations of variables. Preliminary student-level analyses revealed significant differences among students with one or

more years of previous F2S programming, therefore subsequent analyses using the PROC MIXED procedure for pair-wise multiple comparisons was used controlling for grade and baseline student health behavior measure value. An alpha level of 0.5 was set for all significance testing.

RESULTS

Prevalence of Overweight and Obesity. At baseline, 655 children from six F2S sites provided height and weight data. *Figure 1* shows the BMI-for-age-and-gender distribution according to weight status categories of healthy (< 85th percentile), overweight ($\geq 85^{\text{th}}$ to < 95th percentile) and obese ($\geq 95^{\text{th}}$ percentile) among students participating in F2S and from a nationally representative sample of US children age 6 to 11 years. 60.9% of children participating in the Wisconsin F2S were of healthy weight, while 15.6% were overweight and 23.5% were obese. The distribution was similar between genders (data not shown). Compared to national data, children from the Wisconsin sample were more overweight and obese.

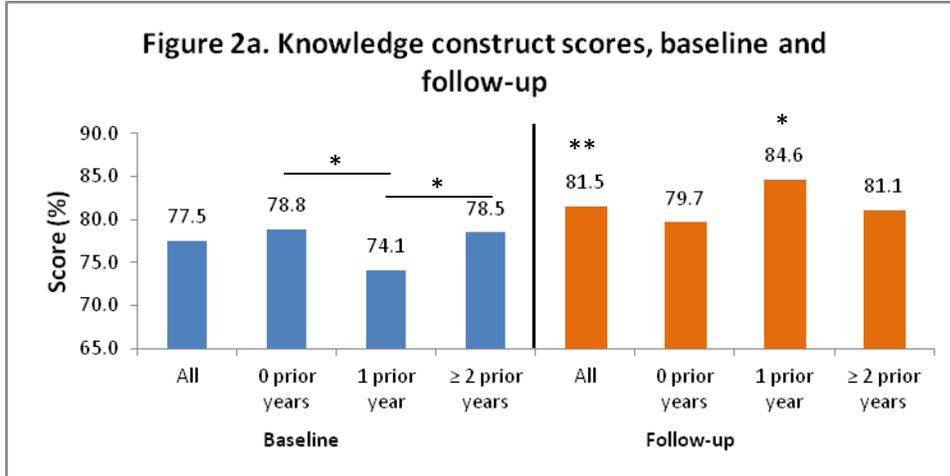
Figure 1. BMI distribution among students participating in F2S Evaluations (n=655 students, n=6 schools) and from the National Health and Nutrition Examination Survey, 2007-2008¹



Student Fruit and Vegetable Knowledge and Attitudes (KA)

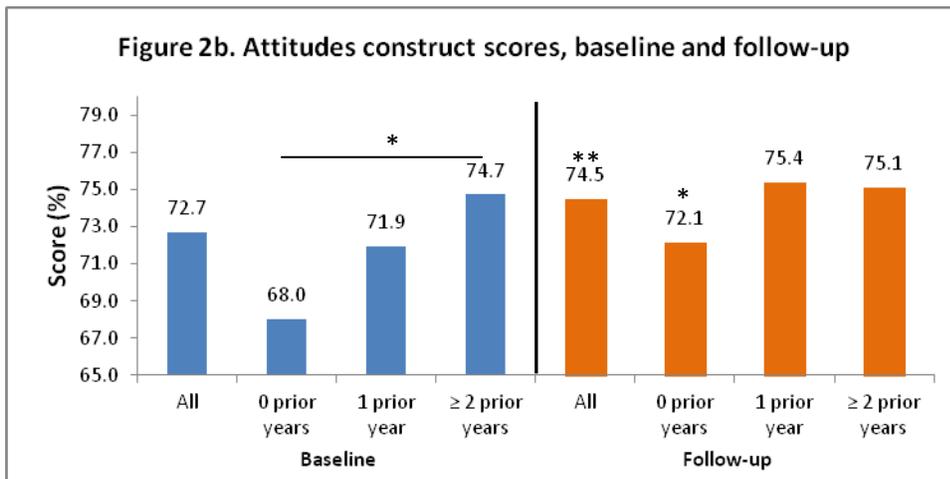
Baseline and follow-up results for the six constructs measuring student's knowledge and attitudes on FV are shown in *Figures 2a-f* (schools: n=9; students: n=1,013 baseline; n=1,014

follow-up). These figures are shown by the full sample and by previous years of F2S. Complete data tables are shown in *Appendix F*. At baseline, on average, students were 78% accurate on questions related to food and agriculture (*Figure 2a*).



For Figures 2a-f, * alone signifies that the group is significantly different than both other groups. * with a line stretching across two or three groups signifies that the groups under the line are significantly different. **, in follow-up, signifies that the group is significantly different from its baseline counterpart and † represents ≥ 2 prior years is significantly different than 0 prior years.

Students scored an average of 73% on the Attitudes scale for liking or trying new FV (*Figure 2b*) and 58% on the Perception/Self-efficacy scale for eating healthy (*Figure 2c*).



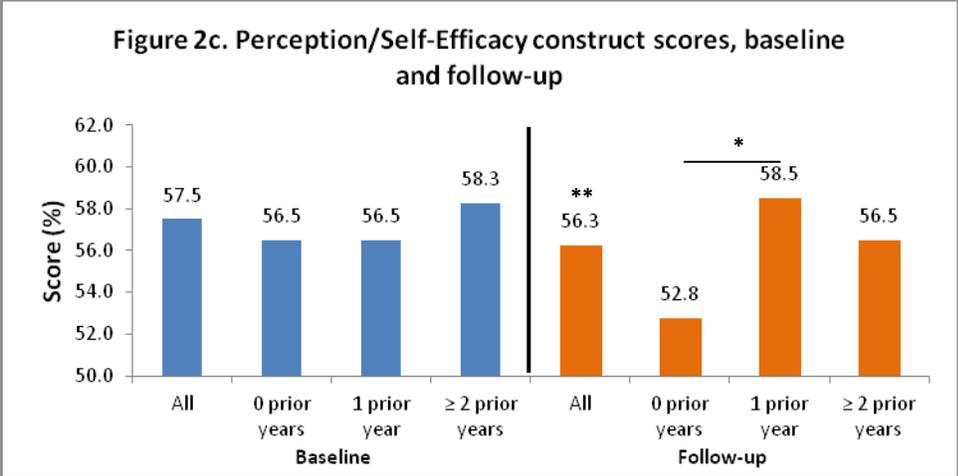
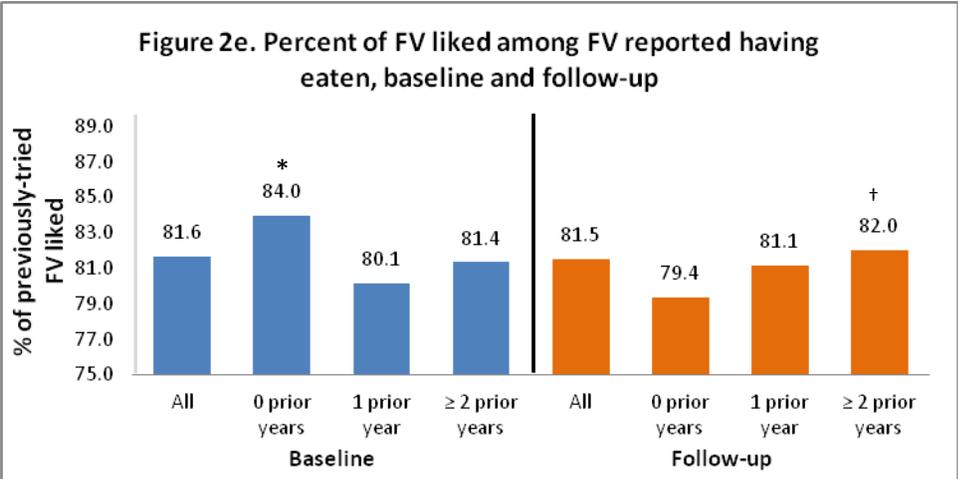
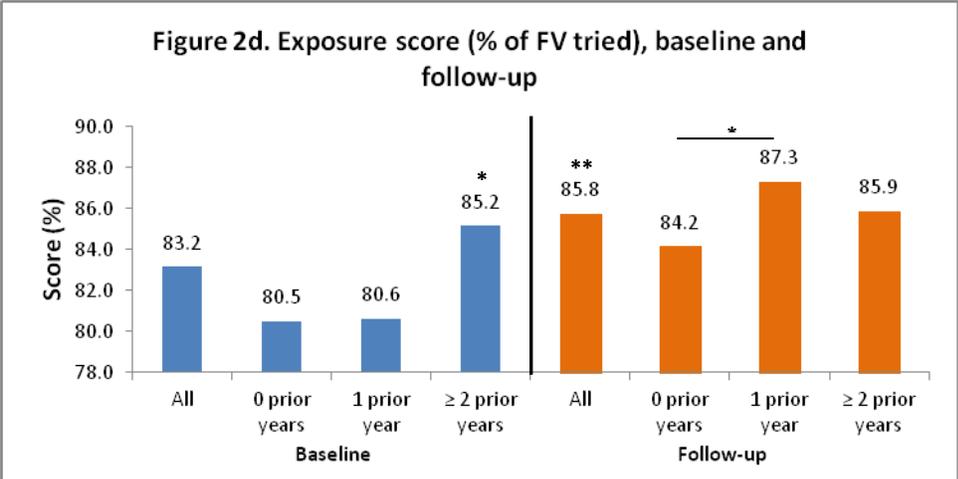
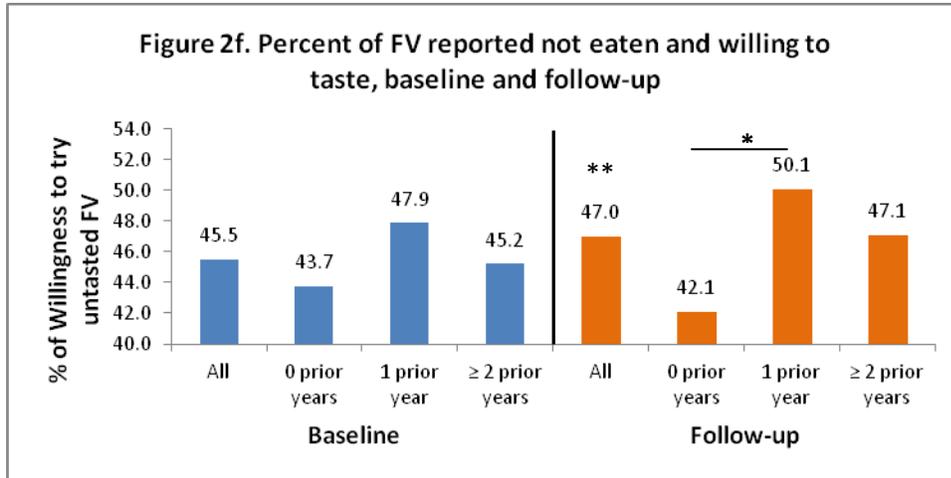


Figure 2d shows that students were exposed to 83% of the FV surveyed. Of the exposed FV, students responded liking them 82% of the time (Figure 2e).



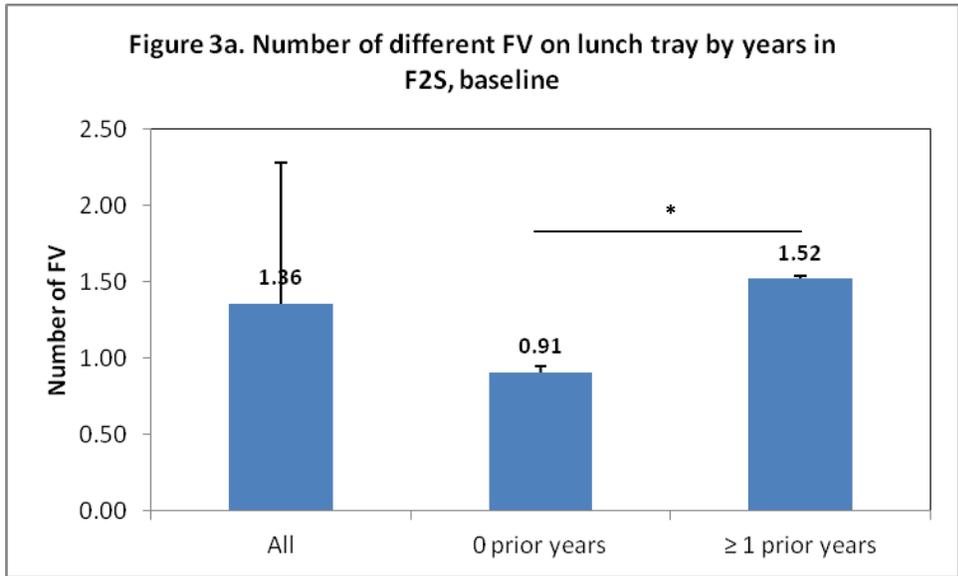
Students were also 46% willing (“yes” or “maybe”) to taste the FV they had not previously tasted (*Figure 2f*). Lastly, students in schools with previous years of F2S versus those new to F2S scored more favorably at baseline for attitudes and exposure.



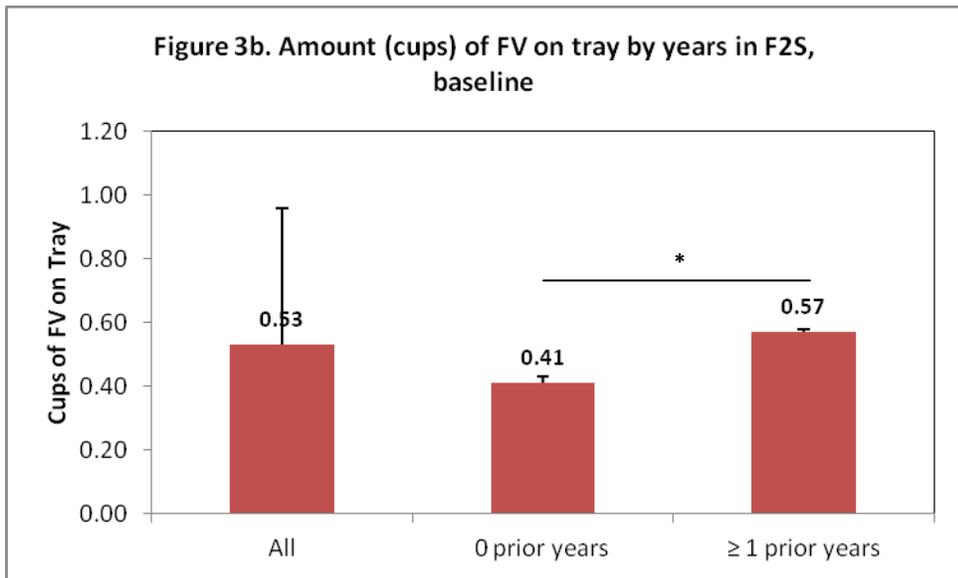
At follow-up evaluations, scores improved among students in schools with previous years of F2S for questions probing Knowledge (*Figure 2a*), Attitudes (*Figure 2b*), FV Exposure (*Figure 2d*), and FV Willingness as a percentage of FV not previously eaten and/or tried (*Figure 2f*). Furthermore, improvements among these constructs were significant among those schools with one previous year of F2S. Perception/self-efficacy decreased slightly from baseline to follow-up (*Figure 2c*) and no significant change was observed for FV liking as a percentage of FV previously eaten and/or tried (*Figure 2e*).

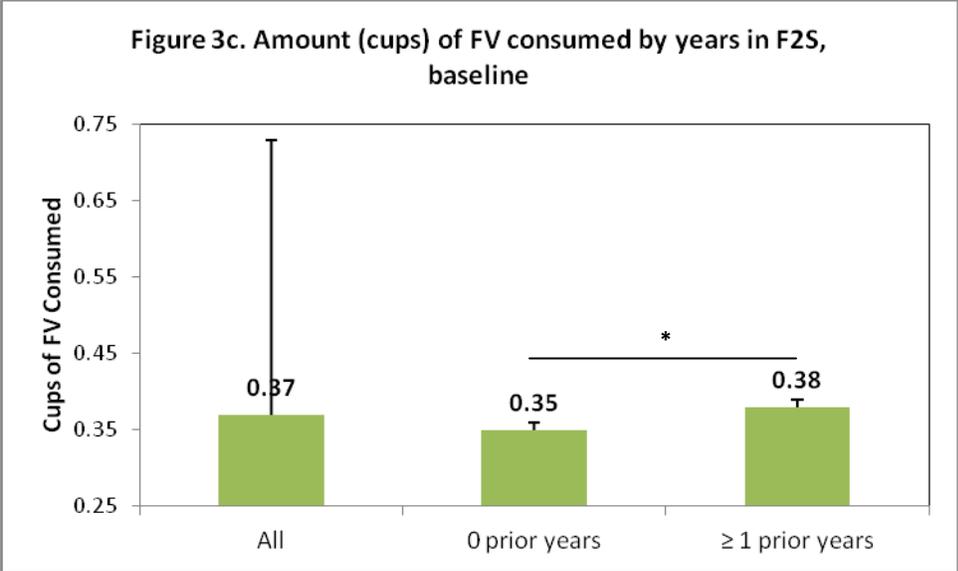
Lunch Tray Photo Observation (LTPO). The LTPO for baseline evaluations yielded 2,214 paired trays of before and after lunch consumption. At baseline evaluations, an average of 1.4 FV was observed on lunch trays (*Figure 3a*). Student trays from schools with one or more previous years of F2S had significantly more FV on the tray compared to schools new to F2S (1.5 vs. 0.9, respectively, $p < 0.05$). Similar trends were observed for cups of FV observed as well as FV consumption. *Figure 3b* shows an average of 0.53 cups of FV was selected/served on students’ trays and 0.37 cups were consumed (*Figure 3c*). Schools with one or more prior years of F2S were observed to have more cups and consumption of FV versus schools new to F2S.

Figures 3a-c. Baseline LTPO evaluation: Number, amount, and consumption of FV and by years in F2S

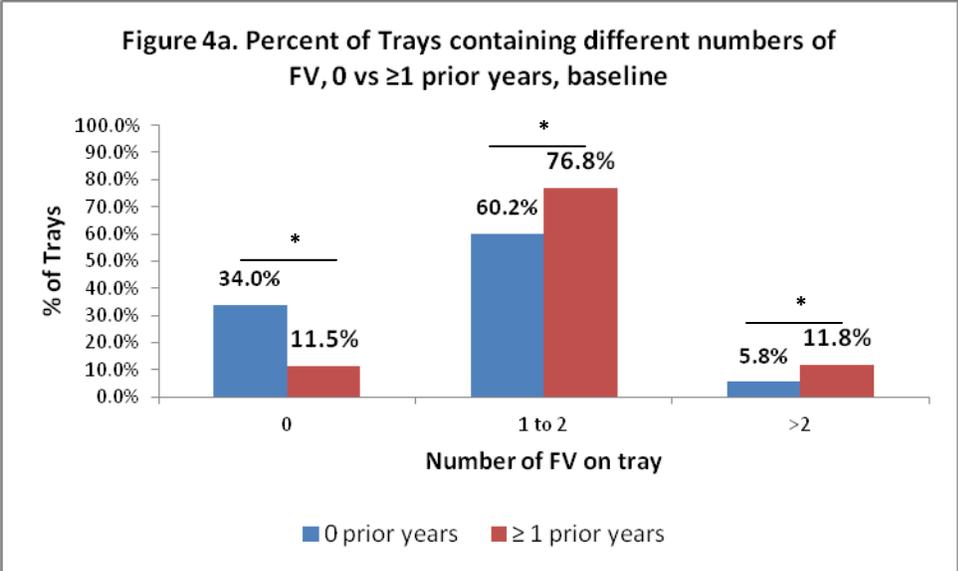


For Figures 3a-c, * with a line stretching across two or three groups signifies that the groups under the line are significantly different.

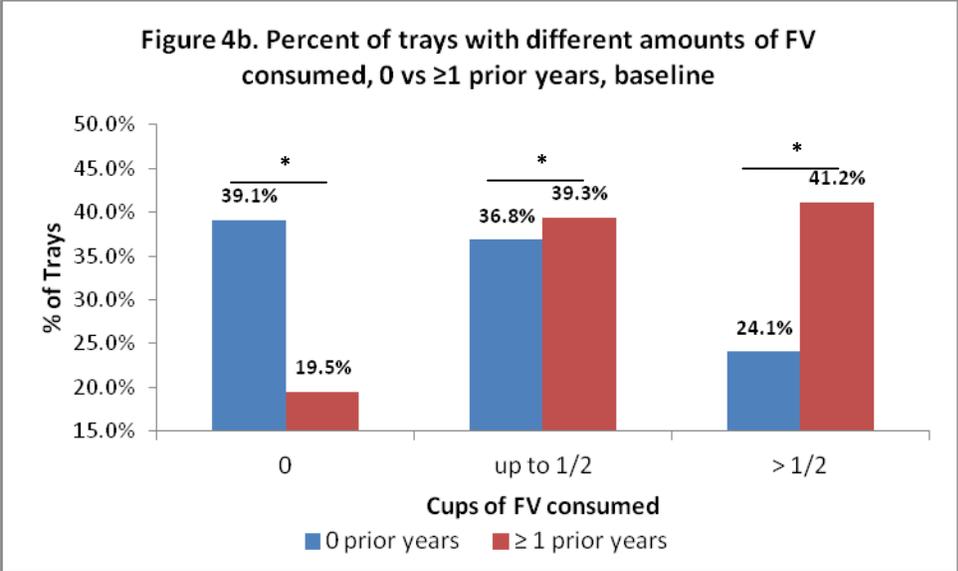




The LTPO data was further analyzed to describe the percent of trays containing different numbers of FV and by amounts consumed. *Figures 4a and 4b* show these results by previous years in F2S. *Figure 4a* shows that a higher percentage of trays from schools new to F2S had no FV (34.0%) versus trays from schools with previous F2S programming (11.5%). Likewise, a higher proportion of trays with no FV consumption (*Figure 4b*) was observed among schools new to F2S (39.1%) than among schools with one or more prior years (19.5%). Furthermore, trays showing the highest FV consumption came from schools with one or more previous years of F2S (41.2%) versus schools new to F2S (24.1%).



For Figures 4a-b, * with a line stretching across two or three groups signifies that the groups under the line are significantly different.



CONCLUSION

Results from this one year evaluation show that obesity prevalence is 23.5% among Wisconsin children in grades 3rd through 5th compared to the national average of 19.6% for 6-11 year olds.¹

Food and agriculture knowledge at baseline was relatively high, but students’ scores did improve during the 2010-2011 F2S program. Grade level was a significant factor to knowledge scores and the number of previous years in the F2S program also positively impacted scores. At baseline, Attitudes for liking, trying, and tasting FV increased as the number of years in F2S programming increased.

Attitudes scores improved from baseline to follow-up, particularly among students in schools that had participated in one or two previous years of F2S. Exposure to FV (tasting) also increased from baseline to follow-up. However, these results may not reflect actual F2S impact on FV exposure, but rather on the types of FV that were on the survey. This may be due to discrepancies between FV specified on the KA survey and FV introduced as part of the F2S-curricula. Willingness to try not-yet-eaten FV increased from baseline to follow-up.

The most significant changes regarding student knowledge and attitudes about food, agriculture and FV occurred among students in schools in their second year of F2S

programming. These results are similar to other programs promoting FV to school-aged children that also showed increases in student willingness to try new FV^{17,18} and preferences and attitudes towards trying, liking and tasting FV.¹⁸ Being willing to try FV is the first step toward liking FV, and liking FV is a step in the direction of choosing FV over energy-dense, nutrient-poor foods, which may contribute to overweight and obesity.

The LTPO baseline results show that students new to F2S have smaller amounts and less variety of FV on their lunch trays and consume less FV overall. In particular, more than twice the percent of trays among new schools have no FV and indicate no consumption of school lunch FV in comparison with schools with one or more prior years of F2S programming. The converse is also true: almost twice the percent of trays have high FV variety and consumption for schools with one or more prior years compared with new schools.

Students with at least one year of prior F2S choose a greater variety of FV and consume more than students who had zero previous years of F2S. This is most likely due to greater FV access and availability to students during lunch, resulting in selecting more FV and eating more. These results also indicate that F2S programs may have a significant impact on FV consumption among children whose diets include little or no FV.

In conclusion, results from this report indicate that Wisconsin F2S programs favorably impact third- through fifth-graders' attitudes, knowledge, and food behaviors, and that improvements were particularly observed among students in schools with one previous year of F2S programming. Improvements in student behaviors tended to increase incrementally with more years of F2S programming. This implies that F2S programs may have gradual, yet sustaining positive impacts on student health behaviors.

Future reports for the Wisconsin F2S evaluation will address baseline and follow-up changes of student behaviors including LTPO and student FV consumption, measured via food frequency questionnaires. Furthermore, future reports will examine other key objectives for the Wisconsin F2S evaluation to ascertain whether additional factors positively impact student health or school/community. These factors include F2S program activities, challenges and opportunities for implementing and sustaining F2S programs, and local economic growth.

REFERENCES

1. Ogden C, Carroll M. Prevalence of Obesity Among Children and Adolescents: United States, Trends 1963-1965 Through 2007-2008. June 2010 Health E-Stat. National Center for Chronic Disease and Health Promotion. Accessed on September 22, 2011.
2. Centers for Disease Control and Prevention. Youth Risk Behavior Surveillance. Surveillance Summaries, June 4, 2010. MMWR 2010; 59(No. SS-5)
3. Pediatric Nutrition Surveillance System. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention; 2009.
<http://www.cdc.gov/nccdphp/dnpa/pednss.htm>.
4. Office of the Surgeon General. The Surgeon General's Vision for a Healthy and Fit Nation. Rockville, MD, U.S. Department of Health and Human Services; 2010.
5. Guo SS, Chumlea WC. Tracking of body mass index in children in relation to overweight in adulthood. *American Journal of Clinical Nutrition* 1999;70:S145-148.
6. Freedman DS, Kettel L, Serdula MK, Dietz WH, Srinivasan SR, Berenson GS. The relation of childhood BMI to adult adiposity: the Bogalusa Heart Study. *Pediatrics* 2005;115:22-27.
7. Freedman D, Wang J, Thornton JC, et al. Classification of body fatness by body mass index-for-age categories among children. *Archives of Pediatric and Adolescent Medicine* 2009;163:801-811.
8. Freedman DS, Khan LK, Dietz WH, Srinivasan SA, Berenson GS. Relationship of childhood obesity to coronary heart disease risk factors in adulthood: the Bogalusa Heart Study. *Pediatrics* 2001;108:712-718.
9. Ernst ND, Obarzanek E. Child health and nutrition: Obesity and high blood cholesterol. *Prev Med* 1994;23:427-436.
10. Nicklas TA, Baranowski T, Cullen KW, Berenson G. Eating patterns, dietary quality and obesity. *J Am Coll Nutr* 2001;20:599-608.
11. Krebs-Smith SM, Cook A, Subar AF, Cleveland L, Friday J, Kahle LL. Fruit and vegetable intakes of children and adolescents in the United States. *Arch Pediatr Adolesc Med* 1996;150:81-86.
12. Centers for Disease Control and Prevention. Recommended Community Strategies and Measurements to Prevent Obesity in the United States. Surveillance Summaries, July 24, 2009. MMWR 2010; 58(RR07). Pgs. 1-26
13. Centers for Disease Control and Prevention. Strategies to Prevent Obesity and Other Chronic Diseases: The CDC Guide to Strategies to Increase the Consumption of Fruits and Vegetables. Atlanta: U.S. Department of Health and Human Services; 2010.
14. Bearing Fruit: Farm to School Evaluation Resources and Recommendations, Center for Food & Justice, Urban & Environmental Policy Institute, Occidental College,
<http://departments.oxy.edu/uepi/cfj/publications/BF%20full%20report.pdf>
15. *Farm to School Evaluation Toolkit*. Center for Health Promotion and Disease Prevention, University of North Carolina at Chapel Hill (2010). [Available online: <http://www.farmentoschool.org/publications.php?pt=eval>.].
16. *CDC Growth Charts: United States*. Atlanta, GA: Centers for Disease Control and Prevention, National Center for Health Statistics; 2000.

17. Jamelske, E., Bica, L., McCarty, D., and Meinen, A. Preliminary Findings from an Evaluation of the USDA Fresh Fruit and Vegetable Program in Wisconsin Schools. *Wisconsin Medical Journal* 2009: 107(5): 225-230.
18. Coyle, K., Potter, S., Schneider, D., May, G., Robin, L., Seymour, J., and Debrot, K. Distributing Free Fresh Fruit and Vegetables at School: Results of a Pilot Outcome Evaluation. *Public Health Reports* Sept-Oct 2009. 124: 660-669.

APPENDIX

- A F2S Characteristics and Data Collection
- B Sample Site Memorandum of Understanding
- C Weigh and Measurement Collection Form
- D Knowledge & Attitudes Survey and Construct Scoring Procedure
- E Lunch Tray Photo Observation Baseline Protocol
- F Baseline Knowledge & Attitude Constructs
- G Baseline and Follow-up Knowledge & Attitude Constructs
- H Baseline Lunch Tray Photo Observation

APPENDIX A

F2S Characteristics and Data Collection

Table 1. F2S Student and Site Characteristics

School	N	Mean age, Baseline (SD)	Gender (% Male/% Female)	Race/ Ethnicity ¹		Mean BMI percentile, Baseline (SD) ²	# Prior yrs of F2S programs
Overall	1191	9.62 (0.85)	53.13 / 46.88	80.90% C 4.48% AfAm 3.21% H	7.27% AI 1.94% AsAm 2.20% O	68.02 (28.46) 1.5% U 15.6% O 59.4% H 23.5% Ob	1.41
1	N=113 3 rd =55 4 th =57	9.10 (0.62)	46.90 / 53.1	77.88% C 6.19% AfAm 11.50% H	1.77% AI 0.00% AsAm 2.65% O	N/A	1
2	N=80 4 th =42 5 th =38	10.10 (0.65)	51.25 / 48.75	31.25% C 27.50% AfAm 12.50% H	3.75% AI 16.25% AsAm 8.75% O	64.57 (29.54) 0.0% U 14.9% O 64.9% H 20.3% Ob	2
3	N=88 3 rd =27 4 th =27 5 th =34	9.79 (0.95)	47.73 / 52.27	14.77% C 2.27% AfAm 3.41% H	73.86% AI 1.14% AsAm 4.55% O	69.67 (35.20) 6.0% U 14.5% O 36.1% H 43.4% Ob	0
4	N=171 3 rd =86 4 th =85	9.20 (0.66)	52.63 / 47.37	90.06% C 2.34% AfAm 1.17% H	2.92% AI 1.75% AsAm 1.75% O	N/A	3
5	N=223 3 rd =60 4 th =85 5 th =88	9.81 (0.88)	52.65 / 47.35	96.90% C 1.33% AfAm 0% H	1.33% AI 0% AsAm 0.44% O	N/A	0
6	N=210 3 rd =60 4 th =71 5 th =79	9.83 (0.87)	53.81 / 46.19	92.86% C 1.90% AfAm 1.90% H	0.95% AI 0.95% AsAm 1.43% O	67.82 (26.47) 0.5% U 18.6% O 64.3% H 16.7% Ob	2
7	N=88 3 rd = 24 4 th =30 5 th =34	9.89 (0.93)	53.41 / 46.59	86.21% C 0% AfAm 2.30% H	5.75% AI 1.15% AsAm 4.60% O	71.51 (25.02) 0.0% U 10.6% O 65.9% H 23.5% Ob	2
8	N=83 3 rd =26 4 th =27 5 th =30	9.86 (0.92)	57.83 / 42.17	98.8% C 0% AfAm 0% H	0% AI 0% AsAm 1.20% O	61.25 (30.91) 3.6% U 16.9% O 61.5% H 18.1% Ob	2
9	N=125 3 rd =57 4 th =68	9.34 (0.60)	60.80 / 39.20	85.80% C 8.80% AfAm 3.20% H	0% AI 2.40% AsAm 0.80% O	71.57 (25.83) 0.8% U 14.2% O 57.5% H 27.5% Ob	1

¹ C=Caucasian; AfAm=African American; H=Hispanic; AI=American Indian; AsAm=Asian American; O=Other

² U=underweight; H=healthy weight; O=overweight; Ob=Obese

Table 2. Collected Student Health Behaviors Nine Participating F2S Sites by Grade

School	N	KA Baseline	KA Follow-up	BMI Baseline	LTPO Baseline (# paired trays)
1	3 rd = 56 4 th = 57	3 rd = 52 4 th = 55	3 rd = 49 4 th = 46	Opted out	3 rd , 4 th combined = 159 (4 days, aggregate)
2	4 th = 42 5 th = 38	4 th = 35 5 th = 36	4 th = 23 5 th = 29	4 th = 39 5 th = 35	Opted out
3	3 rd = 27 4 th = 27 5 th = 34	3 rd = 0 4 th = 20 5 th = 26	3 rd = 0 4 th = 19 5 th = 29	3 rd = 26 4 th = 26 5 th = 31	4 th = 53 (4 days, individual)
4	3 rd = 86 4 th = 85	3 rd = 63 4 th = 80	3 rd = 80 4 th = 77	Opted out	4 th = 145 (3 days, grade aggregate)
5	3 rd = 86 4 th = 85 5 th = 88	3 rd = 50 4 th = 49 5 th = 70	3 rd = 48 4 th = 74 5 th = 78	Opted out	4 th , 5 th = 523 (4 days, aggregate)
6	3 rd = 60 4 th = 71 5 th = 79	3 rd = 56 4 th = 70 5 th = 75	3 rd = 55 4 th = 69 5 th = 71	3 rd = 60 4 th = 71 5 th = 79	3 rd /4 th (1 day) = 111 3 rd = 149 (3 days) 4 th = 178 (3 days) 5 th = 282 (4 days) (grade aggregate)
7	3 rd = 26 4 th = 27 5 th = 34	3 rd = 23 4 th = 29 5 th = 30	3 rd = 22 4 th = 29 5 th = 28	3 rd = 23 4 th = 29 5 th = 33	4 th = 71 (4 days, individual)
8	3 rd = 26 4 th = 27 5 th = 30	3 rd = 23 4 th = 26 5 th = 28	3 rd = 24 4 th = 26 5 th = 28	3 rd = 26 4 th = 27 5 th = 30	3 rd = 70 4 th = 92 5 th = 112 (4 days, individual)
9	3 rd = 57 4 th = 68	3 rd = 53 4 th = 63	3 rd = 53 4 th = 57	3 rd = 54 4 th = 66	3 rd = 137 4 th = 140 (4 days, grade aggregate)

Abbreviations: KA=Knowledge & Attitudes Survey; FFQ= Food Frequency Survey; BMI=Body Mass Index; LTPO=Lunch Tray Photo Observation.

APPENDIX B
Sample Site Memorandum of Understanding

University of Wisconsin—Madison: Center for Integrated Agricultural Systems

Memorandum of Agreement (MOA)

AmeriCorps Farm to School Program Evaluation

This MOA is made and entered into by and between the University of Wisconsin, Madison Center for Integrated Agricultural Systems (hereinafter called "CIAS"), and XXXX Elementary School (hereinafter called "XES").

In consideration of their mutual promises and other good and valuable consideration, CIAS and XES agree as follows:

1. PURPOSE

The purpose of this contract is to set forth the terms and conditions for the parties to help implement and carry out established evaluation protocol in conjunction with the AmeriCorps Farm to School Program. The goal of the program is to increase the availability and consumption of healthy, locally grown foods in schools.

2. SCOPE OF PROJECT; OBLIGATIONS OF PARTIES

XES agrees to provide the services as outlined on the attached proposal contained in Appendix A. Except as otherwise provided in this MOA, each party agrees to provide all necessary personnel, equipment, materials and other resources needed to complete the evaluation project.

3. ADDITIONAL TERMS AND CONDITIONS

This agreement is subject to all terms and conditions set forth in Appendix A and B, which are attached and incorporated into this contract by reference.

For XXXX Elementary School

By _____ Date _____
Name of School Administrator

For The Center for Integrated Agricultural Systems:

By _____ Date _____
Doug Wubben, Wisconsin Farm to School Specialist

Please FAX the signed Memorandum of Agreement to the University of Wisconsin—Center for Integrated Agricultural Systems:

Attention Doug Wubben; F: (608) 265-3020, dwubben@wisc.edu

Please indicate below where UW-CIAS should return the final copy of the Memorandum of Agreement to:

NAME: _____

ADDRESS: _____

EMAIL: _____

Please direct MOA inquiries to your AmeriCorps Member:

NAME	PHONE	EMAIL
------	-------	-------

APPENDIX A (MOU)
AmeriCorps Farm to School Evaluation
SCOPE OF PROJECT WORK

1. OBLIGATIONS OF PARTIES

A. The XES shall:

- Implement the Farm to School Evaluation Program tools and activities in grades 3—5 (or grades in this range housed at XES), outlined in Appendix B, in partnership with the designated Farm to School AmeriCorps Member, with oversight from the Member’s identified on-site supervisor.
- Agree to maintain the Farm to School Evaluation Program timeline and reporting schedule, outlined in Appendix B.
- Assist with the recruitment of any additional labor needed to assist the AmeriCorps Members in the timely completion of the Farm to School Evaluation Program.
- Work with identified teachers and other necessary school officials to schedule required time slots for implementing student questionnaires and other surveys.
- Agree to alert the AmeriCorps Member in a timely way if problems should arise in conjunction with the evaluation procedures.
- Agree to problem solve with Farm to School Evaluation Program experts to overcome any identified barriers during the evaluation period.
- Manage the budget of \$1,000 award to compensate evaluation efforts on the part of the school. Budget due to AmeriCorps Member by 12/1/10.

B. The UW CIAS shall:

- Provide \$1,000 Honorarium, payable to XES, to compensate for costs related to the Farm to School Evaluation Program.
- Provide guidance (not requirements) to XES on evaluation honorarium budget for successful outcome
- Provide all evaluation tools and guidance documents necessary to complete the required evaluation activities.
- Provide training and technical assistance to the AmeriCorps Member and others involved in collecting evaluation data for the Program.
- Provide back to XES summary of the completed Farm to School Evaluation. (completion date TBD)

2. EVALUATION MEASURES

For each evaluation measure, students will only be identified by an evaluation identification number. These are to be assigned per protocol by school and maintained by

only the school and AmeriCorps member. Any further handling or modification of evaluation data will only be done using identification numbers.

- Student Knowledge & Attitudes Survey
 - Online survey (paper copies available if necessary)
 - ~15-20 minutes to implement
 - Given to 3rd—5th grader students
- Block Kids' Food Frequency Questionnaire
 - Online survey
 - ~15-20 minutes to implement
 - Given to 4th grade students only
- Health Indicators
 - FitnessGram (where available) or;
 - Height, weight and birthdate (To Calculate BMI) and
 - Ethnicity
- Plate Waste Observation
 - Digital photos of cafeteria plates only
- Interviews
 - Stakeholders
 - Food Service Directors
 - Farmers
 - Student Focus Groups
- School Food Service Data

3. PROJECTED PROJECT TIMETABLE

This project will take place in the 2010-2011 academic school year.

APPENDIX B (MOU)

Farm to School Evaluation Program ADDITIONAL TERMS AND CONDITIONS

1. Reporting Requirements

- i. AmeriCorps monthly reports including descriptions and quantifications of Farm to School program activities
- ii. WI DPI claim forms of school food service information
 - Participation rates
 - Menus with local foods identified
 - Revenue and cost data to enable economic analysis
- iii. Absentee rates, 2009-10 versus 2010-2011
 - Collected from administration
- iv. Volunteer hours logged, 2010-2011
 - Collected from administration

APPENDIX C

Weight and Measurement Collection Form

Wisconsin Farm-to-School Evaluation
2010-2011

Student Demographics and Measurement

**Please be sure to have read and reviewed To Weigh and Measure prior to collecting this data.*

Student ID

--	--	--	--	--	--	--	--

Date of birth _____
mm/dd/yyyy

Today's date _____
mm/dd/yyyy

Gender Male Female

Ethnicity African-American
 Asian-American
 Caucasian
 Hispanic
 Other – please describe: _____

Measurement data:

Note: Clearly indicate if you are using measurements other than pounds and inches.
If the difference between height measurements 1 and 2 is greater than ¼ inch, re-measure.
If the difference between weight measurements is greater than ¼ pound, re-measure.

1st height: ____&____/8th inches

2nd height: ____&____/8th inches

1st weight: _____.____pounds

2nd weight: _____.____pounds

Unable to assess:

Check a reason below if measurement or student data cannot be obtained:

- Parent refused
- Physical disability
- No longer at this school
- Student refused
- Could not get two height measurements within ¼ inch or two weight measurements within ¼ pound
- Other: _____

School information: Scale make/model: _____

Last calibration date: _____

Stadiometer make/model: _____

APPENDIX D

Knowledge & Attitudes Survey and Construct Scoring Procedure

Wisconsin Farm-to-School

2010-2011

Student Survey

Welcome to the Wisconsin Farm to School Student Survey. We want to hear what you think about fruits and vegetables - thank you for helping us!

This is not a test and it will not affect your grades. Please answer every question, telling us what you really think. If you have questions you may ask your teacher or AmeriCorps member.

Student Evaluation ID:

--	--	--	--	--	--	--	--

Today's date: _____
month / day / year

What is your gender? Male Female

What ethnic group do you belong to?

- African-American
- Asian-American
- Caucasian
- Hispanic
- Other – please describe: _____

What is your birthdate?

Month: _____

Day: _____

Year: _____

Please tell how you feel about fruit.

- | | a lot | a little | not very much | not at all |
|---|--------------------------|--------------------------|--------------------------|--------------------------|
| 1 How much do you like fruit ? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2 When you try a new fruit for the first time, how much do you usually like it? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 3 How much do you like tasting new fruits ? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Please tell how you feel about tasting new fruit.

- | | definitely | probably | probably | definitely |
|---|--------------------------|--------------------------|--------------------------|--------------------------|
| | | | not | not |
| 4 Will you taste a fruit if you don't know what it is? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 5 Will you taste a fruit if it looks strange? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 6 Will you taste a fruit if you have never tasted it before? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 7 When you are at a friend's house , will you try a new fruit ? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 8 When you are at school , will you try a new fruit ? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 9 When you are at home , will you try a new fruit ? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

- | | Never | 1 time | 2 times | 3 times | at least 4 times |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 10 How many times have you tried a new fruit since school started this year? | <input type="checkbox"/> |

Please tell how you feel about vegetables.

- | | a lot | a little | not very
much | not at all |
|--|--------------------------|--------------------------|--------------------------|--------------------------|
| 11 How much do you like vegetables ? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 12 When you try a new vegetable for the first time, how much do you usually like it? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 13 How much do you like tasting new vegetables ? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Please tell how you feel about tasting new vegetables.

- | | definitely | probably | probably | definitely |
|--|--------------------------|--------------------------|--------------------------|--------------------------|
| | | | not | not |
| 14 Will you taste a vegetable if you don't know what it is? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 15 Will you taste a vegetable if it looks strange? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 16 Will you taste a vegetable if you have never tasted it before? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 17 When you are at a friend's house , will you try a new vegetable ? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 18 When you are at school , will you try a new vegetable ? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 19 When you are at home , will you try a new vegetable ? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

- | | Never | 1 time | 2 times | 3 times | at least 4
times |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 20 How many times have you tried a new vegetable since school started this year? | <input type="checkbox"/> |

21. How many times in your life have you been to a farm?

- Never
- 1 time
- 2 times
- 3 times
- 4 times or more

22. How do tomatoes grow? *Please check one.*

- As plants
- As animals
- As minerals
- Something else

23. What part of a plant is a carrot? *Please check one.*

- Leaf
- Root
- Stalk
- Flower

24. Where do eggs come from? *Please check one.*

- Cows
- Goats
- Chickens
- Something else

25. What is a benefit of using compost?

- Compost feeds wild animals.
- Makes farmers use more chemical fertilizers.
- Compost keeps food out of landfills.
- None of the above.

26. Do insects play an important role in growing plants?

- Yes
- No
- I don't know

27. Do TOMATOES grow in Wisconsin?

- Yes
- No
- I don't know

28. Do ORANGES grow in Wisconsin?

- Yes
- No
- I don't know

29. Do APPLES grow in Wisconsin?

- Yes
- No
- I don't know

30. Does SQUASH grow in Wisconsin?

- Yes
- No
- I don't know

31. Do BANANAS grow in Wisconsin?

- Yes
- No
- I don't know

32. Imagine a meal with a hotdog in a bun and a glass of milk. What food group is missing?

Please check one.

- Dairy
- Fruits & Vegetables
- Meat
- Grains

33. What food group does the pear belong to? Please check one.

- Dairy
- Fruits & Vegetables
- Meat
- Grains

34. Why do I need to eat food?

- I need food for energy and to grow.
- I need food **ONLY** because it tastes good.
- I don't need food.
- I don't know.

35. Why do I need to eat different kinds of foods?

- I can get a lot of the **SAME** nutrients.
- I can get many **DIFFERENT** nutrients.
- I don't need to eat different kinds of food.
- I don't know.

36. Healthy eating is:

- eating fruits but **not** vegetables.
- not** eating fruits or vegetables.
- eating **both** fruits **and** vegetables.
- I don't know.

37. The foods that I eat for meals and snacks are healthy. (Choose one.)

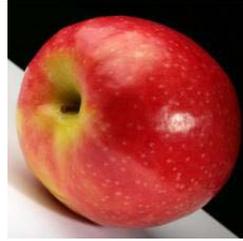
- Yes, all of the time
- Yes, sometimes
- No

38. How likely are you to eat fresh fruit instead of candy? (Choose one.)

- Not likely
- Likely
- Very Likely

39. Have you ever eaten an apple?

- Yes** Did you like it? yes no
- No** Would you try one?
- yes
- no
- maybe



40. Have you ever eaten an orange?

- Yes** Did you like it? yes no
- No** Would you try one?
- yes
- no
- maybe



41. Have you ever eaten watermelon?

- Yes** Did you like it? yes no
- No** Would you try one?
- yes
- no
- maybe



42. Have you ever eaten a pear?

- Yes** Did you like it? yes no
- No** Would you try one?
- yes
- no
- maybe



43. Have you ever eaten a kiwi?

- Yes** Did you like it? yes no
- No** Would you try one?
- yes
- no
- maybe



44. Have you ever eaten a strawberry?

- Yes** Did you like it? yes no
- No** Would you try one?
- yes
- no
- maybe



45. Have you ever eaten a blueberry?

- Yes** Did you like it? yes no
- No** Would you try one?
- yes
- no
- maybe



46. Have you ever eaten cantaloupe?

- Yes** Did you like it? yes no
- No** Would you try one?
- yes
- no
- maybe



47. Have you ever eaten a grape?

- Yes** Did you like it? yes no
- No** Would you try one?
- yes
- no
- maybe



48. Have you ever eaten a cranberry?

- Yes** Did you like it? yes no
- No** Would you try one?
- yes
- no
- maybe



49. Have you ever eaten asparagus?

- Yes** Did you like it? yes no
- No** Would you try one?
- yes
- no
- maybe



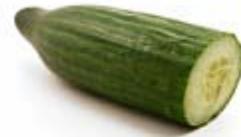
50. Have you ever eaten broccoli?

- Yes** Did you like it? yes no
- No** Would you try one?
- yes
- no
- maybe



51. Have you ever eaten a cucumber?

- Yes** Did you like it? yes no
- No** Would you try one?
- yes
- no
- maybe



52. Have you ever eaten a green pepper?

- Yes** Did you like it? yes no
- No** Would you try one?
- yes
- no
- maybe



53. Have you ever eaten a sweet potato?

- Yes** Did you like it? yes no
- No** Would you try one?
- yes
- no
- maybe



54. Have you ever eaten peas?

- Yes** Did you like it? yes no
- No** Would you try one?
- yes
- no
- maybe



55. Have you ever eaten spinach?

- Yes** Did you like it? yes no
- No** Would you try one?
- yes
- no
- maybe



56. Have you ever eaten green beans?

- Yes** Did you like it? yes no
- No** Would you try one?
- yes
- no
- maybe



57. Have you ever eaten avocado?

- Yes** Did you like it? yes no
- No** Would you try one?
- yes
- no
- maybe



58. Have you ever eaten a tomato?

- Yes** Did you like it? yes no
- No** Would you try one?
- yes
- no
- maybe



59. Have you ever eaten a carrot?

- Yes** Did you like it? yes no
- No** Would you try one?
- yes
- no
- maybe



60. Have you ever eaten a radish?

- Yes** Did you like it? yes no
- No** Would you try one?
- yes
- no
- maybe



Thank you for taking the time to complete this survey!

Knowledge and Attitudes Survey Scoring Procedure

Six constructs from the Knowledge and Attitudes (KA) survey were measured from students' responses.

- 1) Knowledge (questions 21-36, 15 questions): Fifteen questions focused on material typically covered in the curricula used by AmeriCorps F2S members. Correct responses received a score of 1, and incorrect answers received a score of 0. Students who selected *I don't know*, when it was a response option, received a score of 0. Scores ranged from 0 to maximum of 15.

$$\text{Knowledge} = \sum (\text{correct responses, Q22-36})$$

- 2) Attitudes (questions 1-20): Six questions ask how much a student likes FV and how much a student likes *new* FV. Response options included *a lot* (score = 4), *a little, not very much*, or *not at all* (score= 1). Twelve questions asked a student how willing he/she is to try a FV in a variety of situations, with a response scale ranging from *definitely* (score = 4) to *definitely not* (score = 1). Finally, two questions asked how many times a student had tried a new FV since the start of the school year, with a response scale ranging from *never* (score= 1) to *at least 4 times* (score= 5). The total *Attitudes* score summed the values for the 20 questions, with a possible score range from 20 to 82.

$$\text{Attitudes} = \sum (\text{scored responses, Q1-20})$$

- 3) Perception/Self-efficacy (questions 37-38): Two questions asked students' perception of their own diets – whether the foods they eat are healthy: *yes, all the time* (score = 2), *yes, sometimes* (score= 1), or *no* (score= 0); and whether they are likely to eat fresh fruit instead of candy: *very likely* (score=2), *likely* (score = 1), or *not likely* (score= 0). Possible scores are 0 to a maximum of 4.

$$\text{Perception/self efficacy} = \sum (\text{scored responses, Q37-38})$$

- 4) Exposure (questions 39-60, part 1a): 22 questions asked if a student had tried particular FV. (In the final scoring, two foods were omitted (broccoli, asparagus) due to

discrepancies between the paper and electronic versions of the survey as well as an error in the electronic version.) Each question included a photograph of the food to aid with recognition. *Yes* responses (score=1) were summed to create the Exposure construct score; *no* responses scored 0. The response to the Exposure question then led to either a Liking (if the response was *yes*) or Willingness (if the response was *no*) follow-up question. Exposure scores ranged from 0 to 20.

$$Exposure = \sum (\text{yes' responses, Q39-60 parts a})$$

- 5) Liking (questions 39-60, part b): Among the previously FV, students were asked whether they liked it (*yes/no* response options; *yes*=score 1). The sum of *yes* responses were divided by the total number of F/V the student tried (=the Exposure score) and represented as a percentage. The likeness scores ranged from 0 to 100.

$$Liking = \frac{\sum (\text{yes' responses, Q39-60, parts b})}{Exposure\ score}$$

- 6) Willingness (questions 39-60, part c): Among the FV reported in the Exposure questions to have not been previously eaten, students were asked whether they would try it. Response options were *yes* (score= 2), *maybe* (score =1), and *no* (score= 0). The sum of responses were divided by twice the number of *no* responses to Exposure questions (or 20-Exposure score, x 2; because students could score up to two points per Willingness question asked) and reported as a percentage. The willingness scores ranged from 0 to 100.

$$Willingness = \frac{\sum (\text{scored responses, Q39-60, parts c})}{2 \times (20-Exposure\ score)}$$

$$2 \times (20-Exposure\ score)$$

APPENDIX E

Lunch Tray Photo Observation – Baseline Protocol (Fall 2010)

Digital photography will assess fruit and vegetable consumption in third- through fifth-grade students at schools participating in F2S, both at the beginning and the end of the 2010-2011 school year, for four consecutive days each time (Tuesday through Friday) in order to obtain a wide variety of menus and consistency. If possible, the menus should be the same in the fall and spring to reduce variability, but it is not mandatory.

AmeriCorps Members should engage 1-3 volunteers (depending on the number of students being observed) to help take photographs of “before” and “after” school lunch trays each day (preferably the same volunteers each day, but that is not mandatory). Each volunteer should use their own digital camera that has the capability to directly upload to a computer immediately following the observation day (a total of 4 digital cameras are likely to be needed, depending on the size of the memory card; batteries should be new or freshly charged, and extras should be available just in case). At least one previous study has found this method to not disrupt the school cafeteria setting, and analysts’ estimations of consumption levels agreed with each other well (1).

On Site:

1. AmeriCorps Member will provide large (2 to 3 inches in diameter) stickers:

- color-coded by grade: 3rd grade = red, 4th grade = blue, 5th grade = yellow
- pre-numbered (1 through xx) so that there is one for each student eating a school lunch
- It would be ideal if each child had the same number each day (for example, alphabetical order) but it is not mandatory. (Please indicate this to the evaluation team if you manage it, especially if you can correspond it specifically to a student evaluation ID number both in the fall and in the spring.)

2. Either (a) In classrooms prior to lunch, teachers will place stickers on students' wrists, palm-side *and instruct all students to be sure they dump their own trays when they have finished eating.*
or (b) Trays will be labeled in advance by AmeriCorps members and/or volunteers with numbered, color-coded dots or tape (labeled as described in #1 above) that will dissolve in the school dishwasher.
3. Digital photographs should be taken from a height of approximately 16 inches above the tray and at approximately a 45° angle.
 - a) As students exit the lunch line, volunteers will take a digital photograph of each "before" tray, with the student's wrist and sticker showing (no faces).
 - b) Just before students dump their tray at the end of the meal, volunteers will take a digital photograph of the "after" tray with the student's wrist and sticker showing (no faces).
 - (i) Adjustments may need to be made to differentiate between eaten and uneaten portions, for example orange peels remaining versus uneaten orange slices ought to be clearly distinguishable. The photographers may ask the children to move the food themselves, or the photographers may wear gloves and adjust the layout themselves.
 - (ii) If time constraints do not allow for "after" photos **and** if lunch trays are disposable (stickers can be placed directly on the trays), students may leave trays on the table for photographs to be taken after children have left the cafeteria.
4. Volunteers and AmeriCorps Member will upload digital photos to computer (or directly to Dropbox – see # 5) to clear cameras for the next day.
5. The AmeriCorps Member will subsequently upload all photos to the appropriate Dropbox folder (specific to school and day; separate by camera if possible) to submit to the evaluation team.
6. AmeriCorps Member will provide notes and observations to the evaluation team, such as:
 - a) any problems that arose during data collection (photography slowing the serving line, or students disposing of trays prior to photography)
 - b) cameras used (make, model, year)
 - c) whether or not students received same numbers for ID sticker each day

- d) whether or not sticker numbers correspond exactly to an evaluation ID each day
- e) any other observations that you think may be helpful for analysis and interpretation.

Evaluation:

1. Evaluation team will receive school menus as part of monthly data collection from school food service directors.
2. Evaluation team will match “before” and “after” trays according to grade color and number, and compare to visually estimate the percent of each fruit and vegetable consumed (to the nearest 10% increment), and enter data into the appropriate spreadsheet.

The ideal data collection is for each participating school to take “before” and “after” photographs of school lunch trays:

- *for all third through fifth graders*
- *on four consecutive days (see timeline)*
- *by AmeriCorps member plus 3 volunteers each day, with volunteer/borrowed digital cameras.*

If volunteers are not available, we will leave it up to the AmeriCorps member to decide how many grades are possible (target 5th grade first, then add 4th grade, then add 3rd grade). It is intended that the same groups are photographed both in the fall and in the spring.

Reference:

Swanson, M. (2008) Digital Photography as a Tool to Measure School Cafeteria Consumption. J School Health, 78(8): 432-437.

APPENDIX F
Baseline Knowledge & Attitude Constructs

Table 3. Baseline Knowledge and Attitude Constructs by Previous Years in F2S

KA Construct	Group	N, Baseline	Baseline Mean (SD or SE) [‡]	p for model [*]
Knowledge	Full sample	1012	11.63 (2.12)	<0.0001 [*]
	Previous years in F2S[†]: 0	215 (of 321)	11.82 (0.14) ^a	
	1	223 (of 238)	11.11 (0.14) ^{a,b}	
	≥ 2	574 (of 632)	11.77 (0.08) ^b	
Attitudes	Full sample	1013	59.60 (11.53)	<0.0001 [*]
	Previous years in F2S[†]: 0	215 (of 321)	55.76 (0.79) ^a	
	1	223 (of 238)	58.97 (0.79) ^a	
	≥ 2	575 (of 632)	61.28 (0.78) ^a	
Perception/ Self-efficacy	Full sample	1012	2.30 (0.82)	0.0333 [*]
	Previous years in F2S[†]: 0	215 (of 321)	2.26 (0.06)	
	1	223 (of 238)	2.26 (0.06)	
	≥ 2	574 (of 632)	2.33 (0.03)	
Exposure	Full sample	1009	16.63 (3.34)	<0.0001 [*]
	Previous years in F2S[†]: 0	215 (of 321)	16.10 (0.23) ^a	
	1	222 (of 238)	16.12 (0.23) ^b	
	≥ 2	572 (of 632)	17.03 (0.14) ^{a,b}	
Liking	Full sample	1009	81.64 (15.45)	0.8558 [*]
	Previous years in F2S[†]: 0	215 (of 321)	83.97 (1.07) ^{a,b}	
	1	222 (of 238)	80.13 (1.07) ^a	
	≥ 2	572 (of 632)	81.35 (0.65) ^b	
Willingness	Full sample	798	45.53 (31.19)	0.0171 [*]
	Previous years in F2S[†]: 0	177 (of 321)	43.73 (2.39)	
	1	196 (of 238)	47.88 (2.31)	
	≥ 2	425 (of 632)	45.20 (1.53)	

[†] Differences tested by PROC TTEST.

^{*} Means according to Previous years in F2S and significance calculated using PROC MIXED, controlling for Grade and Baseline construct score, and treating School as a random effect.

[‡]SD used for simple means; SE presented for mixed models data.

^{a, b, c, d, ...} Pairwise differences were evaluated using PROC MIXED with Tukey's adjustment for multiple comparisons. Significant differences ($p < 0.05$) within each KA construct are indicated by matching superscripts.

APPENDIX G
Baseline and Follow-up Knowledge & Attitude Constructs

Table 4. Baseline and Follow-up Knowledge and Attitude Constructs by Previous Years in F2S

KA Construct	Group	N, Baseline	Baseline Mean (SD or SE) [‡]	N, Follow-up	Follow-up Mean (SD or SE) [‡]	Difference (SD or SE) [‡]	p
Knowledge	Full sample	1012	11.63 (2.12)	1012	12.22 (2.17)		
	Matched pairs	894	11.66 (2.09)	894	12.23 (2.18)	0.56 (2.10)	<0.0001*
	<i>Previous years in F2S⁺: 0</i>	186	11.82 (0.14) ^a	186	11.95 (0.14) ^{ab}	0.28 (0.14) ^a	
	1	193	11.11 (0.14) ^{a,b}	193	12.69 (0.14) ^a	1.02 (0.14) ^{a,b}	
	≥ 2	515	11.77 (0.08) ^b	515	12.16 (0.08) ^b	0.49 (0.08) ^b	
Attitudes	Full sample	1013	59.60 (11.53)	1014	61.08 (11.63)		
	Matched pairs	897	59.33 (11.47)	897	61.12 (11.69)	1.79 (9.97)	<0.0001*
	<i>Previous years in F2S⁺: 0</i>	187	55.76 (0.79) ^a	187	59.14 (0.67) ^{a,b}	-0.18 (0.67) ^{a,b}	
	1	192	58.97 (0.79) ^a	192	61.82 (0.67) ^a	2.49 (0.67) ^a	
	≥ 2	518	61.28 (0.78) ^a	518	61.58 (0.40) ^b	2.25 (0.40) ^b	
Perception/ Self-efficacy	Full sample	1012	2.30 (0.82)	1011	2.25 (0.87)		
	Matched pairs	893	2.32 (0.82)	893	2.25 (0.86)	-0.07 (0.99)	0.0333*
	<i>Previous years in F2S⁺: 0</i>	186	2.26 (0.06)	186	2.11 (0.06) ^a	-0.20 (0.06) ^a	
	1	192	2.26 (0.06)	192	2.34 (0.06) ^a	0.02 (0.06) ^a	
	≥ 2	515	2.33 (0.03)	515	2.26 (0.04)	-0.05 (0.04)	
Exposure	Full sample	1009	16.63 (3.34)	1009	17.15 (3.14)		
	Matched pairs	889	16.59 (3.39)	889	17.16 (3.12)	0.57 (2.13)	<0.0001*
	<i>Previous years in F2S⁺: 0</i>	184	16.10 (0.23) ^a	184	16.83 (0.14) ^a	0.25 (0.14) ^a	
	1	192	16.12 (0.23) ^b	192	17.46 (0.14) ^a	0.87 (0.14) ^a	
	≥ 2	513	17.03 (0.14) ^{a,b}	513	17.17 (0.09)	0.58 (0.09)	
Liking	Full sample	1009	81.64 (15.45)	1009	81.54 (15.90)		
	Matched pairs	889	81.36 (15.53)	889	81.28 (16.05)	-0.08 (13.31)	0.8558*
	<i>Previous years in F2S⁺: 0</i>	184	83.97 (1.07) ^{a,b}	184	79.36 (0.93) ^a	-2.00 (0.93) ^a	
	1	192	80.13 (1.07) ^a	192	81.14 (0.92)	-0.22 (0.92)	
	≥ 2	513	81.35 (0.65) ^b	513	82.02 (0.54) ^a	0.66 (0.54) ^a	
Willingness	Full sample	798	45.53 (31.19)	748	46.98 (31.71)		
	Matched pairs	609	43.68 (31.08)	609	46.68 (31.09)	3.00 (30.98)	0.0171*
	<i>Previous years in F2S⁺: 0</i>	136	43.73 (2.39)	136	42.09 (2.35) ^a	-1.59 (2.35) ^a	
	1	144	47.88 (2.31)	144	50.05 (2.31) ^a	6.37 (2.31) ^a	
	≥ 2	329	45.20 (1.53)	329	47.10 (1.48)	3.42 (1.48)	

[†]Differences tested by PROC TTEST.

[‡] Means according to Previous years in F2S and significance calculated using PROC MIXED, controlling for Grade and Baseline construct score, and treating School as a random effect.

[§]SD used for simple means; SE presented for mixed models data.

^{a, b, c, d, ...} Pairwise differences were evaluated using PROC MIXED with Tukey's adjustment for multiple comparisons. Significant differences (p <0.05) within each KA construct are indicated by matching superscripts.

APPENDIX H

Baseline Lunch Tray Photo Observation

Table 5. LTPO by FV Variety, Cups and Consumption by Previous Years in F2S

Group	N (# of paired trays)	Variety of FV on tray (selected/served) (SD or SE ^y) ⁺	N (# of paired trays)	Amount of FV on tray (selected/served), cups (SD or SE ^y) ⁺	N (# of paired trays)	Amount of FV consumed from tray, cups (SD or SE ^y) ⁺
All	2214	1.36 (0.92)	2213	0.53 (0.43)	2214	0.37 (0.36)
Previous Years in F2S:						
0	573	0.91 (0.04) ^a		0.41 (0.02) ^a		0.35 (0.01) ^a
≥1	1641	1.52 (0.02) ^a		0.57 (0.01) ^a		0.38 (0.01) ^a

⁺ Differences tested by PROC TTEST.

⁺ LS Means according to Previous years in F2S and significance calculated using PROC MIXED, controlling for Grade, and treating School as a random effect. Additionally, consumption values were calculated while controlling for the starting amount of FV on tray.

^ySD used for simple means; SE presented for mixed models data.

^{a, b, c, d, ...} Pairwise differences were evaluated using PROC MIXED with Tukey's adjustment for multiple comparisons. Significant differences ($p < 0.05$) within each variable are indicated by matching superscripts.

Table 6. LTPO: Percent of Trays by FV Variety and Consumption by Previous Years in F2S

	0 prior yrs F2S		≥ 1 prior yrs F2S		p^1
	N (# trays)	% of trays	N (#trays)	% of trays	
Number of Fruits/vegetables selected					<0.0001
0	195	34.03	188	11.46	statistic = 142.5890 on 2 df
1-2	345	60.21	1260	76.78	
>2	33	5.76	193	11.76	
Total cups of Fruits/vegetables consumed from lunch tray					<0.0001
0	224	39.09	321	19.56	statistic = 96.5323 on 2 df
>0, <1/2	211	36.82	648	39.49	
≥1/2	138	24.08	672	40.95	

¹ p value calculated using the Likelihood Ratio Chi-Square Test.

Table 7. LTPO: T-tests to compare 0 and ≥ 1 Previous Years in F2S

	Mean (SD), 0 prior years	Mean (SD), ≥ 1 prior years	Difference (SD)	p
FV variety	0.99 (0.90)	1.50 (0.89)	-0.51 (0.90)	<0.0001
FV cups selected/ on tray	0.40 (0.42)	0.57 (0.42)	-0.17 (0.42)	<0.0001
FV cups consumed	0.27 (0.30)	0.41 (0.37)	-0.14 (0.35)	<0.0001

Unadjusted means.