

**Assessing optimal nutrition education dosage and long-term behavior
change retention in SNAP-Ed participants**

**Final Report for the Extension Directors/ Administrators @ Land-
Grant University System through Land-Grant SNAP-Ed Office
Assessment**

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BACKGROUND

The education component of the Supplemental Nutrition Assistance Program (SNAP-Ed) across the U.S. does not have a standardized or recommended program design. The number of lessons and the overall program delivery varies from one state to the next and even within individual states. States implement their nutrition education interventions based on their own criteria, especially with regard to the number of lessons to be administered. An extensive literature review has shown that there is a very limited amount of information published on the dosage of nutrition education lessons needed to achieve behavior change as well as the long term retention of the changed behaviors. Due to this lack of knowledge, research-based evidence is needed in order to support the recommendation of promoting program series over one-lesson classes. Underserved groups eat fewer fruits and vegetables compared to families who are not low-income (Champagne et al, 2007). Thus, improving fruit and vegetable intake among low-income populations will likely have significant impact on their health.

GOALS

- I. To determine whether variation in nutrition education dosage results in differences in behavior change related to fruit and vegetable consumption among SNAP-Ed participants using different dosages of nutrition education (one, three, or six lessons).
- II. To determine if behaviors related to fruits and vegetables consumption among SNAP-Ed participants are retained six months after the intervention (six lessons).

MATERIALS AND METHODS

Design

The study was conducted using a one-group retrospective pre-test/post-test design. All participants received the nutrition education intervention.

Subjects

A convenience sample of low-income parents were recruited from a variety of agencies and establishments that serve the food assistance benefits population (e.g. WIC offices, food pantries, churches, SNAP offices, etc.) in five counties throughout Ohio. Adults age 18-59 with at least one child between the ages of 0-17 living in the household, who were SNAP eligible (combined family income of <185% of federal poverty level), and who had not previously taken a nutrition education class on fruits and vegetables in the past six months were eligible for the study. Of the 84 participants who were recruited, 66 (79%) completed the study. Criteria for completing the study included missing not more than one lesson and not missing any data collection days.

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A subset of completers were invited via telephone to participate in a six-month follow-up to determine the extent to which behaviors relating to fruit and vegetables consumption were still being practiced. Thirty-four completers (52%) returned questionnaires.

The Institutional Review Board of The Ohio State University approved the study protocol.

Instruments

Participants were asked to complete a 10-item demographic questionnaire that asked information about age, gender, food assistance program use, race, ethnicity, number of people living in the household according to age group, and food insecurity. Self-reported behaviors relating to the consumption of fruits and vegetables at baseline, after one lesson, after three lessons, and after six lessons were measured using two questionnaires: the Ohio Fruits and Vegetables Retrospective Survey (six items) and the Townsend Food Behavior Checklist – Fruit and Vegetable Subscale (seven items).

Participants for the six-month follow-up completed a packet containing the Ohio Fruits and Vegetables Retrospective Survey, the Townsend Food Behavior Checklist – Fruit and Vegetable subscale, and a set of written instructions for completing and returning the surveys.

Statistical Analysis

Descriptive statistics were computed to summarize the demographic information reported on the Demographic Questionnaire for the intervention completers (n=66) as well as for the subset of participants completing the six-month follow-up (n=34).

Self-reported behaviors from the Ohio Fruits and Vegetables Retrospective Survey were analyzed via repeated-measures ANOVA and pairwise comparisons with a Bonferroni adjustment at four time points (baseline, after 1 lesson, after 3 lessons, and after 6 lessons) and again after the six-month follow-up for three time points (baseline, at the end of the intervention, and at the six-month follow-up).

The net behavior change was computed for each post-test time interval (after 1 lesson, after 3 lessons, and after 6 lessons) relative to baseline for the Ohio Fruits and Vegetables Retrospective Survey, producing three sets of mean differences for each indicator. Repeated-measures ANOVA and pairwise comparisons with a Bonferroni adjustment were used to analyze the differences in the net behavior change after 1 lesson relative to baseline; after 3 lessons relative to baseline; and after 6 lessons relative to baseline.

Reliability was determined using intra-class correlation for the three indicators common to the Ohio Fruits and Vegetables Retrospective Survey and the Townsend Food Behavior Checklist – Fruit and Vegetable Subscale (“Eat at least one vegetable each day,” “Eat at least one fruit each day,” and “Eat fruits and vegetables as snacks”) to determine the extent to which participants rated their behaviors consistently on both instruments.

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Analyses were performed using SPSS version 18 (IBM Corporation, Somers, NY). Significance for all analyses was set at $p < .05$.

RESULTS

Demographics

Table 1 shows the full demographic characteristics of the study participants. Participants were primarily white (96%), non-Latino (97%) women (99%). Eight-five percent of the participants reported use of SNAP benefits. The subset of participants completing the six-month follow-up shared similar demographic characteristics as the sample completing the intervention and was thus considered to be representative of the larger sample.

Table 1: Participant Demographics

	Intervention (N=66)		Follow-up (N=34)	
	N	%	N	%
Use of Food Assistance Programs				
SNAP Benefits	56	85%	27	79%
School Lunch Program	42	66%	21	64%
Food Pantries/Food Banks	32	49%	17	52%
WIC Program	25	39%	13	41%
Race ¹				
Caucasian/White	63	96%	33	97%
African American/Black	5	8%	2	6%
Other Races	4	6%	3	9%
Ethnicity				
Latino/Hispanic	2	3%	2	6%
Gender				
Female	65	99%	33	97%
Age ²				
18 – 59	65	99%	33	97%

¹Participants could select multiple race categories.

²All participants met the inclusion criteria for age at study recruitment.

Self-Reported Behaviors

The results for the four indicators (“Eat fruits and vegetables of different *colors* each day,” “Eat at least one kind of *vegetable* each day,” “Eat at least one kind of *fruit* each day,” and “Eat fruits and vegetables as *snacks*”), show a higher degree of self-reported behaviors after each lesson when compared to baseline ($p < 0.001$) (Table 2 and Figure 1).

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Table 2: Self-Reported Behavior Change Results¹

Indicator	Mean Behavior Score ^{2,3}				F	P
	Baseline	After 1 Lesson	After 3 Lessons	After 6 Lessons		
Eat fruits and vegetables of different colors each day	3.06 ^a	3.39 ^b	3.76 ^c	3.94 ^c	26.82	<0.001
Eat more than one kind of vegetable each day	3.30 ^a	3.56 ^b	3.79 ^b	4.06 ^c	17.30	<0.001
Eat more than one kind of fruit each day	2.88 ^a	3.29 ^b	3.58 ^c	3.76 ^c	26.74	<0.001
Eat fruits and vegetables as snacks	3.06 ^a	3.48 ^b	3.74 ^{bc}	3.95 ^c	24.36	<0.001

¹RM ANOVA

²5-point Likert scale for measuring self-reported behavior: 1=Never; 2=Rarely; 3=Sometimes; 4=Usually; 5=Always.

³Means with common letter not significantly different via pairwise comparison.

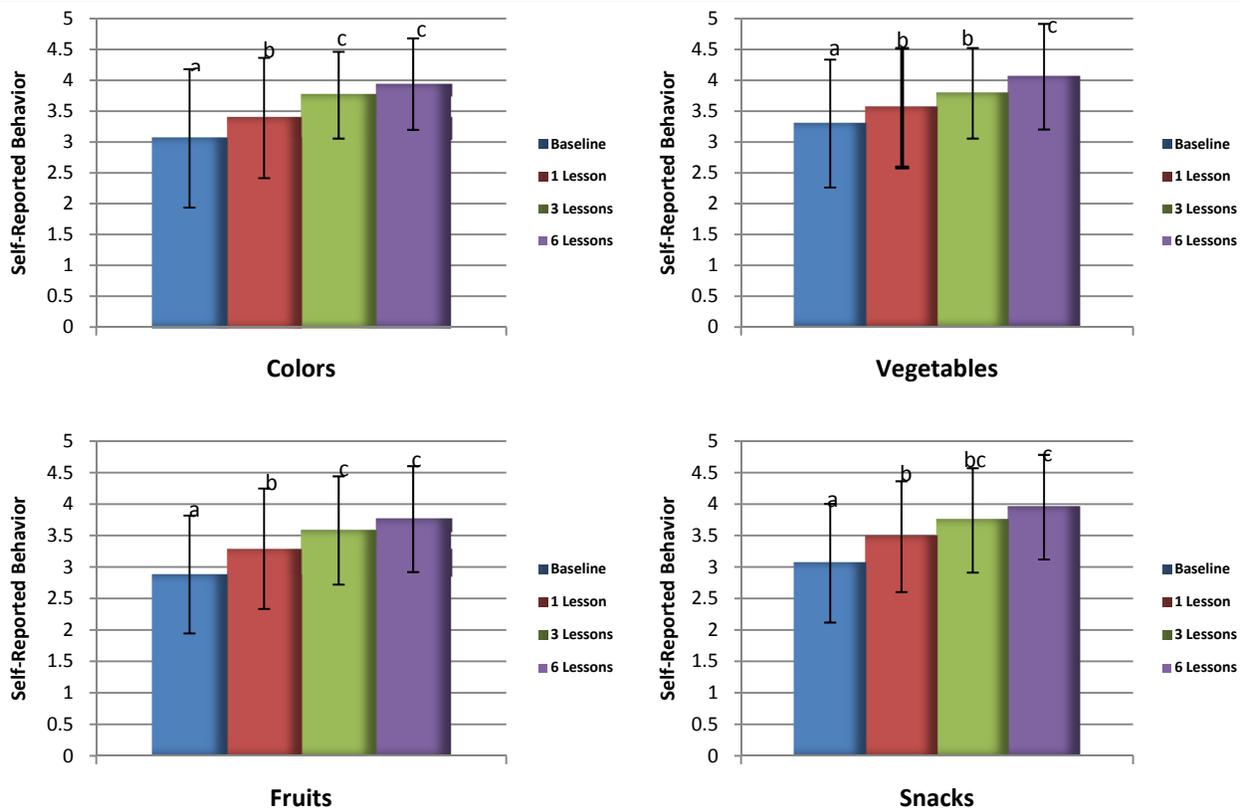
For the indicators “Eat fruits and vegetables of different *colors* each day” and “Eat more than one kind of *fruit* each day,” the mean self-reported behavior scores were significantly higher after 1 lesson compared to baseline ($p < 0.005$); after 3 lessons compared to baseline ($p < 0.001$); after 6 lessons compared to baseline ($p < 0.001$); after 3 lessons compared to after 1 lesson ($p < 0.05$); and after 6 lessons compared to after 1 lesson ($p < 0.001$). The difference in self-reported behavior was not significant for these two indicators after 6 lessons compared to after 3 lessons ($p > 0.05$).

For the indicator “Eat more than one kind of *vegetable* each day,” the mean self-reported behavior scores were significantly higher after 1 lesson compared to baseline ($p = 0.026$); after 3 lessons compared to baseline ($p = 0.002$); after 6 lessons compared to baseline ($p < 0.001$); after 6 lessons compared to after 1 lesson ($p < 0.001$); and after 6 lessons compared to after 3 lessons ($p = 0.013$). The difference in self-reported behavior was not significantly different after 3 lessons compared to after 1 lesson ($p = 0.253$).

For the indicator “Eat fruits and vegetables as *snacks*,” the mean self-reported behavior scores were significantly higher after 1 lesson compared to baseline ($p < 0.001$); after 3 lessons compared to baseline ($p < 0.001$); after 6 lessons compared to baseline ($p < 0.001$); and after 6 lessons compared to after 1 lesson ($p < 0.001$). The difference in self-reported behavior was not significant after 3 lessons compared to after 1 lesson ($p = 0.170$) or after 6 lessons compared to after 3 lessons ($p = 0.202$).

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Figure 1: Self-Reported Behavior Change from Baseline to End of Study^{1,2}



¹5-point Likert scale for measuring self-reported behavior: 1=Never; 2=Rarely; 3=Sometimes; 4=Usually; 5=Always.

²Means with common letter not significantly different via pairwise comparison.

The six-month follow-up results for all four indicators showed that the behavior scores reported at the end of the intervention (6 lessons) and at the six-month follow-up were significantly higher than baseline ($p < 0.001$) (Table 3 and Figure 2). Behavior scores reported at the end of the intervention (6 lessons) and the six-month follow-up were not statistically different ($p \geq 0.05$).

Table 3: Self-Reported Behavior Change Results for the Six-Month Follow-Up¹

Indicator	Mean Behavior Score ^{2,3}			F	P
	Baseline	End of study (6 lessons)	6-Month follow-up		
Eat fruits and vegetables of different colors each day	3.00 ^a	4.00 ^b	3.88 ^b	19.14	<0.001
Eat more than one kind of vegetable each day	3.18 ^a	3.97 ^b	3.76 ^b	9.12	<0.001
Eat more than one kind of fruit each day	2.88 ^a	3.85 ^b	3.82 ^b	19.40	<0.001
Eat fruits and vegetables as snacks	3.00 ^a	3.97 ^b	3.76 ^b	18.60	<0.001

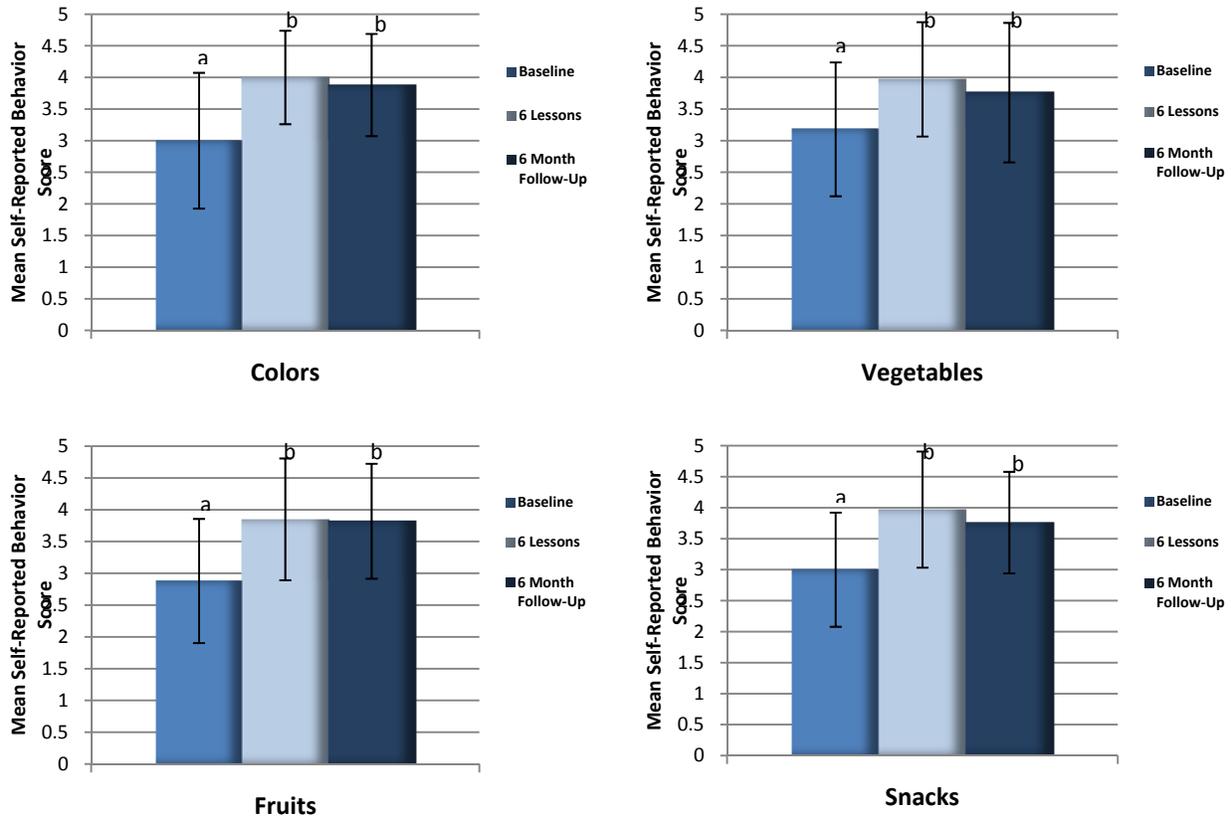
¹RM ANOVA

²5-point Likert scale for measuring self-reported behavior: 1=Never; 2=Rarely; 3=Sometimes; 4=Usually; 5=Always.

³Means with common letter not significantly different via pairwise comparison.

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Figure 2: Self-Reported Behavior Change from Baseline to 6-Month Follow-Up^{1,2}



¹5-point Likert scale for measuring self-reported behavior: 1=Never; 2=Rarely; 3=Sometimes; 4=Usually; 5=Always.

²Means with common letter not significantly different via pairwise comparison.

Net Behavior Change

Net behavior change (mean differences) between baseline and each post-test time interval (after 1 lesson, after 3 lessons, and after 6 lessons) were significantly different for all four indicators ($p < 0.001$) (Table 4).

Table 4: Net Behavior Change Results¹

Indicator	Net Behavior Change with Respect to Baseline ^{2,3}			F	P
	1 Lesson	3 Lessons	6 Lessons		
Eat fruits and vegetables of different colors each day	0.333 ^a	0.697 ^b	0.879 ^b	16.08	<0.001
Eat more than one kind of vegetable each day	0.258 ^a	0.485 ^a	0.758 ^b	11.27	<0.001
Eat more than one kind of fruit each day	0.409 ^a	0.697 ^b	0.879 ^b	10.96	<0.001
Eat fruits and vegetables as snacks	0.424 ^a	0.682 ^{ab}	0.894 ^b	10.17	<0.001

¹RM ANOVA

²Values reported are the mean differences for behavior scores reported at each post-test time interval and baseline.

³Means with common letter not significantly different via pairwise comparison with Bonferroni adjustment.

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For the indicators “Eat fruits and vegetables of different *colors* each day” and “Eat more than one kind of *fruit* each day,” the results showed significantly higher net behavior change after 3 lessons compared to after 1 lesson ($p=0.002$ and $p=0.017$, respectively) and after 6 lessons compared to after 1 lesson ($p<0.001$), but not after 6 lessons compared to after 3 lessons ($p=0.052$ and $p=0.152$, respectively).

For the indicator “Eat more than one kind of *vegetable* each day,” the results showed significantly higher net behavior change after 6 lessons compared to after 3 lessons ($p=0.006$) as well as compared to after 1 lesson ($p<0.001$). There was not a significant difference in net behavior change after 3 lessons compared to after 1 lesson ($p=0.127$).

For the indicator “Eat fruits and vegetables as *snacks*,” the only significant net behavior change was seen after 6 lessons compared to after 1 lesson ($p<0.001$).

Intra-class correlation

The average score intra-class correlation coefficients ranged from 0.629 to 0.934, with the majority of coefficients being 0.7 or higher (Table 5). This suggests that the participants rated the three indicators similarly on the Ohio Fruits and Vegetables Retrospective Survey and the Townsend Food Behavior Checklist – Fruit and Vegetable Subscale.

Table 5: Average Score Intra-class Correlation Coefficients (ICC) for Two Survey Instruments¹

Indicator	Time Interval ²				
	Baseline	1 Lesson	3 Lessons	6 Lessons	Follow-up
Eat at least 1 vegetable each day	0.682	0.776	0.849	0.760	0.934
Eat at least 1 fruit each day	0.730	0.788	0.858	0.871	0.809
Eat fruits & vegetables as snacks	0.629	0.772	0.837	0.890	0.876

¹All intra-class correlation coefficients are significant ($p<0.001$).

²N=66 for Baseline, 1 Lesson, 3 Lessons, and 6 Lessons; N=34 for Follow-up.

DISCUSSION

The results of this study suggest a dose response after a nutrition education intervention with up to 6 lessons in fruit and vegetable consumption in SNAP-Ed participants. With respect to baseline, all indicators showed improvement in behavior after one lesson and again after three lessons and six lessons. Additional behavior change was seen for some indicators between 1 and 3 lessons. Furthermore, all of the indicators showed significant differences in behavior change between 1 and 6 lessons, with the “vegetable” indicator showing significant behavior change between 3 and 6 lessons. Net behavior change relative to baseline for all indicators showed an increasing trend and was significantly different across number of lessons. These results suggest that behavior change is affected when SNAP-Ed participants attend more than one lesson on fruits and vegetables, and that after six lessons, a higher degree of self-reported behavior change is achieved relative to that after one lesson or even after three lessons.

The results of the six month follow-up portion of the study illustrate that participants were able to successfully maintain the behaviors six months after the intervention. All of the indicators showed

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consistent results (no differences) at the end of the sixth lesson and six months post-intervention. This study did not determine if participants would maintain behaviors if they completed less than 6 lessons.

There are several limitations for this study. This study did not include a control group; therefore, the results may not be due to the intervention alone. Also, the study used a relatively small sample size and participants were limited to one state. Researchers are encouraged by the significance of outcomes based on the afforded sample, but for these reasons, findings cannot be generalized to broader, low-income populations. The study relied on self-reported data, which may introduce bias (social desirability) to the results. Finally, the design may allow for a learning effect due to repetition of the same survey at multiple time points.

RECOMMENDATIONS

The results of this study support a program-wide recommendation to include a series of at least 3 lessons and up to 6 lessons on the same topic (i.e. fruits and vegetables) when providing nutrition education to low-income populations. Findings show that three lessons provide improvement with some behaviors with respect to one lesson, and six lessons provide an improvement with all behaviors with respect to one lesson.

In addition, the Ohio SNAP-Ed Fruit and Vegetable Retrospective Questionnaire showed to be a suitable tool to measure behavior change in low income audiences with respects to consumption of Fruits and Vegetables. This tool correlated well at all time intervals with the validated tool Townsend Food Behavior Checklist – Fruit and Vegetable Subscale (Murphy et al, 2001).

Besides the program recommendations, our research group would like to suggest opportunities for further research.

- Larger study with a different group per dose design.
- Generalizability of these study results to other SNAP-Ed topics (i.e. whole grains, low-fat dairy, food safety, etc).
- Assessment of parents' behavior changes and the impact on the diets and feeding practices of their children.
- A follow-up study concerning the long-term effects of a fruit and vegetable nutrition education intervention comprised of one lesson and of three lessons is recommended to determine if the long-term effects of the nutrition education intervention are a function of the number of lessons (dosage).

REFERENCES

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