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EVALUATION OF A POLICY, SYSTEM, AND ENVIRONMENTAL SCHOOL-BASED FRUIT AND VEGETABLE INTERVENTION

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EVALUATION OF A POLICY, SYSTEM, AND ENVIRONMENTAL
SCHOOL-BASED FRUIT AND VEGETABLE INTERVENTION

BY

CATERINA MARIE MORGERA

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF
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MASTER OF SCIENCE THESIS
OF
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2019

ABSTRACT

Objectives: To determine the effect of a policy, systems, and environmental (PSE) intervention, *Students Take Charge!* (STC), among 4th and 5th grade students from low-income communities on 1) fruit and vegetable (FV) intake, and 2) PSE and FV knowledge, and self-efficacy (SE) to ask for FV at school and home.

Methods: A quasi-experimental design was used involving six schools over two years. Schools were purposely selected; two schools each year either received STC or standard instruction. The study sample includes students (n=326 intervention; n=351 comparison) providing pre and post data (baseline and post-assessment at week 18). Supplemental Nutrition Assistance Program-Education (SNAP-Ed) educators provided the 8-lesson STC curriculum across 18 weeks; comparison students received standard instruction. STC is a school-based PSE intervention focusing on empowering students to make FV-based changes at school and at home. STC taught students about wellness policies, persuasive messages, and making requests; it culminated with a vote to add a student submitted FV-based recipe to the school lunch menu. In addition, STC provided information about the importance of FV intake. Students completed the STC survey at both time points assessing FV intake, knowledge and SE. Analyses compared intervention and comparison students from baseline to post-assessment using analysis of covariance (ANCOVA) for objective 1 and multivariate analysis of variance (MANOVA) objective 2.

Results: From baseline to post-assessment, there were significant differences ($p<0.01$) between intervention and comparison students; intervention students had higher fruit intake, increased PSE knowledge and SE in school. There were no between group

differences in vegetable intake, FV knowledge, or in students SE to ask parents for FV in the home when comparing the intervention group to the control group.

Conclusion: STC was associated with an increase in fruit intake, PSE knowledge and student SE to ask for FV in school. STC may require additional strategies, including home-based strategies, to increase vegetable intake, FV knowledge, and student SE to ask for FV at home.

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PREFACE

This thesis was prepared in manuscript format following the author guidelines for *The Journal of Nutrition Education and Behavior*. After submitting this thesis, the manuscript may be submitted for publication.

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MANUSCRIPT

“Evaluation of a Policy, System, and Environmental School-Based
Fruit and Vegetable Intervention”

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INTRODUCTION

The prevalence of childhood obesity in the United States has increased from 16.8% in 2007-2008 to 18.5% in 2015-2016.¹⁻³ According to the 2015-2016 Center for Disease Control (CDC) data, 1 in 5 school age children and young adults between 6 and 19 years of age in the United States are obese.⁴ Some factors associated with the prevalence of childhood obesity include overconsumption of food and beverages as well as inadequate physical activity.⁴ Increasing fruit and vegetable (FV) intake in children has been associated with decreased childhood obesity and decreased chronic disease risk.⁵ FV are important sources of vital micronutrients (vitamins and minerals) necessary for children's growth and development and many children are not meeting the current recommendations.^{5,6} Research suggests that educating school children about the importance of nutrition improves health-related behaviors such as FV consumption as well as FV knowledge and self-efficacy (SE).⁷ Policy, System, and Environmental (PSE) Interventions extend the reach of educational interventions. PSE interventions do this by use a multi-level approach to change behaviors at an *individual* level and *community* level.⁹ For example, a traditional nutrition education workshop provides participants with nutrition related information about the importance of eating more FV. To further enhance the desired behavior change, PSE interventions could change options in the cafeteria to include more FV that the children enjoy.⁹⁻¹¹ Current research suggests school-based PSE interventions can decrease childhood obesity and be more sustainable than providing nutrition education alone.¹² Many PSE interventions focus on increasing FV consumption to decrease the

risk of obesity.^{8,10} However, only a few studies have focused on FV intake behavior among students attending low-income schools.^{13–15}

Low socioeconomic status is associated with increased childhood obesity risk.¹⁶ Students attending low-income schools have low FV consumption due to decreased access to healthy foods and increased consumption of more readily available processed foods high in saturated fat, sodium, and added sugar.^{17–19} FV knowledge and self-efficacy (SE) are also important variables that can be effected by socioeconomic status.⁷ SE is defined as an individual feels empowered, confident, and able to execute the behavior necessary to complete a specific task.²⁰ Hall and colleagues found that students attending low-income schools had lower knowledge and SE scores than students attending higher-income schools.⁷ Past studies have looked at student SE related to FV intake but only few studies have focused on asking SE.^{21–23} Asking SE is defined as an individual feels empowered, confident, and able to ask others for the material necessary to execute a behavior change and has not be measured in past PSE interventions.

PSE interventions have been utilized in past studies to improve FV intake. School-based PSE interventions that focused on changing the school cafeteria menu options or included a wellness committee to promote FV intake resulted in a greater increase in FV intake from baseline to post-assessment in the intervention group when compared to the comparison group.^{17,24} However, few PSE interventions focus primarily on increasing FV intake in students in low-income schools.^{24–26} *Students Take Charge!* (STC) is one of the few school-based PSE interventions to measure asking SE for FV at home and school. STC was based on a program developed by the

pilot study, EMPOWER, a program that was specifically designed for low-income schools. Although EMPOWER resulted in no change in FV intake, researchers found a significant increase in knowledge as well as qualitative data suggest dietary and SE improvements.^{27,28} Modified based on process data from the EMPOWER intervention, STC is an eight-week PSE program developed by the University of Rhode Island (URI) Supplemental Nutrition Assistance Program-Education (SNAP-Ed). STC focuses on empowering low-income 4th and 5th graders to increase FV consumption at school and home. Findings from preliminary qualitative studies with a subset of the STC sample suggest an increase in SE²⁹, but no increase in FV consumed at school based on Digital Photography of school lunches.³⁰ Additional studies are needed to determine if PSE interventions are effective in improving FV intake and asking SE in students attending low-income schools. The primary aim of this study is to determine the effect of STC on FV intake among 4th and 5th grade students in low-income schools. The secondary aim is to determine the effect of STC on knowledge and self-efficacy related to FV.

METHODS

This study used a quasi-experimental design over two years to evaluate the impact of STC on FV intake, knowledge, and SE (Figure 1). Intervention students received the STC intervention and comparison students received standard instruction without the STC program. STC was an 8-week school-based PSE intervention delivered biweekly that focuses on empowering students to make changes around what they eat at school with an emphasis on FV intake. The primary hypothesis is that FV intake will increase more from baseline to post-assessment in the intervention group

than in the comparison group. The secondary hypothesis is that knowledge and self-efficacy related to FV will increase more from baseline to post-assessment in the intervention group than in the comparison group.

Design

STC intervention utilized a 2x2 quasi-experimental design that has two intervention groups and two comparison groups per year (four comparison and four intervention groups in total) with data collected at baseline and post-assessment (refer to Appendix B).

Research Participants

Two low-income racially and ethnically diverse school districts in Rhode Island participated in the study. Within those districts, elementary schools were selected based on principal consent and key informant recommendations in the community. Two schools were asked to participate in the Fall and were randomly selected to be in the intervention or comparison group. The districts were on average 64.5% Hispanic, 16% African American, 11% White, 3% Asian, 3.5% Multiracial, 1.5% Native American.³¹ In these districts, about 88% of students are eligible for free or reduced price lunch.³² According to the community eligibility provision, all students in the two districts receive free lunch because more than 70% of the population is considered low-income.³³ All students at participating schools with completed pre and post data were included in this study. Parents of participants were informed about the program and students could verbally decline to participate. The study was part of URI Institutional Review Board's exempt status. This secondary

data analysis was approved by the University of Rhode Island Institutional Review Board.

As seen in Figure 2, the potential sample size was calculated as $n=883$ because of the students enrolled in the classes. The analytic sample size for the two years of STC that completed pre and post data for variables was $n=722$. Year 1 included two intervention schools ($n=208$) and two comparison schools ($n=180$). Year 2 included two intervention schools ($n=167$) and two comparison schools ($n=223$). The analytical sample did not include students who failed to complete the survey (refer to Figure 1 for specific sample size values). The analytical sample provides 80% statistical power ($p<.05$) to detect a small univariate effect size for the primary outcome (FV) and a small to medium effect size in a multivariate analysis for secondary outcomes (knowledge and SE).³⁴

Procedure

Data collection

Identification (ID) numbers were provided to each student in the intervention and comparison groups. The ID number was used for data entry and analysis. The survey used was the *STC Survey* (Appendix D). The survey includes questions regarding gender, language spoken at home, ethnicity, race, knowledge of FV and PSE, FV intake, and FV self-efficacy questions. The baseline surveys were administered by URI SNAP-Ed Nutrition Educators a week before the first lesson (week 0) and the post-assessment surveys were administered a week after the last lesson (week 18). The intervention was 4 months since the lessons were provided

every 2 weeks. Pre and post comparison data were collected within a two-week period of the intervention group data.

Intervention

The intervention school received a biweekly, 8-week nutrition education intervention with each lesson lasting 30 minutes. The comparison schools received standard instruction. Each lesson was taught by a SNAP-Ed Registered Dietitian (RD) and included a SNAP-Ed created FV nutrition education topic (refer to Appendix C) and PSE component. Family newsletters were sent home to parents including information regarding the lessons taught in class. The PSE components included: learning about the responsibilities of a wellness committee and how a committee can promote nutrition policy changes, interviewing family members about healthy foods, taste-testing recipes submitted by students, and designing marketing material for healthy foods. The program culminates in a recipe-tasting day in the school cafeteria, featuring a fruit- or vegetable-based recipe from one of the participating students. If the school student body likes the recipe, the goal was to add the recipe to the school and district-wide menu, thereby, changing the food environment and systems at school giving the participating students a voice in choosing the food that is available to them. Therefore, the over-arching goal of this intervention is to empower students to make changes around what they eat at school and home (with the main focus on FV intake).

Instruments

The instrument used in this study was the *STC Survey* (Appendix D). Students taking the survey were provided with instructions and received assistance by a SNAP-Ed Nutrition Educator (Appendix E). FV intake items on the survey were adapted

from a validated survey³⁵ and the asking SE scale was adapted from a validated and reliable instrument that has been tested among 9 to 11-year old low-income students²¹ and recently validated³⁶. The knowledge items were developed for this study and have not been validated. The intervention and comparison group received the same survey at baseline and post-assessment.

Intake was evaluated by assessing students' responses to FV intake questions (Appendix F). One question asked about the number of fruits consumed in the previous day (not including fruit juice) and the other asked about the number of vegetables consumed in the previous day (not including French fries). Response categories include none, 1, 2, 3, 4, or 5 or more. Fruit and vegetable intake were measured separately.

Knowledge was evaluated using the students' responses to the knowledge-related questions (Appendix G). The initial section assessed FV knowledge with three items. The first two questions investigated the students' knowledge of what they think other students their age should be consuming for fruits and vegetables (responses range=1 time to 5 times). The third question asks how much of their plate should include FV and the categories include: None, $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, and all. The second section assessed PSE knowledge with three items. The first item investigated the student's knowledge of PSE intervention by asking them what PSE stands for and the responses were as follow: Policy, Systems and Environmental change, Poor School Environment, Public School Exchange, and Public School Environment. The second item investigated whether students knew if they could be a member of a school wellness committee and the responses were as follows: Yes, No, and I don't know.

The third item investigated if students understood persuasive messaging by providing them with four quotes and asking them to pick the quote they trust. For this knowledge section, the students/participants response is considered either correct (which was coded as 1) or incorrect (which was coded as 0) and scores were summed thus the response range is 0 (all incorrect) to 3 (all correct).

Asking SE related to FV at home and at school was explored utilizing student responses to asking SE related questions (Appendix H). There were six questions that asked students about how much they agree with statements relating to their ability to ask an adult at school (two items) or home (four items) for fruits and vegetables they like. Response categories included I disagree very much (score = 1), I disagree a little (score = 2), I am not sure (score = 3), I agree a little (score = 4) and I agree very much (score = 5). The responses were averaged per subscale (school and home) with a range of 1 (low self-efficacy) to 5 (high self-efficacy).

Data Analysis and Statistics

All completed baseline and post-assessments from the four intervention and four comparison schools were included in the data analysis. Normality was assessed for continuous data, and the data was normally distributed.^{34,37} Baseline data including demographic categorical data (e.g. grade, school, etc.), were analyzed using chi-square and continuous data (e.g. age) was analyzed using independent t-tests. School demographic information provided by the Rhode Island Department of Education (RIDE) were used for race because about 75% of students choose “other” as their race on the survey suggesting that race data from the survey may not be reliable (Appendix I).³¹

FV intake was significantly different at baseline between the two groups. Analysis of co-variance (ANCOVA) was used to control for this baseline difference as a covariate. Adjusted post mean $\pm$ SE provided by ANCOVA was used to determine if there was a significant difference between group for FV intake.

To assess changes in knowledge, and SE from baseline to post-assessment in the intervention and comparison group, MANOVA was used to determine the overall effect and ANOVA was utilized to determine significant differences between groups and dependent variables independently. All analyses utilized SPSS and $p < .05$ determined statistical significance.

RESULTS

Baseline demographics are provided in Table 1. The intervention group (n=356) students was significantly younger and more likely to be in 4th grade than comparison group (n=364) students ($p < 0.01$). There were no other demographic differences between the intervention and comparison group. Overall, 49% were female, 67% reported speaking Spanish at home, 75% of the students' moms cook and 91% of the student's moms or dads do the shopping (see Table 1). Table 2 demonstrates that all schools included in the study had students with similar racial/ethnic backgrounds. As seen in the table demonstrating school-level data provides by RIDE, most students are Hispanic (62 to 67%) and were eligible for subsidized lunch (81 to 95%). The RIDE data were used because 75% of the children chose "other" on the survey (Appendix I). When comparing student reported demographics including speaking Spanish at home (67%) with percentage of Hispanics (62 to 67%) from the RIDE data, these percentages were very similar.

The primary hypothesis was that fruit intake and vegetable intake will increase more from baseline to post-assessment in the intervention group than in the comparison group. FV intake was significantly different at baseline, so ANCOVA was used to control for baseline intake as a covariate. As seen in Table 3, there was a significantly higher intake of fruits in the intervention when compared to the comparison group in post adjusted values [$F(1,674df)=7.72, p=0.01$]. There was no difference for vegetable intake in post adjusted values [$F(1,674df)=0.11, p=0.74$]. There was no within group change for fruit intake in the intervention group ($p=0.18$), but there was a significant decrease of fruit intake within the comparison group ($p=0.01$). There was a statistically significant decrease within group for vegetable intake in the intervention ($p=0.001$) and the comparison ($p=0.03$) groups.

The secondary hypothesis was that knowledge and self-efficacy of FV will increase more from baseline to post-assessment in the intervention group than in the comparison group. Using MANOVA, there was an overall effect of group on change in FV knowledge, PSE knowledge, SE school, and SE home [$F(4,595df)=10.5, p<0.001$; Wilk's $\Lambda = 0.93$]. As seen in Table 4, the intervention group increased PSE knowledge [$F(4,595df)=11.6, p=0.001$] and SE school scores [$F(4,595df)=31.5, p=0.00$] more than the comparison, but there were no between group differences for FV knowledge [$F(4,595df)=0.31, p=0.58$] and SE home [$F(4,595df)=2.47, p=0.12$]. Within the intervention group, FV knowledge ($p=0.01$), PSE knowledge ($p=0.001$), SE school scores [3.01 ± 1.28 to 3.36 ± 1.32 ; $p=0.001$], and SE home scores [3.99 ± 0.90 to 4.13 ± 0.90 ; $p=0.001$] increased from baseline to post-assessment. Within the comparison group, FV knowledge increased ($p=0.04$), SE school scores decreased

[3.07+/-1.29 to 2.77+/-1.23; p=0.001], and PSE knowledge and SE home did not change from baseline to post-assessment.

DISCUSSION

The purpose of this study was to determine the effect of STC on FV intake and related variables in 4th and 5th grade students attending low-income schools.

Intervention students participating in STC study increased fruit intake, PSE knowledge, and SE at school more than comparison students. However, the intervention was not affect in increasing vegetable intake, FV knowledge, or SE at home. This study is one of the few PSE studies, delivered by SNAP-Ed, to specifically target low-income youth (an average of 88% eligible for free or reduced price lunch³¹) with a high proportion of Hispanic students (67%) (refer to Table 2).

The results showed a higher fruit intake in the intervention group when compared to the comparison group, but no difference in vegetable intake. Other research has found that fruit intake is easier to change than vegetable intake in PSE interventions.^{24,30,38,39} However, some PSE interventions in both high and low-income schools were successful in increasing both fruit intake and vegetable intake separately.^{13,17,24} Another PSE intervention by Leines et al. focused on increasing FV intake in students from low-income schools and found an increase in fruit intake and vegetable intake separately.¹³ The PSE component included training teachers and food service workers on strategies for increasing FV intake in children.¹³ King and Ling also saw an increase in fruit intake and vegetable intake in kindergarten to third grade children, which may be attributed by training parents and the community to promote healthy behavior change.¹⁵ Incorporating a heightened emphasis on the importance of

vegetables by teachers and food service workers in the cafeteria may be necessary to improve students' eating behavior. Some strategies that could improve these results for the future include not only increasing vegetable availability at school but also including a stronger home or parent component, so that parents are encouraged to buy more vegetables for children to consume at home.

There was a statistically significant increase in PSE knowledge in the intervention group when compared to the comparison group from baseline to post-assessment. There are no current studies measuring students PSE knowledge in a survey except those previously done in the pilot study.²⁸ Both this current study and EMPOWER indicate that there was an increase knowledge of what components are included in a PSE intervention.²⁸ When analyzing FV knowledge, there was no between group difference in the intervention and comparison group from baseline to post-assessment. A STC pilot study by Lepe et al. found a greater increase in FV knowledge from baseline to post-assessment in the intervention group when compared to the comparison group²⁸, which may emphasize the need for further development of this instrument.^{27,29}

Knowledge and SE are associated with each other because understanding the importance of FV intake, may help increase students SE for asking for FV at school and home.⁴⁰ This study assessed students' SE for asking adults to provide FV with two scales, SE in school and SE at home. Intervention students increased SE in school more than comparison students but there was no difference in SE at home. Many studies have looked at students SE related to FV intake²¹⁻²³ but not many studies that measured FV asking SE²⁴. In a preliminary STC study, Hafner et al. conducted focus

groups among STC intervention students (n=32).²⁹ Students indicated higher SE after the intervention both at home and at school.²⁹ Students had a high home asking SE at baseline before the intervention (averaged around 4 on a 5-point scale), which could be another reason why SE did not significantly increase. Focus groups may be a better strategy when measuring students' SE at home due to the ceiling effect.⁴¹ Future interventions should include a parent PSE intervention to understand more about the home environment and if including them in the intervention may improve students asking SE for FV at home.

Strengths and Limitations

Some strengths of this study include that it is one of the few school-based PSE interventions in primarily low-income schools. Another strength is that the PSE intervention was specifically designed for the schools included in the study by SNAP-Ed. The RD educator and data collection was consistent throughout the 2-year study. Some limitations of this study are that it lacked randomization and there were differences between groups at baseline (Table 2). While this study is not generalizable to other populations, it was conducted in low-income schools that contained a high percentage of Hispanic children, who are at a higher risk for poorer dietary behaviors.⁴² Another limitation of this study is that the STC Survey is not validated but components of the survey were taken from previous validated surveys.^{21,36} Furthermore, FV intake was self-reported by students, which can lead to estimation errors.⁴³ This can also be a strength because it allows more data to be collected. Another limitation is that this study did not include a qualitative component, which

could help determining if students FV knowledge and/or home SE has changed overtime.

Implications for Research and Practice

STC is one of the few school-based PSE interventions focusing on evaluating student FV intake in low-income schools.^{13,17} These results indicate that STC was effective in increasing fruit intake, PSE knowledge, and SE at school. These results suggest that more strategies are needed when trying to promote vegetable intake but results are similar to other school-based PSE interventions.^{30,39} More strategies including providing and introducing more vegetables by taste testing vegetables in the classroom and training teachers and food services workers to promote behavior change have been seen to increase vegetable intake in prior PSE intervention.^{13,15} Additional strategies include adding a PSE component for parents to increase understanding of why FV are important and why their children should be consuming more FV may increase behavior change. Qualitative studies are needed to further evaluate asking SE at home and school. These results may also emphasize the need for a validated survey to assess FV knowledge. This study adds to the literature focused on increasing FV intake in students attending low-income schools.^{13,14,17} It can also aid in the future development of the PSE programs to promote more positive FV behavior changes in students attending low-income schools.

FIGURE 1: STC 2-YEAR DESIGN

Year	Academic Semester	Comparison	Intervention
Year 1	Fall	School A (4 th)	School B (4 th)
	Spring	School D (5 th)	School C (5 th)
Year 2	Fall	School E (5 th)	School A (4 th)
	Spring	School F (5 th)	School D (4 th)

FIGURE 2: PARTICIPANTS OF STC AND ANALYTIC SAMPLE

Table 1: Baseline Demographic Characteristics/Sample					
Categorical Variables	Survey Choices	Intervention n (% within category)	Comparison n (% within category)	Total n (%)	Chi Square
Gender (n=720) ^a	Male	175(49.2)	189 (51.9)	364 (50.6)	0.6
	Female	181 (50.7)	175 (48.1)	356 (49.4)	
Spanish Speaking (n=708) ^b	Yes	247 (66.8)	263 (66.6)	510 (66.7)	0.4
	No	121 (32.7)	131 (33.2)	252 (32.9)	
	Sometimes	2 (0.5)	1 (0.3)	3 (0.4)	
Grade (n=722)	4 th grade	210 (58.8)	177 (48.5)	387 (53.6)	7.7**
	5 th grade	147 (41.2)	188 (51.5)	335 (46.4)	
On most nights who makes dinner for you? (n=691) ^c	My mom	245 (73.8)	256 (71.3)	501 (72.5)	1.9
	My dad	23 (6.9)	29 (8.1)	52 (7.5)	
	Myself	16 (4.8)	21 (5.8)	37 (5.4)	
	My brother or sister	10 (3.0)	7 (1.9)	17 (2.5)	
	Another adult that is not my mom or dad	24 (7.2)	30 (8.4)	54 (7.8)	
	I do not eat dinner	14 (4.2)	16 (4.5)	30 (4.3)	
Who usually does most of your family’s shopping? (n=692) ^d	My mom or dad	338 (89.7)	360 (91.4)	698 (90.5)	0.8
	Myself	7 (1.9)	7 (1.8)	14 (1.8)	
	My brother or sister	3 (0.8)	2 (0.5)	5 (0.6)	
	Another adult that is not my mom or dad	29 (7.7)	25 (6.3)	54 (7.0)	
How many other children live in your home? (n=694) ^e	None	31 (9.2)	39 (10.9)	70 (10.1)	5.3
	1	77 (22.9)	101 (28.2)	178 (25.6)	
	2	99 (29.5)	98 (27.4)	197 (28.4)	
	3	58 (17.3)	45 (12.6)	103 (14.8)	
	4	31 (9.2)	35 (9.8)	66 (9.5)	
	More than 4	40 (11.9)	40 (11.2)	80 (11.5)	
Continuous Variable		Intervention Mean+/-SD	Comparison Mean+/-SD	T-test	
Age (n=722)		9.70+/-0.80	9.90+/-0.96	-3.0**	

a= There were 2 students who did not answer this question on the survey.

b= There were 14 students who did not answer this question on the survey.

c= Some students did not respond to this question, this is why n=691.

d= Some students did not respond to this question, this is why n=692.

e= Some students did not answer this question, so this is why n=694.

* = p<0.05

** = p<0.01

*** = p<0.001

SD = standard deviation

Table 2: Baseline School and Race Demographics from RI School Data*					
School	District	Group	Race/Ethnicity	Students from various racial/ethnic backgrounds (%)	Students eligible for subsidized lunch (%)⁺
School A	1	Year 1 Comparison School; Year 2 Intervention School	African American	15	81
			Asian	1	
			Hispanic	65	
			White	13	
			Native American	2	
			Multiracial	3	
School B	1	Year 1 Intervention School	African American	15	89
			Asian	1	
			Hispanic	65	
			White	13	
			Native American	0	
			Multiracial	5	
School C	2	Year 1 Intervention School	African American	16	88
			Asian	8	
			Hispanic	66	
			White	6	
			Native American	1	
			Multiracial	3	
School D	2	Year 1 Comparison School; Year 2 Intervention School	African American	12	88
			Asian	6	
			Hispanic	63	
			White	14	
			Native American	1	
			Multiracial	5	
School E	2	Year 2 Comparison School	African American	19	94
			Asian	6	
			Hispanic	62	
			White	6	
			Native American	2	
			Multiracial	5	
School F	2	Year 2 Comparison School	African American	17	95
			Asian	6	
			Hispanic	67	
			White	4	
			Native American	2	
			Multiracial	5	

*=information from Rhode Island Department of Education School demographic database.

+ = This shows the % of students eligible for subsidized lunch – this high % greater than 70% indicated that all students receive free or reduced lunch.

Table 3: Change in Fruit and Vegetable Intake from Baseline to Post-assessment ⁺						
Continuous Variable	Group	Pre Mean $\pm$ SD	Post Mean $\pm$ SD	Adjusted Post Mean $\pm$ SE	Difference Within (t)	Difference Between (F)
Fruit intake (n=677)^a	Intervention	2.53 $\pm$ 1.60	2.40 $\pm$ 1.65	2.33 $\pm$ 0.08	1.35	7.72**
	Comparison	2.18 $\pm$ 1.54	1.95 $\pm$ 1.48	2.03 $\pm$ 0.08	2.86**	
Vegetable intake (n=677)^a	Intervention	1.81 $\pm$ 1.64	1.51 $\pm$ 1.46	1.45 $\pm$ 0.07	3.25**	0.11
	Comparison	1.53 $\pm$ 1.55	1.36 $\pm$ 1.43	1.42 $\pm$ 0.07	2.21*	

⁺= FV intake was significantly different at baseline, so analysis of covariance (ANCOVA) was used instead to assess if adjusted post mean $\pm$ SD was higher or lower when comparing the intervention and comparison group.

^a= Some students did not answer this question on the survey, therefore n=677.

* = p<0.05

** = p<0.01

*** = p<0.001

SD = standard deviation

Table 4: Change in Fruit and Vegetable Knowledge and Self-efficacy⁺						
Variables¹	Group	Pre Mean+/-SD	Post Mean+/-SD	Within Group (t)	Main Effect (F) (time)	Between Group (F) (time*group)
FV knowledge (n=600)^a	Intervention	0.87+/-0.80	1.03+/-0.90	-2.80**	10.26**	0.31
	Comparison	0.84+/-0.77	0.95+/-0.74	-2.02*		
PSE knowledge (n=600)^a	Intervention	1.24+/-0.85	1.59+/-0.87	-5.22**	12.64***	11.59**
	Comparison	1.15+/-0.77	1.21+/-0.80	-1.14		
SE School (n=600)^a	Intervention	3.01+/-1.28	3.36+/-1.32	-4.50***	0.23	31.54***
	Comparison	3.07+/-1.29	2.77+/-1.23	3.80***		
SE Home (n=600)^a	Intervention	3.99+/-0.90	4.13+/-0.90	-2.93**	4.91*	2.47
	Comparison	4.05+/-0.89	4.08+/-0.88	-0.97		

⁺=MANOVA was used to analyze between group differences and within group differences.

^a=Some students did not answer the question on the survey, therefore n=600. Only those students who completed all the questions for these variables were included in the analysis.

* = p<0.05

** = p<0.01

*** = p<0.001

SD = standard deviation

¹=Multivariate Wilks' Lambda = 0.93, F_(4,595)=10.51, p<0.001

REFERENCES

1. Childhood Obesity Facts | Overweight & Obesity | CDC. <https://www.cdc.gov/obesity/data/childhood.html>. Published August 14, 2018. Accessed February 7, 2019.
2. Ogden CL, Flegal KM. Prevalence of Obesity Among Adults and Youth: United States, 2011–2014. *Natl Cent Health Stat*. 2015;(219):8.
3. Hales CM, Fryar CD, Carroll MD, Freedman DS, Ogden CL. Trends in Obesity and Severe Obesity Prevalence in US Youth and Adults by Sex and Age, 2007-2008 to 2015-2016. *JAMA*. 2018;319(16):1723-1725. doi:10.1001/jama.2018.3060
4. Center for Disease Control and Prevention. Childhood Obesity Facts. *Adolesc Sch Health*. 2014:3-5. doi:2016-09-19
5. Knai C, Pomerleau J, Lock K, McKee M. Getting children to eat more fruit and vegetables: A systematic review. *Prev Med*. 2006;42(2):85-95. doi:10.1016/j.ypmed.2005.11.012
6. CDC Press Releases. CDC. <https://www.cdc.gov/media/releases/2014/p0805-fruits-vegetables.html>. Published January 1, 2016. Accessed February 7, 2019.
7. Hall E, Chai W, Albrecht JA. Relationships between nutrition-related knowledge, self-efficacy, and behavior for fifth grade students attending Title I and non-Title I schools. *Appetite*. 2016;96:245-253. doi:10.1016/j.appet.2015.09.033
8. Albani V, Butler LT, Traill WB, Kennedy OB. Understanding fruit and vegetable consumption in children and adolescents. The contributions of affect, self-concept and habit strength. *Appetite*. 2018;120:398-408. doi:10.1016/j.appet.2017.09.018
9. Savoie-Roskos MR, DeWitt K, Coombs C. Changes in Nutrition Education: A Policy, Systems, and Environmental Approach. *J Nutr Educ Behav*. 2018;50(5):423. doi:10.1016/j.jneb.2018.02.007
10. Aloia CR, Shockey TA, Nahar VK, Knight KB. Pertinence of the recent school-based nutrition interventions targeting fruit and vegetable consumption in the United States:a systematic review. *Health Promot Perspect*. 2016;6(1):1-9. doi:10.15171/hpp.2016.01
11. Micha R, Karageorgou D, Bakogianni I, et al. Effectiveness of school food environment policies on children’s dietary behaviors: A systematic review and meta-analysis. *PLoS One San Franc*. 2018;13(3):e0194555. doi:http://dx.doi.org.uri.idm.oclc.org/10.1371/journal.pone.0194555

12. Foltz SC, Kuder JF, Goldberg JP, et al. Changes in diet and physical activity resulting from the Shape Up Somerville community intervention. *BMC Pediatr.* 2013;13(1). doi:10.1186/1471-2431-13-157
13. Leines D, Gold A, Van Offelen S. Go Wild with Fruits & Veggies! Curriculum Encourages Children to Eat More Fruits and Vegetables. *J Nutr Educ Behav.* 2014;46(1):82-84. doi:10.1016/j.jneb.2013.03.018
14. Kaufman-Shriqui V, Fraser D, Friger M, et al. Effect of a School-Based Intervention on Nutritional Knowledge and Habits of Low-Socioeconomic School Children in Israel: A Cluster-Randomized Controlled Trial. *Nutrients.* 2016;8(4):234. doi:10.3390/nu8040234
15. King KM, Ling J. Results of a 3-year, nutrition and physical activity intervention for children in rural, low-socioeconomic status elementary schools. *Health Educ Res.* 2015;30(4):647-659. doi:10.1093/her/cyv029
16. Datar A, Chung PJ. Changes in Socioeconomic, Racial/Ethnic, and Sex Disparities in Childhood Obesity at School Entry in the United States. *JAMA Pediatr.* 2015;169(7):696-697. doi:10.1001/jamapediatrics.2015.0172
17. HealthierUS School Challenge: Smarter Lunchrooms | Food and Nutrition Service. <https://www.fns.usda.gov/hussc/healthierus-school-challenge-smarter-lunchrooms>. Accessed February 16, 2019.
18. Bateman LB, O'Neal LJ, Smith T, et al. Policy, System and Environmental Correlates of Fruit and Vegetable Consumption in a Low-Income African American Population in the Southeast. *Ethn Dis.* 27(Suppl 1):355-362. doi:10.18865/ed.27.S1.355
19. Why Low-Income and Food-Insecure People are Vulnerable to Poor Nutrition and Obesity. Food Research & Action Center. <http://frac.org/obesity-health/low-income-food-insecure-people-vulnerable-poor-nutrition-obesity>. Published 2019. Accessed February 7, 2019.
20. Bandura A. Health promotion from the perspective of social cognitive theory. *Psychol Health.* 1998;13(4):623-649. doi:10.1080/08870449808407422
21. Keihner AJ, Meigs R, Sugerman S, Backman D, Garbolino T, Mitchell P. The Power Play! Campaign's School Idea & Resource Kits Improve Determinants of Fruit and Vegetable Intake and Physical Activity among Fourth- and Fifth-Grade Children. *J Nutr Educ Behav.* 2011;43(4):S122-S129. doi:10.1016/j.jneb.2011.02.010
22. Baranowski T, Davis M, Resnicow K, et al. Gimme 5 Fruit, Juice, and Vegetables for Fun and Health: Outcome Evaluation. *Health Educ Behav.* 2000;27(1):96-111. doi:10.1177/109019810002700109

23. Wright K, Norris K, Newman Giger J, Suro Z. Improving healthy dietary behaviors, nutrition knowledge, and self-efficacy among underserved school children with parent and community involvement. *Child Obes.* 2012;8(4):347-356.
24. Perry CL, Bishop DB, Taylor GL, et al. A Randomized School Trial of Environmental Strategies to Encourage Fruit and Vegetable Consumption among Children. *Health Educ Behav.* 2004;31(1):65-76.
doi:10.1177/1090198103255530
25. Lawlor DA, Kipping RR, Anderson EL, et al. Active for Life Year 5: a cluster randomised controlled trial of a primary school-based intervention to increase levels of physical activity, decrease sedentary behaviour and improve diet. *Public Health Res.* 2016;4(7):1-156. doi:10.3310/phr04070
26. Malakellis M, Hoare E, Sanigorski A, et al. School-based systems change for obesity prevention in adolescents: outcomes of the Australian Capital Territory 'It's Your Move!' *Aust N Z J Public Health.* 2017;41(5):490-496.
doi:10.1111/1753-6405.12696
27. Goodwin Jennifer L., "Effect of A Nutrition Intervention on Fruit and Vegetable Intake in Elementary School Students" (2017) *Open Access Master's Theses.* Paper 1021. <http://digitalcommons.uri.edu/theses/1021>
28. Lepe S, Goodwin J, Mulligan KT, Balestracci K, Sebelia L, Greene G. Process Evaluation of a Policy, Systems, and Environmental Change Intervention in an Urban School District. *J Nutr Educ Behav.* 2019;51(3):307-317.
doi:10.1016/j.jneb.2018.07.017
29. Hafner, Sabrina G., "Impact of a Policy, Systems, and Environmental Intervention of Low-Income 5th Grade Students' Self-Efficacy" (2018). *Open Access Master's Theses.* Paper 1208. <https://digitalcommons.uri.edu/theses/1208>
30. Weisfeld, Natalie Ruth, "Evaluation of a School-based Fruit and Vegetable Intervention using a Digital Photography Method" (2018). *Open Access Master's Theses.* Paper 1260. <https://digitalcommons.uri.edu/theses/1260>
31. Rhode Island Education Data Reporting - RIDE InfoWorks.
<http://infoworks.ride.ri.gov/>. Accessed March 6, 2019.
32. CNP Program Data & Finances - Program Data & Finances - RIDE Child Nutrition Programs.
<http://www.ride.ri.gov/cnp/ProgramDataFinances/CNPProgramDataFinances.aspx>. Accessed March 7, 2019.
33. Community Eligibility Provision | Food and Nutrition Service.
<https://www.fns.usda.gov/school-meals/community-eligibility-provision>. Accessed February 7, 2019.

34. Harlow LL. *The Essence of Multivariate Thinking*. 2nd ed. Routledge; 2014.
35. Townsend MS, Kaiser LL, Allen LH, Block Joy A, Murphy SP. Selecting Items for a Food Behavior Checklist for a Limited-Resource Audience. *J Nutr Educ Behav*. 2003;35(2):69-82. doi:10.1016/S1499-4046(06)60043-2
36. Balestracci K, McNamara J, Greene G. Development and Validation of the ASKFV-STC Self-Efficacy Questionnaire for Requesting Fruits and Vegetables. Presented at: *J Nutr Educ Behav* 2018;50 (7S); S64 (Abstract)
<https://linkinghub.elsevier.com/retrieve/pii/S1499404618303543>. Accessed March 28, 2019.
37. Blanca MJ, Arnau J, López-Montiel D, Bono R, Bendayan R. Skewness and kurtosis in real data samples. *Methodol Eur J Res Methods Behav Soc Sci*. 2013;9(2):78-84. doi:10.1027/1614-2241/a000057
38. Gold A, Larson M, Tucker J, Strang M. Classroom Nutrition Education Combined With Fruit and Vegetable Taste Testing Improves Children's Dietary Intake. *J Sch Health*. 2017;87(2):106-113. doi:10.1111/josh.12478
39. Evans CE, Christian MS, Cleghorn CL, Greenwood DC, Cade JE. Systematic review and meta-analysis of school-based interventions to improve daily fruit and vegetable intake in children aged 5 to 12 y. *Am J Clin Nutr*. 2012;96(4):889-901. doi:10.3945/ajcn.111.030270
40. Wall DE, Least C, Gromis J, Lohse B. Nutrition Education Intervention Improves Vegetable-Related Attitude, Self-Efficacy, Preference, and Knowledge of Fourth-Grade Students. *J Sch Health*. 2012;82(1):37-43. doi:10.1111/j.1746-1561.2011.00665.x
41. Keeley JW, English T, Irons J, Henslee AM. Investigating Halo and Ceiling Effects in Student Evaluations of Instruction. *Educ Psychol Meas*. 2013;73(3):440-457. doi:10.1177/0013164412475300
42. Wilson TA, Adolph AL, Butte NF. Nutrient Adequacy and Diet Quality in Non-Overweight and Overweight Hispanic Children of Low Socioeconomic Status: The Viva la Familia Study. *J Am Diet Assoc*. 2009;109(6):1012-1021. doi:10.1016/j.jada.2009.03.007
43. Harrington KF, Kohler CL, McClure LA, Franklin FA. Fourth Graders' Reports of Fruit and Vegetable intake at School Lunch: Does Treatment Assessment affect Accuracy? *J Am Diet Assoc*. 2009;109(1):36-44. doi:10.1016/j.jada.2008.10.006

APPENDICES

A. LITERATURE REVIEW

I. Introduction

Childhood obesity continues to be a concern, especially among low-income racially and ethnically diverse children.¹ One factor associated with childhood obesity is decreased fruit and vegetable (FV) intake.² Unhealthy dietary patterns marked by inadequate FV consumption are more common in low-income populations than in higher-income populations.³ In order to positively shape dietary patterns among low-income youth, multi-faceted strategies in the home and school setting are needed. One strategy used to improve healthy dietary patterns is Policy, System, and Environmental (PSE) school-based interventions.⁴ PSE interventions try to effect policy, system, and the environment to promote sustainable healthy behavior change⁵, such as increasing FV intake in children to decrease childhood obesity. Many of the PSE interventions discussed in this literature review have improved children's dietary behavior⁶⁻⁸, but few PSE school-based interventions target FV intake in children attending low-income schools.^{6,8,9} The Supplemental Nutrition Assistance Program-Education (SNAP-Ed) is the nutrition component of the Food Stamps.¹⁰ SNAP-Ed's mission is to educate SNAP eligible participants on how to eat healthy while on a budget.¹⁰ SNAP-Ed has been working to increase their use of PSE intervention to promote more sustainable healthy behavior changes since the fiscal year of 2016.¹¹ SNAP-Ed's *Students Take Charge!* (STC) program is a PSE intervention that focuses on increasing FV intake, knowledge, and self-efficacy (SE) in students attending low-income, urban schools. The goal of this review is to discuss the prevalence of childhood obesity, the impact of

socioeconomic status (SES) on multiple variables including FV intake, introduce the social cognitive theory and self-efficacy¹², then provide an in-depth overview of FV PSE interventions, and lastly discuss prior research on STC. Only results for children in the following studies will be reviewed due to the focus is on interventions for elementary age children.

II. Obesity in Children

Dietary behaviors have influenced the prevalence of childhood obesity.² According to the 2011-2014 Center for Disease Control and Prevention (CDC) and NHANES report, about 17% of children ages 6-11 in the United States were overweight or obese.^{1,13} Childhood obesity in the United States has tripled since the 1970s from 5.2% to 16.9% in 2011-2012,^{1,14,15} thus heightening the need for more sustainable interventions (one type of these are PSE) focused on improving dietary behavior.^{13,17} According to *The State of Obesity: Better Policies for a Healthier America*, in Rhode Island 2016, 36.3% of children between the ages of 10-17 were overweight or obese.¹⁸ Many factors have an impact on the prevalence of childhood obesity, including, increased consumption of less healthy foods such as sugar sweetened beverages and foods that contain added fat and added sugar and environmental factors such as limited availability of healthier options such as FV at home and school.^{19,20} A strategy to address childhood obesity is increased FV intake and availability in the environment. As discussed previously, there is a correlation between increased FV intake and decreased chronic disease risk, such as obesity.²¹ FV are important sources of vital micronutrients (vitamins and minerals) necessary for child growth and development and can help promote healthy weight. Promoting higher

intake of FV can be difficult depending on environmental factors such as socioeconomic status, which will be discussed next.

III. Impact of SES on Nutrition-related Outcomes in Children

SES has an effect on overall FV intake, knowledge and SE. SES refers to the level of education, income, and occupation an individual holds.²² An individual's SES offers insight to the available resources they may or may not have available to them.²² Those with low-SES or students attending low-income schools receive food assistance provided through the National School Lunch Program. The National School Lunch Program in Rhode Island provides students with low-cost or free nutritious lunches to over 72,000 children every day.²³ The Community Eligibility Provision (CEP) of the school lunch program allows schools that have a large proportion of low-income families to provide students with free meals during school without individual income verification.- If a school has greater than or equal to 70% free or reduced lunch eligibility, then all students receive free or reduced lunch.^{219,203} One-third to one-half of meals are consumed at school, thus foods that are provided to students during school hours should include healthy options such as FV.²⁵ A recent meta-analysis found that studies that including increasing fruits and vegetables at mealtimes during school by implementing policies, increased consumption of fruits by 0.27 servings/day, vegetables were only slightly impacted, and FV together increased by 0.28 servings.²⁵ The FV options that schools provide can play a key role in what foods students consume.²⁶ Other components such as FV knowledge and SE are effected by socioeconomic status.²⁷ Title I schools have greater than or equal to 40% of children that are low-income and receive free or reduced lunch.²⁸ Non-Title I schools have less

than 40% of students receiving free or reduced lunch.²⁸ The next sections will focus on how low SES can affect FV intake, knowledge, and student's SE for asking for FV at school and home.

FV intake

This section will discuss FV intake and how SES can impact children's overall intake. According to the United States Department of Agriculture (USDA) in 2007 to 2010, 60% of children ages 1-18 years did not meet the recommended intake for fruit and 93% did not meet the recommended intake for vegetables per day.²⁹ The Center for Disease Control (CDC) recommends that FV are available or offered to children during school³⁰, which can increase the likelihood that children will consume adequate FV.³¹ In low-income families, consumption of FV is low due to decreased access to healthy foods and increased consumption of more easily available processed foods high in saturated or solid fat, sodium, and added sugar.^{32,33,34} Low-income populations' decrease in FV intake has been shown to increase their risk of coronary heart disease, stroke, obesity and type 2 diabetes.³⁵ In general, most children are not meeting the current recommendations for FV and these habits can continue into adulthood.^{36,37} School, home, and community-based interventions have been used in the past to promote FV intake in children to improve diet quality. The next section will discuss FV knowledge and how knowledge is affected by SES.

FV Nutrition Knowledge

This section will discuss how FV knowledge overall is affected by SES. SES has been seen to have a significant effect on dietary behaviors and diet quality.³⁸ In Nebraska-Lincoln, Title 1 and non-Title 1 schools participated in a nutrition education

intervention called Fuel Up that was created to change 5th grade students overall knowledge of specific nutrition topics. One Title 1 school (n=58) and three non-Title 1 schools (n=135) participated in the post-survey only design study.³⁴ The participant's ethnicities were as follow: 42.4% white (21.4% did not know if they were white), 5.2% were Latino or Hispanic (30.7% of the students did not know if they were Hispanic or Latino). The difference in race was significant between the Title I and non-Title I schools ($p=0.003$). About 68.9% of students in the Title I school received reduced or free price school lunch (while only 21.76% of students in the non-Title I school received reduced or free school lunch). Among these participating schools, only the Title 1 School participated in the Fresh Fruit and Vegetable Program and one of the two non-Title schools participated in the Fuel Up to Play 60 program.³⁴ The Fresh Fruit and Vegetable Program introduced students to fruits and vegetables.²⁶ The Fuel Up to Play 60 program is a school-based nutrition and physical activity program that encourages students to lead healthy lives.³⁹ Both the Fresh Fruit and Vegetable Program and the Fuel Up to Play 60 program are funded by the USDA.^{26,39} The post-survey provided to the students at each school was the validated Healthy Habits survey that evaluated the students overall nutrition knowledge including the following topics, the five food groups, nutrition benefits, recommended daily intake, healthy snacks, and breakfast benefits.²⁷ The results indicated that the non-Title 1 group scored better than the Title 1 group for knowledge variables, including significantly higher average scores for knowledge when identifying food in the vegetable ($p=0.026$) and lean protein groups ($p=0.008$), whole grain versus refined grains ($p=0.01$), and recommended daily intakes of fruit and vegetables ($p=0.004$).³⁴ The overall

knowledge of health-related behaviors was also significantly higher in the non-Title I than in the Title I group.³⁴ These results suggest that there is an increased need for nutrition related school-based interventions in Title I schools because of their lower knowledge.³⁴

The Social Cognitive Theory

This section will focus on the social cognitive theory and how reciprocal determinism and SE constructs (including individuals confidence asking for FV) were used in prior FV intervention to promote positive behavior change. Interventions that are informed by behavioral theories are more likely to be effective at shaping health behaviors, including diet.⁴⁰ One theory that is commonly used in the design of school-based nutrition interventions is the social cognitive theory. The main goal of the social cognitive theory is to promote change and maintain positive behavior. The six constructs of the social cognitive theory are reciprocal determinism, behavioral capability, observational learning, reinforcement, expectation, and SE.⁴⁰ This theory focuses on how important it is to not only educate and increase knowledge to promote healthy lifestyle changes but to also increase SE. The social cognitive theory has been associated with increased lifestyle behavior changes.⁴¹ The constructs of the social cognitive theory that were utilized in the STC intervention (which will be discussed later on in this review) are reciprocal determinism and SE. Reciprocal determinism refers to a person's interaction with the environment and how this effects their behavior.⁴⁰ SE is referred to as the "beliefs in one's capabilities to organize and execute the courses of action required to produce given levels of attainments."⁴⁰ The

next study will explain how the social cognitive theory and its constructs was utilized to promote behavior change.

One intervention utilizing the social cognitive theory constructs, reciprocal determinism and SE, was a single-group pretest, posttest design for an after-school program including urban Native American youth.⁴¹ There were 65 children ages 5 to 10 years and 39 adolescents ages 11 to 18 years in the study (total n=104).⁴¹ The intervention lasted 7 months and focused on improving nutrition self-efficacy by student taste testing two food options to see if the students could determine the healthier option confidently, discussing ways to achieve balance with exercise and healthy eating, and children working with the adolescents in the study to promote modeling.⁴¹ The environment was also changed in the cafeteria by only providing option low in fat and increasing the availability of FV for dinner that was provided to the students in the after school program.⁴¹ Education was also provided to teach students how to make healthy choices in their environment using situations in their everyday life.⁴¹ The lessons were 30 to 60 minutes monthly and were provided to both the children and adolescents.⁴¹ In this study, personal and environment factors of the social cognitive theory were addressed in the hopes of increasing students SE for choosing and having healthier options.⁴¹ This differs from asking SE because students are not asking adults for healthier options but are picking the options themselves in this study. SE was measured using a self-efficacy questionnaire with a response scale of 1 to 3, 3 being the highest SE and scores were averaged.⁴¹ The mean $\pm$ SD for SE at baseline to post-assessment was 2.06 $\pm$ 0.50 to 2.34 $\pm$ 0.41 in the children (p=0.002).⁴¹ Overall this intervention resulted in a significant improved self-efficacy

related to choosing and having healthier options in children.⁴¹ This study demonstrates how reciprocal determinism of the social cognitive theory was utilized to promote increased SE.⁴¹

The social cognitive theory can be used to promote FV intake, knowledge, and SE in school-based PSE intervention (this will be defined in a later section). The environment plays an important role in the development of obesity and poor dietary quality and Fetter and colleagues found changes in the environment promote healthy behavior changes.⁴² Changes in the school food environment and the home food environment have a potential impact on the children's eating behavior.⁴² The next section will define and discuss school-based PSE interventions and how they were used to improve dietary behaviors in children.

Asking Self-Efficacy for FV

In this section, SE and asking SE will be defined and past research will be discussed. SE is defined as allowing an individual to feel empowered, confident, and able to execute the behaviors necessary to complete a specific task.⁴⁰ Asking SE is defined as individual feels empowered, confidence, and able to ask others for the material necessary to execute a behavior change. For example, self-efficacy in asking for FV would be high in students would if they feel comfortable to ask their parents to buy FV they like at home. Students need to increase their asking SE to feel confident to ask their parents for FV. This construct is also related to social cognitive theory, which will be discussed in a later section. Increasing student's asking SE for FV can improve dietary behavior.⁴³ Guiding children to have high SE or feel a sense of empowerment to make healthy choices is an important component to include in PSE

interventions, especially in low-income populations.³⁴ Keihner et al., Wright et al., and Hall et al. are some of the few studies that have evaluated SE in children.^{44,45}

Power Play! Campaign's School Idea and Resource Kits study was a randomized control study that included 10 grade-specific FV lessons and assessed self-efficacy and knowledge.⁴⁴ The study focused on encouraging students to consume more fruits and vegetables by including the following PSE components: allowing the students to create their own persuasive messages, advertise the importance of FV, and role-play scenarios where the students can practice asking for FV at home.⁴⁴ There were 1,154 4th and 5th graders from 31 low-income schools and a 58% of students were Hispanic.⁴⁴ The self-efficacy survey included 8 questions on asking/shopping and 3 items related to eating, which were some of the questions created by Baranowski et al.⁴⁶ The intervention resulted in a significantly higher self-efficacy score in the intervention group than in the control group for asking/shopping ($p=0.04$).⁴⁴ This study is one of the few that have proven interventions focused on students in low-income schools can be effective in increasing FV self-efficacy.⁴⁴ The limitation of this study was that it did not evaluate overall FV intake and if this behavior changed overtime.⁴⁴

Wright et al. created a 6-week Kids Nutrition and Fitness program including the school wellness board, parents and other community members to improve children's self-efficacy and weight status.⁴⁵ The sample included 251 8 to 10 year old, low-income, Mexican-American children. There were two groups, the intervention group and the control group. The intervention group received a nutrition program and environmental changes that effected school and home, while the control group

received general education without environmental change. The environmental or PSE components included: creating a School Wellness Advisory Council that implemented wellness policies with the goal of decreasing weight gain and poor diet quality and at home the parents received biweekly educational newsletters created by the School Wellness Advisory Council. The Child and Adolescent Trial for Cardiovascular Health After-School Student Questionnaire was used to evaluate self-efficacy in children and took about 30 minutes for the students to complete. The survey included: 6 questions regarding diet for the previous day and the responses ranged from 0 to 3 plus times, 10 questions regarding students' knowledge of which food option is healthier, 3 questions related to food pyramid knowledge, and 8 questions were focused on dietary self-efficacy. The study resulted in significantly reduced body mass index (BMI) ($p=0.04$) and BMI z-scores ($p=0.03$) and a significant increase in vegetable intake ($p=0.03$), fruit consumption ($p=0.001$), knowledge of the food pyramid ($p=0.001$), and self-efficacy of healthy food choices ($p=0.03$) from baseline to 12-month follow-up. This study was effective in increasing self-efficacy related to food choices but did not focus on asking SE.

The Fuel Up study discussed previously was one of the few programs that assessed SE with Title 1 children.³⁴ On the Healthy Habits Survey the students answered 10 items/statements regarding their confidence concerning the following topics: healthy meal identification, healthy meal choices, food group choices, meal planning, healthy choices in the presence of social pressure, healthy snack choices, and breakfast consumption.³⁴ These items were scored from 1 to 3, ranging from low being 1 to high being 3.³⁴ The program resulted in non-Title 1 students scored slightly

higher for most variables related to SE when compared to the Title 1 students.³⁴ These results indicate the need for interventions that can empower student in Title 1 or low-income schools to ask for healthy FV options.³⁴

IV. Overview of School-Based PSE Interventions

What are PSE Interventions

PSE intervention are designed to change policy, systems and environments to promote health behaviors changes in the community.⁴ PSE interventions are ongoing interventions focused on changing policy, systems, and the environment to promote long-term healthy behavior change in a community or population.⁴ Some components of a PSE include, changing a school policy (policy), training teachers (systems), changing cafeteria options (environment). As discussed previously, social cognitive theory constructs including reciprocal determinism and SE have been used to encourage healthy behavior change.^{41,47} Reciprocal determinism focuses on how the environment can effect behavior⁴⁰ and PSE intervention hone in on this by focusing a portion of the intervention on environmental change to promote sustainable behavior change.⁴ There is a difference between PSE interventions and a nutrition education workshop.⁴ For example, a nutrition education workshop would provide subjects with nutrition related information like the importance of eating more FV, while PSE interventions could also promote this behavior change by changing options in the cafeteria to include more FV that the subjects enjoy.^{4,25,48} School and home-based PSE interventions have been used to increase positive eating behaviors, such as increased FV intake, knowledge, and SE.^{48,49} PSE intervention are different than simple behavior change programs because PSE intervention promote school-wide changes

instead of just focusing on the individual students.⁴ The goal of PSE interventions is to increase positive behavior by providing a school with the means to make these changes and then sustain these changes over time.^{4,48,49} School-based PSE interventions provide students with the appropriate material to make sustainable behavior changes³⁵ and the following section will focus on the effectiveness and methods used in prior PSE interventions.

PSE Interventions not focused on income level

One of the larger PSE interventions is the *Active for Life* program, which was a cluster randomized control trial and is primary school-based intervention in England which focused on decreasing sedentary behavior and improving diet.⁵⁰ This study did not focusing on a specific income level.⁵⁰ Students in 4th grade were recruited, randomized and measured at baseline before receiving the intervention during 5th grade.⁵¹ The sample consisted of 8 to 11 years old students; total n=2211, intervention n=1064, comparison n=1157.⁵⁰ The students received an outcome assessment survey 1 year post intervention during 6th grade.⁵⁰ *Active for Life* is considered a PSE intervention because it focuses on the systems component of PSE by providing teachers with the means to educate in order to promoting behavior change in all the student involved.⁵⁰ Training, lesson plans, resources and material for 16 lessons, and 10 parent-child homework assignments were provided.⁵⁰ The comparison schools were given none of the material.⁵⁰ The 5th graders were also part of the immediate follow-up after the intervention in 5th grade and received a one-year follow up during 6th grade.⁵⁰ FV intake was measured using child-reported consumption and the validated 'Day in the Life Questionnaire.'⁵⁰ To measure screen time, a previously

validated screen viewing questionnaire was used.⁵⁰ The results demonstrated no differences at the immediate follow-up between the intervention and comparison school when looking at the primary outcome of FV intake ($p=0.42$ at the end of intervention).⁵⁰ The intervention was successful in decreasing screen time on weekends ($p=0.01$) and decreasing the consumption of snacks ($p=0.01$) and high-energy drinks ($p=0.002$).⁵⁰ The intervention reported below focused on changing the cafeteria environment.

The Cafeteria Power Plus project was a 2-year school-based randomized control trial including an intervention and comparison group and utilizing the PSE approach for intervention group.⁷ It focused on increasing the availability of fruits and vegetables in the cafeteria in 26 schools in Minnesota.⁷ This study was evaluated by collecting baseline lunch observation data from first and third grade students in spring 2000 and spring 2002 when these students were third and fifth graders ($n=1668$ at baseline; $n=1168$ at 2-year follow up).⁷ These observations were processed using Nutrition Data System and servings of FV were calculated using gram weights. The intervention utilized social cognitive theory and changing environmental factors, thus defining it as a PSE intervention.⁷ The PSE components include increasing opportunities during school lunch for the students to consume a variety of FV, providing students with role models eating FV, and instituting social support for children to promote FV consumption at lunchtime.⁷ One day training lessons for food service staff was also provided.⁷ The results of this study were that the intervention group consumed 0.14 servings more of fruits and vegetables than the control group. Fruit intake in the intervention group was 0.79 servings of fruit and in the comparison

group it was 0.63 servings of fruit consumed when the researcher was observing the students in the lunchroom. For fruit intake, there was a 0.16 difference, with the intervention group consuming more fruit than the comparison group. For vegetable intake alone, 0.27 servings were consumed in the intervention group and 0.29 servings were consumed in the comparison group. The comparison group consumed more vegetables than the intervention group by 0.02 servings. SE itself was not measured but was a component the researchers tried to increase by using this PSE approach.⁷ *The Cafeteria Power Plus Project* did not focus on a low-income population, but did result in higher fruit intake after the intervention.⁷ The next intervention was effective in improving healthy behavior changes.

Shape Up Somerville (SUS) was a quasi-experimental 2-year community-based multi-component PSE intervention with the main goal of decreasing obesity prevalence and increasing positive behavior change such as increased FV intake.²⁰ The children in the intervention community were 6 to 8 years of age and were in the 10 Somerville public elementary schools (n=454).²⁰ This is a PSE intervention because the before-school environment was changed by increasing the fresh fruit, low-fat milk and whole grains in the free breakfast program and healthy eating was modeled by adults. At school, the environment was changed by changing school lunch by including more FVs each month, having taste tests of these FVs, educational posters and tabletop tents around the cafeteria, new kitchen preparation and serving equipment and training for food service staff, etc. The students in the intervention group also received a 30-minute nutrition and physical activity lesson on top of the PSE work. The after-school environment was also changed by adding a 28-lesson curriculum

including crafts, cooking demonstrations and physical activity games. This study saw no significant difference in FV intake based on parental reported intake of children; however, there was a significant decrease in BMI z scores comparing the intervention to the control communities.²⁰ This study highlights the importance of looking at many other factors and conducting future studies to measure behavioral change.²⁰ The next FV PSE intervention focused on lower-income youth.

Low-income School-based PSE Interventions

As discussed previously, low-income youth are at higher risk for low FV intake.³⁵ One of the few PSE interventions focused on improving FV intake in students attending low-income schools include, *Go Wild With Fruits and Veggies!* (GWWFV) a PSE intervention.⁶ GWWFV is a one group pre to post design with 7 FV lessons.⁶ The students were 8 to 10 years of age and 4,128 students participated in the study.⁶ This is a PSE intervention because there were also additional activities for the teachers, food service, and families to reinforce the system and environment changes being made in order to facilitate behavior change.⁶ A survey was adapted from the United States Department of Agriculture's impact indicators from the Expanded Food and Nutrition Education Program and other Minnesota SNAP-Ed evaluation tools.⁶ This survey was used to determine the effectiveness of GWWFV to increase FV intake.⁶ The intervention group from baseline consumed 0.93+/-0.88 cups of fruit and after intervention consumed 1.57+/-0.89 cups of fruit.⁶ The intervention group from baseline consumed 0.92+/-0.85 cups of vegetables and after intervention consumed 1.32+/-0.94 cups of vegetables.⁶ This intervention demonstrated how students

attending low-income schools can benefit from PSE related work, but a comparison group was not present.

Another PSE intervention focused on a low-income school was a 3-year, nutrition and physical activity study.⁸ This study uses a quasi-experimental that included an intervention group only and evaluated the longitudinal effects of a 3-year, school-based PSE intervention.⁸ The intervention was provided to four rural elementary schools in the southern United States (n=999). On average, 65% of the youth were eligible for free or reduced priced lunch and students age averaged 7.30+/- 1.36 and 237 of students were in kindergarten, 232 students were in 1st grade, 264 students were in 2nd grade, 264 students were in 3rd grade. The PSE components of this intervention includes, promotion for staff and family and community involvement, school wellness policies, and professional development. The goal for each school was to achieve 'bronze,' which is considered higher status of the HealthierUS School Challenge. The HealthierUS School Challenge: Smart Lunchrooms is the challenge to create a healthier school environment and increase physical activity.⁵² The validated School Physical Activity and Nutrition questionnaire was used to measure fruit and vegetable consumption and physical activity.⁵³ The questionnaire was provided at baseline and then 12 follow-up assessments were conducted over 3 years. From baseline to follow-up, there was a significant increasing trend of percentages of children that met the overall recommendation for nutrition over time (from about 12% to 23%; $p<0.001$). The students FV intake average intake was about 2.58 servings at baseline and increasing by about 0.50 servings each month.⁸ There was also a significant increase in physical activity after the intervention and during follow-up

($p < 0.001$).⁸ Overall, this PSE intervention was successful but did not include a comparison group.⁸

Healthy options for nutrition environments in schools (Healthy ONES) is one of the few PSE intervention focused on primarily low-income schools.⁹ This is a two-year, randomized group trial.⁹ At baseline, three elementary and one middle school were randomly assigned to the intervention and another three elementary and one middle school were randomly assigned to the comparison group.⁹ In this low-income district, there were a total of 4,033 students and of these students, 42% were Hispanic/Latino, 26% were African American, 21% were non-Hispanic white, and 11% were other or mixed race. All children in the district received free or reduced lunch because they participate in CEP. The main goal of this study and PSE intervention was to increase healthy options in the cafeteria environment and encourage student to make healthier choices at school. The student's meals (by behavior observation or observing the students in the cafeteria) and BMI (by obtaining height and weight) were monitored over the study. Coleman et al. found that there was a significant decrease in the selection of unhealthy options in students in the intervention group when compared to those in the comparison group ($p = 0.005$). The comparison group showed an increase in outside unhealthy food items over time ($p = 0.04$). BMI increased significantly over time in both the intervention and comparison group ($p < 0.001$).¹ This study demonstrates how a school-based PSE intervention can promote positive nutrition related behavior changes over time and how it is important to evaluate PSE intervention to make sure they are also promoting other behavior changes to promote a healthy lifestyle.⁹ This study did not show

positive results related to BMI, thus further emphasizing importance of intervention effectiveness.

The studies provided in this section indicate that most but not all PSE interventions are effective in increasing FV or healthy dietary behaviors.^{6-9,20,50} It also indicated a need for more PSE interventions focused on low-income populations and focused on components like increasing FV intake and students asking SE. In the studies above, for low-income youth, cafeteria PSE interventions were associated with increased FV intake. The next section will explain the importance of evaluating these types of intervention with specifically low-income youth.

V. Pilots and Preliminary Studies for STC

There is an increased need for evaluation of PSE interventions such as the STC program. STC is one of the few FV PSE interventions focused on 4th and 5th grade low-income youth.^{7-9,50} Compared to past PSE interventions, it is the only study that include taste testing a recipe picked by the students and offering this recipe in the cafeteria for the whole school to sample.^{54,55} It is also one of the few interventions that evaluate asking SE of FV at home and school.^{54,55} The following section highlights other studies related to the STC PSE intervention.

Empowering Urban School Children to Increase Fruit and Vegetable Consumption Through EFNEP-Enhance PSE Intervention (EMPOWER), the pilot program for STC, was a PSE intervention that focused on low-income, 5th graders in Rhode Island.⁵⁶ The objective of the intervention was to empower urban school children to increase FV consumption. It utilized a tool that is not validated called the FV Checklist. This checklist was developed by SNAP-Ed to analyze overall child

intake of FV from the day before. Using a quasi-experimental design with an intervention group (n=142) and comparison group (n=170), there was no significant difference in FV consumption between or within groups from pre to post-intervention. However, there was a higher in PSE knowledge when comparing post adjusted values in the intervention group at 4.92 ± 0.14 when compared to the comparison group at 3.76 ± 0.13 ($p=0.001$). FV knowledge also was higher in the intervention group at 4.52 ± 0.15 when compared to the comparison at 4.10 ± 0.14 ($p<0.05$).

Lepe et al conducted a process evaluation of the EMPOWER pilot study. A rubric was created to evaluate the program delivery. Focus groups with students and semi-structured interviews with staff were conducted to evaluate outcome and process evaluation.⁵⁷ In the focus groups, students indicated that they made dietary changes after being part of the intervention although there were no changes in FV consumption (measured using survey in EMPOWER study).⁵⁷ SE was not measured in this study.

A preliminary study of STC looked at SE in a subset of students. Hafner used a 2x2 quasi-experimental mixed-method design that assessed SE using a survey created by SNAP-Ed and qualitative data (cognitive interviews and focus groups).⁵⁴ Portions of the survey were adapted from a validated survey.⁴⁴ This study only used data from the Fall 2017 group of students (n=142; intervention n=85, comparison n=57). This study assessed if student SE increased in the intervention group more than the comparison group. In addition, focus groups were conducted pre and post students at the intervention schools to ask students questions regarding their favorite FV's and who is responsible for the food at home or school.⁵⁴ Hafner et al. found no difference between or within group differences in school SE and home SE.⁵⁴ The qualitative

results included 32 students in each focus groups. Before the intervention almost all students had high SE regarding asking for FV's at home, but a few reported some adults at home are very busy and might not have enough money. After the intervention, students reported having higher SE at home and at school. The difference between quantitative and qualitative may suggest that SE needs to be further investigated and that focus groups may be a better strategy to determine changes in student SE. This study indicated the importance of evaluating this survey and evaluate the program further.⁵⁴

Another preliminary STC study was the *Evaluation of a school-based fruit and vegetable intervention using a digital photography method*.⁵⁵ The researcher utilized Digital Photography of Food Method (DPFM) to determine if the STC intervention would result in increased healthy fruits and vegetables consumption and variety based on DPFM. DPFM was used by taking a photo before and after lunch to determine how much FV the student consumed and how many different types of FV were on their tray. Photos were taken before and after the intervention and Wilcoxon signed-rank test was conducted to see if there were any changes in FV consumption within the intervention group.

The results of Weisfeld's study were that at baseline both groups had a low intake of FV (treatment=0.26 cups of fruit and 0.03 cup of vegetables; comparison=0.11 cups of fruit and 0.04 cups of vegetables).⁵⁵ There was a significant greater fruit consumption in the comparison school than the intervention group ($p<0.01$). There was a significant decrease of 0.12 ± 0.46 cups of fruit within the intervention school ($p=0.02$) and a non-significant increase of 0.12 ± 0.49 cups of fruit

in the comparison group. There was no significant difference in vegetable consumption between or within groups. For variety, at baseline, there was a statistically significant difference in fruit variety comparing the intervention and comparison school ($p < 0.001$), primarily because a smaller portion of intervention students had no fruit on their tray (40.7%) when compared to comparison students (88.3%). At the end of the STC program, there was no difference in fruit variety. Vegetable variety was significantly different at baseline ($p < 0.001$) between schools (intervention=50.6% had no vegetable; comparison=90.3% had no vegetables). At follow up, there was no difference in vegetable variety. However, the intervention group decreased variety of fruits from baseline to follow up and the comparison group increased variety of vegetables ($p < 0.001$). One average student consumed 0.03 cups of vegetables during lunch.⁵⁵ A limitation to this study is the small sample size and the FV provided at lunchtime were not the same at baseline and follow up. This study highlighted the importance of environment and how the availability of FV in the lunchroom can effect overall FV intake and variety.⁵⁵

The pilot and preliminary studies suggest the need for further evaluation of the STC PSE intervention and its effectiveness to increasing FV intake, knowledge, and SE to improve children healthy eating behaviors and decrease the prevalence of childhood obesity.⁵⁴⁻⁵⁷

VI. Conclusion

Based on the research discussed above, the prevalence of childhood obesity has increased over time and low income youth are the most at risk due in part to poor dietary habits (including low intake of FV).^{19,35} As explained in the social cognitive

theory section of this review, reciprocal determinism and self-efficacy constructs need to be addressed to promote positive behavior change; these constructs has been utilized in the past and resulted in positive behavior changes.^{40,41} This review also defined PSE intervention and how they work by changing policy, systems and the environment to promote positive behavior change.⁴

This review also discussed seven past PSE intervention, three that did not focus on low-income youth ^{7,20,50} and three that had some low-income youth.^{6,8,9} Depending on the method used, some school-based PSE interventions have been successful in increased positive behavior change like FV intake in children.⁶⁻⁹ The methods used in successful studies included providing teachers with training, changing some options in the cafeteria, and changing other aspects of the school environment to promote healthy behavior change.^{7,20,50} Of the PSE interventions that did not focus on low-income youth, only one intervention was successful in increasing FV behavior change; this intervention focused on changing the cafeteria environment to include more FV.⁷ From this review, studies that were successful utilized many strategies including changing the environment so that more FV were available to children and educating adults and staff about the importance of FV.

PSE interventions that did include low-income youth focused on increasing FV knowledge, and changed some aspects of the cafeteria environment.^{6,8,9} Two out of the three PSE interventions were successful in increasing nutrition knowledge.^{6,8,9} As far as this writer knows, there has been few PSE interventions focused on increasing FV intake in low-income youth and few PSE interventions have focused on increasing students asking SE for FV at school and home.

All of these variables have been assessed in STC. The preliminary studies that have been conducted on the STC pilot or intervention, utilized outside data to determine if the program is successful.^{54,55} Both preliminary STC studies found different results for fruit and vegetable intake. The secondary data analysis of STC reported in this thesis will help evaluate if the intervention is associated with increasing student FV intake, knowledge, and SE and provide more important data regarding the effectiveness of PSE intervention in low-income schools.

REFERENCES

1. Childhood Obesity Facts | Overweight & Obesity | CDC.
<https://www.cdc.gov/obesity/data/childhood.html>. Published August 14, 2018.
Accessed February 7, 2019.
2. Ambrosini GL, Emmett PM, Northstone K, Jebb SA. Tracking a dietary pattern associated with increased adiposity in childhood and adolescence. *Obesity*. 2014;22(2):458-465. doi:10.1002/oby.20542
3. Hinnig P de F, Monteiro JS, Altenburg de MA, et al. Dietary Patterns of Children and Adolescents from High, Medium and Low Human Development Countries and Associated Socioeconomic Factors: A Systematic Review. *Nutrients; Basel*. 2018;10(4):436. doi:http://dx.doi.org.uri.idm.oclc.org/10.3390/nu10040436
4. Communities Putting Prevention to Work (CPPW). What is “Policy, Systems and Environmental Change”? 2012:1-3.
5. Bateman LB, O’Neal LJ, Smith T, et al. Policy, System and Environmental Correlates of Fruit and Vegetable Consumption in a Low-Income African American Population in the Southeast. *Ethn Dis*. 27(Suppl 1):355-362.
doi:10.18865/ed.27.S1.355
6. Leines D, Gold A, Van Offelen S. Go Wild with Fruits & Veggies! Curriculum Encourages Children to Eat More Fruits and Vegetables. *Journal of Nutrition Education and Behavior*. 2014;46(1):82-84. doi:10.1016/j.jneb.2013.03.018
7. Perry CL, Bishop DB, Taylor GL, et al. A Randomized School Trial of Environmental Strategies to Encourage Fruit and Vegetable Consumption among Children. *Health Education & Behavior*. 2004;31(1):65-76.
doi:10.1177/1090198103255530
8. King KM, Ling J. Results of a 3-year, nutrition and physical activity intervention for children in rural, low-socioeconomic status elementary schools. *Health Education Research*. 2015;30(4):647-659. doi:10.1093/her/cyv029
9. Coleman KJ, Shordon M, Caparosa SL, Pomichowski ME, Dzewaltowski DA. The healthy options for nutrition environments in schools (Healthy ONES) group randomized trial: using implementation models to change nutrition policy and environments in low income schools. *International Journal of Behavioral Nutrition and Physical Activity*. 2012;9(1):80. doi:10.1186/1479-5868-9-80
10. Supplemental Nutrition Assistance Program-Education.
<https://web.uri.edu/snaped/>. Accessed March 9, 2019.
11. SNAP-Ed Strategies & Interventions: An Obesity Prevention Toolkit for States. April 2016.

<https://www.nccor.org/downloads/SNAPedStrategiesAndInterventionsToolkitForStates.pdf>. Accessed March 9, 2019.

12. Bandura A. *Social Foundations of Thought and Action: A Social Cognitive Theory*. Englewood Cliffs, N.J.: Prentice-Hall; 1986.
13. Ogden CL, Carroll MD, Fakhouri TH, et al. Prevalence of Obesity Among Youths by Household Income and Education Level of Head of Household — United States 2011–2014. *MMWR Morbidity and Mortality Weekly Report*. 2018;67(6):186-189. doi:10.15585/mmwr.mm6706a3
14. Ogden CL, Flegal KM. Prevalence of Obesity Among Adults and Youth: United States, 2011–2014. *National Center for Health Statistics*. 2015;(219):8.
15. Hales CM, Fryar CD, Carroll MD, Freedman DS, Ogden CL. Trends in Obesity and Severe Obesity Prevalence in US Youth and Adults by Sex and Age, 2007-2008 to 2015-2016. *JAMA*. 2018;319(16):1723-1725. doi:10.1001/jama.2018.3060
16. Center for Disease Control and Prevention. Childhood Obesity Facts. *Adolescent and School Health*. 2014;3-5. doi:2016-09-19
17. M. B, P.J. W. Are dietary interventions effective at increasing fruit and vegetable consumption among overweight children? A systematic review. *Journal of epidemiology and community health*. 2014;68(5):485-490.
18. Traynor K. Rhode Island The State of Obesity. 2014;71(16):1328-1332. doi:10.2146/news140057
19. Dietz WH. Childhood obesity: Susceptibility, cause, and management. *The Journal of Pediatrics*. 1983;103(5):676-686. doi:10.1016/S0022-3476(83)80457-0
20. Foltz SC, Kuder JF, Goldberg JP, et al. Changes in diet and physical activity resulting from the Shape Up Somerville community intervention. *BMC Pediatrics*. 2013;13(1). doi:10.1186/1471-2431-13-157
21. Knai C, Pomerleau J, Lock K, McKee M. Getting children to eat more fruit and vegetables: A systematic review. *Preventive Medicine*. 2006;42(2):85-95. doi:10.1016/j.ypmed.2005.11.012
22. Socioeconomic Status. <https://www.apa.org>. <https://www.apa.org/topics/socioeconomic-status/>. Accessed February 14, 2019.
23. National School Lunch Program - Nutrition Programs - RIDE Child Nutrition Programs. <http://www.ride.ri.gov/cnp/NutritionPrograms/NationalSchoolLunchProgram.aspx#21381431-community-eligibility-provision>. Accessed February 14, 2019.

24. Community Eligibility Provision | Food and Nutrition Service.
<https://www.fns.usda.gov/school-meals/community-eligibility-provision>. Accessed February 7, 2019.
25. Micha R, Karageorgou D, Bakogianni I, et al. Effectiveness of school food environment policies on children’s dietary behaviors: A systematic review and meta-analysis. *PLoS One; San Francisco*. 2018;13(3):e0194555.
doi:<http://dx.doi.org/uri.idm.oclc.org/10.1371/journal.pone.0194555>
26. Fresh Fruit and Vegetable Program | Food and Nutrition Service.
<https://www.fns.usda.gov/ffvp/fresh-fruit-and-vegetable-program>. Accessed February 14, 2019.
27. Hall E, Chai W, Koszewski W, Albrecht J. Development and validation of a social cognitive theory-based survey for elementary nutrition education program. *International Journal of Behavioral Nutrition and Physical Activity*. 2015;12(1).
doi:10.1186/s12966-015-0206-4
28. Title I: Improving Academic Achievement - Instructional Resources - Instructions & Assessment World-Class - Rhode Island Department of Education (RIDE).
<http://www.ride.ri.gov/InstructionAssessment/InstructionalInitiativesResources/TitleIImprovingAcademicAchievement.aspx>. Accessed February 7, 2019.
29. Kim SA, Moore LV, Galuska D, et al. Vital signs: Fruit and vegetable intake among children — United States, 2003–2010. *Morbidity and Mortality Weekly Report*. 2014;(31).
30. Information C, Arias I. Children eating more fruit, but fruit and vegetable intake still too low | CDC Online Newsroom | CDC. *Centers for Disease Control and Prevention*. 2014:1.
31. Ohri-Vachaspati P, Turner L, Chaloupka FJ. Fresh Fruit and Vegetable Program Participation in Elementary Schools in the United States and Availability of Fruits and Vegetables in School Lunch Meals. *Journal of the Academy of Nutrition and Dietetics*. 2012;112(6):921-926. doi:10.1016/j.jand.2012.02.025
32. Bateman LB, O’Neal LJ, Smith T, et al. Policy, System and Environmental Correlates of Fruit and vegetable Consumption in a Low-Income African American Population in the Southeast. *Ethnicity & Disease*. 2017;27(Sup 1):355-362. doi:10.18865/ed.27.S1.355.Keywords
33. Food Research and Action Center. Why Low-Income and Food-Insecure People are Vulnerable to Poor Nutrition and Obesity - Food Research & Action Center. *Frac*. 2018:1-5.

34. Hall E, Chai W, Albrecht JA. Relationships between nutrition-related knowledge , self-efficacy , and behavior for fifth grade students attending Title I and non-Title I schools. *Appetite*. 2016;96:245-253. doi:10.1016/j.appet.2015.09.033
35. Di Noia J, Byrd-Bredbenner C. Determinants of fruit and vegetable intake in low-income children and adolescents. *Nutrition Reviews*. 2014;72(9):575-590. doi:10.1111/nure.12126
36. Kim SA, Moore LV, Galuska D, et al. Vital Signs: Fruit and Vegetable Intake Among Children — United States, 2003–2010. *MMWR Morb Mortal Wkly Rep*. 2014;63(31):671-676.
37. Holman DM, White MC. Dietary behaviors related to cancer prevention among pre-adolescents and adolescents: the gap between recommendations and reality. *Nutrition Journal*. 2011;10(1). doi:10.1186/1475-2891-10-60
38. McInerney M, Csizmadia I, Friedenreich CM, et al. Associations between the neighbourhood food environment, neighbourhood socioeconomic status, and diet quality: An observational study. *BMC Public Health*. 2016;16(1):984. doi:10.1186/s12889-016-3631-7
39. What is Fuel Up To Play 60? | Fuel Up To Play 60. <https://www.fueluptoplay60.com/about/about-the-program>. Accessed February 14, 2019.
40. Bandura A. Health promotion from the perspective of social cognitive theory. *Psychology & Health*. 1998;13(4):623-649. doi:10.1080/08870449808407422
41. Rinderknecht K, Smith C. Social Cognitive Theory in an After-School Nutrition Intervention for Urban Native American Youth. *Journal of Nutrition Education and Behavior*. 2004;36(6):298-304. doi:10.1016/S1499-4046(06)60398-9
42. Fetter DS, Scherr RE, Linnell JD, Dharmar M, Schaefer SE, Zidenberg-Cherr S. Effect of the Shaping Healthy Choices Program, a Multicomponent, School-Based Nutrition Intervention, on Physical Activity Intensity. *Journal of the American College of Nutrition*. 2018;37(6):472-478. doi:10.1080/07315724.2018.1436477
43. Division of Adolescent and School Health NC for CDP and HP. *School Health Guidelines to Promote Healthy Eating and Physical Activity*. Vol 60.; 2011. doi:21918496
44. Keihner AJ, Meigs R, Sugerman S, Backman D, Garbolino T, Mitchell P. The Power Play! Campaign's School Idea & Resource Kits Improve Determinants of Fruit and Vegetable Intake and Physical Activity among Fourth- and Fifth-Grade Children. *Journal of Nutrition Education and Behavior*. 2011;43(4):S122-S129. doi:10.1016/j.jneb.2011.02.010

45. Wright K, Norris K, Newman Giger J, Suro Z. Improving healthy dietary behaviors, nutrition knowledge, and self-efficacy among underserved school children with parent and community involvement. *Child Obes.* 2012;8(4):347-356.
46. Bagherniya M, Darani FM, Sharma M, et al. Assessment of the Efficacy of Physical Activity Level and Lifestyle Behavior Interventions Applying Social Cognitive Theory for Overweight and Obese Girl Adolescents. :6.
47. The Social Cognitive Theory. <http://sphweb.bumc.bu.edu/otlt/MPH-Modules/SB/BehavioralChangeTheories/BehavioralChangeTheories5.html>. Accessed February 16, 2019.
48. Aloia CR, Shockey TA, Nahar VK, Knight KB. Pertinence of the recent school-based nutrition interventions targeting fruit and vegetable consumption in the United States:a systematic review. *Health Promotion Perspectives.* 2016;6(1):1-9. doi:10.15171/hpp.2016.01
49. Story M, Kaphingst KM, Robinson-O'Brien R, Glanz K. Creating healthy food and eating environments: policy and environmental approaches. *Annu Rev Public Health.* 2008;29:253-272. doi:10.1146/annurev.publhealth.29.020907.090926
50. Lawlor DA, Kipping RR, Anderson EL, et al. Active for Life Year 5: a cluster randomised controlled trial of a primary school-based intervention to increase levels of physical activity, decrease sedentary behaviour and improve diet. *Public Health Research.* 2016;4(7):1-156. doi:10.3310/phr04070
51. Da L, Rr K, El A, et al. Active for Life Year 5: a cluster randomised controlled trial of a primary school-based intervention to increase levels of physical activity, decrease sedentary behaviour and improve diet. *Public Health Research.* 2016;4(7). doi:10.3310/phr04070
52. HealthierUS School Challenge: Smarter Lunchrooms | Food and Nutrition Service. <https://www.fns.usda.gov/hussc/healthierus-school-challenge-smarter-lunchrooms>. Accessed February 16, 2019.
53. Thiagarajah K, Fly AD, Hoelscher DM, et al. Validating the Food Behavior Questions from the Elementary School SPAN Questionnaire. *Journal of Nutrition Education and Behavior.* 2008;40(5):305-310. doi:10.1016/j.jneb.2007.07.004
54. Hafner, Sabrina G., "Impact of a Policy, Systems, and Environmental Intervention of Low-Income 5th Grade Students' Self-Efficacy" (2018). *Open Access Master's Theses*. Paper 1208. <https://digitalcommons.uri.edu/theses/1208>
55. Weisfeld, Natalie Ruth, "Evaluation of a School-based Fruit and Vegetable Intervention using a Digital Photography Method" (2018). *Open Access Master's Theses*. Paper 1260. <https://digitalcommons.uri.edu/theses/1260>

56. Goodwin, Jennifer L., "Effect of A Nutrition Intervention on Fruit and Vegetable Intake in Elementary School Students" (2017) *Open Access Master's Theses*. Paper 1021. <http://digitalcommons.uri.edu/theses/1021>
57. Lepe S, Goodwin J, Mulligan KT, Balestracci K, Sebelia L, Greene G. Process Evaluation of a Policy, Systems, and Environmental Change Intervention in an Urban School District. *Journal of Nutrition Education and Behavior*. 2019;51(3):307-317. doi:10.1016/j.jneb.2018.07.017

B. DESIGN CHART

Table 2: STC 2-year Design		
Year of STC Program	Comparison School	Intervention School
Year 1	Ella Risk Carnevale	Veterans Young & Woods
Year 2	Fogarty Lima	Ella Risk Carnevale

*A,B,C,D,E,F – represent schools in STC program

C. STC GENERAL LESSON PLAN FOR INTERVENTION SCHOOLS

STC Lesson Plan*	
Lesson 1	MyPlate/FV you Enjoy <u>PSE component:</u> Brainstorm FV students would like to have in cafeteria and draft a letter to wellness committee and foodservice
Lesson 2	Function of FV/Overcoming Barriers <u>PSE component:</u> Read letter drafted, add barriers and have students sign it
Lesson 3	Amount of FV/Recipe Reading
Lesson 4	Go, Slow and Whoa (GSW)/Role-playing interviewing adult about favorite fruit or vegetable recipe <u>PSE component:</u> Have students role play and ask students to have a recipe with a F or V by the next lesson
Lesson 5	Healthy Snack/Taste Testing & Discussion on slogans/persuasive messages <u>PSE component:</u> Students taste test recipes and vote on their favorite recipe to include in the cafeteria and student are assigned to create slogans about FV
Lesson 6	Winning Recipe Announced/Make Posters <u>PSE component:</u> Students work on posters and persuasive messages for the loudspeaker to promote their school-wide recipe tasting day
Lesson 7	Make Requests & Practice Polling <u>PSE component:</u> Students learn how to make requests and also learn their jobs for recipe tasting day
Lesson 8	Recap – talk about recipe tasting day and students’ feedback regarding the program

*STC includes 8-week, 30-minute lessons.

General Outline of Lessons:

Lesson 1 Feb: MyPlate/Fruits & Veggies (F&V) you Enjoy (25-30 min)

- Introduce “students take charge project” and the Providence wellness committee
- Introduction to MyPlate; focus on F&V;
- Brainstorm F&V would like to see in cafeteria and draft up letter to Providence wellness committee & Sodexo
- Handouts to take home: MyPlate & Family Newsletter #1

Lesson 2 Feb: Function of F&V/Overcoming Barriers (25-30 min)

- Report on most popular F&V class wanted to see in cafeteria
- Why variety of F&V is important
- Have students brainstorm ideas to overcome barriers to eating F&V
- Read letter drafted for providence wellness committee/Sodexo, add line about barriers and have students initial signature sheet
- Introduce environmental scan- have students do during lunch time next week (set up a schedule for them, give environmental scans to teachers to complete week of _____)
- Handouts to take home: Eat variety of color, Family Newsletter #2

Lesson 3 March: Amounts of F&V/Recipe Reading (25-30 min)

- Amount of F&V to consume
- Learn how to read a recipe
- Math activity using information from recipe
- Handouts to take home: F&V 2+2, Family Newsletter #3

Lesson 4 March: Go, Slow and Whoa (GSW) /Role-playing interviewing adult about favorite fruit or vegetable recipe (25-30 min)

- Hand in environmental scan completed week of _____
- Give permission slip for families to attend next PPSD wellness committee meeting
- What are GSW foods
- Role play interviewing an adult about a recipe
- Review recipe criteria (we want these recipes to be GO recipes, so not too much sugar, salt, fat added to it AND need to have fruit or veggie as main ingredient in the side dish (provide examples of side dish recipes)
- Handout to take home: 5 food groups (G,S,W) , Script for Recipe interview, Family Newsletter #4
- Give date that recipes must be submitted by. SNAP-Ed will filter through recipes and choose ones that meet the criteria (narrowing down to two recipes)

Lesson 5 April: Healthy Snack/Taste Tasting & Discussions on slogans/persuasive messages (25-30 min)

- Reminder about PPSD wellness committee meeting on _____
- Taste test two recipes & vote (SNAP-Ed will provide food samples for voting)
- Define healthy snack, slogan, persuasive message
- Homework assignment: Create a slogan/persuasive message for Fruits, Veggies, & the two recipes which will be used for posters or to read over the loudspeaker. They will bring their slogans/persuasive messages next class to work in groups
- Handouts to take home: Family newsletter #5, Top 10 reasons to eat F&V handout, persuasive message/slogan homework assignment

Lesson 6 April: Winning Recipe Announced/Make Posters (25-30 min)

- Reveal winning recipe (students form a bar graph on the board to reveal winner)
- Students gather in their groups to work on the posters, persuasive messages for loudspeaker
- Handouts to take home: Family newsletter #6

Lesson 7 May: Making Requests & Practice Polling (25-30 min)

- How to make requests for F&V
- Have students complete “Making requests for F&V” worksheet
- Practice their roles for recipe tasting day in the cafeteria
- Handouts to take home: Family newsletter #7

SNAP-Ed will coordinate with Sodexo for a recipe tasting in cafeteria; students from each classroom will be chosen to help with food tasting/voting during each lunch that day

Lesson 8 May: Recap (25-30 min)

- Recap of program and student feedback
- Handouts to take home: Family Newsletter #8

D. STUDENT'S TAKE CHARGE! PRE/POST SURVEY

CODE SHEET *Pre*

THE UNIVERSITY OF RHODE ISLAND SNAP-Ed

Student's Take Charge! Survey

2017-2018

1 = Ella RISK
2 = Fogarty
3 = Lima
4 = Carpentier

STAFF ONLY

Date: *of survey*

School: *# entered*

Classroom: *# entered*

Circle one: Pre Post

ID# *number given*

PLEASE PRINT

Age: *age* _____

My Name Is: _____

DO NOT ENTER
Separate ID sheet was created

First Name Last Name

Have you been to a URI SNAP-Ed workshop since October 1, 2016? ☐ Yes ☐ No *DO not enter*

gender I am a: ☒ 1 Boy ☒ 2 Girl

speaks spa I speak Spanish at home: ☐ 1 Yes ☐ 2 No ☐ 3 Sometimes

ethn I am (choose all that apply):

1 = ☒ *checked*

0 = not *checked*

☐ Asian

☐ Black or African-American

☐ White

☐ American Indian or Alaskan Native

☐ Native Hawaiian/other Pacific Islander

☐ Other

Missing = 99

OVER →

1

PART 1

DIRECTIONS: Circle what you think the correct answer is for each of the following questions.

1. *know*
How many fruits should 4th and 5th graders eat each day?

(1) (2) (3) (4) (5)

2. *know*
How many vegetables should 4th and 5th graders eat each day?

(1) (2) (3) (4) (5)

3. *know*
How much of a 4th and 5th grader's plate should be filled with fruits and vegetables?

None (1) $\frac{1}{4}$ $\frac{1}{2}$ $\frac{3}{4}$ all
(0) (1) (2) (3) (4)

PART 2

DIRECTIONS: Choose what you think the correct answer is for each of the following questions.

4. *know PSE*
What does PSE stand for? (choose one)

(1) ☐ Policy, Systems and Environmental change
(2) ☐ Poor School Environment
(3) ☐ Public School Exchange
(4) ☐ Public School Environment

5. *know swc*
Can students be members of a School Wellness Committee? (choose one)

(1) ☐ Yes
(2) ☐ No
(3) ☐ I don't know

6. *know tru*
Which of the following sentences is trying to make you trust it? (choose one)

(1) ☐ "Doctors recommend eating fruits and vegetables every day for good health."
(2) ☐ "Peppers come in all different shapes, sizes, and colors including red, green, and orange!"
(3) ☐ "Carrots are a root vegetable that contain vitamin A and help your eyes."
(4) ☐ "Eat a variety of colorful fruits and vegetables to feel great every day!"

PART 3

DIRECTIONS: Yesterday was _____. Try to remember what fruits and vegetables

you ate yesterday at home and at school. This includes breakfast, lunch, dinner and snacks.

7. How many fruits did you eat yesterday? Do not include fruit juice.

- ☐ None (0)
☐ 1 (1)
☐ 2 (2)
☐ 3 (3)
☐ 4 (4)
☐ 5 or more (5)

Each of these is an example of a fruit:

8. How many vegetables did you eat yesterday? Do not include French Fries.

- ☐ None (0)
☐ 1 (1)
☐ 2 (2)
☐ 3 (3)
☐ 4 (4)
☐ 5 or more (5)

Each of these is an example of a vegetable:

PART 4

DIRECTIONS: Choose one answer for each question.

9. Do you eat more than one kind of fruit each day?

- (1) ☐ No
 (2) ☐ Yes, sometimes
 (3) ☐ Yes, often
 (4) ☐ Yes, every day

10. Do you eat more than one kind of vegetable each day?

- ☐ (1) No
☐ (2) Yes, sometimes
☐ (3) Yes, often
☐ (4) Yes, every day

OVER →

PART 5

DIRECTIONS: Circle the answer that you disagree or agree with the most.

	① I disagree very much	② I disagree a little	③ I am not sure	④ I agree a little	⑤ I agree very much
<u>asefamfv</u>					
11. I think I can ask someone in my family to buy my favorite fruit or vegetable.	A	B	C	D	E
<u>asefamvd</u>					
12. I think I can ask someone in my family to make my favorite <u>vegetable</u> for dinner.	A	B	C	D	E
<u>asefamfd</u>					
13. I think I can ask someone in my family to serve my favorite <u>fruit</u> at dinner.	A	B	C	D	E
<u>asefamfr</u>					
14. I think I can ask someone in my family to have <u>fruits</u> where I can reach them.	A	B	C	D	E
<u>asefamvr</u>					
15. I think I can ask someone in my family to have <u>vegetables</u> cut up where I can reach them.	A	B	C	D	E
<u>aseschfv</u>					
16. I think I can ask an adult in my school to offer fruits and vegetables I like to eat.	A	B	C	D	E
<u>aseschfo</u>					
17. I think I can ask an adult at school to change foods offered in my school.	A	B	C	D	E

Thank you!

CODE SHEET - POST

THE UNIVERSITY OF RHODE ISLAND

Student's Take Charge! Survey

2016-2017

STAFF ONLY

Date:

School: P# entered

Classroom:

Circle one: Pre

Post

ID# # given

PLEASE PRINT

age

Age: _____

1=ER
2=Vets

3= ~~camerata~~ young was Grade 4-4th gr
4= ~~young~~ ~~was~~ camerata 5-5th gr

My Name Is: _____

First Name

Last Name

DO NOT ENTER
USE ID given instead

gender

①

②

I am a: ☐ Boy ☐ Girl

dinner

On most nights who makes dinner for you?

①

☐ My mom

②

☐ My dad

③

☐ Myself

④

☐ My brother or sister

⑤

☐ Another adult that is not my mom or dad

⑥

☐ I do not eat dinner

shop

Who usually does most of your family's food shopping?

①

☐ My mom or dad

②

☐ Myself

③

☐ My brother or sister

④

☐ Another adult that is not my mom or dad

Kidshome

How many other children live in your home?

①

☐ None

②

☐ 1

③

☐ 2

④

☐ 3

⑤

☐ 4

⑥

☐ More than 4

MISSING = 99

OVER →

PART 1

DIRECTIONS: Circle what you think the correct answer is for each of the following questions.

bknowf
1. How many fruits should 4th and 5th graders eat each day?

- (1) (2) (3) (4) (5)

bknowv
2. How many vegetables should 4th and 5th graders eat each day?

- (1) (2) (3) (4) (5)

bknowpla
3. How much of a 4th and 5th grader's plate should be filled with fruits and vegetables?

- None (0) $\frac{1}{4}$ (1) $\frac{1}{2}$ (2) $\frac{3}{4}$ (3) all (4)

PART 2

DIRECTIONS: Choose what you think the correct answer is for each of the following questions.

bknowPSE
4. What does PSE stand for? (choose one)

- (1) ☐ Policy, Systems and Environmental change
(2) ☐ Poor School Environment
(3) ☐ Public School Exchange
(4) ☐ Public School Environment

bknowSWC
5. Can students be members of a School Wellness Committee? (choose one)

- (1) ☐ Yes
(2) ☐ No
(3) ☐ I don't know

bknowtra
6. Which of the following sentences is trying to make you trust it? (choose one)

- (1) ☐ "Doctors recommend eating fruits and vegetables every day for good health."
(2) ☐ "Peppers come in all different shapes, sizes, and colors including red, green, and orange!"
(3) ☐ "Carrots are a root vegetable that contain vitamin A and help your eyes."
(4) ☐ "Eat a variety of colorful fruits and vegetables to feel great every day!"

PART 3

DIRECTIONS: Yesterday was _____. Try to remember what fruits and vegetables

you ate yesterday at home and at school. This includes breakfast, lunch, dinner and snacks.

beatf
7. How many fruits did you eat yesterday? Do not include fruit juice.

- ☒ 0 ☐ None
☐ 1
☐ 2
☐ 3
☐ 4
☐ 5 or more

Each of these is an example of a fruit:

beatv
8. How many vegetables did you eat yesterday? Do not include French Fries.

- ☒ 0 ☐ None
☐ 1
☐ 2
☐ 3
☐ 4
☐ 5 or more

Each of these is an example of a vegetable:

PART 4

DIRECTIONS: Choose one answer for each question.

beatvarf
9. Do you eat more than one kind of fruit each day?

- ☒ 1 ☐ No
☐ 2 ☐ Yes, sometimes
☐ 3 ☐ Yes, often
☒ 4 ☐ Yes, every day

10. Do you eat more than one kind of vegetable each day?

- ☒ 1 ☐ No
☐ 2 ☐ Yes, sometimes
☐ 3 ☐ Yes, often
☒ 4 ☐ Yes, every day

OVER →

PART 5

DIRECTIONS: Circle the answer that you disagree or agree with the most.

① ② ③ ④ ⑤

	I disagree very much	I disagree a little	I am not sure	I agree a little	I agree very much
<i>bsefamfv</i> 11. I think I can ask someone in my family to buy my favorite fruit or vegetable.	A	B	C	D	E
<i>bsefamvd</i> 12. I think I can ask someone in my family to make my favorite <u>vegetable</u> for dinner.	A	B	C	D	E
<i>bsefamfd</i> 13. I think I can ask someone in my family to serve my favorite <u>fruit</u> at dinner.	A	B	C	D	E
<i>bsefamfr</i> 14. I think I can ask someone in my family to have <u>fruits</u> where I can reach them.	A	B	C	D	E
<i>bsefamvr</i> 15. I think I can ask someone in my family to have <u>vegetables</u> cut up where I can reach them.	A	B	C	D	E
<i>bsebschfv</i> 16. I think I can ask an adult in my school to offer fruits and vegetables I like to eat.	A	B	C	D	E
<i>bsebschfo</i> 17. I think I can ask an adult at school to change foods offered in my school.	A	B	C	D	E

Thank you!

E. PRE/POST SURVEY SCRIPT

SAY → Hello everybody, my name is _____, and I am from URI SNAP-Ed.

Over the next few months SNAP-Ed will be visiting your health class to conduct nutrition education workshops.

SAY → Before we start, we need you to complete a survey. We are going to complete the survey together. When you get a survey please leave it face down so that you are looking at PART 5.

DO NOT TURN THE SURVEY OVER UNTIL EVERYONE HAS ONE.

(once everyone has a survey have them flip it over, follow the prompts next to each survey question)

1. **SAY** → Please do not fill out the “STAFF ONLY” box.

Student’s Take Charge! Survey
2017-2018

STAFF ONLY
Date: _____
School: _____
Classroom: _____
Circle one: Pre Post
ID# _____

PLEASE PRINT

2. **SAY** → Please write your room # next to where it says “Please print.”

Age: _____ 3. **SAY** → Next fill in your age, first and last name.

My Name Is: _____
First Name Last Name

4. **SAY** → For the URI SNAP-Ed workshop question everyone will fill in “No.”

Have you been to a URI SNAP-Ed workshop since October 1, 2016? ☐ Yes ☐ No

5. **SAY** → Please fill in whether you are a “boy” or “girl”

I am a: ☐ Boy ☐ Girl

I speak Spanish at home: ☐ Yes ☐ No ☐ Sometimes

6. **SAY** → Next question, “I speak Spanish at home: yes, no or sometimes”

I am (choose all that apply): ☐ Asian
☐ Black or African-American
☐ White
☐ American Indian or Alaskan Native
☐ Native Hawaiian/other Pacific Islander
☐ Other

7. **SAY** → The last question asks about your ethnicity or where your family comes from, please fill it out to the best of your ability, if you don’t see your ethnicity fill in the “other” circle.

8. **SAY** → When you are done please, flip the page over and find “Part 1.” Once you’ve done so, look up at me so I know you are ready to begin “Part 1.”

OVER →

PART 1 1. For PART 1: Read the directions below, read each question out loud as well as each choice.

DIRECTIONS: Circle what you think the correct answer is for each of the following questions.

1. How many fruits should 4th and 5th graders eat each day?
1 2 3 4 5
2. How many vegetables should 4th and 5th graders eat each day?
1 2 3 4 5
3. How much of a 4th and 5th grader's plate should be filled with fruits and vegetables?
None 1/4 1/2 3/4 all
- 2. SAY** → Remember it is asking what you "think" the correct answer is. It is not asking about what you eat but what you "think" the correct answer is.
- 3. SAY** → Please look up at me when you are done with #3 so I know you are ready for "PART 2."

PART 2 4. For PART 2: Read the directions below, read each question out loud as well as each choice.

DIRECTIONS: Choose what you think the correct answer is for each of the following questions.

4. What does PSE stand for? (choose one)
- ☐ Policy, Systems and Environmental change
- ☐ Poor School Environment
- ☐ Public School Exchange
- ☐ Public School Environment
5. Can students be members of a School Wellness Committee? (choose one)
- ☐ Yes
- ☐ No
- ☐ I don't know
6. Which of the following sentences is trying to make you trust it? (choose one)
- ☐ "Doctors recommend eating fruits and vegetables every day for good health."
- ☐ "Peppers come in all different shapes, sizes, and colors including red, green, and orange!"
- ☐ "Carrots are a root vegetable that contain vitamin A and help your eyes."
- ☐ "Eat a variety of colorful fruits and vegetables to feel great every day!"
- 5. SAY** → If you don't know what PSE stands for or what a Wellness Committee is that is okay. Just make your best guess.

6. ASK → Who knows what the word trust means?

7. SAY → When you are done, please flip the page over and find "Part 3." Once you've done so, look up at me so I know you are ready to begin "Part 3." 3

NEXT PAGE →

1. SAY → “Yesterday was Monday,(continue reading the directions along with choices for each question). “There are pictures to help you remember examples of fruits and vegetables. You may have eaten fruits and vegetables not pictured, and that’s okay, you can still count them!”

DIRECTIONS: Yesterday was _____. Try to remember what fruits and vegetables you ate yesterday at home and at school. This includes breakfast, lunch, dinner and snacks.

7. How many fruits did you eat yesterday? Do not include fruit juice.

- ☐ None
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5 or more

8. How many vegetables did you eat yesterday? Do not include French Fries.

- ☐ None
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5 or more

2. SAY → Please look up at me when you are done with #8 so I know you are ready for “PART 4.”

PART 4 3. For PART 4: Read the directions below, read each question out loud as well as each choice.

DIRECTIONS: Choose one answer for each question.

9. Do you eat more than one kind of fruit each day?

- ☐ No
- ☐ Yes, sometimes
- ☐ Yes, often
- ☐ Yes, every day

4. SAY → For example if you eat an apple at breakfast & applesauce at lunch, that is not more than one kind of fruit. If you have a banana at breakfast and an apple at lunch that would be more than one kind of fruit.

10. Do you eat more than one kind of vegetable each day?

- ☐ No
- ☐ Yes, sometimes
- ☐ Yes, often
- ☐ Yes, every day

5. SAY → For example if you eat mashed potatoes at lunch & a baked potato at dinner, that is not more than one kind of veggie. If you have mashed potatoes at lunch and broccoli at dinner that is more than one kind of veggie.

6. SAY → When you are done, please flip the page over and find “Part 5.” Once you’ve done so, look up at me so I know you are ready to begin “Part 5.”

PART 5 1. For PART 5: Read the directions below, ASK → Who knows what it means to agree or disagree?

Then, read each statement out loud as well as each choice each time!

DIRECTIONS: Circle the answer that you disagree or agree with the most.

	I disagree very much	I disagree a little	I am not sure	I agree a little	I agree very much
11. I think I can ask someone in my family to buy my favorite fruit or vegetable.	A	B	C	D	E
12. I think I can ask someone in my family to make my favorite <u>vegetable</u> for dinner.	A	B	C	D	E
13. I think I can ask someone in my family to serve my favorite <u>fruit</u> at dinner.	A	B	C	D	E
14. I think I can ask someone in my family to have <u>fruits</u> where I can reach them.	A	B	C	D	E
15. I think I can ask someone in my family to have <u>vegetables</u> cut up where I can reach them.	A	B	C	D	E
16. I think I can ask an adult in my school to offer fruits and vegetables I like to eat.	A	B	C	D	E
17. I think I can ask an adult at school to change foods offered in my school.	A	B	C	D	E

2. f students need examples or clarification:

11. "At the store or farmer's market before they head out to shop or if you are with them while they shop"

12/13. "A few days in advance, not the day they are making dinner because they may not be able to go to the store that day to the buy the vegetable or fruit."

14./15. "For example on a table, countertop or in the refrigerator where you can reach them."

16./17. "This adult could be your teacher, a food service worker, health/PE teacher, or the Principal."

Thank you!

3. SAY → Thank you for completing the survey. Please put your pencils down when you are done and we will collect your surveys.

F. PRE & POST SURVEY – AIM #1 FV INTAKE QUESTIONS (A=PRE, B=POST)

PART 3

DIRECTIONS: Yesterday was _____. Try to remember what fruits and vegetables you ate yesterday at home and at school. This includes breakfast, lunch, dinner and snacks.

7. How many fruits did you eat yesterday? Do not include fruit juice.

eatf

☐ None ①

☐ 1 ①

☐ 2 ②

☐ 3 ③

☐ 4 ④

☐ 5 or more ⑤

Each of these is an example of a fruit:

8. How many vegetables did you eat yesterday? Do not include French Fries.

eatv

☐ None ①

☐ 1 ①

☐ 2 ②

☐ 3 ③

☐ 4 ④

☐ 5 or more ⑤

Each of these is an example of a vegetable:

PART 4

PART 3

DIRECTIONS: Yesterday was _____. Try to remember what fruits and vegetables you ate yesterday at home and at school. This includes breakfast, lunch, dinner and snacks.

7. How many fruits did you eat yesterday? Do not include fruit juice.

eatf

☐ ① None

☐ ①

☐ ②

☐ ③

☐ ④

☐ ⑤ or more

Each of these is an example of a fruit:

8. How many vegetables did you eat yesterday? Do not include French Fries.

eatv

☐ ① None

☐ ①

☐ ②

☐ ③

☐ ④

☐ ⑤ or more

Each of these is an example of a vegetable:

G. PRE & POST SURVEY – AIM #2 KNOWLEDGE QUESTIONS

(A=PRE, B=POST)

PART 1

DIRECTIONS: Circle what you think the correct answer is for each of the following questions.

aknowf

1. How many fruits should 4th and 5th graders eat each day?

(1) (2) (3) (4) (5)

aknowv

2. How many vegetables should 4th and 5th graders eat each day?

(1) (2) (3) (4) (5)

aknowpla

3. How much of a 4th and 5th grader's plate should be filled with fruits and vegetables?

None $\frac{1}{4}$ $\frac{1}{2}$ $\frac{3}{4}$ all

(0) (1) (2) (3) (4)

PART 1

DIRECTIONS: Circle what you think the correct answer is for each of the following questions.

bknowf

1. How many fruits should 4th and 5th graders eat each day?

(1) (2) (3) (4) (5)

bknowv

2. How many vegetables should 4th and 5th graders eat each day?

(1) (2) (3) (4) (5)

bknowpla

3. How much of a 4th and 5th grader's plate should be filled with fruits and vegetables?

None $\frac{1}{4}$ $\frac{1}{2}$ $\frac{3}{4}$ all

(0) (1) (2) (3) (4)

H. PRE & POST SURVEY – AIM #2 SELF-EFFICACY QUESTIONS

(A=PRE, B=POST)

PART 5

DIRECTIONS: Circle the answer that you disagree or agree with the most.

	① I disagree very much	② I disagree a little	③ I am not sure	④ I agree a little	⑤ I agree very much
<i>asefamfv</i>					
11. I think I can ask someone in my family to buy my favorite fruit or vegetable.	A	B	C	D	E
<i>asefamvd</i>					
12. I think I can ask someone in my family to make my favorite <u>vegetable</u> for dinner.	A	B	C	D	E
<i>asefamfd</i>					
13. I think I can ask someone in my family to serve my favorite <u>fruit</u> at dinner.	A	B	C	D	E
<i>asefamfr</i>					
14. I think I can ask someone in my family to have <u>fruits</u> where I can reach them.	A	B	C	D	E
<i>asefamvr</i>					
15. I think I can ask someone in my family to have <u>vegetables</u> cut up where I can reach them.	A	B	C	D	E
<i>aseschfv</i>					
16. I think I can ask an adult in my school to offer fruits and vegetables I like to eat.	A	B	C	D	E
<i>aseschfo</i>					
17. I think I can ask an adult at school to change foods offered in my school.	A	B	C	D	E

PART 5

DIRECTIONS: Circle the answer that you disagree or agree with the most.

①

②

③

④

⑤

	I disagree very much	I disagree a little	I am not sure	I agree a little	I agree very much
<i>bsefamfv</i> 11. I think I can ask someone in my family to buy my favorite fruit or vegetable.	A	B	C	D	E
<i>bsefamvd</i> 12. I think I can ask someone in my family to make my favorite <u>vegetable</u> for dinner.	A	B	C	D	E
<i>bsefamfd</i> 13. I think I can ask someone in my family to serve my favorite <u>fruit</u> at dinner.	A	B	C	D	E
<i>bsefamfr</i> 14. I think I can ask someone in my family to have <u>fruits</u> where I can reach them.	A	B	C	D	E
<i>bsefamvr</i> 15. I think I can ask someone in my family to have <u>vegetables</u> cut up where I can reach them.	A	B	C	D	E
<i>bsebschfv</i> 16. I think I can ask an adult in my school to offer fruits and vegetables I like to eat.	A	B	C	D	E
<i>bsebschfo</i> 17. I think I can ask an adult at school to change foods offered in my school.	A	B	C	D	E

I. DEMOGRAPHIC INFORMATION QUESTIONS

gender
I am a: ☐ ① Boy ☐ ② Girl

speaks pa
I speak Spanish at home: ☐ ① Yes ☐ ② No ☐ ③ Sometimes

ethn
I am (choose all that apply):

- ☐ Asian
- ☐ Black or African-American
- ☐ White
- ☐ American Indian or Alaskan Native
- ☐ Native Hawaiian/other Pacific Islander
- ☐ Other

1 = ✓
0 = not checked

Missing = 99