



# Association Between Educational Attainment and EFNEP Participants' Food Practice Outcomes

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## ABSTRACT

**Objective:** Examine the association between educational attainment and improvement in food practice outcomes of the California *Expanded Food and Nutrition Education Program* (EFNEP) participants.

**Design:** Secondary data analysis.

**Participants:** A total of 19,089 participants, 92.3% female, 77.2% Hispanic, 19.7% with  $\leq$  sixth-grade education, and 68.9% with incomes  $\leq$  100% of the federal poverty level.

**Main Outcome Measures:** Improvement in food resource management practices (FRMP), nutrition practices, and food safety practices (FSP).

**Analysis:** Wilcoxon signed rank tests examined pre-post outcomes. Mann-Whitney U tests compared whether participants in the lowest and highest educational attainment quartiles had similar levels of improvement.

**Results:** California EFNEP is associated with improved FRMP ( $z = -95.33$ ), nutrition practices ( $z = -94.91$ ), and FSP ( $z = -92.37$ ); ( $P < 0.001$ ). Lowest educational quartile was associated with more improvement in FRMP and FSP ( $P < 0.001$ ).

**Conclusions and Implications:** California EFNEP contributed to improved food practice outcomes for low and high educational attainment participants. Program content and instruction are effective across the education continuum.

**Key Words:** EFNEP, nutrition education, food practice outcomes, low income, educational attainment (*J Nutr Educ Behav.* 2022;54:902–907.)

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## INTRODUCTION

Federal nutrition education programs, such as the *Expanded Food and Nutrition Education Program* (EFNEP), play an important role in empowering families with low incomes to pursue healthy nutrition practices and improve their ability to access and afford a healthy diet.<sup>1–6</sup>

National EFNEP was first funded in 1969 by the US Department of Agriculture's National Institute of

Food and Agriculture and is administered by Cooperative Extension through land-grant institutions in all states, US territories, and the District of Columbia. Each year, EFNEP reaches half a million adults and families with low incomes, with 80% or more of these families reporting living  $\leq$  100% of the federal poverty level (FPL) and 70% indicating a minority status.<sup>7</sup> The EFNEP professionals recruit and train peer nutrition educators who typically live in,

or are from, the communities in which they work. Educators collaborate with schools and community-based organizations to recruit participants. Program priorities include diet quality, physical activity, food resource management, food safety, and food security.<sup>8</sup> Education to improve participants' food resource management practices (FRMP) and referrals to food assistance programs, when needed, is intended to improve their food security.<sup>8</sup> In addition, EFNEP professionals partner with community organizations to facilitate personal, family, and community change to support the sustained nutritional health and well-being of families with low income.<sup>9</sup>

In California, EFNEP is administered through the University of California Cooperative Extension in 24 counties and is delivered by peer nutrition educators who are predominately bilingual in English and Spanish. California EFNEP uses the evidence-based curriculum *Eating Smart Being Active* (ESBA),<sup>10</sup> which is based on the social cognitive

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theory, providing an overarching framework to consider the interaction of personal, behavioral, and environmental factors,<sup>11</sup> and adult learning theory which acknowledges the importance of the processes involved in learning and understanding how adults learn best.<sup>12</sup> Weekly group lessons are taught in-person at schools or community sites, typically ranging from 60–90 minutes, and are taught over 2 months. Lesson topics include low-cost ways to stay physically active for overall health; meal planning and food shopping strategies to save money and not run out of food; the health benefits of eating fruits, vegetables, whole grains, lean protein, and high calcium foods; how to keep food safe; and the health benefits of limiting foods high in salt, sugar, and saturated fat. Instruction and materials are provided in English or Spanish, including ESBA handouts, worksheets, and visual instructional aids. Each lesson includes hands-on activities, movement breaks, a recipe demonstration, and/or a food tasting. Participants receive basic food preparation tools (measuring cups/spoons, meat thermometer, produce brush), and graduates (completing at least 6 of 8 lessons and entry/exit surveys) also receive an ESBA cookbook and a walking exercise DVD.

Between Federal Fiscal Year (FFY) 2014–2017, 68.9% of California EFNEP graduates reported incomes that were  $\leq$  100% FPL, and 24.6% reported incomes  $\leq$  50% FPL, putting them at higher risk for negative health, developmental and educational consequences.<sup>13</sup> During the same period, California EFNEP reached a predominantly female (92.3%), Hispanic (77.2%) population, and many reported extremes in educational attainment (19.7% with  $\leq$  sixth-grade education and 24.1% with at least some college).

Previous studies have demonstrated significant improvement in food practice outcomes after participating in EFNEP.<sup>1–6</sup> One of these studies<sup>4</sup> demonstrated the positive impact of the ESBA curriculum on EFNEP participants' nutrition-related behaviors from multiple states, including California. However, we are unaware of studies examining the association between extremes in educational attainment and food

practice outcomes using the ESBA curriculum. We were interested in examining this association because participants with  $\leq$  sixth-grade education compared with those with at least some college may have very different life experiences<sup>14</sup> and different needs with regard to healthy food practice strategies and class instruction. Because the California EFNEP dataset includes participants with extremes in educational attainment, we aimed to investigate the effectiveness of the California EFNEP program in improving food practice outcomes for all participants, specifically for those with low vs high educational attainment. Our study will add to the literature by analyzing EFNEP food practice outcomes using a large California dataset collected over 4 years after using the ESBA curriculum an additional 6–9 years from the time of Auld et al.<sup>4</sup>

This study was guided by the following research questions: Is California EFNEP associated with improvements in food resource management, nutrition, and food safety practice outcomes for program graduates? Is California EFNEP equally effective at supporting improvements in food resource management, nutrition, and food safety practice outcomes for graduates with low educational attainment ( $\leq$  sixth grade) vs high educational attainment (at least some college)?

## METHODS

### Study Design

This study used prepost-secondary data analysis gathered from the national EFNEP database, Web-based Nutrition Education and Evaluation Reporting System (WebNEERS; version 1.2, 2017),<sup>15</sup> and was deemed exempt by the University of California Institutional Review Board.

### Participants

Per federal policies,<sup>8</sup> the primary EFNEP adult audience is parents and caregivers with limited financial resources who have primary responsibility for obtaining and preparing food for their children and pregnant women and teens with low income. Participants (n = 19,089) included in

this study were adults (aged  $\geq$  19 years) who graduated from EFNEP (completed their entry and exit surveys and completed a minimum of 6 out of the 8 lessons).

### Procedures

The primary data were collected in FFY 2014–2017. Peer educators were trained in strategies to help participants complete the survey tools and protocols for entering entry and exit survey results into the WebNEERS national EFNEP database.

### Measures

Self-reported participant demographic and behavior change outcomes were collected using the following California EFNEP developed survey tools, available in English and Spanish, that included the National EFNEP required sociodemographic data and the 10-item core questions.

*About me.*<sup>16</sup> An entry demographic/family record survey tool developed for California EFNEP audiences. This 1-page participant-driven tool uses simple text and removed math symbols. It includes icons and colors to assist the educator in guiding a group of participants with a range of educational attainment through the survey questions.

*Checklist.*<sup>16</sup> This visually enhanced evaluation survey tool includes 15 items using a 5-point Likert scale. For this study, the 10 National EFNEP core questions were included to measure behaviors in the constructs of FRMP: I plan meals, I compare prices, I shop with a list, and I run out of food before the end of the month; nutrition practices (NP): I choose healthy foods for my family, I make food without adding salt, I use this food label, and my child eats food within 2 hours of waking up; and food safety practices (FSP): Meat and dairy foods-I let them sit out for > 2 hours, and I thaw frozen foods at room temperature. The 4-page checklist uses color visuals to replace text to improve readability and was based on prior work using visual information processing theories.<sup>17–19</sup> The

checklist was administered at entry and exit and accompanied the about me tool. Participants reported their educational attainment and monthly family income on the exit checklist. The household FPL was calculated using income and household size and was based on the corresponding year's level as defined by the US Department of Health and Human Services.<sup>20</sup>

### Data Analysis

All analyses were conducted using SPSS (version 28, IBM Corp, 2021). Nonparametric analyses and medians (rather than means) were used to account for the ordinal nature of the variables. Further Kolmogorov-Smirnov tests indicated that distributions were not normal for the following pre-EFNEP scores: FRMP (D[19,076]=0.08,  $P < 0.001$ ), NP (D[19,052]=0.07,  $P < 0.001$ ), and FSP (D[19,052]=0.13,  $P < 0.001$ ); and post-EFNEP scores: FRMP (D[19,085]=0.12,  $P < 0.001$ ), NP (D[19,080]=0.12,  $P < 0.001$ ), and FSP: (D[19,027]=0.27,  $P < 0.001$ ). Thus, to address this non-normal distribution and ordinal type of variables, we used Wilcoxon signed rank tests to determine whether these 3 practices improved after attending EFNEP. To test whether there was influence of educational attainment on improvement in healthy food practices (ie, FRMP, NP, FSP), we compared participants in the lowest quartile ( $\leq$  sixth-grade education) with those in the highest quartile (completed at least some college). We computed change scores (subtracting prescore from postscore) and given that they were also non-normally distributed for FRMP (D[19,072]=0.09,  $P < 0.001$ ), NP (D[19,043]=0.08,  $P < 0.001$ ), and FSP (D[19,004]=0.12,  $P < 0.001$ ), we ran Mann-Whitney U tests to investigate the influence of educational attainment on improvement in the 3 food practices. We also ran robustness checks using Aligned Rank Transform ANOVAs (nonparametric analyses) and repeated measures ANOVAs (parametric analyses) to confirm our findings.

**Table 1.** EFNEP Participant and Program Characteristics During FFY 2014–2017 (n = 19,089)

Study Variables	n (%) or Mean $\pm$ SD
Gender	
Female	17,616 (92.3)
Male	1,473 (7.7)
Age, y	38.9 $\pm$ 11.00
Ethnicity	
Hispanic	14,737 (77.2)
Non-Hispanic	4,252 (22.3)
Missing	100 (0.5)
Race	
White (including Hispanic)	13,737 (72.0)
Asian	1,804 (9.5)
Black or African American	532 (2.8)
American Indian or Alaska Native	429 (2.2)
Multiracial/Other	274 (1.4)
Native Hawaiian or Other Pacific Islander	56 (0.3)
Missing	2,257 (11.8)
Residence <sup>a</sup>	
City	14,022 (73.5)
Town	3,305 (17.3)
Suburb	1,223 (6.4)
Small town	494 (2.6)
Farm	45 (0.2)
Educational attainment	
Grades $\leq$ 6	3,761 (19.7)
Grades 7–11	4,066 (21.3)
Grade 12 and GED	4,849 (25.4)
At least Some college	4,608 (24.1)
Missing <sup>b</sup>	1,805 (9.5)
Pregnant	487 (2.6)
Breastfeeding	735 (3.9)
No. of children	
0–1	5,647 (29.6)
2–3	11,083 (58.1)
$\geq$ 4	2,359 (12.4)
No. in household	
1–2	1,843 (9.7)
3–4	8,299 (43.5)
5–6	7,217 (37.8)
$\geq$ 7	1,730 (9.1)
Household monthly income	\$1,673.95 $\pm$ \$967.37
Percentage of poverty level	
$\leq$ 50%	4,695 (24.6)
51–75%	4,633 (24.3)
76–100%	3,811 (20.0)
101–125%	2,214 (11.6)
126–150%	1,188 (6.2)
151–185%	748 (3.9)
$\geq$ 186%	551 (2.9)
Not specified	1,249 (6.5)
Mean no. of lessons received	7.8 $\pm$ 0.60
Mean no. of sessions attended <sup>c</sup>	6.7 $\pm$ 1.31
Mean no. of hours taught	10.0 $\pm$ 2.35

EFNEP indicates *Expanded Food and Nutrition Education Program*; FFY, Federal Fiscal Year.

<sup>a</sup>Residence: determined by participant's home address or class location and defined by Office of Management and Budget. Farm is defined by US Department of Agriculture; <sup>b</sup>Excluded from analyses; <sup>c</sup>Sessions attended may include 2 lessons.

**RESULTS**

**Participant Characteristics**

The majority of participants were female, Hispanic, lived in a city, and had a household income ≤ 185% FPL. Educational attainment ranged from ≤ sixth grade to at least some college. **Table 1** contains participant and program characteristics.

**Effect of EFNEP on Healthy Food Practices**

**Table 2** shows the interquartile ranges of pre-EFNEP and post-EFNEP FRMP, NP, and FSP scores and Wilcoxon signed rank test scores. Participating in the program significantly improved FRMP ( $z = -95.33, P < 0.001$ ), NP ( $z = -94.91, P < 0.001$ ); and FSP ( $z = -92.37, P < 0.001$ ).

**Effect of Educational Attainment on Improvement in Food Practices**

**Table 3** shows the interquartile scores of pre-EFNEP and post-EFNEP for FRMP, NP, and FSP by the lowest and highest quartile of educational attainment. Mann-Whitney U tests (**Table 4**) show that educational attainment was significantly associated with improvement in FRMP and FSP. Participants with an education of ≤ sixth grade showed more improvement in FRMP ( $U[N_{lowest} = 3,760, N_{highest} = 4,605] = 7,802,177, z = -7.82, P < 0.001$ ) and FSP ( $U[N_{lowest} = 3,751, N_{highest} = 4,582] = 7,810,448, z = -7.24, P < 0.001$ ) compared with those with at least some college education. However, there was no significant effect of educational attainment on improvement in NP ( $U[N_{lowest} = 3,755, N_{highest} = 4,599] = 8,489,023, z = -1.33, P < 0.18$ ). Nonparametric ART ANOVAs (**Supplementary Table 1**) and parametric repeated measures ANOVAs (**Supplementary Table 2**) confirmed the robustness of our findings.

**DISCUSSION**

Contributing to the body of literature aimed at understanding the effectiveness of nutrition education interventions, we sought to identify if California EFNEP, using the ESBA curriculum, is associated with

improvements in FRMP, NP, and FSP and if low vs high educational attainment was associated with these improvements. The results showed that graduating from EFNEP is associated with significant improvement in FRMP, NP, and FSP, at least in the short term, which supports the findings of previous studies.<sup>6</sup> Median participant scores for FRMP, NP, and FSP increased from pre-EFNEP to post-EFNEP—between 1.0 and 1.5 points. The largest improvements were made in FSP. This may be because the FSPs (storing meat and dairy within 2 hours and not thawing food at room temperature) are associated with the immediate health concern of foodborne illness.

The low vs high educational attainment findings (**Table 4**) revealed that participants in the lowest quartile (≤ sixth-grade education) showed more improvement in FRMP and FSP compared with those in the upper quartile (at least some college); for NP, improvements between the 2 groups were the same. This suggests that California EFNEP is successfully communicating healthy food practice concepts to audiences with low educational attainment. Some of this success may be attributable to the emphasis California EFNEP has placed on following instructional best practices<sup>17,21–24</sup> (ie, using images rather than text and oral over written instruction) to meet the needs of all participants regardless of educational attainment. Our findings may also indicate that program content is relevant to low and high educational attainment participants. However, we acknowledge that other factors may influence the short-term improvement and long-term maintenance of healthy food practices, including a participant’s access to affordable healthy food, job opportunities, housing, and social service programs.<sup>25</sup>

The strengths of this study include the large sample size collected in FFY 2014–2017 from 24 California counties. Furthermore, demographic and EFNEP food practice outcome data were collected using visually enhanced tools<sup>16,26</sup> to reduce the cognitive load for participants, potentially improving the completeness and accuracy of the data.

**Table 2.** Interquartile Scores of Pre-EFNEP and Post-EFNEP for FRMP, NP, and FSP and Wilcoxon Signed Rank Z-scores for Comparing Pre-EFNEP and Post-EFNEP Scores

Variable	Pre-EFNEP			Post-EFNEP			Wilcoxon Signed Rank Tests		
	25th Percentile	50th Percentile (Median)	75th Percentile	25th Percentile	50th Percentile (Median)	75th Percentile	Z score	P	
FRMP	2.8	3.3	3.8	3.5	4.0	4.5	-95.33	< 0.001	
NP	2.5	3.0	3.7	3.5	4.0	4.3	-94.91	< 0.001	
FSP	3.0	3.5	4.0	4.0	4.5	5.0	-92.37	< 0.001	

EFNEP indicates Expanded Food and Nutrition Education Program; FRMP, Food Resource Management Practices; FSP, food safety practices; NP, nutrition practices.

**Table 3.** Interquartile Scores of Pre-EFNEP and Post-EFNEP for FRMP, NP, and FSP by Lowest and Highest Quartile of Educational Attainment

Variables	Lowest 25% Educational Attainment (n = 3,761)			Highest 25% Educational Attainment (n = 4,608)		
	25th Percentile	50th Percentile (Median)	75th Percentile	25th Percentile	50th Percentile (Median)	75th Percentile
Pre-EFNEP						
FRMP	2.5	3.3	3.8	3.0	3.5	4.0
NP	2.5	3.0	3.5	2.8	3.3	3.8
FSP	2.5	3.0	4.0	3.0	3.5	4.0
Post-EFNEP						
FRMP	3.5	4.0	4.5	3.8	4.3	4.8
NP	3.3	3.8	4.3	3.5	4.0	4.5
FSP	4.0	5.0	5.0	4.0	5.0	5.0

EFNEP indicates *Expanded Food and Nutrition Education Program*; FRMP, Food Resource Management Practices; FSP, food safety practices; NP, nutrition practices.

Note: Lowest quartile educational attainment: grades  $\leq 6$ ; highest quartile educational attainment: at least some college.

**Table 4.** Mann-Whitney U test scores for FRMP, NP, and FSP by Educational Attainment

Variables	$n_{\text{lowest}}$	$n_{\text{highest}}$	U-score	Z score	P
FRMP	3,760	4,605	7,802,177	-7.82	< 0.001
NP	3,755	4,599	8,489,023	-1.33	0.18
FSP	3,751	4,582	7,810,448	-7.24	< 0.001

EFNEP indicates *Expanded Food and Nutrition Education Program*; FRMP, Food Resource Management Practices; FSP, food safety practices;  $n_{\text{highest}}$ , sample size of highest quartile educational attainment (at least some college);  $n_{\text{lowest}}$ , sample size of lowest quartile educational attainment (grades  $\leq 6$ ); NP, nutrition practices.

This study has several limitations. First, the participants were predominantly Hispanic females from cities in California and may not represent participants from other areas in the US. Second, because of a lack of data, we cannot report the actual number of classes that were taught in English and/or Spanish and the actual number of peer educators who were bilingual in English and Spanish. Third, entry and exit data were not available to examine if participation in food assistance programs impacted FRMP outcomes. A prior study found that participation in the *Supplemental Nutrition Assistance Program Education* and food assistance is associated with greater improvement in not running out of food by the end of the month.<sup>27</sup> This may be a confounding variable the authors were not able to control for in this study. Finally, the California EFNEP dataset did not measure food practice outcome data in a follow-up survey to assess if improvements were maintained postgraduation. A recent systematic

review of EFNEP identified the need to measure long-term outcomes.<sup>6</sup>

## IMPLICATIONS FOR RESEARCH AND PRACTICE

This study has implications for practitioners, Cooperative Extension professionals, and nutrition education researchers. Findings highlight the potential public health impact that federal nutrition education programs like EFNEP can have on families with limited resources, in addition to showing that Cooperative Extension nutrition educators make a difference in the health of local communities. This study provides encouraging results that using an evidence-based curriculum, such as ESBA, and following instructional best practices effectively improves the food practice outcomes of participants with low income and a range of educational attainment. Nutrition education programs targeting similar audiences can benefit from incorporating

nutrition education best practices,<sup>28</sup> and addressing nutrition educator training needs on effective and inclusive instructional and evaluation strategies. Moreover, this study demonstrates the feasibility and usefulness of evaluation research. Future work is needed to expand these findings to test the generalizability to other geographical areas and ethnically diverse populations and include data on participation in food assistance programs. Finally, longitudinal studies are needed to conclude that participating in EFNEP results in sustained nutrition-related behaviors.<sup>6</sup>

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## SUPPLEMENTARY DATA

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.jneb.2022.06.001>.

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