Impact Evaluation of the Fresh Fruit and Vegetable Program with Michigan Harvest of the Month in Schools (Grades K-8)

Prepared for the

Michigan Fitness Foundation

by

The Public Health Institute

November 12, 2014

Principle Report Author: Angie Jo Keihner, MS

Acknowledgements: We thank the Michigan Fitness Foundation staff members Dr. Marci Scott, PhD, RD; Sarah Jones, MS, RD; and Jaime Rahrig, RD for their guidance, coordination and feedback. We also thank Public Health Institute staff Barbara MkNelly, MS; Suzanne Ryan-Ibarra, MS, MPH; Danielle Ewing, MPH; and Sharon Sugerman, MS, RD, FADA for their guidance and feedback.

Funded in part by U.S. Department of Agriculture Supplemental Nutrition Assistance Program (SNAP) through the State of Michigan and the Michigan Fitness Foundation. These institutions are equal opportunity providers and employers. For food help contact the toll free Michigan Food Assistance Program Hotline: (855) ASK-MICH.

TABLE OF CONTENTS

EXECUTIVE SUMMARY 6
INTRODUCTION 8
METHODS 10
FINDINGS 16
STUDENT SURVEY 20
PARENT SURVEY 31
TEACHER SURVEY 34
FRESH FRUIT AND VEGETABLE PROGRAM ADMINISTRATOR SURVEY 48
ENVIRONMENTAL ASSESSMENT TOOL 52
STUDY STRENGTHS AND LIMITATIONS 62
CONCLUSIONS AND RECOMMENDATIONS 64
REFERENCES 66

TABLE LISTING

TABLE 1: SCHOOL RECRUITMENT 11
TABLE 2: TEACHER RECRUITMENT 12
TABLE 3: CHARACTERISTICS OF SCHOOLS IN THE INTERVENTION AND CONTROL GROUPS 17
TABLE 4: STUDENT RECRUITMENT AND PARTICIPATION 18
TABLE 5: CHARACTERISTICS OF 4TH AND 5TH GRADE STUDENTS INCLUDED IN THE INTERVENTION AND CONTROL GROUPS 19
TABLE 6: FRUIT AND VEGETABLE CONSUMPTION (TIMES/YESTERDAY) AT BASELINE AND FOLLOW-UP 20
TABLE 7: PEER AND SOCIAL NORMS, PERCEIVED MODELING, INTENTIONS, AND LIKING FOR FRUIT, MEAN SCORE . 22
TABLE 7A: PEER AND SOCIAL NORMS, PERCEIVED MODELING, INTENTIONS, AND LIKING FOR FRUIT, PERCENT WHO REPORT AGREEING 23
TABLE 8: PEER AND SOCIAL NORMS, PERCEIVED MODELING, INTENTIONS, AND LIKING FOR VEGETABLES, MEAN SCORE 24
TABLE 8A: PEER AND SOCIAL NORMS, PERCEIVED MODELING, INTENTIONS AND LIKING FOR VEGETABLES, PERCENT WHO REPORT AGREEING 25
TABLE 9: PREFERENCES FOR FRUITS AND VEGETABLES, MEAN SCORE 26
TABLE 10: FRUIT AND VEGETABLE AVAILABILITY AT HOME, MEAN SCORE 27
TABLE 10A: FRUIT AND VEGETABLE AVAILABILITY AT HOME, PERCENT REPORTING ALWAYS 27
TABLE 11: FRUITS AND VEGETABLES READY-TO-EAT FOR SNACKS AT HOME, MEAN SCORE 28
TABLE 11A: FRUITS AND VEGETABLES READY-TO-EAT FOR SNACKS AT HOME, PERCENT REPORTING EVERY DAY 28
TABLE 12: FRUIT AND VEGETABLE BEHAVIORS AT HOME, PERCENT REPORTING YES 30
TABLE 13: CHILD FRUIT AND VEGETABLE BEHAVIORS AT HOME REPORTED BY PARENTS 31
TABLE 14: PERSONAL FRUIT AND VEGETABLE BEHAVIORS AT HOME REPORTED BY PARENTS 32
TABLE 14A: HOUSEHOLD FRUIT AND VEGETABLE BEHAVIOR CHANGES REPORTED BY PARENTS 33
TABLE 15: USE OF THE MIHOTM FAMILY NEWSLETTER REPORTED BY PARENTS 33
TABLE 16: NUMBER OF MINUTES PER MONTH TEACHERS SPEND USING THE MIHOTM MATERIALS WITH THEIR CLASS 35
TABLE 17: NUMBER OF TEACHERS USING MIHOTM ACTIVITIES FROM THE EDUCATOR NEWSLETTER AND AVERAGE NUMBER OF FEATURED PRODUCE USED FOR EACH ACTIVITY 36
TABLE 18: NUMBER OF TEACHERS FEATURING MIHOTM PRODUCE AND AVERAGE NUMBER OF ACTIVITIES IMPLEMENTED FOR EACH FEATURED PRODUCE ITEM 37
TABLE 19: NUMBER OF TEACHERS DISTRIBUTING THE MIHOTM FAMILY NEWSLETTER FOR STUDENTS TO TAKE HOME 37
TABLE 20: MIHOTM MATERIALS THAT TEACHERS REPORTED USING IN THEIR CLASS 38
TABLE 21: NUMBER OF MINUTES PER MONTH TEACHERS SPEND USING OTHER NUTRITION EDUCATION MATERIALS WITH THEIR CLASS 38
TABLE 22: LEVEL OF CONFIDENCE WITH THE MIHOTM PROGRAM AND RESOURCES REPORTED BY INTERVENTION TEACHERS 41
TABLE 23: LEVEL OF SATISFACTION WITH THE MIHOTM MATERIALS REPORTED BY INTERVENTION TEACHERS 41
TABLE 24: CHALLENGES WITH IMPLEMENTING MIHOTM REPORTED BY INTERVENTION TEACHERS 42

TABLE 25: DESCRIPTION OF TEACHER OR SCHOOL POLICY TO GUIDE THE TYPES OF FOODS AND BEVERAGES GIVEN TO SCHOOL STUDENTS AT CLASS CELEBRATIONS TO ENCOURAGE HEALTHY OPTIONS 44
TABLE 26: DESCRIPTION OF HOW TEACHERS ENCOURAGE PARENTS TO BRING FRUITS AND VEGETABLES FOR CLASS CELEBRATIONS 44
TABLE 27: ENCOURAGING STUDENTS TO BRING FRUITS AND VEGETABLES AS CLASSROOM SNACKS 45
TABLE 28: PROVIDING FOODS OR BEVERAGES TO REWARD STUDENTS OR THE CLASS 45
TABLE 29: DESCRIPTION OF THE FOODS OR BEVERAGES THAT TEACHERS GIVE TO STUDENTS OR THEIR CLASS AS REWARDS 46
TABLE 30: SCHOOLS WITH A FRUIT OR VEGETABLE GARDEN THAT STUDENTS CAN USE 46
TABLE 31: SCHOOL DISTRICTS OR SCHOOLS WITH AN ONGOING SCHOOL WELLNESS COMMITTEE THAT MAKES NUTRITION OR EXERCISE RECOMMENDATIONS FOR STUDENTS 47
TABLE 32: DESCRIPTION OF OTHER NUTRITION EDUCATION AND PHYSICAL ACTIVITY PROMOTION MATERIALS THAT MFF COULD PROVIDE TO ENCOURAGE KIDS TO BE MORE ACTIVE AND EAT MORE FRUITS AND VEGETABLES 47
TABLE 33: ROLES FFVP ADMINISTRATORS PLAY IN THE GRANT IMPLEMENTATION 48
TABLE 34: NUMBER OF ADMINISTRATORS REPORTING THAT SCHOOLS SERVE THE MIHOTM FEATURED PRODUCE AS THE FFVP SNACK 50
TABLE 35: NUMBER OF TIMES EACH MIHOTM FEATURED PRODUCE WAS SERVED AS THE FFVP SNACK DURING THE SCHOOL YEAR 50
TABLE 36: NUMBER OF SCHOOLS THAT HAVE A SALAD BAR 52
TABLE 37: NUMBER OF DAYS PER WEEK THE STUDENTS WERE OFFERED THE SALAD BAR 52
TABLE 38: LOCATION WHERE THE FFVP SNACK WAS SERVED TO STUDENTS 53
TABLE 39: TYPE OF STAFF SUPPORT FOR SERVING THE FFVP SNACK TO STUDENTS 53
TABLE 40: NUMBER OF SCHOOLS WHERE SCHOOL PERSONNEL ENCOURAGE STUDENTS TO EAT THE FVVP SNACKS 54
TABLE 41: NUMBER OF SCHOOLS WHERE SCHOOL PERSONNEL ENCOURAGE STUDENTS TO EAT FRUITS AND VEGETABLES IN THE LUNCH LINE 54
TABLE 42: NUMBER OF SCHOOLS WHERE SCHOOL PERSONNEL ENCOURAGE STUDENTS TO EAT FRUITS AND VEGETABLES AT LUNCH TABLES 54
TABLE 43: NUMBER OF SCHOOLS THAT PROVIDE FRUIT AND VEGETABLE TASTE TESTING IN THE CAFETERIA 55
TABLE 44: NUMBER OF SCHOOLS WITH A SCHOOL GARDEN THAT GROWS FRUITS AND VEGETABLES 55
TABLE 45: NUMBER OF SCHOOLS WITH A SCHOOL FOOD SERVICE DEPARTMENT ACTIVELY INVOLVED IN THE PLANNING AND DELIVERY OF NUTRITION EDUCATION 55
TABLE 46: NUMBER OF SCHOOLS THAT PROMOTED THE MIHOTM FEATURED FRUITS AND VEGETABLES OTHER THAN THE NUTRITION EDUCATION DONE BY TEACHERS IN THE CLASSROOM 56
TABLE 47: NUMBER OF SCHOOLS THAT IMPLEMENTED SMARTER LUNCHROOM STRATEGIES IN THE CAFETERIA 57
TABLE 48: NUMBER OF SCHOOLS WITH A SCHOOL WELLNESS COMMITTEE ENGAGED IN MAKING NUTRITION RECOMMENDATIONS FOR STUDENTS 58
TABLE 49: NUMBER OF SCHOOLS THAT IMPLEMENTED NUTRITION-RELATED RECOMMENDATIONS FOR FRUITS AND VEGETABLES IN THE SCHOOL WELLNESS POLICY 58
TABLE 50: NUMBER OF SCHOOLS WITH DINING AREA NUTRITION PROMOTIONS 59
TABLE 51: NUMBER OF SCHOOLS WITH NON-DINING AREA NUTRITION PROMOTIONS 60
TABLE 52: NUMBER OF SCHOOLS WITH BRAND NAME PROMOTIONS OR ADVERTISING IN THE NON-DINING AREAS 61

Executive Summary

Background. The Michigan Fitness Foundation (MFF) is collaborating with the Michigan Department of Education in Fresh Fruit and Vegetable Program (FFVP) school sites to implement the Michigan Harvest of the Month (MiHOTM) program. The MiHOTM and FFVP snack intervention aims to coordinate the delivery of the FFVP snack with nutrition education in schools to increase fruit and vegetable (FV) intake among children in order to promote healthy growth, development, and academic achievement. MiHOTM is funded by USDA's Supplemental Nutrition Assistance Program Education (SNAP-Ed) for low-income families. Its primary mandate is to serve families living in households with income at or below 185 percent of the federal poverty level. The current study was designed to evaluate the extent to which participation in the MiHOTM and FFVP snack intervention improves FV intake and related psychosocial factors among 4th and 5th grade students attending low-resource public schools, compared to students in similar control schools. The intervention took place in 14 schools in Michigan and consisted of teacher-administered nutrition education activities in classrooms, cafeteria-based promotions, and parent education materials.

Study Methods. A quasi-experimental intervention/control design was used to evaluate the impact of the MiHOTM and FFVP snack intervention among 4th and 5th grade students. The primary outcome was FV intake. Schools eligible to participate in the study met the following criteria: 1) 50 percent or more students enrolled in the free and reduced-price meal program; and 2) were not participating in any other SNAP-Ed nutrition intervention programs. During the 2013 to 2014 school year, 18 schools serving grades K-8 (14 intervention schools; 4 control schools) from six school districts in Michigan with 68 4th and 5th grade classrooms (49 intervention; 19 control) participated in the study. A sample size of 25 schools with 100 classrooms per group was needed to detect a 0.4 times per day difference in the change in FV consumption between the control and intervention groups. The final student sample included 1,062 4th and 5th grade children (683 intervention; 379 control).

Compensation (from private funds) was offered to key stakeholders who participated in the study. All teachers were provided with nutrition education materials valued up to $50 following the study. Teachers who complete all of the activities in their commitment letter were also entered into a drawing to receive a $100 gift card. FFVP Administrators who worked with intervention schools and families who completed and returned the Healthy Homework assignment (parent survey) were entered into a drawing to win a $25 gift card.

The following methods and study instruments were used to collect data:

- **Student Survey:** A 4-page pre/post Scantron® survey was administered to students that included questions on FV consumption, intentions, preferences, liking, peer and social norms, perceived modeling, home activities, and individual-level demographics (age, gender, and race/ethnicity). Students were surveyed at baseline (December 2013 to February 2014) and again following the intervention (May to June 2014).

- **Parent Survey:** Parents were surveyed retrospectively (April to June 2014) through a take-home, paper Scantron® survey (called Healthy Homework) to determine any changes that occurred at the family/household level including perceived FV intake; snack choices; cooking and shopping practices; use of nutrition labels; and availability of FV in the home.
- **Teacher Survey:** All teachers were asked questions about nutrition education practices in the classroom and nutrition policies and practices at the school (May to June 2014). Intervention teachers were also asked about the implementation of MiHOTM nutrition education in the classroom.
- **FFVP Administrator Survey:** FFVP Administrators for intervention schools participating in this study were asked questions about the administration of the FFVP snack, coordination with MiHOTM nutrition education, and related school practices (June 2014).
- **Environment Assessment Tool:** Food and nutrition factors related to the school environment were observed and a school administrator was asked questions about school policies and practices in both the intervention and control schools (March to June 2014).

All data analyses were performed using SAS 9.3/9.4 and SPSS 22. Multivariate linear and logistic regression models were used and cluster design effects and demographic factors were controlled for in the analyses. Means, standard deviations, and frequencies were also computed.

Main Findings. Students who participated in the MiHOTM and FFVP snack intervention reported a non-significant increase in FV consumption of 0.08 times per day more at follow-up than control students, whose intake decreased from baseline to follow-up. For students participating in the MiHOTM and FFVP snack intervention there was a significant increase in peer norms for eating fruit. The MiHOTM and FFVP snack intervention also appeared to improve children's confidence with respect to preparing fruit with intervention students reporting that they prepared recipes with fruit at home.

Conclusions. MiHOTM and FFVP snack intervention had a limited impact on children's daily FV consumption, but improved peer norms for eating fruit and promoted the preparation of recipes with fruit at home. These findings indicate that MiHOTM and FFVP snack intervention has beneficial impacts on the psychosocial factors that mediate FV intake. More research is needed on strategies for engaging and supporting school staff to deliver effective nutrition education interventions that complement the FFVP snack.

Introduction

Background and Significance

School-aged children in the U.S. eat an abundance of nutrient-poor, energy-dense foods, and few consume adequate amounts of FV and other nutrient-rich foods.[1,2] The USDA Dietary Guidelines call for a shift to a diet that focuses on nutrient-rich foods such as FV, rather than energy-dense, nutrient-poor foods.[3] These guidelines promote improving the overall nutritional quality of individuals' diets, ultimately lowering total caloric intake. The USDA's Fresh Fruit and Vegetable Program (FFVP) works to address the inadequate consumption of FV among children by providing free fresh FV snacks during the school day at low-resource schools serving grades K-8. Coupling this direct access to fresh FV with nutrition education is essential for children in order for them to understand and establish lifelong healthy eating habits. Interventions designed to improve children's nutrition knowledge, attitudes, and behaviors are critical since poor eating behavior is an underlying cause of obesity, the nation's greatest public health threat. Schools offer many opportunities to provide children with the education they need to establish lifelong healthy behavior patterns.[4]

The Michigan Fitness Foundation (MFF) is collaborating with the Michigan Department of Education in Fresh Fruit and Vegetable Program (FFVP) school sites to implement the Michigan Harvest of the Month (MiHOTM) program. This collaboration reached approximately 80,000 students during the 2013 to 2014 school year in low-resource schools where at least 80% of the students qualify for the free and/or reduced-price school meal program. During the 2013 to 2014 school year, there were 156 schools awarded to participate in the FFVP, and many of these schools also opted to receive MiHOTM materials for classroom teachers and cafeterias.

An introduction to MiHOTM for FFVP Administrators serving as the food service liaison for the schools (either child nutrition directors or school administrators) took place on August 19, 2013 during MDE's training of FFVP administrators. The FFVP Administrator introduction included the expectations for the nutrition directors including 1) to order and distribute monthly packages with MiHOTM resources containing the Educator Newsletter to all interested classroom teachers in their buildings for use with students, 2) to feature menu items in the cafeteria that relate to the featured fruit or vegetable, 3) to serve the featured fruit or vegetable as a snack option at least one time per month with the funds provided by the FFVP, and 4) to promote the featured fruit or vegetable in the cafeteria with posters and menu slicks. The MiHOTM child nutrition director training guide, "How to Grow Healthy Students," was available online to provide FFVP Administrators with ideas on how to implement MiHOTM at schools. A brief online training was also developed for intervention teachers to provide them with an orientation to the MiHOTM materials and implementation strategies.

This study was funded by the United States Department of Agriculture Supplemental Nutrition Assistance Program Education (SNAP-Ed), Michigan Department of Human Services, through a contract with the MFF and administered by the Public Health Institute in collaboration with MFF.

Purpose of the Impact Evaluation

The purpose of this impact evaluation was to assess the changes in FV intake and related psychosocial factors (intentions, preferences, liking, peer and social norms, perceived modeling, home activities) among 4th and 5th grade students from schools serving low-income families in Michigan exposed to the FFVP only[†] and the FFVP combined with MiHOTM nutrition education compared to similar control students receiving neither FFVP or MiHOTM during the 2013 to 2014 school year. In addition, a take-home retrospective parent survey was used to determine any changes that occurred at the family/household level including perceived FV intake, snack choices, cooking and shopping practices, use of nutrition labels, and availability of FV in the home.

Research Questions

The primary research question was: do students exposed to MiHOTM and FFVP snack intervention report significantly higher levels of FV consumption compared to those not exposed to the intervention. Also evaluated as secondary outcomes were psychosocial factors (intentions, preferences, liking, peer and social norms, and perceived modeling) known to mediate FV consumption among children,[5] and supportive family and household nutrition practices (snack choices, cooking and shopping practices, and availability of FV in the home) that promote FV intake. We hypothesized that implementing MiHOTM and FFVP snack intervention would improve perceived modeling, dietary intentions, norms, liking, preferences for FV, as well as family and household nutrition practices; which in turn would lead to increased FV consumption by children.

Intervention Components

The FFVP with MiHOTM intervention schools were provided with a list of intervention expectations to complete in order to participate in the study. These intervention components included the following. The FFVP with MiHOTM intervention schools received fresh FV as a snack option at least twice a week with the funds provided by the FFVP and packages from MFF with monthly MiHOTM resources featuring a specific fruit or vegetable for all classroom teachers in their school. Each teacher MiHOTM packet included: an Educator Newsletter (1), Family Newsletters (35), Botany worksheets (35), Nutrient Facts Labels (35), and Student Sleuth Answers (1) for use with their students. In addition, school cafeterias aimed to serve menu items that featured the MiHOTM fruit or vegetable at least one time per month and promoted the featured produce in the cafeteria with posters and menu slicks. The final component of the intervention was serving the MiHOTM featured fruit or vegetable as the FFVP snack option at least one time per month with the funds provided by the FFVP. (Note: No SNAP-Ed funding was used to purchase the featured produce).

[†] The FFVP Only group was excluded from the final study sample because there was only one FFVP only school.

Compensation (from private funds) was offered to teachers, FFVP Administrators, and parents who participated in the study. All participating teachers in both the control and intervention schools were provided with nutrition education materials valued up to $50 at the end of the study as a thank you for taking part in the evaluation. Teachers who completed all of the activities outlined in their commitment letter were also entered into a drawing to receive a $100 gift card. FFVP Administrators who worked with intervention schools and families in both the control and intervention schools that completed and returned the Healthy Homework assignment (parent survey) were entered into a drawing to win a $25 gift card.

Methods

Study Design

The study design was a quasi-experimental intervention/control design to assess the impact of the FFVP and the FFVP implemented in conjunction with the MiHOTM nutrition education program on student FV intake and related factors during the 2013 to 2014 school year. It was conducted with 4th and 5th grade children in the school setting. The original design aimed to examine two intervention groups: the FFVP snack only group and the FFVP with MiHOTM group, which included classroom based nutrition education activities, cafeteria based promotions, and parent education materials. However, the FFVP snack only group was excluded due to inadequate sample (only one school). The final sample was 1,062 4th and 5th grade students and 430 parents from a convenience sample of 18 Michigan schools serving grades K-8 (14 FFVP with MiHOTM intervention; 4 control) serving low-resource families.

Sample Selection and Recruitment

In total, approximately 999 schools (50 percent or more students enrolled in the free and reduced-price meal program) serve predominately low-resource families in Michigan (Michigan Department of Education, October 2012) and were eligible to participate in the evaluation. Of the total schools, approximately 15 percent (156 schools) received the FFVP in the 2013 to 2014 school year, and the remaining schools did not implement the program (not awarded FFVP or did not apply). A subset of the 156 schools receiving the FFVP also opted to receive MiHOTM. The recruitment goal for this study was to obtain an equal number of schools in the three study groups: FFVP, FFVP with HOTM, and control to obtain a total of 75 schools (25 FFVP, 25 FFVP with HOTM, and 25 control) to reach a total of 300 classrooms (100 FFVP, 100 FFVP with HOTM, and 100 control).

In October 2013, the MDE provided the MFF with a list of the 156 Michigan schools participating in the FFVP during the 2013 to 2014 school year. Schools were screened and excluded from the study if they were currently conducting any nutrition education initiatives or programs that specifically target FV intake (such as PE-Nut –Physical Education and Nutrition Education Working Together). For school recruitment, the initial contact was made by sending an email recruitment letter from MFF to qualifying schools, followed by a phone call, if needed. MFF offered these schools MiHOTM

nutrition education materials to implement in conjunction with the FFVP snack. In addition, schools were sent a MOU and Commitment Agreement for the participating principals and teachers to sign and fax back to MFF. The FFVP Administrators for intervention schools were also asked to complete a Commitment Agreement for the study and return it to MDE.

MFF conducted school recruitment in an effort to reach the sample size targets of 25 schools (with 100 classrooms) per study group (see Power Calculation below). Out of the 999 eligible schools, MFF contacted 176 schools to participate in the evaluation: 13 as FFVP snack only schools, 67 as MiHOTM and FFVP snack schools, and 93 as control schools (Table 1). MFF faced significant challenges in recruiting schools to participate in the FFVP snack only and control groups. When MFF contacted the FFVP snack only schools and described the study, many of the schools expressed an interest in administering MiHOTM as well. As a result, only one school remained in the FFVP snack only group. MFF also had difficulty recruiting eligible schools to participate in the control group that met eligibility guidelines for the study. In the end, only 4 out of the 93 control schools contacted were eligible based on the study design and agreed to participate in the study.

TABLE 1: School Recruitment

	Number of Schools			
Schools	**FFVP Only**	**INT**	**CON**	**Total**
Contacted to participate[1]	13	67	93	176
Baseline total recruited[2]	1	14	4	19
Follow-up total maintained[2]	1	14	4	19
Final study sample	--	**14**	**4**	**18**

[1] Data obtained from Michigan Fitness Foundation.

[2] Data obtained from school building recruitment file.

INT=Intervention (FFVP w/ MiHOTM), CON=Control.

By January 2014, MFF recruited a total of 19 Michigan schools into the study. All recruited schools met the following eligibility requirements: 1) 50 percent or more of the student population was enrolled in the free and reduced-price meal program, and 2) the schools confirmed that they were not participating in other SNAP-Ed nutrition interventions during the 2013 to 2014 school year. The final sample represented eleven school districts in Michigan. The majority of the districts had only one school in the study, except for the Detroit City School District where nine schools participated, all in the intervention group. Although data collection occurred at 19 schools, the FFVP snack only group was excluded from the analysis because there were too few schools in this group to draw meaningful comparisons. The final study sample included 14 MiHOTM and FFVP snack intervention schools and 4 control schools. Throughout the tables in this report, INT signifies the MiHOTM and FFVP snack intervention group and CON signifies the control group. When feasible, data tables present the FFVP only group too.

Nearly all of the 4th and 5th grade teachers (50 of 53, 94.3%) in intervention schools and many of the teachers (20 of 27, 74.1%) from control schools agreed to participate in the

study (Table 2). At the end of the study, only one additional teacher dropped from each group. In total, 68 4th and 5th grade classrooms participated with 49 in the intervention group and 19 in the control group.

TABLE 2: Teacher Recruitment

4th/5th Teachers	Number of 4th/5th Grade Classrooms			
	FFVP Only	INT	CON	Total
Total at school[1]	5	53	27	85
Baseline total participating[2]	5	50	20	75
Follow-up total maintained[2]	5	49	19	73
Final study sample	--	**49**	**19**	**68**

[1] Data obtained from Michigan Fitness Foundation.
[2] Data obtained from school building recruitment file.
INT=Intervention, CON=Control.

Power Calculation

To ensure that the impact evaluation would have adequate power to detect potential intervention effects, calculations were used to determine the number of participants for whom data would be needed, and estimates of attrition were used to calculate the starting sample size needed. We estimated that a total of 300 classrooms (100 FFVP, 100 FFVP and HOTM, and 100 Control) with 25 students per classroom would allow us to evaluate a total of 7,500 4th and 5th grade students at baseline, anticipating that 90 percent of the classes would complete follow-up measures. Assuming 4 classrooms per school, this would be 75 schools (25 FFVP, 25 FFVP with HOTM, and 25 Control). With this sample size, we would be able to detect a difference between groups of 0.40 change in "times of daily FV" consumed (assuming a 5% type I error, 80% power, an intra-class correlation of 0.038 and a standard deviation of the change in FV intake of 3.47). The intra-class correlation coefficient and the standard deviation of change statistics were estimated using data from prior HOTM nutrition education evaluations of children from low-resource schools using the same survey instrument (SPAN).[6] Unfortunately, the sample size estimate of 25 schools (with 100 classrooms) per group was not reached in the control group, substantially reducing the power to detect potential intervention effects in this study.

IRB Approval

A study protocol was submitted and approved by the Human Subjects Institutional Review Board of the Western Michigan University in October 2013. Western Michigan University Human Subjects Institutional Review Board granted MFF an exemption of informed consent for this study (HSIRB #: 13-10-43), based on the fact that the program evaluation assesses a nutrition education program using procedures and methods that are typically employed in the education setting.

Teacher Training

In January 2014, all participating 4th and 5th grade teachers at the 14 intervention schools were forwarded a link from MFF via e-mail to a standardized online training that provided teachers with a brief orientation on how to use the MiHOTM and FFVP snack intervention activities in their classrooms. The training demonstrated the use of the intervention components in the classroom including the student worksheets and presented the family newsletters to send home with students. FFVP administrators were also available to provide additional guidance. Regional coordinators provided teachers with direction on how to complete the fidelity log to track the implementation of MiHOTM intervention components (intervention teachers only) and other nutrition education offered (intervention and control teachers) during the 2013 to 2014 school year.

Regional Coordinator Training

By November 2013, two regional coordinators were identified to lead the data collection activities at participating schools. MFF trained the regional coordinators using a data collection protocol developed by PHI that included step-by-step administration procedures for the student survey and the environmental assessment tool. Regional coordinators were trained in how to effectively work with school administrators, classroom teachers, and 4th and 5th grade students; procedures for obtaining student assent; administration of the instruments; tracking documentation; and study logistics.

Instruments and Administration

Assent Process. Regional coordinators provided a brief description of the study out loud in class to inform all students about the evaluation, to let the students know that their participation was voluntary, and to provide students the opportunity to decline to participate. Students who declined participation remained in the classroom, but did not take part in the data collection. In total, only a small proportion (7.5%) of students was absent or declined to participate in baseline data collection.

Student Survey. In each classroom, the regional coordinator administered the 30-minute student survey to all participating children in a classroom by reading the instructions and questions aloud. The survey included questions about student's intentions, preferences, liking, peer and social norms, perceived modeling, home activities, and consumption related to FV and individual-level demographics (age, race/ethnicity, and gender). Students were asked to follow along and complete the questions together. The regional coordinator was available to answer questions. Survey questions were based on pre-existing validated items from the following tools: FV food frequency from the School and Physical Activity Nutrition Project (SPAN) survey[6]; FV availability from the Home Availability Survey[7]; FV preferences[8]; Taste of many FV and tasting new FV (Liking) and teacher/ cafeteria worker social norms for FV from Child Nutrition Questionnaire[9]; Want to eat FV (Intentions), FV peer norms (best friends/ most classmates) and school norms (most classmates think it's cool) from the ProKids Survey of Attitude-Social Influence-Self-Efficacy[10]. The SPAN survey measures FV intake using times eaten yesterday; fruit excludes 100% fruit juice and vegetables

exclude fried potatoes. The baseline student survey data were collected between December 2013 and early February 2014. Follow-up data collection took place between May and June 2014. The student survey and data collection protocol were the same at baseline and follow-up.

Parent Survey. Regional coordinators provided teachers with a set of parent surveys (Healthy Homework) for their students. Teachers assigned the Healthy Homework by asking students to take it home for their parents to fill in. The parent survey was a 1-page Scantron® that took about 15 minutes to complete. This survey provided a retrospective examination of changes in student and family behaviors and household nutrition practices based on parents' observations and experiences over the course of the intervention period. It assessed the perceived changes that occurred in child and parent FV intake; child and parent snack choices; cooking and shopping practices; use of nutrition labels; and availability of FV in the home. This tool was completed once toward the end of the intervention (April to June 2014).

Environmental Assessment Tool (EAT). The Environmental Assessment Tool (EAT) was completed both by observation of the school cafeteria and other school facilities and through an interview with a school administrator. This tool assessed nutrition variables related to the school environment and school nutrition policies with specific sections designed to collect information about salad bars, FFVP snacks, school vending machines, nutrition promotions in the indoor and outdoor dining areas, and nutrition policies and practices. The last section, school nutritional and wellness policies and practices, was answered by a school administrator. The MFF regional coordinators completed the EAT once at all intervention and control schools during the intervention period around the time of the follow-up data collection (March to June 2014).

Teacher Survey. Intervention and control teachers were asked to complete an online survey comprised of 50 questions on classroom practices. MFF sent teachers a link via e-mail to participate in the survey. Unique online surveys were sent to teachers in the intervention group and control group. The survey for the intervention schools included questions on what MiHOTM activities were provided in the classroom, how the nutrition programs were delivered, coordination between MiHOTM and FFVP snack, any training received, and school and classroom policies around nutrition education and bringing foods into the classroom. The survey for the control schools included the identical classroom environment questions, but only a single question about MiHOTM (whether or not it was implemented). The online teacher survey was completed once during the intervention period around the time of the follow-up data collection (May to June 2014).

FFVP Administrator Survey. This survey was comprised of 42 questions about school practices related to MiHOTM and the FFVP snack that FFVP Administrators could complete either online or by telephone interview. MFF sent FFVP Administrators a link through e-mail to review and complete the survey online with an invitation to set up a convenient time for a telephone interview, if preferred. The survey included questions on what MiHOTM activities were provided in the classroom, how the nutrition programs were delivered, coordination between MiHOTM and FFVP snack, and any training

provided. The FFVP administrator interview was completed once during the intervention period around the time of the follow-up data collection (June 2014).

Intervention Fidelity

To ensure that the intervention components were implemented, teacher fidelity logs were created. Intervention information was also collected through the teacher survey (MiHOTM implementation), parent survey (MiHOTM family newsletter activities), and EAT (MiHOTM posters/menu slicks) described above.

Teacher Fidelity Logs. All intervention and control teachers participating in the study were asked to keep a log of the nutrition education activities conducted in the classroom during the intervention. Control teachers recorded the total time they spent delivering nutrition education and what, if any, nutrition education materials they used. Intervention teachers reported which MiHOTM materials they used to provide nutrition education, the time they spent on MiHOTM implementation, whether they sent MiHOTM materials home with students for their parents, and what, if any, other nutrition education materials they used, as well as the time spent on them. Teachers began completing their fidelity logs early in the school year (October to December 2013) and continued documenting their nutrition education activities until the follow-up data collection started (April to June 2014).

Data Processing

Each study instrument was labeled to identify the school and class/teacher, as relevant. For student and parent surveys, unique and anonymous study identification codes were created from the child specific demographic data reported and then concatenated with the school and class/teacher identification codes to create unique student identification numbers. The student identification numbers were used to match the baseline and follow-up surveys. The environmental assessment tool was coded to the school. All of these data were uploaded to box.com by MFF and downloaded by PHI for data processing and analysis. FFVP Administrator and teacher surveys were collected and analyzed through Survey Monkey. Data from the student surveys, parent surveys, fidelity logs, and environmental assessment tool were entered into SAS/SPSS databases. As a standard quality control measure, all data from the EAT were double entered to ensure accuracy. Total counts were generated for student surveys, parent surveys, teacher surveys, fidelity logs, FFVP administrator surveys, and the environmental assessment tool.

Data Analysis

Baseline data on control and intervention groups collected from students (from the Student Survey) as well as school level data from the Michigan Department of Education were compared to assess potential differences between the groups, as random assignment was not feasible as part of the study design (Table 3). Data collected on the school environment (from the EAT) for factors that might affect the intervention impact were also compared between the intervention and control schools.

Data collected on classroom environments that might affect the intervention impact (from the Teacher Fidelity Log and Teacher Survey) were compared between the intervention and control classrooms. When sufficient sample sizes were available, t-tests were used to compare continuous variables and chi-square tests were used to compare categorical variables.

The primary outcome variable, FV intake, was examined as a continuous variable (e.g., mean times/day of FV consumed). We assessed the impact on change in the primary outcome as a continuous variable from baseline to follow-up between the control and intervention groups using multivariate regression models. The computed change score acted as the dependent variable in regression models, with "intervention status" as the primary predictor of interest. The baseline value for the outcome was included in each of these models along with potential confounders. We controlled for demographic characteristics as potential confounders (i.e., age, gender, and race/ethnicity) and examined possible interaction effects with intervention status. Adjustments for cluster design effects at the classroom and school level were made using Generalized Estimation Equation (GEE) techniques.

To assess changes in secondary outcomes (intentions, preferences, liking, peer and social norms, perceived modeling, home activities, family behaviors, and household nutrition practices) from baseline to follow-up between the control and intervention groups, we used methods similar to those described above. All analyses were conducted using SAS version 9.3/9.4 and SPSS version 22. A p-value of <0.05 indicates a significant difference between groups for all statistical tests presented.

Findings

Demographics

Table 3 illustrates the population characteristics of schools in the intervention and control groups, based on information from the Michigan Department of Education and Michigan Great Schools available online (2013 to 2014 school year, when available). Significant differences were found between intervention and control schools in the gender of students (more male students at intervention schools than controls; 52.0%, 48.5%, respectively), in the ethnic/racial distribution of students (more African American/Black children; 81.2%, 16.7%), percentage of school population that were English Language Learners (fewer English learners; 1.2%, 20.9%), and percentage of the school population enrolled in the free and reduced-price meal program (higher participation; 84.2%, 81.0%), and percentage of the school population that were proficient or above on the standardized math and reading tests (fewer proficient; 17.8%, 41.9% at math and 43.5%, 65.3% at reading; respectively). Similar distributions of school characteristics by study group is often not achieved without random assignment of schools which was not feasible in this study. Demographic characteristics collected from students were used to control for the demographic variations between groups in the analysis.

TABLE 3: Characteristics of Schools in the Intervention and Control Groups

	FFVP Only (N=1 School)		INT (N=14 Schools)		CON (N=4 Schools)		
School Enrollment[1]	**N**	**Mean (SD)**	**N**	**Mean (SD)**	**N**	**Mean (SD)**	**P-value**
Total students	248	N/A	5,695	406.79 (238.81)	1,486	371.50 (151.30)	0.786
4th/5th grade students	136	N/A	1,391	99.36 (53.07)	714	178.50 (91.38)	0.181
	FFVP Only (N=248 Students)		**INT (N=5,695 Students)**		**CON (N=1,486 Students)**		
Gender[1]	**N**	**Percent**	**N**	**Percent**	**N**	**Percent**	**P-value**
Male	105	42.2%	2,959	52.0%	721	48.5%	0.018
Female	143	57.9%	2,736	48.0%	765	51.5%	
Race/Ethnicity[1]							
White	49	19.8%	958	16.8%	991	66.7%	<0.001[2]
Latino/Hispanic	16	6.5%	55	1.0%	171	11.5%	
African American/Black	182	73.4%	4,625	81.2%	248	16.7%	
Asian or Pacific Islander	0	0.0%	8	0.1%	26	1.7%	
Native Hawaiian	0	0.0%	1	0.0%	1	0.1%	
Native American	1	0.4%	11	0.2%	6	0.4%	
Two or more ethnicities, not Hispanic	0	0.0%	36	0.6%	43	2.9%	
English Language Learners[1]							
English learners	4	1.6%	66	1.2%	310	20.9%	<0.001
School Meal Participation[3]							
Free or reduced-price lunch	228	91.8%	4,793	84.2%	1,203	81.0%	0.003
	FFVP Only (N=136 4th/5th Students)		**INT (N=1,391 4th/5th Students)**		**CON (N=714 4th/5th Students)**		
Proficient or Above on Standardized Tests[4]	**N**	**Percent**	**N**	**Percent**	**N**	**Percent**	**P-value**
Math test (MEAP)	15	11.0%	248	17.8%	299	41.9%	<0.001
Reading test (MEAP)	52	38.2%	605	43.5%	466	65.3%	<0.001

[1] Michigan Department of Education (https://www.mischooldata.org/); 2013/14 school year: total students.
[2] Analysis run on four collapsed race/ethnic categories (White, Latino/Hispanic, African American/Black, Other) due to the small sample sizes (collapsed N's < 50).
[3] Michigan schools from http://www.greatschools.org/michigan/ for the 2013/14 school year: total students.
[4] Michigan schools from http://www.greatschools.org/michigan/ for the 2012/13 school year: 4th/5th grades.
INT=Intervention, CON=Control.
P-values for INT/CON from T-Test analysis and Pearson Chi-Square test. Columns may not add up to 100% due to rounding.

A total of 1,062 students (683 intervention; 379 control) met all of the study criteria for inclusion (Table 4). The final analytic sample included students with complete data for demographic characteristics. In total, nearly two-thirds (63.5%) of the students who provided baseline data also completed the follow-up data collection. Retention from

baseline to follow-up among intervention students (63.8%) was lower than the rate observed among control students (78.8%).

TABLE 4: Student Recruitment and Participation

4th/5th Students	Number of 4th/5th Students			
	FFVP Only	INT	CON	Total
Total 4th/5th enrollment at school[1] (2013-14 MDE)	129	1,364	756	2,249
Total 4th/5th in participating classrooms[2] (if not all classrooms participated)	129	1,175	504	1,808
Baseline total participating	120	1,071	481	1,672
Follow-up total maintained	77	688	382	1,147
Total matched pre/post with completed data (FV & demos)	76	683	379	1,138
Final study sample	**--**	**683**	**379**	**1,062**

[1] Data obtained from Michigan Department of Education (2013-14).

[2] Data obtained from Michigan Fitness Foundation.

INT=Intervention, CON=Control.

Table 5 shows the demographic characteristics collected as part of the student survey from the 4th and 5th grade students participating in the evaluation study and represents the final sample of students included in the analyses. While there were no significant differences between groups on the distribution of gender, grade, or age; students in the intervention group were significantly more likely to describe themselves as Black or African American at baseline compared to controls (57.4% vs. 11.9%, $p<0.001$).

TABLE 5: Characteristics of 4th and 5th Grade Students included in the Intervention and Control Groups

	Total (N=1,062)		INT (N=683)		CON (N=379)		P-value*
	n	%	n	%	n	%	
Gender							
Male	521	49.1	337	49.3	184	48.6	0.731
Female	541	50.9	346	50.7	195	51.5	
Ethnicity[1]							
White	280	26.4	161	23.6	119	31.4	<0.001
Black or African American	437	41.2	392	57.4	45	11.9	
Mexican American	155	14.6	58	8.5	97	25.6	
Asian	20	1.9	8	1.2	12	3.2	
American Indian or Alaska Native	10	0.9	9	1.3	1	0.3	
Arab-American	57	5.4	8	1.2	49	12.9	
Multi-Racial	103	9.7	47	6.9	56	14.8	
Grade							
4th	521	49.1	362	53.0	159	42.0	0.572
5th	541	50.9	321	47.0	220	58.1	
	Total		**INT**		**CON**		**P-value****
Age							
Mean (SD)	9.93 (0.77)		9.91 (0.79)		9.96 (0.73)		0.842

[1] Analysis run on four collapsed race/ethnic categories due to the small sample sizes (collapsed N's < 50).
Columns may not add up to 100% due to rounding.
* P-values from Rao-Scott Chi-square test comparing INT and CON differences adjusted for cluster design effects.
** P-values from GEE techniques comparing mean differences between INT and CON adjusted for cluster design effects.
INT=Intervention, CON=Control.

Student Survey

Fruit and Vegetable Intake. Results from the analysis of FV intake (times consumed yesterday) are presented in Table 6. The mean total vegetables consumed was lower among intervention students when compared to control students at baseline (1.35 vs. 1.68 times, p=0.018). Intervention students reported consuming more FV from baseline to follow-up (0.06 times), while consumption among control students decreased (-0.09 times). The observed mean difference in the change in FV intake from baseline to follow-up between the groups was 0.15 times per day (not displayed in table), far below the target change of 0.40 times per day needed to detect significance. As shown in Table 6, after adjusting for cluster design effects and demographics (gender, race/ethnicity, age, and grade) the adjusted mean difference in change dropped to 0.08 times per day with a p-value of 0.509. The adjusted mean differences will be presented from this point forward. The majority of the difference in FV intake among intervention students came from eating more fruit (adjusted mean difference of 0.07 times), and only a small amount was attributed to the change in vegetable consumption (adjusted mean difference of 0.01 times). In fact, vegetables consumption declined in both groups from baseline to follow-up.

TABLE 6: Fruit and Vegetable Consumption (times/yesterday) at Baseline and Follow-up

	Baseline			Follow-up		Change	
	INT (N=675) mean (SD)	CON (N=376) mean (SD)	P-value*	INT (N=675) mean (SD)	CON (N=376) mean (SD)	Adjusted Mean Difference	P-value**
Total Fruit	1.58 (1.41)	1.89 (1.42)	0.214	1.72 (1.46)	1.94 (1.46)	0.07	0.447
Total Vegetables	1.35 (1.31)	1.68 (1.44)	0.018	1.29 (1.34)	1.53 (1.40)	0.01	0.909
Total Fruit and Vegetables	2.93 (2.23)	3.57 (2.45)	0.064	3.00 (2.30)	3.48 (2.42)	0.08	0.509

SCALE: No, I didn't eat any [fruit/vegetables] yesterday=0; Yes, I ate [fruit/vegetables] 1 time yesterday=1; Yes, 2 times yesterday=2; Yes, 3 times yesterday=3; Yes, 4 times yesterday=4; Yes, 5 or more times yesterday=5. INT=Intervention, CON=Control.

* P-values from GEE techniques comparing differences between INT and CON at baseline adjusted for cluster design effects.

** P-values from GEE techniques comparing change in INT versus change in CON adjusted for baseline values, cluster design effects, and demographics (gender, race/ethnicity, age, and grade).

Social Support, Perceived Modeling, Norms, and Enjoyment of Fruits and Vegetables. Students were asked "How much do you agree or disagree with the following statements about fruit?" and to choose from the following responses: Disagree a lot, Disagree a little, Not Sure, Agree a little, Agree a lot. Mean scores were computed using a five-point scale. Table 7 shows the change from baseline to follow-up and adjusted mean difference between intervention and control groups. Table 7a shows the proportion of students who agreed, responding "Agree a little" or "Agree a lot," at each

time point. The baseline assessment showed that intervention students reported higher peer norms, but lower parent modelling for eating fruit compared to control students. For students participating in the MiHOTM and FFVP snack intervention there was a significant increase in peer norms for eating fruit. Significant changes between intervention and control groups were found for the following statements on peer norms: “Most of my classmates eat fruit at school every day” and “Most of my classmates think it is cool to eat fruit at school every day.” The adjusted mean differences in scored responses between intervention and control students from baseline to follow-up for these questions were 0.30 ($p<0.001$) and 0.21 ($p=0.039$), respectively. Finally, although significant changes were not found in response to some of the other statements regarding fruit, it is noteworthy that at baseline both groups reported high mean scores for the following questions: “I want to eat fruit every day,” and “I like the taste of many fruits,” indicating that intentions and desire to eat fruit, and liking fruit were already highly endorsed by children at the beginning of the study and prior to the intervention.

TABLE 7: Peer and Social Norms, Perceived Modeling, Intentions, and Liking for Fruit, Mean Score

How much do you agree or disagree?	Sample		Baseline			Follow-up		Change	
	INT	CON	INT mean (SD)	CON mean (SD)	P-value*	INT mean (SD)	CON mean (SD)	Adjusted Mean Difference	P-value**
a. My best friends eat fruit every day	663	375	2.51 (1.08)	2.46 (1.03)	0.398	2.54 (1.07)	2.53 (1.06)	0.05	0.591
b. Most of my classmates eat fruit at school every day	661	376	2.99 (1.18)	2.51 (1.18)	<0.001	3.03 (1.09)	2.61 (1.12)	0.30	<0.001
c. Most of my classmates think it is cool to eat fruit at school every day	660	372	2.29 (1.31)	1.65 (1.18)	<0.001	2.21 (1.31)	1.72 (1.25)	0.21	0.039
d. The people who work at my school cafeteria ask students to eat fruit	663	374	2.74 (1.48)	3.06 (1.33)	0.700	2.81 (1.48)	3.25 (1.28)	-0.16	0.212
e. My parents eat fruit every day	662	374	2.62 (1.39)	2.92 (1.21)	0.016	2.68 (1.32)	2.93 (1.21)	-0.13	0.209
f. My teachers ask students to eat fruit	655	358	2.33 (1.53)	2.25 (1.45)	0.430	2.41 (1.51)	2.25 (1.46)	0.12	0.475
g. I want to eat fruit every day	658	371	3.26 (1.22)	3.28 (1.16)	0.928	3.35 (1.12)	3.25 (1.20)	0.13	0.165
h. I like the taste of many fruits	661	368	3.31 (1.16)	3.40 (1.13)	0.424	3.37 (1.13)	3.55 (0.93)	-0.07	0.255
i. I like tasting new fruits that I haven't tried before	671	378	3.03 (1.34)	2.87 (1.36)	0.103	2.94 (1.39)	2.80 (1.40)	0.06	0.523

SCALE: Disagree a lot=0, Disagree a little=1, Not sure=2, Agree a little=3, Agree a lot=4.
INT=Intervention, CON=Control.
* P-values from GEE techniques comparing differences between INT and CON at baseline adjusted for cluster design effects.
** P-values from GEE techniques comparing change in INT versus change in CON adjusted for baseline values, cluster design effects, and demographics (gender, race/ethnicity, age, and grade).

TABLE 7a: Peer and Social Norms, Perceived Modeling, Intentions, and Liking for Fruit, Percent who Report Agreeing

How much do you agree or disagree?	Sample		Baseline		Follow-up	
	INT	CON	INT % Agree	CON % Agree	INT % Agree	CON % Agree
a. My best friends eat fruit every day.	663	375	43.4	42.4	47.8	46.4
b. Most of my classmates eat fruit at school every day.	661	376	69.6	50.3	72.6	53.5
c. Most of my classmates think it is cool to eat fruit at school every day.	660	372	41.1	20.2	40.3	22.3
d. The people who work at my school cafeteria ask students to eat fruit.	663	374	62.3	71.1	65.9	77.5
e. My parents eat fruit every day.	662	374	59.2	66.6	61.6	66.8
f. My teachers ask students to eat fruit.	655	358	50.2	45.0	51.5	44.4
g. I want to eat fruit every day.	658	371	80.6	84.4	83.7	83.0
h. I like the taste of many fruits.	661	368	83.4	85.3	84.6	91.3
i. I like tasting new fruits that I haven't tried before.	671	378	73.6	69.3	72.1	70.4

SCALE: % Agree included Agree a little and Agree a lot.
INT=Intervention, CON=Control.

Students were asked the same questions as above for fruits, but with a focus on vegetables. As with the questions on fruit, mean scores for vegetable questions were computed using a five-point scale. Table 8 shows the change from baseline to follow-up and adjusted mean difference between intervention and control groups. Table 8a shows the proportion of students who agreed, responding "Agree a little" or "Agree a lot," at each time point. Similar to the baseline findings on fruit, intervention students reported higher peer norms, but lower parent modelling for eating vegetables when compared to control students at baseline. For vegetables, changes in peer and social norms, perceived modeling, intentions, and liking were all non-significant.

TABLE 8: Peer and Social Norms, Perceived Modeling, Intentions, and Liking for Vegetables, Mean Score

How much do you agree or disagree?	Sample		Baseline			Follow-up		Change	
	INT	CON	INT mean (SD)	CON mean (SD)	P-value*	INT mean (SD)	CON mean (SD)	Adjusted Mean Difference	P-value**
a. My best friends eat vegetables every day.	669	376	2.03 (1.16)	2.10 (1.09)	0.522	1.99 (1.21)	2.16 (1.20)	-0.08	0.524
b. Most of my classmates eat vegetables at school every day.	656	375	2.18 (1.33)	2.05 (1.18)	0.125	2.12 (1.29)	2.09 (1.19)	0.01	0.940
c. Most of my classmates think it is cool to eat vegetables at school every day.	664	376	1.84 (1.32)	1.57 (1.19)	0.011	1.74 (1.29)	1.56 (1.21)	0.10	0.348
d. The people who work at my school cafeteria ask students to eat vegetables.	657	374	2.53 (1.48)	2.87 (1.35)	0.305	2.58 (1.50)	2.87 (1.41)	-0.00	0.999
e. My parents eat vegetables every day.	656	367	2.48 (1.42)	2.87 (1.23)	0.001	2.62 (1.33)	2.81 (1.27)	-0.06	0.498
f. My teachers ask students to eat vegetables.	643	372	2.11 (1.52)	2.11 (1.43)	0.657	2.21 (1.50)	2.18 (1.42)	0.09	0.490
g. I want to eat vegetables every day.	653	367	2.41 (1.54)	2.62 (1.46)	0.132	2.38 (1.52)	2.53 (1.48)	-0.06	0.502
h. I like the taste of many vegetables.	662	371	2.43 (1.55)	2.50 (1.53)	0.843	2.45 (1.52)	2.57 (1.51)	-0.02	0.850
i. I like tasting new vegetables that I haven't tried before.	668	374	2.48 (1.56)	2.33 (1.57)	0.122	2.28 (1.59)	2.43 (1.51)	-0.16	0.088

SCALE: Disagree a lot=0, Disagree a little=1, Not sure=2, Agree a little=3, Agree a lot=4.
INT=Intervention, CON=Control.
* P-values from GEE techniques comparing differences between INT and CON at baseline adjusted for cluster design effects.
** P-values from GEE techniques comparing change in INT versus change in CON adjusted for baseline values, cluster design effects, and demographics (gender, race/ethnicity, age, and grade).

TABLE 8a: Peer and Social Norms, Perceived Modeling, Intentions, and Liking for Vegetables, Percent who Report Agreeing

How much do you agree or disagree?	Sample		Baseline		Follow-up	
	INT	CON	INT % Agree	CON % Agree	INT % Agree	CON % Agree
a. My best friends eat vegetables every day.	669	376	27.7	31.4	30.2	33.5
b. Most of my classmates eat vegetables at school every day.	656	375	42.4	34.9	41.6	34.7
c. Most of my classmates think it is cool to eat vegetables at school every day.	664	376	28.6	17.6	26.1	18.1
d. The people who work at my school cafeteria ask students to eat vegetables.	657	374	53.9	65.8	58.8	67.7
e. My parents eat vegetables every day.	656	367	54.1	63.5	58.2	61.6
f. My teachers ask students to eat vegetables.	643	372	42.9	41.1	45.6	40.9
g. I want to eat vegetables every day.	653	367	58.2	65.1	57.7	61.3
h. I like the taste of many vegetables.	662	371	59.1	60.9	59.2	62.5
i. I like tasting new vegetables that I haven't tried before.	668	374	59.6	54.3	53.1	58.6

SCALE: % Agree included Agree a little and Agree a lot.
INT=Intervention, CON=Control.

Preferences for Fruits and Vegetables. Students in the intervention group were provided with fresh FV snacks every week as part of the MiHOTM and FFVP snack intervention. In addition, MiHOTM materials were made available to schools to feature some or all of the 12 potential produce items. To assess changes in students' preferences for the MiHOTM featured FV, they were asked "How much do you like these FV?" with the following responses to choose from: I don't know or never tasted it, I don't like this, I like this a little, or I like this a lot. Mean scores were computed using a four-point scale. Table 9 shows the change from baseline to follow-up and adjusted mean difference between intervention and control groups. At baseline, preferences for tomatoes, carrots, melon, and potatoes were lower among intervention students when compared to control students; while higher preferences were observed among intervention students for greens and strawberries. Contrary to expectations, significant decreases in liking apples (adjusted mean difference of -0.06, $p<0.001$) and melon (adjusted mean difference of -0.17, $p<0.001$) were found for students participating in the MiHOTM and FFVP snack intervention compared to students in the control group. Changes in preferences for the remaining MiHOTM featured produce items were not significant.

TABLE 9: Preferences for Fruits and Vegetables, Mean Score

How much do you like…?	Sample		Baseline			Follow-up		Change	
	INT	CON	INT mean (SD)	CON mean (SD)	P-value*	INT mean (SD)	CON mean (SD)	Adjusted Mean Difference	P-value**
a. Apples	663	378	2.77 (0.50)	2.80 (0.44)	0.653	2.75 (0.51)	2.79 (0.44)	-0.06	<0.001
b. Tomatoes	665	376	1.61 (0.86)	1.87 (0.90)	<0.001	1.55 (0.82)	1.77 (0.87)	-0.01	0.770
c. Squash	652	369	0.90 (0.89)	0.87 (0.97)	0.608	0.88 (0.89)	0.90 (0.94)	-0.04	0.449
d. Carrots	649	370	2.33 (0.74)	2.46 (0.68)	0.019	2.26 (0.78)	2.40 (0.71)	-0.04	0.324
e. Asparagus	643	372	1.02 (1.13)	1.12 (1.09)	0.757	1.13 (1.10)	1.18 (1.09)	0.13	0.095
f. Berries	658	369	2.62 (0.72)	2.64 (0.72)	0.800	2.61 (0.78)	2.66 (0.71)	-0.01	0.738
g. Greens	653	375	2.22 (0.88)	2.09 (0.98)	0.040	2.28 (0.85)	2.13 (0.92)	0.07	0.326
h. Melon	651	372	2.41 (0.96)	2.65 (0.73)	<0.001	2.50 (0.89)	2.76 (0.60)	-0.17	<0.001
i. Pears	655	375	2.36 (0.88)	2.22 (0.96)	0.342	2.39 (0.83)	2.26 (0.92)	0.05	0.177
j. Potatoes	651	370	2.51 (0.71)	2.67 (0.61)	0.004	2.51 (0.69)	2.60 (0.64)	-0.05	0.283
k. Spinach	652	371	1.54 (1.04)	1.49 (1.07)	0.508	1.52 (1.05)	1.53 (1.06)	-0.03	0.674
l. Strawberries	669	378	2.85 (0.51)	2.80 (0.57)	0.021	2.86 (0.48)	2.79 (0.57)	0.03	0.116

SCALE: I don't know or never tasted it=0, I don't like this=1, I like this a little=2, I like this a lot =3.
INT=Intervention, CON=Control.
* P-values from GEE techniques comparing differences between INT and CON at baseline adjusted for cluster design effects.
** P-values from GEE techniques comparing change in INT versus change in CON adjusted for baseline values, cluster design effects, and demographics (gender, race/ethnicity, age, and grade).

Availability and Accessibility of Fruits and Vegetables at Home. Students were asked "At your home, do you have [fruits/vegetables] to eat?" and "At your home, do you have the kind of [fruits/vegetables] that you like to eat?" with the following responses to choose from: Never, Sometimes, and Always. Mean scores were computed using a three-point scale. Table 10 shows the change from baseline to follow-up and adjusted mean difference between intervention and control groups. Table 10a shows the proportion of students who responded "Always" at each time point. The baseline assessment showed that intervention students reported lower availability of fruits and vegetables to eat at home than control students. There was only one significant change in the availability of FV at home from baseline to follow-up between the study groups, and it was in the opposite direction. A significant decrease in the availability of the kind of vegetables that you like to eat (adjusted mean difference of -

0.09, p=0.030) was found for students participating in the MiHOTM and FFVP snack intervention compared to students in the control group.

TABLE 10: Fruit and Vegetable Availability at Home, Mean Score

At your home, do you have…?	Sample		Baseline			Follow-up		Change	
	INT	CON	INT mean (SD)	CON mean (SD)	P-value*	INT mean (SD)	CON mean (SD)	Adjusted Mean Difference	P-value**
a. fruits to eat	655	367	1.57 (0.52)	1.69 (0.47)	0.003	1.59 (0.51)	1.70 (0.46)	-0.05	0.120
b. the kind of fruits that you like to eat	656	364	1.57 (0.53)	1.59 (0.51)	0.499	1.57 (0.55)	1.58 (0.50)	-0.01	0.830
c. vegetables to eat	631	351	1.61 (0.54)	1.73 (0.46)	0.005	1.64 (0.54)	1.68 (0.47)	-0.02	0.546
d. the kind of vegetables that you like to eat	619	347	1.31 (0.64)	1.40 (0.57)	0.082	1.26 (0.63)	1.39 (0.57)	-0.09	0.030

SCALE: Never=0, Sometimes=1, Always=2.
INT=Intervention, CON=Control.
* P-values from GEE techniques comparing differences between INT and CON at baseline adjusted for cluster design effects.
** P-values from GEE techniques comparing change in INT versus change in CON adjusted for baseline values, cluster design effects, and demographics (gender, race/ethnicity, age, and grade).

TABLE 10a: Fruit and Vegetable Availability at Home, Percent Reporting Always

At your home, do you have…?	Sample		Baseline		Follow-up	
	INT	CON	INT % Always	CON % Always	INT % Always	CON % Always
a. fruits to eat	655	367	58.0	69.8	60.2	70.0
b. the kind of fruits that you like to eat	656	364	59.3	59.9	59.3	58.2
c. vegetables to eat	631	351	64.2	73.2	67.0	68.7
d. the kind of vegetables that you like to eat	619	347	40.9	44.1	36.5	43.8

SCALE: Never=0, Sometimes=1, Always=2.
INT=Intervention, CON=Control.

In addition to having desirable FV available to eat at home, the perceived accessibility of FV was also assessed by asking students "At home how often are [fruits/vegetables] cut up and ready to eat when you want a snack?" Response options included: Never, A few days a week, Most days a week, and Every day. Mean scores were computed using a four-point scale. Table 11 shows the change from baseline to follow-up and adjusted mean difference between intervention and control groups. Table 11a shows the proportion of students who responded "Every day" at each time point. Changes in access to cut up and ready to eat FV at home as snacks were not significant.

TABLE 11: Fruits and Vegetables Ready-to-Eat for Snacks at Home, Mean Score

At home, how often are…?	Sample		Baseline			Follow-up		Change	
	INT	CON	INT mean (SD)	CON mean (SD)	P-value*	INT mean (SD)	CON mean (SD)	Adjusted Mean Difference	P-value**
a. fruits cut up and ready to eat when you want a snack	525	296	1.61 (1.08)	1.81 (1.04)	0.224	1.61 (1.08)	1.64 (1.03)	0.09	0.153
b. vegetables cut up and ready to eat when you want a snack	510	284	1.44 (1.09)	1.54 (1.08)	0.528	1.40 (1.10)	1.43 (1.08)	-0.03	0.766

SCALE: Never=0, A few days a week=1, Most days a week=2, Every day=3.
INT=Intervention, CON=Control.
* P-values from GEE techniques comparing differences between INT and CON at baseline adjusted for cluster design effects.
** P-values from GEE techniques comparing change in INT versus change in CON adjusted for baseline values, cluster design effects, and demographics (gender, race/ethnicity, age, and grade).

TABLE 11a: Fruits and Vegetables Ready-to-Eat for Snacks at Home, Percent Reporting Every Day

At home, how often are…?	Sample		Baseline		Follow-up	
	INT	CON	INT % Every day	CON % Every day	INT % Every day	CON % Every day
a. fruits cut up and ready to eat when you want a snack	525	296	27.8	32.4	28.0	24.7
b. vegetables cut up and ready to eat when you want a snack	510	284	22.8	26.1	22.4	21.8

SCALE: Never=0, A few days a week=1, Most days a week=2, Every day=3.
Intervention, CON=Control.

Fruit and Vegetable Behaviors at Home. The student survey also assessed the magnitude of behavior changes at home related to aspects of the MiHOTM and FFVP snack intervention that encouraged children to choose FV as snacks, talk with their family about FV, ask adults to buy FV, prepare FV recipes, and read nutrition facts labels (Table 12). Students were asked, “During the past week, did you do this activity at home?” The MiHOTM and FFVP snack intervention activities that students were most likely to report doing at home were: “ask the adults in your home to buy fruit that you like at the grocery store” and “choose a fruit for a snack.” Students were least likely to indicate: “talk with your family about reading the nutrition facts labels on food.” At baseline, both choosing a fruit for a snack and preparing a fruit recipe at home were reported less often by intervention students when compared to control students; while the proportion talking with their family about reading the nutrition facts labels on food at home was higher in intervention students. Among the FV behaviors at home assessed for change, only one activity showed a significant improvement in change from baseline to follow-up between the study groups: “prepare a recipe with fruit.” The proportion of students in the intervention group who reported preparing a recipe with fruit at home increased by 5.6 percentage points from baseline to follow-up, while students in the control group reported a decrease of -2.1 percentage points ($p=0.017$).

TABLE 12: Fruit and Vegetable Behaviors at Home, Percent Reporting Yes

During the past week, did you do this activity at home?	Sample		Baseline			Follow-up		Change
	INT	CON	INT % Yes	CON % Yes	P-value*	INT % Yes	CON % Yes	P-value**
a. Choose a fruit for a snack	677	378	78.9	85.2	0.033	81.4	84.7	0.345
b. Talk with your family about eating fruit	674	377	30.1	31.8	0.650	32.9	29.2	0.138
c. Ask the adults in your home to buy fruit that you like at the grocery store	669	379	82.2	80.7	0.631	83.3	82.1	0.998
d. Prepare a recipe with fruit	677	378	42.4	49.2	0.023	48.0	47.1	0.017
e. Read nutrition facts labels on food	671	376	50.1	57.5	0.145	50.5	51.9	0.276
f. Talk with your family about reading the nutrition facts labels on food	668	378	29.0	22.8	0.030	25.2	21.2	0.423
g. Choose a vegetable for a snack	663	376	57.9	63.3	0.271	53.2	58.5	0.947
h. Talk with your family about eating vegetables	663	377	41.0	34.2	0.084	36.4	31.0	0.742
i. Ask the adults in your home to buy vegetables that you like at the grocery store	674	378	61.9	63.5	0.655	58.9	56.9	0.327
j. Prepare a recipe with vegetables	670	376	49.0	51.9	0.477	50.2	50.0	0.353

SCALE: No=0, Yes=1.
INT=Intervention, CON=Control.
* P-values from Rao-Scott Chi-square test comparing INT and CON differences adjusted for cluster design effects.
** GEE techniques for dichotomous outcomes used to compare change in INT versus change in CON adjusted for cluster design effects and demographics (gender, race/ethnicity, age, and grade).

Parent Survey

The parent survey provided parents' perceptions about behavior changes of the child and parent that occurred at the family/household level including FV intake, snack choices, cooking and shopping practices, use of nutrition labels, and the availability of FV in the home which are important secondary outcomes that can influence the change in students' FV consumption; and assessed whether parents received the MiHOTM materials providing data about the fidelity of the intervention. Parents from each study group completed the "Healthy Homework" parent survey and returned it to the classroom. In total, 430 parents (288 intervention; 142 control) completed the take home parent survey assignment, representing approximately two out of five parents (42.2% intervention; 37.5% control) of the students participating in the study.

Towards the end of the intervention period, parents were asked to reflect back over the school year and respond to the following questions, "What has changed? My child is…" and "What has changed? I am…" These were followed by a list of behaviors closely related to MiHOTM intervention materials and activities (Tables 13 and 14). Family and household level changes were reported by many parents in both the intervention and control groups. However, among the behaviors assessed (Table 13), intervention parents were significantly more likely than controls to report that their children were: "eating more [fruits/vegetables]" (88.1% vs. 75.9%, 77.8% vs. 59.9%; p<.001), "choosing fruits as snacks" (79.2% vs. 70.4%; p<.05), "asking me to buy more [fruits/vegetables] at the grocery store" (83.2% vs. 72.3%, 47.9% vs. 34.8%; p<.01), and "preparing new recipes with vegetables" (50.0% vs. 40.4%; p<.01).

TABLE 13: Child Fruit and Vegetable Behaviors at Home Reported by Parents

What has changed? My child is...	FFVP Only (N=65) % Yes	INT (N=288) % Yes	CON (N=142) % Yes	P-value*
a. eating more fruits	83.1%	88.1%	75.9%	<0.001
b. eating more vegetables	63.1%	77.8%	59.9%	<0.001
c. choosing fruits as snacks	75.4%	79.2%	70.4%	0.027
d. choosing vegetables as snacks	49.2%	39.6%	32.9%	0.092
e. reading nutrition facts labels on foods	40.9%	49.5%	48.6%	0.873
f. talking about the nutrition facts labels on foods	40.0%	51.9%	46.1%	0.238
g. asking me to buy more fruits at the grocery store	84.6%	83.2%	72.3%	0.002
h. asking me to buy more vegetables at the grocery store	41.5%	47.9%	34.8%	0.007
i. preparing new recipes with fruits	46.2%	53.3%	49.6%	0.533
j. preparing new recipes with vegetables	43.1%	50.0%	40.4%	0.007

SCALE: No=0, Yes=1.

INT=Intervention, CON=Control.

* P-values from Rao-Scott Chi-square test comparing INT and CON differences adjusted for cluster design effects.

In addition, a larger proportion of parents in the intervention group compared to the control group reported changes in their own behaviors (Table 14) including "eating more fruits" (86.8% vs. 77.9%; p<.05) and "adding more fruits or vegetables to the meals I prepare" (87.8% vs. 80.6%; p<.05). The majority of parents participating in the study, regardless of the study group, reported having more FV available and ready-to-eat in their home. As a result, no significant differences were found between parents in the intervention and control groups with respect to the availability of ready-to-eat FV that children like in the home (Table 14a).

TABLE 14: Personal Fruit and Vegetable Behaviors at Home Reported by Parents

What has changed? I am...	FFVP Only (N=66) % Yes	INT (N=288) % Yes	CON (N=140) % Yes	P-value*
a. eating more fruits	83.1%	86.8%	77.9%	0.034
b. eating more vegetables	79.7%	81.9%	82.7%	0.831
c. choosing more fruits or vegetables at the grocery store	87.7%	87.2%	83.6%	0.405
d. preparing new recipes with fruits or vegetables	72.3%	67.2%	71.4%	0.320
e. adding more fruits or vegetables to the meals I prepare	76.6%	87.8%	80.6%	0.030
f. reading nutrition facts labels more often	62.1%	64.2%	64.2%	1.000
g. providing my child with fruits or vegetables as snacks for school events and celebrations	67.7%	68.2%	64.0%	0.475
h. providing my child with fruits or vegetables as snacks at home	92.3%	87.5%	87.1%	0.910
i. sending fruits or vegetables as snacks to school for my child	36.9%	53.1%	48.9%	0.458

SCALE: No=0, Yes=1.

INT=Intervention, CON=Control.

* P-values from Rao-Scott Chi-square test comparing INT and CON differences adjusted for cluster design effects.

TABLE 14a: Household Fruit and Vegetable Behavior Changes Reported by Parents

What has changed? In my home...	FFVP Only (N=65) % Yes	INT (N=283) % Yes	CON (N=138) % Yes	P-value*
a. there are more fruits to eat that my child likes	92.3%	87.9%	85.6%	0.595
b. there are more vegetables to eat that my child likes	72.3%	74.2%	67.4%	0.199
c. there are more fruits kept out in a place where my child can get them	83.1%	86.2%	80.3%	0.173
d. there are more vegetables cut up and ready to eat where my child can get them	52.3%	54.4%	60.1%	0.331

SCALE: No=0, Yes=1.

INT=Intervention, CON=Control.

* P-values from Rao-Scott Chi-square test comparing INT and CON differences adjusted for cluster design effects.

Nearly three-quarters (73.5%) of parents from the intervention group and two-thirds (62.4%) of parents from the control group reported that their child brought home the MiHOTM Family Newsletter at least once (Table 15). MiHOTM materials were not provided to control schools, so control parents may have thought this question referred to the standard classroom or school newsletter. With respect to intervention fidelity (Table 15), over one-quarter (26.5%) of the intervention parents did not report receiving the MiHOTM Family Newsletter. Out of those intervention parents who reported receiving the MiHOTM Family Newsletter, most (92.1%) parents read the newsletter, over one-third (37.4%) made the recipe, and over two-thirds (72.7%) used the produce tips or healthy serving size recommendations.

TABLE 15: Use of the MiHOTM Family Newsletter Reported by Parents

MiHOTM Family Newsletter	FFVP Only (N=64) % At least one time	INT (N=264) % At least one time	CON (N=125) % At least one time
a. my child brought the newsletter home	59.4%	73.5%	62.4%
Out of Those Who Received the MiHOTM Family Newsletter	**FFVP Only (N=35) % At least one time**	**INT (N=189) % At least one time**	**CON (N=73) % At least one time**
b. I read the newsletter (among parents whose child brought the newsletter home)	91.4%	92.1%	87.7%
c. I made the recipe from the newsletter	18.8%	37.4%	34.9%
d. I used produce tips or healthy serving sizes	65.6%	72.7%	68.3%

SCALE: No=0, 1 Time=1, 2 Times=2, 3 or More Times=3.

INT=Intervention, CON=Control.

Note: Use caution when interpreting these numbers. MiHOTM materials were not sent to FFVP Only or CON schools. Parents at these schools may have thought this question referred to the standard classroom/school newsletter. Therefore, no statistical comparisons were made between the groups.

Teacher Survey

Finding from teachers came from two complementary data collection tools: 1) fidelity logs filled out during the intervention and 2) an online teacher survey completed toward the end of the intervention. The fidelity logs documented what nutrition education activities and the amount of nutrition education that students in the study received in the classroom for the 2013 to 2014 school year, providing information about the fidelity of the intervention and potential differences in implementation between schools that may impact the change in students' FV intake. The online teacher survey was designed to capture teachers' experiences implementing the FFVP with MiHOTM, such as what and how much was used; the link between MiHOTM and FFVP; their confidence, challenges, and satisfaction with MiHOTM; what training was received; what, if any, feedback was received from students/parents; and teachers suggestions for MiHOTM improvement(s).

Teacher participation for the fidelity logs was high (47 of 49 intervention teachers; 19 of 19 control teachers). However, very few teachers completed the online teacher survey and therefore the final sample represented only a small fraction of the total teachers (7 of 49 intervention teachers; 4 of 19 control teachers) and schools (4 of 14 intervention schools; 2 of 4 control schools) participating in the study.

Intervention Fidelity (Fidelity Log and Online Teacher Survey). Findings from the fidelity log indicate that nearly 20% of intervention teachers (9 of 47) did not use MiHOTM materials in their classroom during the 2013 to 2014 school year. In addition, two of the nine intervention teachers who reported not implementing any MiHOTM activities or using any MiHOTM materials in their classroom when completing the online teacher survey provided brief explanations for this: one did not receive any MiHOTM materials and the other cited testing requirements and days off due to the weather.

MiHOTM Training (Online Teacher Survey). Intervention teachers reported very little introduction, orientation, or training to implement the MiHOTM program. Only three of five teachers in intervention schools who used MiHOTM received the Teacher Letter introducing MiHOTM’s purpose and materials. None of the intervention teachers (0 of 5) who used MiHOTM said they viewed the brief 20-minute training video on how to use the MiHOTM materials in their classroom or read part or all of the Child Nutrition Director’s training manual. Only one teacher (1 of 5) reported receiving any type of training on how to use the MiHOTM materials in the classroom; he/she reported receiving training provided by the FFVP Administrator. In addition, three of five teachers disagreed or were not sure that the training they received provided them with the information needed to successfully implement the MiHOTM materials. One of these teachers also mentioned that it would have been helpful to receive training provided by the FFVP Administrator.

Michigan Harvest of the Month Use (Fidelity Log and Online Teacher Survey). The fidelity logs indicated that 80.9% of intervention teachers (38 of 47) conducted MiHOTM activities or used MiHOTM materials during the intervention. The online teacher survey asked intervention teachers who had implemented MiHOTM (5 of 7 teachers) how they

used the materials. One teacher (1 or 5) reported simply sending the MiHOTM materials home, while the other teachers (4 of 5) used MiHOTM materials both during school activities and sent them home with students. Intervention teachers also provided estimates of the time they spent using MiHOTM materials with their class on the fidelity logs (Table 16). These estimates showed that nearly half (44.7%) of teachers (21 of 47) from intervention schools spent over 30 minutes per month using MiHOTM materials with their class, while 27.7% of teachers (13 of 47) spent less than 30 minutes and 0 minutes per month.

TABLE 16: Number of Minutes per Month Teachers Spend Using the MiHOTM Materials with Their Class

Number of Minutes per Month	FFVP Only (N=4) N (%)	INT (N=47) N (%)
0 minutes	3 (75.0%)	13 (27.7%)*
30 minutes or less	1 (25.0%)	13 (27.7%)
More than 30 minutes	0 (0.0%)	21 (44.7%)

INT=Intervention.

*Four teachers indicated that they used MiHOTM materials, but reported 0 minutes.

Most Frequently Used MiHOTM Educator Newsletter Activities and Featured Produce (Fidelity Log). Teachers could choose among many different MiHOTM Educator Newsletter activities‡ focused on one of twelve featured produce§ items to implement in their classrooms (Tables 17 and 18). Among teachers in intervention schools, the most common activities reported from the Educator Newsletter were: Taste Testing (53% of teachers used at least once; featuring an average of 3.7 different produce items), Nutrient Facts Label (53% of teachers used at least once; featuring an average of 2.7 different produce items), and Reasons to Eat (47% of teachers used at least once; featuring an average of 2.2 different produce items). Activities reported least often by teachers were: Student Champions (0 teachers), and Student Sleuths (6% of teachers used at least once; featuring an average of 0.5 different produce items). In total, 21.3% of intervention teachers (10 of 47) reported using none of the Educator Newsletter activities during the intervention.

‡ Educator Newsletter activities included: Nutrient Facts Label, Exploring [Featured Produce] Taste Testing, Reasons to Eat [Featured Produce], Adventurous Activities, Just the Facts, How Do [Featured Produce] Grow?, Botanical Facts, Student Sleuths, School Garden: From Seed to Life, Health and Learning Go Hand-in-Hand, Cooking in Class, Physical Activity Corner, Cafeteria Connections, Literature Links, How Much Do I Need?, The Roots of [Featured Produce] History, Student Champions, and Home Grown Facts.

§ Featured produce were apples, asparagus, berries, carrots, greens, melons, pears, potatoes, spinach, squash, strawberries, and tomatoes.

TABLE 17: Number of Teachers Using MiHOTM Activities from the Educator Newsletter and Average Number of Featured Produce Used for Each Activity

MiHOTM Activities	INT (N=47) Teachers N (%)	INT (N=47) Number of Featured FV* Mean (SD)
Exploring FV: Taste Testing	25 (53.2%)	3.72 (3.89)
Nutrition Facts Label	25 (53.2%)	2.74 (3.58)
Reasons to Eat FV	22 (46.8%)	2.21 (3.22)
How Much Do I Need?	14 (29.8%)	1.43 (2.95)
Just the Facts	11 (23.4%)	1.28 (2.95)
How Do FV Grow?	10 (21.3%)	0.81 (2.01)
Home Grown Facts	9 (19.1%)	0.98 (2.52)
Botanical Facts	9 (19.1%)	0.81 (1.79)
Cafeteria Connections	7 (14.9%)	0.55 (1.63)
Health and Learning Go Hand-In-Hand	6 (12.8%)	0.64 (2.05)
Literature Links	6 (12.8%)	0.49 (1.40)
Adventurous Activities	6 (12.8%)	0.45 (1.36)
School Garden: From Seed to Life	5 (10.6%)	0.30 (0.93)
The Roots of FV History	4 (8.5%)	0.43 (1.43)
Physical Activity Corner	4 (8.5%)	0.36 (1.79)
Cooking In Class	4 (8.5%)	0.19 (0.71)
Student Sleuths	3 (6.4%)	0.49 (2.05)
Student Champions	0 (0.0%)	0.00 (0.00)
None of the Above**	10 (21.3%)	

INT=Intervention.

* Out of a total of 12 MiHOTM featured produce items available for teachers to use.

** Reported "None of the Above" for all 12 featured produce items.

When examining the 12 featured produce items, the most commonly featured produce items when implementing MiHOTM activities were apples (74.5% of teachers featured at least once; featured in an average of 3.1 different activities) and tomatoes (68% of teachers featured at least once; featured in an average of 2.0 different activities). The least common featured produce items were asparagus (32% of teachers featured at least once; featured in an average of 0.6 different activities) and potatoes (27.7% of teachers featured at least once; featured in an average of 0.6 different activities).

TABLE 18: Number of Teachers Featuring MiHOTM Produce and Average Number of Activities Implemented for Each Featured Produce Item

MiHOTM Featured Produce	INT (N=47) Teachers N (%)	INT (N=47) Number of Activities* Mean (SD)
Apples	35 (74.5%)	3.15 (2.82)
Tomatoes	32 (68.1%)	2.02 (2.09)
Carrots	30 (63.8%)	2.09 (2.25)
Strawberries	30 (63.8%)	1.83 (2.29)
Berries	28 (59.6%)	1.47 (2.18)
Pears	25 (53.2%)	1.43 (2.00)
Melons	24 (51.1%)	1.32 (1.91)
Greens	23 (48.9%)	1.40 (2.47)
Squash	20 (42.6%)	1.02 (1.71)
Spinach	18 (38.3%)	0.94 (1.93)
Asparagus	15 (31.9%)	0.57 (1.21)
Potatoes	13 (27.7%)	0.64 (1.44)

INT=Intervention.

* Out of a total of 18 MiHOTM Educator Newsletter activities available for teachers to use.

MiHOTM Family Newsletter, Botany Worksheets, Nutrition Facts Labels, and Student Sleuth Answers (Fidelity Log and Online Teacher Survey). When examining the other MiHOTM materials distributed to intervention teachers, the fidelity logs show that teachers were most likely to report using the Family Newsletter. More than three-quarters of teachers (80.9%) in the intervention schools who completed the fidelity log sent the Family Newsletter home with students at least once during the 2013 to 2014 school year (Table 19). The Family Newsletter was primarily distributed in English (5 teachers, 100%), but Spanish (1 teacher, 20%) and Arabic (1 teacher, 20%) versions were also used based on responses to the online teacher survey (table not shown).

TABLE 19: Number of Teachers Distributing the MiHOTM Family Newsletter for Students to Take Home

Number of Teachers Distributing the MiHOTM Family Newsletter	FFVP Only (N=4) N (%)	INT (N=47) N (%)
Yes	1 (25.0%)	38 (80.9%)
No	3 (75.0%)	9 (19.2%)

SCALE: No=0, Yes=1.

INT=Intervention.

Note: One control teacher reported distributing the MiHOTM Family Newsletters. This is discussed in the study limitations section.

Teacher were less likely to report using the classroom worksheets. The majority of teachers (60.7%) who completed the fidelity log at intervention schools reported using the Nutrient Facts Labels (Table 20). Fewer teachers reported using the Botany Worksheets (19.2%), and only two teachers (4.3%) reported using the Student Sleuth Answers. More than a third (38.3%) of the teachers reported that they hadn't used either worksheet or the Student Sleuth Answers.

TABLE 20: MiHOTM Materials that Teachers Reported Using in Their Class

Number of Teachers Using MiHOTM Materials	FFVP Only (N=4) N (%)	INT (N=47) N (%)
Nutrition Facts Labels	0 (0.0%)	29 (61.7%)
Botany Worksheets	0 (0.0%)	9 (19.2%)
Student Sleuth Answers	0 (0.0%)	2 (4.3%)
None of the Above	4 (100.0%)	18 (38.3%)

INT=Intervention.

Other Nutrition Education in the Classroom (Fidelity Log). More than half (59.6%) of intervention teachers reported spending time using nutrition education materials in addition to MiHOTM during the 2013 to 2014 school year. Three-quarters (73.6%) of teachers in control schools also reported using nutrition education materials. The length of time spent implementing other nutrition education activities was similar among teachers from intervention and control schools. As shown in Table 21, approximately one-third of teachers in both groups spent up to 30 minutes per month implementing other nutrition education activities, while a similar proportion exceeded 30 minutes per month. When examining the implementation of MiHOTM and other nutrition education together, the data show that the majority (92.3%) of intervention teachers (12 of 13) who reported 0 minutes conducting MiHOTM also spent 0 minutes using other nutrition education materials with their class.

TABLE 21: Number of Minutes per Month Teachers Spend Using Other Nutrition Education Materials with Their Class

Number of Minutes per Month	FFVP Only (N=4) N (%)	INT (N=47) N (%)	CON (N=19) N (%)
0 minutes	3 (75.0%)	19 (40.4%)	6 (31.6%)*
30 minutes or less	1 (25.0%)	13 (27.7%)	6 (31.6%)
More than 30 minutes	0 (0.0%)	15 (31.9%)	7 (36.8%)

INT=Intervention, CON=Control.

* One teacher indicated that he/she used nutrition education materials, but reported 0 minutes.

Half of intervention teachers (22 of 47, 46.8%) reported information about the nutrition education materials they used in addition to MiHOTM or shared additional open ended comments (summarized under What Parts of MiHOTM Worked Best and Least Well?).

These teachers from intervention schools reported using nutrition education materials from several organizations and programs including:

- school health class/health teacher devoted to healthy eating and healthy choices (2 of 22 teachers),
- Michigan Model for Health (1 of 22 teachers), and
- the GoGreen program (1 of 22 teachers).

Other sources of nutrition information provided by intervention teachers were:

- websites (1 of 22 teachers) and
- activities showing how the FV grow (1 of 22 teachers).

Several intervention teachers (6 of 22) also reported actively discussing nutrition with their class. This included topics such as fruits, vegetables, FFVP snacks, trying new foods, providing positive encouragement *("encourage them to try new foods and eat from the cart"*), and also addressed botanical facts *("discussed plants and which part of the plant we are eating"*).

Teachers (11 of 19, 57.9%) in control schools who conducted nutrition education during the study period reported using materials from several organizations and programs including:

- Michigan Model for Health (2 of 11 teachers),
- USDA Team Nutrition (2 of 11 teachers),
- National Kidney Foundation of Michigan Kids + Kidneys Program (2 of 11 teachers),
- district curriculum and healthy living materials (2 of 11 teachers),
- Body Systems and Nutrition (1 of 11 teachers), and
- Good Things First Nutrition with Joan O'Keefe (1 of 11 teachers).

Control teachers also shared sources of nutrition information[**] that they used to teach nutrition education:

- local restaurants (1 of 11 teachers),
- healthykids.com (1 of 11 teachers), and
- Google searches (1 of 11 teachers).

A few teachers (3 of 11) reported discussing nutrition with their students in general, at designated times (*"before lunch and before they go home"*), or to address a specific topic (*"encourage students to do more at home"*). Several teachers (4 of 11) also implemented nutrition activities such as:

- looking at *"calorie counts (backs of snacks) and protein/fiber information"*,
- *"sampling snack suppers kids receive",*
- *"reviewing nutritional values of breakfast items and setting goals at home for better food choices"*, and
- *completing an "economics activity related to informed choices".*

[**] Unexpectedly, one control teacher reported using MiHOTM FV information sheets from the previous school year.

What Parts of MiHOTM Worked Best and Least Well (Fidelity Log and Online Teacher Survey)? When asked which of the MiHOTM materials worked best and why, two of five teachers who had implemented MiHOTM identified the nutrition fact sheets/labels and botanical section/images as two materials that worked best, because they were *"quick and easy to understand"* and *"fit into the 4th grade curriculum."* In addition, open ended responses from the comments section of the fidelity log provides more detail about what parts of MiHOTM that intervention teachers (22 of 47) liked. Many teachers (5 of 22) provided positive feedback about MiHOTM. They felt:

- *"The materials were beautiful!"*
- *"Snacks are great!"*, and
- endorsed MiHOTM as a *"Great Program."*

One teacher wrote: *"Love this program! It helped me teach my students about healthy eating and allowed them to learn the benefits"* and *"some interesting facts."* There was also a commitment made by another teacher to continue to utilize the MiHOTM material as a valuable resource for healthy choices. Some teachers (4 of 22) mentioned sending MiHOTM materials home; while another developed a more intensive approach using the materials to conduct 30-minute mini lessons. One teacher reported conducting a fun nutrition activity for children: melting chocolate over strawberries for Mother's Day.

The feedback received from teachers (3 of 5) with respect to what worked least well was focused on challenges with having enough time to implement MiHOTM materials. The reasons provided by teachers included:

- *"The try your own recipes and deeper lesson options just are not viable due to lack of time",*
- *"Handouts were too long for what would be read"*, and
- *"Our parents want to look at short and sweet resources!"*

These online survey findings are supported by comments from the fidelity log where intervention teachers (4 of 22) reported having little to no time in their current schedule to teach MiHOTM material. One teacher suggested 5-10 minute activities and recommended that reading materials be limited to one side of one sheet.

Confidence with MiHOTM Program and Resources (Online Teacher Survey). Intervention teachers who reported implementing MiHOTM were asked to rate their level of confidence with the program and resources. Table 22 shows that few teachers using MiHOTM activities and materials reported feeling "very confident". In fact, not a single teacher said they were "very confident" in their understanding of the MiHOTM program. All five teachers reported being only somewhat confident about their own understanding of the MiHOTM program. Although all five intervention teachers who used MiHOTM reported feeling very or somewhat confident with all aspects of the MiHOTM program and resources that they were asked about, teachers' confidence was relatively higher regarding their abilities to use the MiHOTM Educator Newsletter, the Nutrient Facts Labels, and the Botany Worksheets than to use the Student Sleuth Activities or link the MiHOTM classroom activities to the FFVP.

TABLE 22: Level of Confidence with the MiHOTM Program and Resources Reported by Intervention Teachers

	INT (N=5)		
	Very Confident	Somewhat Confident	Not Confident
	N (%)	N (%)	N (%)
My own understanding of the MiHOTM program.	0 (0.0%)	5 (100.0%)	0 (0.0%)
My ability to use the MiHOTM Educator Newsletter in my classroom.	3 (60.0%)	2 (40.0%)	0 (0.0%)
My ability to use the Nutrient Facts Labels in my classroom.	3 (60.0%)	2 (40.0%)	0 (0.0%)
My ability to use the Botany Worksheets in my classroom.	3 (60.0%)	2 (40.0%)	0 (0.0%)
My ability to use the Student Sleuth Activities/Answers in my classroom.	1 (20.0%)	4 (80.0%)	0 (0.0%)
My ability to link the MiHOTM activities conducted in my classroom to the FFVP snack.	1 (20.0%)	4 (80.0%)	0 (0.0%)

INT=Intervention.

Satisfaction with MiHOTM Materials (Online Teacher Survey). Overall, intervention teachers expressed high satisfaction with MiHOTM materials (Table 23). All five teachers who reported using MiHOTM expressed high levels of satisfaction (top two levels) with the quantities of materials received, their ease of use, and their overall satisfaction; four of the five teachers also reported high satisfaction with the activities. Four of five teachers agreed that the MiHOTM materials were age-appropriate, and all four teachers responding felt that students were engaged when using the materials and activities. Four of five teachers would recommend MiHOTM to other teachers, and three of five teachers using MiHOTM materials said they would use the materials and activities again in the future.

TABLE 23: Level of Satisfaction with the MiHOTM Materials Reported by Intervention Teachers

	INT (N=5)				
	Very Low (1)	(2)	(3)	(4)	Very High (5)
	N (%)	N (%)	N (%)	N (%)	N (%)
Ease of use	0 (0.0%)	0 (0.0%)	0 (0.0%)	3 (60.0%)	2 (40.0%)
Activities	0 (0.0%)	0 (0.0%)	1 (20.0%)	3 (60.0%)	1 (20.0%)
Quantities of materials received	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (40.0%)	3 (60.0%)
Overall satisfaction	0 (0.0%)	0 (0.0%)	0 (0.0%)	3 (60.0%)	2 (40.0%)

INT=Intervention.

Challenges Implementing MiHOTM (Fidelity Log and Online Teacher Survey). Across MiHOTM materials and activities, intervention teachers found time constraints to be most challenging when implementing MiHOTM. Online survey results showed that all five teachers in intervention schools who had used MiHOTM mentioned not having enough time as a challenge to using the MiHOTM Educator Newsletter activities, nutrition fact labels, and botanical image worksheets for in school activities with their students. Other reasons provided by two teachers included:

- *"Was not familiar enough with the materials to carry out the suggested activities."* and
- *"Short on funding. The foods didn't start right away and ended before school let out by a few weeks."*

Teachers were also asked to rank a list of challenges with implementing MiHOTM from least to most challenging on the online survey (Table 24). It takes too much class time was perceived as the greatest challenge by teachers with two of five teachers ranking it as most challenging, the only item reported as "most" challenging by teachers. Another two teachers ranked limited class time as moderately challenging (score of 2 or 3). Other components of MiHOTM intervention that were rated as moderately challenging by intervention teachers include (in declining order): lack of equipment for activities (3 of 5 teachers); materials not grade appropriate, lack of training to use the materials, and too little administrative support (2 of 5 teachers); and too little cafeteria support (1 of 5 teachers). Getting the MiHOTM materials was ranked as least challenging by all five teachers.

TABLE 24: Challenges with Implementing MiHOTM Reported by Intervention Teachers

	INT (N=5)			
	Least Challenge (1)	(2)	(3)	Most Challenge (4)
	N (%)	N (%)	N (%)	N (%)
Getting the MiHOTM materials	5 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Materials are not grade appropriate	3 (60.0%)	1 (20.0%)	1 (20.0%)	0 (0.0%)
It takes too much class time	1 (20.0%)	1 (20.0%)	1 (20.0%)	2 (40.0%)
Lack of equipment for activities	2 (40.0%)	2 (40.0%)	1 (20.0%)	0 (0.0%)
Lack of training to use the materials	3 (60.0%)	0 (0.0%)	2 (40.0%)	0 (0.0%)
Too little cafeteria support	4 (80.0%)	1 (20.0%)	0 (0.0%)	0 (0.0%)
Too little administrative support	3 (60.0%)	2 (40.0%)	0 (0.0%)	0 (0.0%)

INT=Intervention.

Some of the same challenges were repeated in the comments section of the fidelity log where intervention teachers who provided comments (22 of 47 teachers) reported:

- not receiving the MiHOTM materials/ Educator Newsletter (2 of 22 teachers),
- not getting any expectations from the school principal for MiHOTM use (1 of 22 teachers),
- not being informed about the [MiHOTM] program after returning from maternity leave (1 of 22 teachers), and

- sometimes the snacks were not fresh (1 of 22 teachers).

Student and Parent Feedback (Fidelity Log and Online Teacher Survey). Only one of five teachers received feedback from students or their parents about the MiHOTM materials and activities. This teacher reported that *"students enjoyed trying different fruits and vegetables"* and would *"rather have some of the veggies in a salad"*. The online survey findings were reinforced by comments from the fidelity log where intervention teachers (4 of 22) reported that students didn't like some of the vegetables (asparagus, snow peas, radishes) and preferred eating fruit (2 of 22 teachers). Intervention teachers did not share any parent feedback or comments about parents.

Other Suggestions for Improvement (Online Teacher Survey). Other specific suggestions for improving MiHOTM for the next school year pertained to time available to devote to MiHOTM in the classroom (2 of 5 teachers):

- One teacher commented that *"there are many ideas and activities that are wonderful! I just cannot devote that amount of time to this subject."*
- Another teacher mentioned that *"simple hands-on activities that students can do at home (other than recipes and readings) that might be more interesting to the students"* would be best.

Linking MiHOTM to the Fresh Fruit and Vegetable Program (FFVP) Snacks (Online Teacher Survey). All five teachers in intervention schools who had used MiHOTM reported that they were able to link MiHOTM education and activities with the FFVP snack. Four of five teachers also incorporated MiHOTM materials and activities into classroom discussions and activities, including:

- Comparing foods using Nutrition Facts Labels,
- Incorporating them into science lessons,
- Learning about the plant parts of FV offered in the FFVP, and
- Integrating them into health class

School Environment (Online Teacher Survey). One control teacher (1 of 4) reported that his/her school had a policy to guide the types of foods and beverages provided to students at classroom parties or celebrations in an effort to encourage healthy options (Table 25). However, the description provided by the teacher indicated that this was a teacher request to parents, and not a policy (*"send home a classroom newsletter stating healthy food options I would like at the event"*). No teachers in intervention schools reported having such a policy.

TABLE 25: Description of Teacher or School Policy to Guide the Types of Foods and Beverages Given to Students at Class Celebrations to Encourage Healthy Options

Description of FFVP Only (N=2)	Description of INT (N=0)	Description of CON (N=1)
• One teacher reported having a fruit tray, cheese and crackers, or something similar during class parties (n=1) • Another expressed: "It is really up to the teacher to decide what is allowed in the classroom." (n=1)	No teachers at intervention schools reported a policy.	• Send home a classroom newsletter requesting healthy food options for events/ celebrations (n=1)

INT=Intervention, CON=Control.

About half of the teachers in both intervention (4 of 7 teachers, 57.1%) and control (2 of 4 teachers, 50.0%) schools stated that they encouraged parents to bring FV for celebrations in class. To achieve this, teachers in both groups used similar strategies (Table 26): letters to parents, assigning individual foods to each parent (and only assigning "sweets" to one parent), and providing a list of healthy options for parents to choose from.

TABLE 26: Description of How Teachers Encourage Parents to Bring Fruits and Vegetables for Class Celebrations

Description of FFVP Only (N=2)	Description of INT (N=4)	Description of CON (N=2)
The following strategies were mentioned: • Use class newsletter asking parents to send in cut up carrots, celery, and sometimes wheat crackers (n=1) • Teacher requests the food items he/she would like donated (n=1)	The following strategies were mentioned: • Letter (n=1) • Asking parents to bring fruits for holiday celebrations (n=1) • Teacher plans all the food that parents will bring and assigns specific items to each parent (n=2) • Teacher assigns sweet treats to only one parent for classroom celebrations (n=1)	The following strategies were mentioned: • Parent letter asking parents to provide healthy snacks (n=1) • Provide a list of options for parents to choose from (n=1)

INT=Intervention, CON=Control.

More than half of teachers in both intervention (4 of 7 teachers, 57.1%) and control (3 of 4 teachers, 75.0%) schools encouraged students to bring FV as classroom snacks (Table 27).

TABLE 27: Encouraging Students to Bring Fruits and Vegetables as Classroom Snacks

	FFVP Only (N=4) N (%)	INT (N=7) N (%)	CON (N=4) N (%)
Yes	4 (100.0%)	4 (57.1%)	3 (75.0%)
No	0 (0.0%)	2 (28.6%)	1 (25.0%)
Don't know	0 (0.0%)	1 (14.3%)	0 (0.0%)

INT=Intervention, CON=Control.

As shown in Table 28, a majority of intervention and control teachers reported sometimes giving out foods or beverages as rewards to their students or class (5 of 7 INT teachers, 71.4%; all 4 CON teachers, 100.0%).

TABLE 28: Providing Foods or Beverages to Reward Students or the Class

	FFVP Only (N=4) N (%)	INT (N=7) N (%)	CON (N=4) N (%)
Yes	4 (100.0%)	5 (71.4%)	4 (100.0%)
No	0 (0.0%)	2 (28.6%)	0 (0.0%)

INT=Intervention, CON=Control.

A description of these foods and beverages is provided in Table 29. Foods and beverages used included both healthy (fruit, vegetables, juice, nuts, yogurt/cheese, and whole grains) and less healthy (candy, cookies, and sweets) options. Some control teachers (2 of 5) also reported using food(s) as part of their lessons (salad w/low-fat dressing for science, lemons for writing, some candy for science, and a cookie for digestion lesson).

TABLE 29: Description of the Foods or Beverages that Teachers Give to Students or Their Class as Rewards

Description of FFVP Only (N=4)	Description of INT (N=5)	Description of CON (N=4)
The following foods and beverages were mentioned: • Candy (suckers) (n=1) • Fruit drinks (Capri Sun) (n=2) • Chips (n=2) • Crackers, cheese w/crackers (n=2) • Protein/snack bars (n=2) • Veggies w/dip (n=1) • FFVP snack (n=1)	The following foods and beverages were mentioned: • Candy (hard candies, pieces of candy) (n=3) • Cookies (n=1) • Fruit (raisins, apples, bananas) (n=2) • Juice (n=1) • Nuts (peanut butter) (n=1) • Vegetables (carrots, celery) (n=1) • Whole grains (popcorn) (n=2)	The following foods and beverages were mentioned: • Dairy (yogurt, cheese) (n=2) • Granola (n=1) • Fruit (fruits, lemons) (n=2) • Juice (n=1) • "sweets" (n=1) Some teachers (2 of 5) also reported using foods as part of their lessons (salad w/low-fat dressing for science, lemons for writing, some candy for science, and a cookie for digestion lesson).

INT=Intervention, CON=Control.

Only two of seven intervention school teachers reported that their schools have a FV garden for students to use; no control school teachers reported having a FV garden (Table 30). Garden-related activities that students had an opportunity to participate in at the intervention schools with a FV garden included: garden club (planting, tending, or harvesting) and visits to local farms.

TABLE 30: Schools with a Fruit or Vegetable Garden that Students Can Use

	FFVP Only (N=4) N (%)	INT (N=7) N (%)	CON (N=4) N (%)
Yes	0 (0.0%)	2 (28.6%)	0 (0.0%)
No	4 (100.0%)	5 (71.4%)	4 (100.0%)

INT=Intervention, CON=Control.

Very few teachers reported that their school or school district had an ongoing school wellness committee or team that makes recommendations regarding nutrition and/or exercise for students (Table 31). One intervention teacher reported that his/her school district had an ongoing school wellness committee, and one control teacher responded that his/her school had an ongoing school wellness committee.

TABLE 31: School Districts or Schools with an Ongoing School Wellness Committee that Makes Nutrition or Exercise Recommendations for Students

	FFVP Only (N=4) N (%)	INT (N=7) N (%)	CON (N=4) N (%)
Yes, at the school level only	0 (0.0%)	0 (0.0%)	1 (25.0%)
Yes, at the district level only	0 (0.0%)	1 (14.3%)	0 (0.0%)
Yes, at both the school and district levels	0 (0.0%)	0 (0.0%)	0 (0.0%)
No	2 (50.0%)	2 (28.6%)	1 (25.0%)
Don't Know	2 (50.0%)	4 (57.1%)	2 (50.0%)

INT=Intervention, CON=Control.

Teachers from intervention and control schools offered suggestions on how MFF could provide nutrition education and physical activity promotion materials (Table 32). Suggestions included cooking classes for families, providing supplies for teaching, and adding physical activity that links to the FFVP snack that can be done at recess so no class time is used.

TABLE 32: Description of Other Nutrition Education and Physical Activity Promotion Materials that MFF Could Provide to Encourage Kids to Be More Active and Eat More Fruits and Vegetables

Description of FFVP Only (N=2)	Description of INT (N=2)	Description of CON (N=2)
• Add physical activity – perhaps instead of just sitting in the classroom, one day students could exercise in the gym with an instructor and the teacher (n=1) • Provide MiHOTM materials to teach with; "I do use the Michigan Model for Health to teach nutrition, as well." (n=1)	• Add physical activity – for example, an exercise routine that links to the fruit or vegetable snack and done at recess so no class time is used (n=1) • Look at materials that are available (n=1)	• Cooking classes for families to teach them how to prepare foods in healthy ways (n=1) • Provide supplies for teaching (n=1)

INT=Intervention, CON=Control.

Fresh Fruit and Vegetable Program Administrator Survey

Fresh Fruit and Vegetable Program (FFVP) Administrators completed an online survey or telephone interview describing their experience administering the FFVP and MiHOTM in the intervention schools. This assessment collected information about the MiHOTM introductions and trainings, MiHOTM use, MiHOTM featured produce, and FFVP Administrators' opinions about MiHOTM. Four (three food service directors and one principal) of the six FFVP Administrators who participated in the study completed the survey: two completed the survey online, one completed the survey online and answered follow-up questions over the telephone, and one completed the survey by telephone interview only. The four administrators who completed the survey administered the FFVP in a single school, representing 4 of the 14 intervention schools. Of the two administrators that did not participate one administered the program in a single school, but the other administered the program across 134 schools 9 of which were in the intervention group. The lack of participation by the FFVP administrator that served multiple school sites, limits the generalizability of the findings presented here to a small subset of the intervention schools.

Primary Roles of FFVP Administrators. FFVP Administrators played many roles in the implementation of the FFVP grant (Table 33). The primary roles were ordering produce for FFVP snack (4 of 4), ordering produce and other food for the regular school meal program (3 of 4), and providing administrative overview for the program (3 of 4).

TABLE 33: Roles FFVP Administrators Play in the Grant Implementation

	INT (N=4) N (%)
Applied for the FFVP grant	1 (25.0%)
Administrative overview	3 (75.0%)
Order produce and other food for the regular school meal program	3 (75.0%)
Order produce for the FFVP snack program	4 (100.0%)
Pick up fresh fruit and vegetables	1 (25.0%)
Distributed surveys and learning materials	1 (25.0%)

INT=Intervention, CON=Control.

Due to multiple responses, each row has a possible maximum of 100%.

MiHOTM Introduction for FFVP Administrators. Three of the four FFVP Administrators were present for the introduction to MiHOTM offered at the Michigan Department of Education's training on August 19th, 2013 and reported reading the MiHOTM Child Nutrition Director Guide: How to Grow Healthy Students. All three FFVP Administrators who attended the training agreed that the MiHOTM introduction, training, and guide helped clarify the nutrition education approach and prepared them to provide nutrition education resources in their school(s).

Engaging the School Community. One key role of the FFVP Administrators was to provide MiHOTM introductions to the school community in an effort to involve them in the planning and implementation of MiHOTM at their school(s). FFVP Administrators (3

of 4) reported engaging the school community at staff meetings, during coffee with the principal for parents and stakeholders, through staff introductions (principals, teachers, and food service staff), and by sharing information in newsletters. Parents, students, and school staff (other than teachers/child nutrition staff) were also actively involved in the implementation of MiHOTM, based on administrators' observations (3 of 4). They helped with classroom discussions, assisted students at the FV snack cart and encouraged them to try all the FV available, hung posters, and provided input on classroom activities.

Training School Staff to Implement MiHOTM. Most administrators (3 of 4) did not encourage their teachers to watch the online training video. Follow-up interviews with administrators showed they were unaware that this online training existed. All four FFVP Administrators provided additional training to child nutrition staff and/or building cafeteria staff, and half of them (2 of 4) also reported providing additional training opportunities to teachers. For future trainings, all FFVP Administrators preferred using webinars compared to faced-to-face trainings.

Ordering and Distributing MiHOTM Materials. All of the administrators (4 of 4) reported ordering teacher resource packets to distribute to teachers, and most (3 of 4) ordered cafeteria posters to distribute at their schools. Teacher packets were distributed to 42 teachers across the 4 schools. Overall, FFVP Administrators tended to agree that the ordering process was easy, timely, and accurate. However, two administrators reported being uncertain that if they had questions about ordering materials, they would be answered in a timely manner. MiHOTM packets were distributed to classroom teachers in a variety of ways: placed in teachers' mailboxes, hand delivered to classrooms, and provided at staff meetings.

Coordinating MiHOTM with the FFVP Snack and Menu Items. All four administrators coordinated with child nutrition staff and/or building cafeteria staff to serve the featured MiHOTM FV as the FFVP snack during the school year. Different produce items were served during the year, and the most popular FV were: apples, berries, carrots, melon, pears, strawberries, and tomatoes (Table 34). Although a variety of FV were provided as FFVP snacks, Table 35 shows that carrots and apples were served most often (84 and 83 times, respectively). Asparagus was the only produce item that was not featured at any of the administrators' schools.

TABLE 34: Number of Administrators Reporting that Schools Serve the MiHOTM Featured Produce as the FFVP Snack

MiHOTM Featured Produce	INT (N=4) N (%)
Apples	4 (100.0%)
Berries	4 (100.0%)
Carrots	4 (100.0%)
Melon (cantaloupe, honeydew, watermelon)	4 (100.0%)
Pears	4 (100.0%)
Strawberries	4 (100.0%)
Tomatoes	4 (100.0%)
Greens (collard, mustard, kale, Swiss chard)	3 (75.0%)
Squash	3 (75.0%)
Potatoes	2 (50.0%)
Spinach	1 (25.0%)
Asparagus	0 (0.0%)

INT=Intervention.
Due to multiple responses, each row has a possible maximum of 100%.

TABLE 35: Number of Times Each MiHOTM Featured Produce Was Served as the FFVP Snack during the School Year

MiHOTM Featured Produce	Alpena Public Schools	Threshold Academy	Owosso Public Schools	Global Health Academy	Total Times
Carrots	20	40	18	6	84
Apples	15	40	18	10	83
Melon (cantaloupe, honeydew, watermelon)	10	2	18	17	47
Tomatoes	15	9	18	4	46
Strawberries	8	9	18	1	36
Berries	5	2	18	2	27
Pears	10	--	12	2	24
Greens (collard, mustard, kale, Swiss chard)	5	0	6	3	14
Squash	6	0	2	3	11
Potatoes	5	0	6	0	11
Spinach	5	0	0	0	5
Asparagus	0	0	0	0	0

INT=Intervention.
-- No response.

Half of administrators (2 of 4) reported that the featured produce item was “always” coordinated with the MiHOTM education provided by teachers, while others indicated that it was coordinated “usually” (1 of 4) or “sometimes” (1 of 4). One FFVP Administrator provided a detailed description of how the FV snack is coordinated with MiHOTM nutrition education at their school:

- *"Most classrooms did [MiHOTM] lessons on Friday and talked about fruit or vegetable at snack on Tuesday through Friday of the same week. Had a schedule to distribute snacks. Received packet and included MDE meal plan schedule – had what we would receive each week (2 fruit, 2 vegetable options), teachers knew what to expect. A management office coordinated order to match education."*

Coordination of the featured produce item as part of the cafeteria menu was also common. Most administrators (3 of 4) indicated that they coordinated with child nutrition staff and building cafeteria staff to serve and promote at least one menu item per month that featured a MiHOTM fruit or vegetable. Efforts to promote the featured produce as a menu item included posters, nutrition education reinforcement items (beanie baby fruit and vegetables), classroom education and discussions, teacher encouragement to try FV, newsletters, and morning announcements. Administrators felt that more MiHOTM featured FV were served in the cafeteria because of the MiHOTM materials provided (3 of 4). Every administrator (4 of 4) agreed that student ate more of the featured FV, either at snack or at lunch, because of the MiHOTM materials.

- One administrator reported: *"Kids knew what the fruits and vegetables looked and tasted like and were more apt to eat them in the classroom."*
- Teacher leadership was also perceived as very influential: *"Direct lessons impacted the most, student buy-in, when teachers talked about fresh fruit and vegetable, observed students eating more fruits and vegetables."*

FFVP Administrator Success Stories. Most administrators (3 of 4) expressed a desire to participate in the program again next year. Several responses from the FFVP Administrators showcase the increased opportunities for students to try and eat fresh FV at school through the FFVP.

- One administrator shared this success story: "*when kids come to the principal and say I wouldn't have had this opportunity to eat all these new fruits and vegetables had it not been for the school to offer this program.*"
- Another administrator mentioned: "*Our kids really enjoyed the fruit and vegetables and would pick that for their snack rather than crackers. It was great to see them walking with an apple in their mouth. Our kids are at risk and I don't think they get a lot of fresh fruit and vegetables. Loved the program!"*

Environmental Assessment Tool

The Environmental Assessment Tool (EAT) is a direct observation tool supplemented with school administrator interview data. It was used to describe the characteristics and conditions in the school environment that have the potential to influence changes in students' FV consumption including salad bars, FFVP snack, vending machines, promotional materials, competitive food ads, as well as Policy, Systems, and Environmental (PSE) change efforts. Regional coordinators completed the EAT once during the intervention period at each participating school (14 intervention schools; 4 control schools) in order to assess differences between intervention and control school environments and examine the fidelity of the intervention in terms of what MiHOTM promotional materials were visible at the intervention schools. Descriptive data are presented below. Tests of significance between intervention and control schools were not conducted due to the small samples.

Availability of Salad Bars in the School Cafeteria. Table 36 displays the proportion of schools with a salad bar in the cafeteria. While only 3 of 14 (21.3%) intervention schools had a salad bar in the school cafeteria, the majority of control schools (3 of 4, 75%) reported having a salad bar. All but one of the schools with a salad bar in the cafeteria reported having salad bars available to students daily (Table 37).

TABLE 36: Number of Schools that Have a Salad Bar

Salad Bar	FFVP Only (N=1) N (%)	INT (N=14) N (%)	CON (N=4) N (%)
Yes	1 (100.0%)	3 (21.4%)	3 (75.0%)
No	0 (0.0%)	11 (78.6%)	1 (25.0%)

SCALE: No=0, Yes=1, Don't Know=2.
INT=Intervention, CON=Control.

TABLE 37: Number of Days per Week the Students Were Offered the Salad Bar

Number of Days per Week Offering Salad Bar	FFVP Only (N=1) N (%)	INT (N=3) N (%)	CON (N=3) N (%)
1 day	0 (0.0%)	0 (0.0%)	0 (0.0%)
2 days	0 (0.0%)	0 (0.0%)	0 (0.0%)
3 days	0 (0.0%)	1 (33.3%)	0 (0.0%)
4 days	0 (0.0%)	0 (0.0%)	0 (0.0%)
5 days	1 (100.0%)	2 (66.7%)	3 (100.0%)

SCALE: 1=1 day, 2=2 days, 3=3 days, 4=4 days, 5=5 days.
INT=Intervention, CON=Control.

FFVP Snack Service. The environmental assessment also provided data on the FFVP snack service such as where the snack was served and who served it to students (Tables 38 and 39). At intervention schools, the FFVP snack was primarily served to students in the classroom (12 of 14, 85.7%). The cafeteria and the hallway were also

mentioned as FFVP snack service locations, but far less frequently. The FFVP snack was most commonly provided to students by teachers, but also by school nutrition staff, students, para-professionals, service assistants, and made available as self-serve.

TABLE 38: Location where the FFVP Snack Was Served to Students

Number of Schools Reporting Location	FFVP Only (N=1) N (%)	INT (N=14) N (%)
Classroom	1 (100.0%)	12 (85.7%)
Cafeteria	1 (100.0%)	2 (14.3%)
Other: Hallway	0 (0.0%)	1 (7.1%)

INT=Intervention.
Due to multiple responses the column may exceed the total N and 100%.

TABLE 39: Type of Staff Support for Serving the FFVP Snack to Students

Number of Schools Reporting Staff Type	FFVP Only (N=1) N (%)	INT (N=14) N (%)
Teachers	1 (100.0%)	8 (57.1%)
Others: Self-serve, students, para-professionals, and service assistants.	0 (0.0%)	5 (35.7%)
School Nutrition Staff	0 (0.0%)	4 (28.6%)

INT=Intervention.
Due to multiple responses the column may exceed the total N and 100%.

School Personnel Encourage Students to Eat Fruits and Vegetables. At intervention schools, the majority (85.7%) of school administrators reported that school personnel encourage students to eat the FFVP snacks (Table 40). The descriptions of how school personnel encouraged students primarily included who served the FFVP snack and where it was served. The majority of school administrators (9 of 14) indicated that child nutrition or food service staff provide the FFVP snack to teachers who serve it in the classroom. In addition, two school administrators reported how often they serve the FFVP snack (daily and twice a day). The time of day that the FFVP snack was served was also shared by three administrators: either morning (2 of 3 schools) or afternoon (1 of 3 schools). Lastly, a few school administrators described the packaging of the FFVP snack, mentioning that *"it is individually wrapped and passed out to each student"* and *"[they are served] in the packaging they are delivered in"*, as well as the delivery of the FFVP snack *"[it is served] from crates that are delivered to classrooms"* and *"[it is] delivered in buckets"*.

TABLE 40: Number of Schools where School Personnel Encourage Students to Eat the FFVP Snacks

School Personnel Encourage Students to Eat the FFVP Snacks	FFVP Only (N=1) N (%)	INT (N=14) N (%)
Yes	1 (100.0%)	12 (85.7%)
Don't Know	0 (0.0%)	2 (14.3%)

SCALE: No=0, Yes=1, Don't Know=2.
INT=Intervention.

Nearly all school administrators from both intervention and control schools reported that school personnel encourage students to eat FV in the lunch line (Table 41). However, when asked about school personnel encouraging students to eat FV at lunch tables, most (92.9%) of administrators (12 of 14) from intervention schools replied "yes", but only half (50.0%) of those (2 of 4) from control schools agreed (Table 42).

TABLE 41: Number of Schools where School Personnel Encourage Students to Eat Fruits and Vegetables in the Lunch Line

School Personnel Encourage Students to Eat Fruits and Vegetables in the Lunch Line	FFVP Only (N=1) N (%)	INT (N=14) N (%)	CON (N=4) N (%)
Yes	1 (100.0%)	12 (85.7%)	4 (100.0%)
No	0 (0.0%)	1 (7.1%)	0 (0.0%)
Don't Know	0 (0.0%)	1 (7.1%)	0 (0.0%)

SCALE: No=0, Yes=1, Don't Know=2.
INT=Intervention, CON=Control.

TABLE 42: Number of Schools where School Personnel Encourage Students to Eat Fruits and Vegetables at Lunch Tables

School Personnel Encourage Students to Eat Fruits and Vegetables at Lunch Tables	FFVP Only (N=1) N (%)	INT (N=14) N (%)	CON (N=4) N (%)
Yes	1 (100.0%)	13 (92.9%)	2 (50.0%)
No	0 (0.0%)	1 (7.1%)	2 (50.0%)
Don't Know	0 (0.0%)	0 (0.0%)	0 (0.0%)

SCALE: No=0, Yes=1, Don't Know=2.
INT=Intervention, CON=Control.

Experiential Learning: Fruit and Vegetable Tasting and Gardening. Opportunities to participate in FV taste testing in the cafeteria and FV gardening were not reported by the majority of school administrators participating in the study (Tables 43 and 44). Only half of administrators (7 of 14) at intervention schools and one-quarter of administrators from control schools (1 of 4) reported that their schools provide FV taste testing in the cafeteria. Half of intervention schools (7 of 14) and none of the control schools (0 of 4) had a school garden that grows FV.

TABLE 43: Number of Schools that Provided Fruit and Vegetable Taste Testing in the Cafeteria

Fruit and Vegetable Taste Testing in the Cafeteria	FFVP Only (N=1) N (%)	INT (N=14) N (%)	CON (N=4) N (%)
Yes	0 (0.0%)	7 (50.0%)	1 (25.0%)
No	0 (0.0%)	4 (28.6%)	3 (75.0%)
Don't Know	1 (100.0%)	3 (21.4%)	0 (0.0%)

SCALE: No=0, Yes=1, Don't Know=2.
INT=Intervention, CON=Control.

TABLE 44: Number of Schools with a School Garden that Grows Fruits and Vegetables

School Garden that Grows Fruits and Vegetables	FFVP Only (N=1) N (%)	INT (N=14) N (%)	CON (N=4) N (%)
Yes	0 (0.0%)	7 (50.0%)	0 (0.0%)
No	1 (100.0%)	7 (50.0%)	4 (100.0%)
Don't Know	0 (0.0%)	0 (0.0%)	0 (0.0%)

SCALE: No=0, Yes=1, Don't Know=2.
INT=Intervention, CON=Control.

School Food Service Involvement in Nutrition Education. Table 45 shows the number school food service departments actively involved in the planning and delivery of nutrition education for students. Nearly two-thirds of intervention schools and half of control schools (64.3% and 50.0%, respectively) had food service departments that were actively involved in the planning and delivery of nutrition education. Nearly one-third (28.6%) of intervention school administrators reporting not knowing about the food service department's involvement.

TABLE 45: Number of Schools with a School Food Service Department Actively Involved in the Planning and Delivery of Nutrition Education

School Food Services Department Actively Involved in Nutrition Education	FFVP Only (N=1) N (%)	INT (N=14) N (%)	CON (N=4) N (%)
Yes	0 (0.0%)	9 (64.3%)	2 (50.0%)
No	1 (100.0%)	1 (7.1%)	2 (50.0%)
Don't Know	0 (0.0%)	4 (28.6%)	0 (0.0%)

SCALE: No=0, Yes=1, Don't Know=2.
INT=Intervention, CON=Control.

When asked to describe how the food service department was actively involved, school administrators from intervention schools reported that food service staff:

- posted menus and MyPlate (1 of 9 schools),
- visited classrooms (1 of 9 schools), and

- shared the MiHOTM program and resources with staff (1 of 9 schools).

One intervention school administrator replied "not sure" and several schools did not provide a response (5 of 9 schools). Although 2 of 4 control school administrators reported that their school food services department was actively involved in the planning and delivery of nutrition education for students, no responses were provided to explain how they were involved.

Promotion of the MiHOTM Featured Fruits and Vegetables outside of the Classroom. School administrators were also asked "Other than the nutrition education done by teachers in their classroom, does your school promote the MiHOTM featured fruits and vegetables in other ways?" (Table 46). Over half (57.1%) of school administrators at intervention schools reported promoting the MiHOTM featured FV in addition to the nutrition education implemented by teachers in their classroom. Two control schools answered "yes" to this question, but were excluded because they were not sent any MiHOTM materials with the featured produce (see study limitations below).

TABLE 46: Number of Schools that Promoted the MiHOTM Featured Fruits and Vegetables Other than the Nutrition Education Done by Teachers in the Classroom

School Promoted the MiHOTM Featured Fruits and Vegetables (outside of the classroom)	FFVP Only (N=1) N (%)	INT (N=14) N (%)	CON (N=2)* N (%)
Yes	0 (0.0%)	8 (57.1%)	0 (0.0%)
No	1 (100.0%)	3 (21.4%)	2 (100.0%)
Don't Know	0 (0.0%)	3 (21.4%)	0 (0.0%)

SCALE: No=0, Yes=1, Don't Know=2.

* Missing data for two control schools. Two control schools answered "yes", but were excluded because they were not sent any MiHOTM materials.

INT=Intervention, CON=Control.

When asked to describe how they promoted the MiHOTM featured FV, the method used most often by intervention schools was to distribute and use MiHOTM materials (4 of 8 schools). School administrators cited the following approaches:

- *"food service staff distributed MiHOTM materials"*,
- *"provided daily announcements"*,
- *"sent flyers to parents"*, and
- *"[used] class newsletters"*.

Several schools (3 of 8) also reported displaying posters (café, classrooms, and wall). Two schools reported that school staff promoted the featured produce either through *"teacher involvement"* or *"PE school success staff rotated to each classroom once a week"* (2 of 8 schools). Lastly, one school indicated that *"they served healthier lunch"* (1 of 8 schools) to promote the MiHOTM featured FV and another indicated that they *"connect to [the] body and nutrition"* (1 of 8 schools). Two schools did not provide a response (2 of 8 schools).

Implementation of Smarter Lunchroom Strategies. When asked about Smarter Lunchroom strategies (Table 47), nearly half (42.9%) of the school administrators (6 of 14) at intervention schools and three-quarters (75.0%) of control school administrators (3 of 4) reported implementing Smarter Lunchroom strategies in the cafeteria. Half (50.0%) of the school administrators (7 of 14) from intervention schools did not know if any Smarter Lunchroom strategies had been implemented at the school.

TABLE 47: Number of Schools that Implemented Smarter Lunchroom Strategies in the Cafeteria

School Implemented Smarter Lunchroom Strategies in the Cafeteria	FFVP Only (N=1) N (%)	INT (N=14) N (%)	CON (N=4) N (%)
Yes	1 (100.0%)	6 (42.9%)	3 (75.0%)
No	0 (0.0%)	1 (7.1%)	1 (25.0%)
Don't Know	0 (0.0%)	7 (50.0%)	0 (0.0%)

SCALE: No=0, Yes=1, Don't Know=2.
INT=Intervention, CON=Control.

Those who reported implementing Smarter Lunchroom strategies provided descriptions of the efforts undertaken at their schools. The strategy reported most frequently by intervention school administrators was that they position healthy options (FV) as the first choice in the school cafeteria (3 of 6 schools). Other smarter lunchroom strategies implemented by intervention schools included: *"use only whole grain"*, *"emphasize fruits & veggies"*, and *"encourage seconds"* (1 of 6 schools); and displaying a *"poster on [the] wall"* (1 of 6 schools). Control school administrators mentioned using posters (one specified "fruit posters") as a smarter lunchroom strategy (2 of 4 schools). Other strategies reported by control schools included using funny names for foods and on signage (1 of 4 schools) and positioning milk and FV first in line (1 of 4 schools).

School Wellness Committee Engagement with Nutrition Recommendations. School administrators were asked "How engaged is your school wellness committee in making recommendations related to nutrition for students?" As shown in Table 48, nearly one-third (28.6%) of intervention schools (4 of 14) reported that their wellness committee was "very engaged" and an additional 21.4% of schools (3 of 14) were somewhat engaged; while out of the remaining 7 intervention schools, 2 schools were "not engaged", 4 school administrators reported not knowing the level of engagement, and one school had no wellness committee. Control schools were evenly split with half (50.0%) reporting that their school wellness committee was "somewhat engaged" and the other half (50.0%) "not engaged".

TABLE 48: Number of Schools with a School Wellness Committee Engaged in Making Nutrition Recommendations for Students

Level of Engagement among School Wellness Committee in Making Nutrition Recommendations	FFVP Only (N=1) N (%)	INT (N=14) N (%)	CON (N=4) N (%)
Very Engaged	0 (0.0%)	4 (28.6%)	0 (0.0%)
Somewhat Engaged	0 (0.0%)	3 (21.4%)	2 (50.0%)
Not Engaged	0 (0.0%)	2 (14.3%)	2 (50.0%)
Don't Know	1 (100.0%)	4 (28.6%)	0 (0.0%)
Not Applicable (No Committee)	0 (0.0%)	1 (7.1%)	0 (0.0%)

SCALE: 0=Not Engaged, 1=Somewhat Engaged, 2=Very Engaged, 3=Don't Know, 4=Not Applicable.
INT=Intervention, CON=Control.

Of the four intervention schools who reported that their school wellness committees were "very engaged" in making recommendations related to nutrition for students, only one provided a description of how the school wellness committee was actively engaged. This school administrator replied that they *"work with kids to write letters about FV and the nutritional benefits."*

Implementation of Nutrition Recommendations for Fruits and Vegetables in the School Wellness Policy. Schools were also asked to report whether they implemented any nutrition-related recommendations for FV as part of their school wellness policy (Table 49). Over one-third (35.7%) of intervention schools (5 of 14), but no control schools (0 of 4) reported having school wellness policies with nutrition-related recommendations for FV. A large proportion of administrators from both intervention (5 of 14) and control schools (2 of 4) reported not knowing whether their school implemented nutrition-related recommendations as part of their school wellness policy.

TABLE 49: Number of Schools that Implemented Nutrition-Related Recommendations for Fruits and Vegetables in the School Wellness Policy

School Implemented Nutrition-Related Recommendations for Fruits and Vegetables in School Wellness Policy	FFVP Only (N=1) N (%)	INT (N=14) N (%)	CON (N=4) N (%)
Yes	0 (0.0%)	5 (35.7%)	0 (0.0%)
No	0 (0.0%)	4 (28.6%)	2 (50.0%)
Don't Know	1 (100.0%)	5 (35.7%)	2 (50.0%)

SCALE: No=0, Yes=1, Don't Know=2.
INT=Intervention, CON=Control.

When asked to describe what recommendations or policies related to FV were implemented, only three of the five intervention schools provided a response. These school administrators shared very little detail about the recommendations or policies which included:

- *"Lehanon provides nutritional info",*
- *"It is done through our in-house covenant clinic",* and
- *"It is part of our SIP (School Improvement Plan)"*.

Availability of Vending Machines. Access to vending machines was rare at all schools serving grades K-8 participating in the study. Not a single study school had snack vending machines available to students and only one intervention school had a beverage vending machine. Only unsweetened water was stocked in this beverage vending machine.

Dining Area Nutrition Promotions. Dining area nutrition promotions were recorded by regional coordinators and are shown in Table 50. Regional coordinators counted 18 MiHOTM posters in the dining areas at 4 of the 14 intervention schools. No MiHOTM posters were observed at control schools. Regional coordinators did not find any MiHOTM menu slicks in the dining areas of schools participating in the study. In addition, there were no brand name promotions advertising foods or beverages in the school dining areas (table not shown).

TABLE 50: Number of Schools with Dining Area Nutrition Promotions

Dining Area Nutrition Promotions	FFVP Only (N=1) N (%)	INT (N=14) N (%)	CON (N=4) N (%)
MiHOTM Posters	0 (0.0%)	4 (28.6%)	0 (0.0%)
MiHOTM Menu Slicks	0 (0.0%)	0 (0.0%)	0 (0.0%)
Other Nutrition Posters or Displays	1 (100.0%)	8 (57.1%)	3 (75.0%)
None	0 (0.0%)	4 (28.6%)	1 (25.0%)

INT=Intervention, CON=Control.

Due to multiple responses these columns may exceed the total N and 100%.

Regional coordinators observed nutrition posters and displays not related to MiHOTM in 8 of the 14 intervention schools with a total of 45 nutrition posters and displays counted across these schools. The nutrition promotions were located in the dining area and hall. The posters covered topics including:

- fruit (5 of 8 schools),
- My Plate (4 of 8 schools),
- healthy eating (3 of 8 schools),
- drink milk/got milk? (2 of 8 schools), and
- Fuel Up to Play 60 (1 of 8 schools).

Some resources were identified from the United Dairy Industry of Michigan (UDIM) such as “Got Milk?”, “Got Breakfast?”, “Do Amazing Things”, and “9 Essential Nutrients”. USDA My Plate posters were also observed. In addition, the following promotions were present:

- “Let’s Get Moving” (Mileage Club),
- “Food Footprints” (Central Michigan University),
- “Apples +” (Pure Michigan), and
- “skate/surf/ski/kayak/camp” --made out of food (Learning Zone Express).

At the three control schools, a total of 21 nutrition posters and displays were counted by regional coordinators. The nutrition promotions were located in the dining area and hall and covered similar topics observed in intervention schools. These included:

- fruit (2 of 3 schools),
- healthy eating (1 of 3 schools),
- drink milk (1 of 3 schools),
- what makes a breakfast & lunch (1 of 3 schools), and
- good to do breakfast (1 of 3 schools).

Some posters were identified as resources from the UDIM such as "drink milk" and the "Mi, My, Mi" healthy eating posters. Nutrition posters from the USDA were also present depicting "what makes a healthy breakfast and lunch".

Non-Dining Area Nutrition Promotions. Nutrition promotions in non-dining areas (halls, recreation facilities, main office, assembly areas, etc.) were also recorded by regional coordinators (Table 51). In total, 42 MiHOTM posters were observed in classrooms (3 of 5) and halls (3 of 5) at 5 of the 14 intervention schools, and 6 MiHOTM menu slicks were found at 1 of the 14 intervention schools. There were no MiHOTM posters or menu slicks on display at control schools.

TABLE 51: Number of Schools with Non-Dining Area Nutrition Promotions

Non-Dining Area Nutrition Promotions	FFVP Only (N=1) N (%)	INT (N=14) N (%)	CON (N=4) N (%)
MiHOTM Posters	0 (0.0%)	5 (35.7%)	0 (0.0%)
MiHOTM Menu Slicks	0 (0.0%)	1 (7.1%)	0 (0.0%)
Other Nutrition Posters or Displays	1 (100.0%)	10 (71.4%)	3 (75.0%)
None	0 (0.0%)	1 (7.1%)	1 (25.0%)

INT=Intervention, CON=Control.
Due to multiple responses these columns may exceed the total N and 100%.

Nutrition posters and displays other than MiHOTM were observed by regional coordinators in 10 of the 14 intervention schools with a total of 32 nutrition posters and displays counted across the schools. The nutrition promotions were primarily located in the halls (10 of 10) and main offices/entryways (4 of 10). Similar to those featured in dining areas, the posters covered the following topics:

- fruits and vegetables (6 of 10),
- My Plate (4 of 10),
- healthy eating (2 of 10),
- drink milk/got breakfast? (1 of 10), and
- Fuel Up to Play 60 (1 of 10).

Some resources were identified from the UDIM, such as splash banners and "Got Breakfast?" The USDA's My Plate and "Eat Your Colors" posters were present and "Food Is Fuel" and See How Smart You Can Be" (MFF) were also observed.

Regional coordinators found other nutrition posters and displays (not related to MiHOTM) at three of the four control schools with a total of 9 nutrition posters and displays observed. The nutrition promotions were located in classrooms (1 of 3 schools), gyms (2 of 3 schools), and halls (1 of 3 schools). The posters in control schools were similar to those displayed at intervention schools covering topics such as:

- fruit (1 of 3 schools),
- My Plate (1 of 3 schools), and
- healthy eating (1 of 3 schools).

Lastly, regional coordinators identified brand name promotions advertising foods or beverages in the non-dining areas at two intervention schools and one control school (Table 52). Observation of one intervention school indicated that the snack shacks have potato chips, Doritos, Lays, etc. available every day at lunch. The other intervention school featured a more nutritious option: *"displays of fruit"*. No description of the posters or displays was recorded for the control school.

TABLE 52: Number of Schools with Brand Name Promotions or Advertising in the Non-Dining Areas

Brand Name Promotions or Advertising in Non-Dining Areas	FFVP Only (N=1) N (%)	INT (N=14) N (%)	CON (N=4) N (%)
Snack Shacks	0 (0.0%)	1 (7.1%)	0 (0.0%)
Posters or Displays	0 (0.0%)	1 (7.1%)	1 (25.0%)
None	1 (100.0%)	12 (85.7%)	3 (75.0%)

INT=Intervention, CON=Control.

Comparing Intervention and Control School Environments. In summary, findings from the EAT indicated that intervention schools had more supportive nutrition environments than controls with respect to:

- school personnel encouraging students to eat FV at lunch tables,
- opportunities to participate in FV taste testing in the cafeteria and FV gardening,
- promotion of the MiHOTM featured produce outside of the classroom,
- more engaged school wellness committees making and implementing recommendations related to nutrition for students, and
- MiHOTM-specific nutrition promotions in dining and non-dining areas.

Similar environmental supports were observed across both groups for:

- school personnel encourage students to eat FV in the lunch line,
- the number of school food services departments actively involved in the planning and delivery of nutrition education for students,
- access to vending machines, and
- nutrition promotions in dining and non-dining areas.

There were some areas however where intervention schools had less supportive nutrition environments than control schools. Intervention schools were less likely to have salad bars and implement Smarter Lunchroom strategies in the cafeteria. In addition, one intervention school had a snack shack serving potato chips, Doritos, Lays, etc. every day at lunch.

Intervention Fidelity. As part of the intervention, schools were asked to promote the MiHOTM featured produce in the cafeteria with posters and menu slicks. The EAT examined the fidelity of the intervention by assessing the MiHOTM promotional materials visible at intervention schools. Only one-third of intervention schools had MiHOTM posters displayed in the dining (4 of 14, 28.6%) and non-dining areas (5 of 14, 35.7%). Even fewer intervention schools featured the monthly produce using MiHOTM menu slicks in the dining (0 of 14) and non-dining areas (1 of 14, 7.1%). This observational data indicates that many intervention schools did not adhere to the MiHOTM intervention by displaying promotional materials (posters and menu slicks) in or around the school cafeteria.

Study Strengths and Limitations

This study had multiple strengths that contributed to its success. Conducting school-based interventions and evaluations of school-based interventions can be challenging given that schools have many competing demands and obligations. However, not a single school dropped out of the study and only two individual teachers dropped out and did not complete the intervention and evaluation activities. In addition to a high rate of school retention, the study was conducted using a quasi-experimental control/ intervention design; a strong study design for inferring causality in school-based interventions. The study instruments used in this evaluation were previously tested and/or validated in similar study populations. Regional coordinators were trained on data collection procedures with children in the school environment and followed observation protocols to conduct the EAT. All intervention activities were documented with logs to assess the fidelity of the intervention. Finally, data collected on student demographics were controlled for in the analyses. Data on school nutrition environments were used to ensure that control and intervention schools were similar on factors that might influence the findings and to help interpret unexpected findings.

Some study limitations are also worth mentioning. Recruitment of a convenience sample of schools based on specific criteria (FFVP participation) to the intervention and control groups appeared to result in a poorly-matched distribution of students on the basis of race/ethnicity. This primarily resulted from all nine Detroit City School District schools participating in the intervention group. When examining food environments, intervention schools were less likely than control schools to have salad bars and implement Smarter Lunchroom strategies in the cafeteria. In addition, one intervention school had a snack shack serving chips (Doritos, Lays, etc.) every day at lunch. The presence of competitive foods and less access to fresh produce in the cafeteria could limit the potential change in FV intake among intervention students. All student data were captured by self-report and may have been impacted by a social desirability bias.[11] However, the prevalence of non-significant findings suggests a limited influence of

social desirability on the study outcomes. The low school recruitment rates in the FFVP only and control groups contributed to small samples. As a result, the sample size estimate of 25 schools (or 100 classrooms) per group was not reached, substantially reducing the power to detect potential intervention effects in this study. The intervention period was brief limiting the ability of this study to examine the long-term impact of MiHOTM and FFVP snack intervention on children.

As part of the standard MiHOTM administration procedures, teachers can order and receive MiHOTM materials in October. Teachers participating in the study were asked not to use any MiHOTM materials until baseline data collection was completed with their class. However, based on responses provided to the teacher survey three of the five teachers (60%) implementing MiHOTM at intervention schools reported that they used the MiHOTM materials five to six times before the MFF regional coordinators administered the pre-test. This may have contributed to the higher baseline scores on peer norms for eating FV found among intervention students. In addition, the FFVP snack was being offered at schools before baseline data collection. These two factors have significant impacts on the integrity of the study design and may have resulted in an inflated measure of FV consumption among students in the intervention group at baseline.

In addition, intervention fidelity was self-reported by the teachers, rather than observed. Teacher fidelity logs indicated that nearly 20% of intervention teachers did not use any MiHOTM materials in their classroom during the 2013 to 2014 school year. Approximately 40% of intervention teachers did not use the MiHOTM classroom worksheets (Nutrition Fact Labels and Botany) or Student Sleuth Answers. Intervention teachers reported very little introduction, orientation, or training to implement the MiHOTM program. Some teachers were not motivated to complete the intervention because they had limited time available and unclear expectations. Over one-quarter of the intervention parents did not report receiving the take home materials: the MiHOTM Family Newsletters. Observational data indicated that over two-thirds of intervention schools did not adhere to the MiHOTM intervention by displaying promotional materials (posters and menu slicks) in or around the school cafeteria. Taken together, this suggests that the MiHOTM intervention was not fully implemented.

Lastly, use of the MiHOTM materials was reported by key stakeholders from the control and FFVP only groups. One control teacher reported using past MiHOTM FV information sheets for nutrition education with his/her class under the comments section on the fidelity log. Similarly, although the FFVP only group was not included in the final study sample, it is worth noting that half of the teachers (2 of 4) from the FFVP only school who completed the teacher survey reported using MiHOTM materials in the classroom during the 2013 to 2014 school year. When control school administrators were interviewed for the EAT and asked if their school promoted the MiHOTM featured produce, two control schools answered “yes”. These teachers and school administrators could have misinterpreted the questions, particularly if they were not very familiar with MiHOTM. However, the number of different reports from key stakeholders suggests that MiHOTM materials were used to some degree in the control group during the intervention period.

Conclusions and Recommendations

The primary finding of this study was that the MiHOTM and FFVP snack intervention, as implemented in 14 Michigan schools compared to 4 control schools in the State, showed a non-significant increase in FV consumption of 0.08 times per day among 4th and 5th grade children. The magnitude of the change in FV intake was smaller than the mean difference in change observed (0.41 times per day) using data from prior HOTM nutrition education interventions of children from low-resource elementary schools in California. Most of the increase in FV consumption in this and previous studies with children was due to an increase in fruit intake.

Study findings indicate that the MiHOTM and FFVP snack intervention had some influence on psychosocial factors that may mediate FV intake. For students participating in the MiHOTM and FFVP snack intervention there was a significant positive difference in the change in peer norms for eating fruit compared to control students. MiHOTM and FFVP snack intervention also appeared to improve children's confidence with respect to preparing fruit with intervention students reporting that they prepared recipes with fruit at home.

Furthermore, although this study lacked the power to detect a change in FV intake reported by students, supplemental data collected from parents provides some additional insight into the changes in children's nutrition-related behaviors observed at home. Parents of intervention children reported observing their children eat more FV, choose more fruits as snacks, ask parents to buy more FV at the grocery store, and prepare new recipes with vegetables when compared to parents of control children. Parents also made healthy changes themselves to support their children which included modeling good nutrition by eating more fruits and preparing meals for their family with more FV added.

Students participating in the MiHOTM and FFVP snack intervention did not show significant gains in FV intake compared to control students. The small effect on FV intake may be attributable to: 1) baseline data collection being conducted after the intervention began which may have resulted in an inflated measure of FV consumption at baseline among students in the intervention group; 2) a limited implementation of the MiHOTM intervention, with approximately 20% of intervention teachers not implementing MiHOTM classroom materials or sending home the MiHOTM Family Newsletters and two-thirds of intervention schools not displaying the MiHOTM promotional materials; and/or 3) MiHOTM materials being used to some degree in control schools during the intervention period.

Based on these findings, further research is needed to examine the best models and approaches for training and supporting school staff in Michigan to implement the FFVP with MiHOTM intervention. Key stakeholders would be: MFF staff, MiHOTM school/teacher champions, FFVP administrators, regional coordinators, and SNAP-Ed funded projects. Qualitative exploration in the following areas is still needed: examine the capacity that key stakeholders have or will develop to support MiHOTM implementation in schools; explore different implementation methods (FFVP with

MiHOTM, FFVP with MiHOTM and SNAP-Ed, others); investigate the use of teacher stipends to support the school/teacher champion model (coach and mentor for implementation); describe and get feedback from key stakeholders on potential models; and explore why the MiHOTM materials are underutilized by schools/teachers and how to promote their use.

References

[1] Cole N, Fox MK. Quality of American school-age children by school lunch participation status: data from National Health and Nutrition Examination Survey, 1999-2004. Alexandria, VA: US Department of Agriculture, Food and Nutrition Services; 2008.

[2] Slining MM, Mathias KC, Popkin BM. Trends in Food and Beverage Sources among US Children and Adolescents: 1989-2010. J Acad Nutr Diet. 2013; 113(12): 1683-1694.

[3] US Department of Health and Human Services and US Department of Agriculture. Dietary Guidelines for Americans 2010. Accessed on November 10, 2014. Available at http://www.cnpp.usda.gov/sites/default/files/dietary_guidelines_for_americans/PolicyDoc.pdf

[4] Centers for Disease Control and Prevention. School Health Guidelines to Promote Healthy Eating and Physical Activity. MMWR. 2011; 60(5): 1-76.

[5] McClain AD, Chappuis C, Nguyen-Rodriguez ST, Yaroch AL, Spruijt-Metz D: Psychosocial correlates of eating behavior in children and adolescents: a review. Int J Behav Nutr Phys Act. 2009, 6: 54.

[6] Thiagarajah K, Fly AD, Hoelscher DM, Bai Y, Lo K, Leone A, Shertzer JA. Validating the food behavior questions from the elementary school SPAN questionnaire. J Nutr Educ Behav. 2006; 38(4): S55.

[7] Hearn MD, Baranowski T, Baranowski J, Doyle C, Matthew S, Lin LS, Resnicow K. Environmental influences on dietary behavior among children: availability and accessibility of fruits and vegetables enable consumption. J Health Educ. 1998; 29(1): 26-32.

[8] Domel SB, Baranowski T, Davis H, Leonard SB, Riley P, Baranowski J: Measuring fruit and vegetable preferences among 4th- and 5th-grade students. Prev Med. 1993; 22(6): 866-879.

[9] Wilson AM, Magarey AM, Mastersson N: Reliability and relative validity of a child nutrition questionnaire to simultaneously assess dietary patterns associated with positive energy balance and food behaviours, attitudes, knowledge and environments associated with healthy eating. Int J Behav Nutr Phys Act. 2008; 5: 5.

[10] De Bourdeaudhuij I, Klepp KI, Due P, Rodrigo CP, de Almeida M, Wind M, Krolner R, Sandvik C, Brug J: Reliability and validity of a questionnaire to measure personal, social and environmental correlates of fruit and vegetable intake in 10-11-year-old children in five European countries. Public Health Nutr. 2005; 8(2): 189-200.

[11] Klesges LM, Baranowski T, Beech B, et al. Social desirability bias in self-reported dietary, physical activity and weight concerns measures in 8- to 10-year-old African-American girls: results from the Girls Health Enrichment Multisite Studies (GEMS). Prev Med. 2004; 38 Suppl: S78-87.