

FINAL REPORT

REGIONAL NUTRITION EDUCATION AND OBESITY PREVENTION CENTER OF EXCELLENCE – WEST REGION

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*Regional Nutrition Education and Obesity Prevention Centers of Excellence: West Region
2014-2018 Final Report*

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ACROYNMS AND GLOSSARY

A1c: glycated (or glycosylated) hemoglobin
ANOVA: Analysis of Variance
ARS: USDA Agricultural Research Service
ASA24: Automated Self-Administered 24-hour Recall
ASNNA: Association of SNAP Nutrition Education Administrators
BCL: Behavior Checklist
Biometric Study: Long-term follow-up evaluation of EFNEP
BMI: Body Mass Index
BP: Blood Pressure
cm: centimeter
CSU: Colorado State University
DBP: Diastolic Blood Pressure
DGA: Dietary Guidelines for Americans
EB: Experimental Biology
E-scan: environmental scan/observational survey
EFNEP: The Expanded Food and Nutrition Education Program
FFY: Federal Fiscal Year
FNS: Food and Nutrition Service
FNDDS: Food and Nutrient Database for Dietary Studies
FoodAPS: USDA Economic Research Service National Household Food Acquisition and Purchase Survey
FPAQ: The Food and Physical Activity Questionnaire
FRM: Food Resource Management
GED: General Education Development test or certificate completion, considered equivalent to a high school diploma in the USA
GPQI-2016: The Grocery Purchase Quality Index-2016
HbA1c: glycated (or glycosylated) hemoglobin
HEI: Healthy Eating Index
HFPAT: Healthy Food Pantry Assessment Toolkit
HFSS: US Household Food Security Survey
HS: High School Diploma
ICC: intra-class correlation coefficient
IRB: Institutional Review Board
kcal: kilocalorie
kg: kilogram

ACRONYMS AND GLOSSARY, Continued

min/max: minimum/maximum

mm: millimeter

mmHg: millimeters of Mercury

NIFA: National Institute of Food and Agriculture

PA: physical activity

PI: Principal Investigator

PSE: Policy, Systems, and Environmental Change

Pre: before or at the first class of a series of lessons

Post: at the end of a series of classes or a specific time frame following a series of classes

RNECE: Regional Nutrition Education and Obesity Prevention Centers of Excellence

RNECE – West: Regional Nutrition Education and Obesity Prevention Centers of Excellence-West Region

SBP: Systolic Blood Pressure

SNAP: Supplemental Nutrition Assistance Program, formerly known as “Food Stamp Program”

SNAP-Ed: Supplemental Nutrition Assistance Program Education

SSB: sugar-sweetened beverage

TANF: Temporary Assistance for Needy Families

TEFAP: The Emergency Food Assistance Program, also known as “commodity food assistance”

tertile: 1. (*statistics*) Either of the two points that divide an ordered distribution into three parts, each containing a third of the population. 2. (*statistics*) Any one of the three groups so divided.

USDA: United States Department of Agriculture

US: United States of America

WebNEERS: Web-based Nutrition Education Evaluation and Reporting System

Western Region or WR: USDA NIFA designation for Alaska, American Samoa, Arizona, California, Colorado, Guam, Hawaii, Idaho, Micronesia, Montana, Nevada, New Mexico, Northern Mariana Islands, Oregon, Utah, Washington, Wyoming

WIC: Special Supplemental Nutrition Program for Women, Infants and Children

WSU: Washington State University

YPAR: Youth Participatory Action Research

BACKGROUND

Nutrition education programs for less advantaged groups have been a priority within the USDA for the last half-century. USDA administers nutrition education programs that target low-income populations through the Food and Nutrition Service (FNS) and the National Institute of Food and Agriculture (NIFA). The Supplemental Nutrition Assistance Program Education (SNAP-Ed), created in 1992, is the primary nutrition education program administered through FNS. The Expanded Food and Nutrition Education Program (EFNEP), initiated in 1969, is the principal nutrition education effort administered through NIFA. Between FFY 2014 and FFY 2015, FNS and NIFA funded the Regional Nutrition Education and Obesity Prevention Centers of Excellence (RNECE) to support collaboration between program leaders and researchers, build the evidence-base regarding SNAP-Ed and EFNEP programs, and identify strategies to strengthen both programs. This work, which was completed in FFY 2018, funded a national coordination center, four regional centers, and in 2015, a policy, systems, and environmental change (PSE) center (Figure 1). In 2015, the RNECE Longitudinal Research Study: Multi-Disciplinary Methods for Effective, Sustainable, and Scalable Evaluations of Nutrition Education Programs was funded at Utah State University. This research, which was embedded in the RNECE – West Center, is nearing completion. Only initial findings are reported here. The work of RNECE from 2014-2018 established regional relationships among researchers and program implementation agencies throughout the nation, and contributed to the evidence-base on nutrition education and obesity prevention strategies. This final report summarizes the outcomes of the RNECE-West Center’s objectives.



Figure 1. Map of five RNECE Centers and Longitudinal Research Project

OBJECTIVES OF THE RNECE

RNECE – West was a collaboration between Colorado State University (CSU) and Washington State University Extension (WSU). The project aimed to improve the health of low-income Americans through strategies at the individual and environmental levels of the socio-ecological model, including complementary nutrition education and public health approaches targeting EFNEP and SNAP-Ed programs. The overall goals are noted below.

Objective #1: Strengthen the evidence-base on effective nutrition education/obesity prevention programs for diverse population groups.

Objective #2: Evaluate the long-term effectiveness of nutrition education/obesity prevention interventions for disadvantaged and underserved populations and opportunities for new research.

Objective #3: Identify and create research collaborations and synergistic relationships among researchers and EFNEP/SNAP-Ed program directors, universities and other implementers, and state and federal agencies.

Objective #4: Enhance the impact of state and community nutrition education and obesity prevention efforts by providing the public health-related training and evidence that practitioners need for improving nutrition and health behaviors, environments, and policies in ways that are equitable, efficient, and sustained over time.

The RNECE – West conducted research and advanced collaborative opportunities between practitioners and researchers in nutrition education and public health in the NIFA Western Region to enhance direct education and environmental change efforts to address the objectives. These efforts are depicted in Figure 2. A list of RNECE – West collaborators can be found in Appendix A.

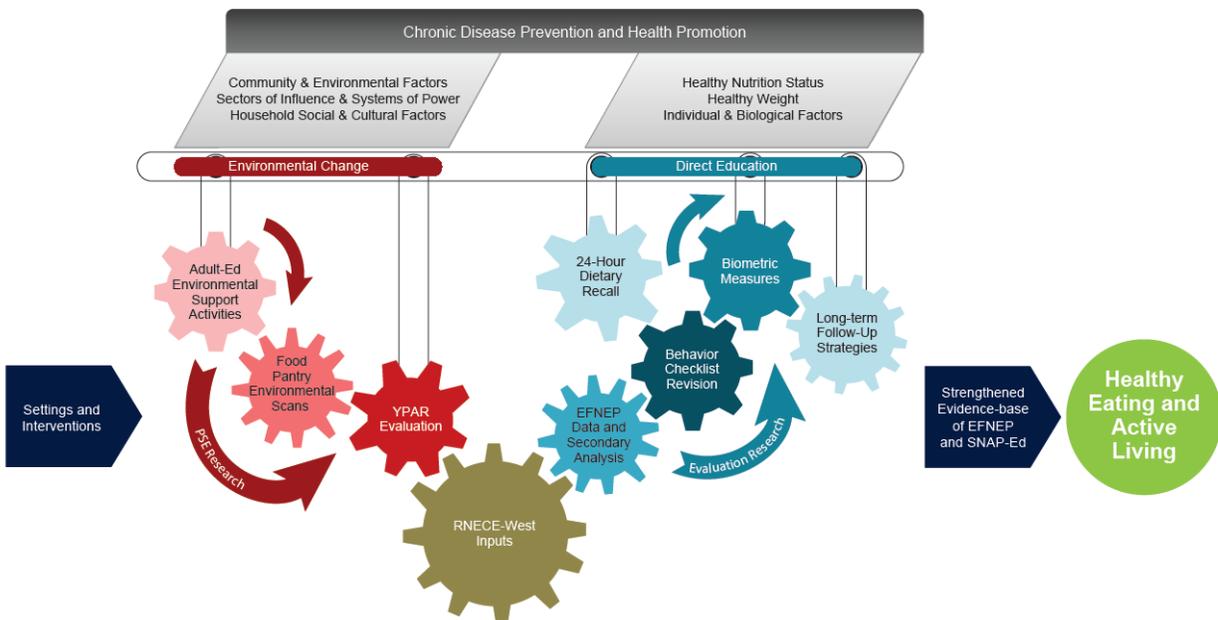


Figure 2. RNECE – West Research Efforts Schema

OVERVIEW OF RNECE – WEST PROJECTS

Project Abstracts for each research project can be found in Appendix B. RNECE – West presentation and peer-reviewed publications can be found in Appendices C and D.

LONG-TERM FOLLOW-UP EVALUATION OF EFNEP

The objectives of the this research (hereafter referred to as the “biometric study”) were to determine: 1) if participation in EFNEP impacted several objective biometric measures (body mass index [BMI], blood pressure [BP], and hemoglobin A1c [HbA1c]); 2) if those biometric measures could be accurately collected in the varied community settings in which EFNEP classes take place; and, 3) if EFNEP participants could be retained for the one year study.

Free-living EFNEP participants were recruited at their first EFNEP class and agreed to allow collection of the biometric measures at four time points: pre (at the first lesson), post (at the ninth and final lesson), and 6 and 12 months after the lesson series. Participants received cash incentives of \$30 (pre), \$30 (post), \$50 (6 months post), and \$50 (12 months post).

Identical models of the clinical equipment were used at each time point and in each location to collect the biometric measurements including scales and stadiometers to calculate BMI, blood pressure monitors, and HhA1c test kits.

All persons collecting the biometric data received standardized training on the equipment, participated in supervised practice sessions, and completed a pilot test of data collection with groups of EFNEP participants who were not included in the study. Both inter-interviewer and intra-interviewer reliability were established and monitored over the course of the study.

Data was entered into Excel spreadsheets and analyzed using the R statistical program. Analysis of covariance (ANOVA) was used to assess changes over the four time points; covariates were age, education (some college or not), and ethnicity (Hispanic or not).

Table 1 provides the demographic and biometric data of the 118 participants at their first lesson (pre): 65 were from Colorado (55%) and 53 from Washington (45%). Almost 20% had some college education and 71% identified as Hispanic. The average BMI was 31.8, in the obesity category, while the average blood pressure was normal and HbA1c was 5.7 (borderline between normal and pre-diabetes).

Table 2 presents the biometric measures for the 69 participants (58% retention) who had biometric measures at the four collection times. No changes were found for BMI or Systolic Blood Pressure (SBP) over the study period. Compared to measures taken at the first lesson, Diastolic Blood Pressure (DBP) significantly increased at 6 months (+ 3.25 mmHg to 78.0 mmHg, $p < .00$) and was not statistically higher at 12 months (+2.35 mmHg to 77.0 mmHg, $p < 0.06$). HbA1c was also significantly higher at the 6 and 12 month times, reaching 6.0 ($p < 0.02$ and < 0.01 , respectively).

We also examined changes within tertiles of each biometric measure compared to the pretest. No differences were found for BMI. The upper SBP tertile had a significant increase at 6 months (4.4 mmHg, $p < 0.011$) that regressed to a non-significant difference at 12 months. Similarly, the upper tertile for DBP significantly increased at 6 months (+3.3 mmHg, $p < 0.02$) then regressed to a non-significant difference at 12 months. There were no significant differences by tertile for HbA1c.

Table 1. Demographic and biometric data from pretest (n = 118)

Variable	Mean (sd) or n (%)
Age (years)	37.8 (11.3)
Hispanic	76 (71%)
College (some)	21 (20%)
State	
Colorado	65 (55%)
Washington	53 (45%)
Height (cm)	158.9 (7.5)
Weight (kg)	80.3 (19.4)
BMI	31.8 (7.2)
Systolic blood pressure (mmHg)	109.6 (12.5)
Diastolic blood pressure (mmHg)	75.0 (8.3)
Hemoglobin A1c	5.7 (0.9)

Table 2. Estimated Biometric Means and Contrasts by Time (n = 69)

Biometric	Pre	Post	6 Month	12 Month	Post - Pre	6 Month - Pre	12 Month - Pre
	X (SD)				Difference (p)		
BMI (kg/m ²)	32.3 (1.1)	32.4 (1.1)	32.4 (1.1)	31.9 (1.1)	0.10 (p = 0.92)	0.13 (p = 0.87)	-0.36 (p = 0.36)
SBP (mmHg)	109.2 (1.9)	108.9 (1.9)	109.7 (1.9)	110.1 (2.0)	-0.30 (p = 0.97)	0.45 (p = 0.94)	0.88 (p = 0.80)
DBP (mmHg)	74.7 (1.5)	75.7 (1.4)	78.0 (1.4)	77.0 (1.4)	1.04 (p = 0.55)	3.26 (p = 0.00)	2.35 (p = 0.06)
HbA1c (%)	5.8 (0.1)	5.8 (0.1)	6.0 (0.1)	6.0 (0.1)	-0.07 (p = 0.42)	0.15 (p = 0.02)	0.17 (p = 0.01)

*Estimated means are adjusted for age and average over levels of education and ethnicity.
P value adjustment method done for 3 tests.*

No improvements were found for any of the four biometric measures over the course of the study period. The slight increase in DBP and HbA1c, while statistically significant, would not be clinically significant, particularly since all BP measures were in the normal range. Thus, based on the findings, it does not appear that EFNEP participation improved participants' health status as indicated by the biometric measures. However, there was no comparison group in this study. It is possible that the maintenance of BMI, BP, and HbA1c could be a positive outcome if a comparison group's biometric measures worsened over time, which is possible given US population trends.

Relative to a “proof of concept,” the study successfully showed that EFNEP participants were willing to be assessed on these measures, biometric measures could be accurately collected in diverse community settings, and a solid retention rate (58%) could be achieved with this low-income population using a relatively small monetary incentive and sharing with participants their personal biometric measurements. Thus, the overall study supports the potential for conducting a larger EFNEP cost-effectiveness study that includes biometric measures and a comparison group.

FOOD PANTRY ENVIRONMENTAL SCAN (HEALTHY FOOD PANTRY ASSESSMENT PROJECT)

The purpose of this project was to develop and test an environmental scan/observational survey known as an “e-scan” for the food pantry setting. Food pantries and food banks are regular partners with SNAP-Ed and EFNEP in the delivery of nutrition education and PSE interventions in local communities. Objectives of this project were to: 1) gather evidence of the shared best practices of food pantry partnerships in the NIFA Western Region; 2) develop and test an e-scan for the food pantry setting; and 3) disseminate the final e-scan with resources that were relevant to the target audience.

The body of evidence supporting healthy retail interventions and observational evaluation form the basis of this work. The socio-ecological framework as proposed by Story et al ¹ describes how physical settings may encourage or hinder the adoption of healthy nutrition and physical activity behaviors. The food pantry has become a regular source of food for people experiencing poverty, making it an essential part of the community nutrition environment for this population. Thus, interventions directed at the environments where food is obtained, including the nutritional density of foods offered, may greatly improve health outcomes for people experiencing poverty.

Local agencies that provide nutritional assistance at no-cost to clients, commonly known as “food pantries,” and their SNAP-Ed and EFNEP community partners in the NIFA Western Region participated in the project.

This project was designed in three phases. Phase one included in-depth semi-structured qualitative interviews with food pantry managers and EFNEP/SNAP-Ed implementers to determine current practices of “healthy food pantries” within the food assistance system of the NIFA Western Region. Phase two tested a draft pilot assessment tool in five states and included site visits to food pantry sites by a trained researcher who completed on-site cognitive interviews of the assessment tool content. Phase three was a field test of the food pantry environment with the assessment tool.

The pilot-tool was cognitively tested in follow-up interviews; the field-tool was evaluated by interrater and test-retest reliability.

This RNECE – West project published *The Healthy Food Pantry Assessment Toolkit*. It includes the e-scan for food pantry settings, an instruction guide, a training webinar, and a pantry resource guide. This toolkit can be used by local food pantries and their partner EFNEP/SNAP-Ed agencies to assess, identify, plan, implement, and re-assess interventions targeting this important food environment. The Toolkit is available at

¹ Story, M., Kaphingst, K. M., Robinson-O’Brien, R., & Glanz, K. (2007) Creating Healthy Food and Eating Environments: Policy and Environmental Approaches. *Annual Review of Public Health*, 29, 253-272.
<http://dx.doi.org/10.1146/annurev.publhealth.29.020907.090926>

<https://extension.wsu.edu/pierce/nutrition/healthy-food-pantry-assessment-toolkit/>. Additional details can be found in a peer reviewed journal article.²

BEHAVIOR CHECKLIST VALIDATION IN CONJUNCTION WITH NC2169 AND THE EFNEP BEHAVIOR CHECKLIST COMMITTEES

The objectives of this research were to 1) establish valid and reliable nutrition and food resource management content domain questions for a food and physical activity behaviors questionnaire and 2) establish reliability and validity for food security content domain questions.

The work was done in conjunction with the multi-state research group, NC2169: EFNEP Related Research, Program Evaluation and Outreach and the EFNEP Behavior Checklist Committee. RNECE – West collaborated with these groups to coordinate efforts ensuring that consistent methodologies were utilized across all research so that content domain questions could be combined into a final evaluation tool without duplication of efforts. RNECE – West funding supported only the projects reported here. The new questionnaire is called the EFNEP Food and Physical Activity Questionnaire (FPAQ).

For a comprehensive report, including the design and methods, see the technical report in Appendix E.

Participants in each testing stage were low-income, primarily women, from different regions of the US. The majority were young adults (18-39 years) and did not have a college degree, which aligns with the overall EFNEP population. Compared to national EFNEP data, lower proportions of Hispanic and higher proportions of white, non-Hispanic adults participated in testing. This difference may be due in part to the exclusion of Hispanic adults who did not speak English, because the questions were developed in English. National EFNEP data does not provide information on the percentage of non-English speaking Hispanic participants.

Nutrition

Content Validity: A panel of six nutrition experts determined which Dietary Guidelines for Americans (DGA) nutrition recommendations were most important to teach the low-income population EFNEP serves. A second group of experts further prioritized which nutrition content areas should be evaluated in EFNEP. This EFNEP expert panel consisted of 21 researchers (state EFNEP program leaders, national EFNEP program administrators, and academic researchers) from 15 states across the US.

Face Validity: Interviews were completed with 111 EFNEP participants in seven states through three-rounds of revisions. Questions were re-worded based on themes that emerged in each round of interviews to improve question clarity and ease of understanding. Response options were revised to align with participants' internally-generated responses and recommendations. This process resulted in 14 questions covering the six nutrition content areas. There were no differences in the findings by region nor pre- versus post- EFNEP participation.

Construct Validity: Sixty sets of pre-recalls were collected and 30 sets of post-recalls collected. The construct validity testing for the nutrition items, using multiple 24-hour recalls did not support the nutrition items. However, there were several problems with the protocols: the recalls were not completed in a timely manner so that there was a different time frame for answering the nutrition items and the recalls; secondly, the recall interviewers failed

² Bush-Kaufman, A., Barale, K., Aragón, M.C., Walsh, M. 2018. Development and Testing of the Healthy Food Pantry Assessment Tool (HFPAT), an Observational Survey for Food Assistance Settings. Journal of Nutrition Education and Behavior <https://doi.org/10.1016/j.jneb.2018.10.004>.

to ask specific probing questions that would have clarified behaviors such as cooking at home versus eating out. Thus, the recalls, under the circumstances, may not have been an appropriate method to establish construct validity.

Food Resource Management

Content Validity: A Food Resource Management (FRM) Work Group reviewed the literature from 2000-2013, identified and confirmed primary concepts and supporting strategies associated with FRM. The primary strategies identified were budgeting, meal planning (planning menus, using foods on hand, decreasing food waste), shopping skills (using a grocery list, unit pricing, coupons) and cooking skills (food preparation at home). Supporting strategies included family budgeting, home food preservation, hunting and fishing, gardening, emergency planning and couponing. Existing FRM evaluation tools and questions found in the literature were also compiled and reviewed.

The three most frequently used curricula across EFNEP nationally were reviewed to determine the type, frequency, and depth of FRM content. The results of the content analysis were compared with the FRM recommendations outlined by the FRM Work Group. Twenty-two questions were identified for testing.

Face Validity: Three rounds of cognitive interviews were completed with 105 EFNEP participants in 6 states. Questions were re-worded based on themes that emerged in each round of interviews to improve question clarity and ease of understanding. Response options were revised to align with participants' internally-generated responses and recommendations. This process resulted in 10 questions covering the primary strategies.

Construct Validity: Telephone interviews were conducted with 32 female participants from Washington, Tennessee and New Jersey. Participants identified as Black (28%), White (70%) or American Indian (2%); 13% identified as Hispanic. At the time of the interview, 47% of the sample had completed four or fewer lessons; the remainder completed five or more lessons. Responses from both the FRM items and the interviews were collapsed into ordinal options for all the responses based on whether individual responses met recommendations. Thus, responses were assigned into three categories: "meets recommendations", "close to meeting recommendations", and "does not meet recommendations" according to Web-based Nutrition Education Evaluation and Reporting System (WebNEERS) defined classifications. These criteria for this ordinal scale are the same criteria used for the sensitivity analyses. Data analysis is being finalized and is expected to be available Spring 2019.

Food Security

Food security in the original EFNEP 10-question behavior checklist was measured by a single question: "How often do you run out of food before the end of the month?" While there are valid and reliable tools to measure household food insecurity such as the United States Household Food Security Survey (HFSS)³, these instruments are too long to be administered in an EFNEP class along with other behavioral measures. Content and face validity research studies were conducted by NC2169 researchers to select appropriate questions. This research is reported elsewhere.⁴ The final two items resulting from cognitive testing were "In the past month, how often did you eat

³ United States Household Food Security Survey – <https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/survey-tools.aspx>

⁴ Aragon, M. C., Barale, K. V., Walsh, J.R., Owens, N., Betz, N. (2019) Reliability & Validity Testing of Food Security Items in the EFNEP Food and Physical Activity Questionnaire. Submitted for review for Journal of the Academy of Nutrition and Dietetics.

less than you wanted so there was more food for your family?” (Question 1) and “In the past month, how often did you not have money or another way (such as SNAP, WIC, or a food pantry) to get enough food for your family?” (Question 2). Both items had Likert-type response options (1=Never; 2= Rarely [about 20% of the time or less]; 3=Sometimes [about 40% of the time]; 4=Often [about 60% of the time]; 5=Usually [about 80%of the time]; and 6 = Always).

Construct Validity: Most of the respondents in the construct validity testing (n=85) were female (87%). The mean age of respondents was 35.4 years and, on average, participants reported living with two children in the household. Most participants identified as White (68%). Federal assistance program participation was high with many participating in the Supplemental Nutrition Assistance Program (SNAP) (76%), school meal programs (69%), and Special Supplemental Nutrition Program for Women, Infants and Children (WIC) (41%). After completing the HFSS, 33% of the respondents were classified as food secure. The remaining 67% were classified as food insecure, with 39% reporting low food security and 28% reporting very low food security.

Higher scores on the HFSS were positively correlated with a higher score of Question 1 ($r=0.532$; $p<.01$) and Question 2 ($r=0.545$; $p<.01$). However, the highest correlation was observed when both items were analyzed together ($r=0.592$; $p<.01$).

Overall Reliability Testing

Thirty-three questions were combined to cover all domains. Test-retest data for the questions were collected from 217 low-income, EFNEP-eligible adults in seven states across the US. Most of the reliability testing respondents were female (99%) with a mean age of 35.4 years. On average, respondents reported living with two children in the household. Most respondents identified as White (58%). Respondents reported participation in SNAP (6%), school meal programs (13%), and WIC (6%). Nominal difference scores (+1 difference between two time points) for each question showed >70% of adults reported similar responses for all questions between time 1 and 2 administrations (median=80.6%, range=72.4%-94.4%). Paired t-tests showed no statistically significant differences in the means for any question between time 1 and 2 administration except for the item “How often to you throw food away because it spoiled or expired before you could use it?”. That question did not meet the reliability standard and was eliminated.

Overall Sensitivity Testing

As part of normal class evaluation processes, 382 EFNEP participants in eight states completed the 32-question FPAQ at the beginning and end of class series. Eighty percent were female, mean age 37.4 years. Thirty-two percent identified as White, 23% Black; 41% identified as Hispanic but did not always indicate a race. Differences between pre- to post-means were significantly different for all items except “washing surfaces after cutting raw meat” and frequency of drinking “energy drinks,” indicating the 30 of 32 items were sensitive to change. The critical domain scales (Food Resource Management, Fruit/Vegetables, Nutrition, Physical Activity, and Food Security) showed significant pre/post differences according to t-tests and all but Dairy showed significant differences according to Wilcoxon tests. These critical domain scales had internal consistency values > 0.7. Dairy, Sugar Sweetened Beverages, Cooking, and Food Safety scales had marginal internal consistency values < 0.6. The results of the sensitivity testing in combination with the prior reliability and validity testing of the new items supports EFNEP’s use of FPAQ as an effective program evaluation tool.

Conclusion

Researchers concluded that this study contributed to the reliability and validity testing of new evaluation questions in three of five content domains (nutrition, food resource management, and food security) for the national EFNEP program. Validation testing of questions for the new evaluation tool involved collaborating with 34 states, representing EFNEP's primary racial/ethnic groups and all geographic regions. This new tool will strengthen the evidence-base for nutrition education programs for low-income families.

ENVIRONMENTAL BARRIERS TO HEALTHFUL DIETARY AND PHYSICAL ACTIVITY BEHAVIORS IN THE EFNEP/SNAP-Ed PARTICIPANT POPULATION

The purpose of this project was to develop an understanding of 1) environmental barriers that directly impact dietary and physical activity behaviors in the EFNEP and SNAP-Ed participant populations, and 2) environmental changes that may encourage more healthful behaviors in this population.

The authors conducted telephone focus groups (n=10) with paraprofessional educators. Focus groups used a semi-structured script reviewed by an expert panel and pilot-tested with a group of Colorado EFNEP educators. The target audience was EFNEP and/or SNAP-Ed paraprofessional educators (n=50) from 10 different US states representing all NIFA regions. The main outcome measures included key themes and quotations relevant to environmental barriers experienced by this population and educator-generated ideas for solutions to target each barrier. Two reviewers independently coded each transcript then met to come to consensus on themes related to environmental themes and potential solutions.

Consistent with existing literature, reduced availability, high costs, a lack of adequate transportation, and safety concerns emerged as key barriers to accessing and utilizing healthful dietary and physical activity resources within this population. The educators also provided valuable ideas for strategies to target each barrier. For example, potential solutions to the availability barrier include creating mobile farmers' markets, partnering with volunteer groups to provide free delivery of food from food banks or retailers to areas with limited access, working with alternative retailers (e.g. dollar stores) to offer produce in urban areas, providing free seeds to encourage home gardening, and facilitating development of or participation in community gardens.

Environmental barriers are complex, multifactorial, and often interrelated. Employing PSE efforts in combination with direct nutrition and physical activity education is recommended to promote healthful behavior change in the low-income population. Additional research is needed to understand how to best incorporate PSE into EFNEP/SNAP-Ed programs with the potential for including PSE activities for participants in direct education lessons.

TESTING OF METHODS TO REACH EFNEP PROGRAM GRADUATES LONG-TERM

The objectives of this research were to determine: 1) which, if any, follow-up method for contacting graduates was most effective; and, 2) graduates' willingness to complete additional assessments. Three EFNEP programs participated in the research: Colorado, Kentucky, and West Virginia.

In each state, 120 graduates at both 6 and 12 months post-graduation were randomly assigned to contact using one of six methods. Those methods were a phone call by their educator, a text from their educator, a phone call or text from the state office, and an email or USPS mail from the state office. For the phone calls, three attempts were made to reach a graduate before dropping the "subject." Graduates were not aware that we would be contacting them, i.e., these were cold contacts.

Table 3 shows the percentage return for each method according to state and time (6 or 12 months post-graduation). There was no clear pattern by state, time, or method but several points should be noted. Only about 20% of the graduates were reached in total, suggesting cold contacts post-graduation are not particularly effective. Calls from the educator were the best way to reach participants (32% and 47% at 6 or 12 months, respectively) while educator texts reached about one fifth of participants. The success of phone calls from the state EFNEP office appeared to be more effective at 12 months (28%) than 6 months (13%) post-graduation although we cannot offer a rationale for this finding. Postal mail or text messages from the state EFNEP office were the least effective approaches.

Table 3. Response rates for reaching EFNEP graduates according to state, contact method, and time (6 or 12 months post-graduation).

Contact Time/Method	Number Per State	State			Total
		Colorado	Kentucky	West Virginia	
6 Months					
Educator Phone	20	25%	30%	40%	32%
Educator Text	20	50%	10%	5%	22%
State Office Phone	20	25%	0%	15%	13%
State Office Email	20 ^a	35%	15%	-	25%
State Office Mail	20	15%	0%	10%	8%
State Office Text	20	25%	0%	10%	12%
Overall Response Rate at 6 mos.		29%	9%	16%	18%
12 Months					
Educator Phone	20	50%	45%	45%	47%
Educator Text	20	15%	25%	15%	18%
State Office Phone	20	35%	20%	30%	28%
State Office Email	20 ^a	15%	20%	-	18%
State Office Mail	20	35%	5%	5%	15%
State Office Text	20	5%	10%	0%	5%
Overall Response Rate at 12 mos.		26%	21%	19%	22%
Overall Response Rate		28%	15%	18%	20%

^a West Virginia did NOT use state office email

Relative to the second objective, Table 4 provides a summary of graduates' willingness, in principle, to complete a variety of evaluations. More than half indicated they would, or probably would, complete the 7 types of evaluations; 58-67% were willing to complete a questionnaire, dietary recall, interview, or allow BMI and blood pressure to be collected. Looking at the responses on the 4-point Likert scale, the average fell just under 3 (range 2.64-2.95), i.e., closer to "probably yes" than "probably not."

Table 4. EFNEP graduates' willingness to provide additional evaluation data.

Evaluation Method	n ¹	Mean (SD) ²	% indicating Yes or Probably Yes
Questionnaire	111	2.95 (1.25)	67%
Dietary Recall	110	2.64 (1.26)	58%
Interview	110	2.70 (1.25)	58%
BMI/Blood Pressure	109	2.76 (1.16)	61%

Small Blood Sample	109	2.64 (1.21)	52%
Urine Sample	62	2.69 (1.30)	55%
Fecal Sample	62	2.66 (1.29)	56%

¹ Only those reached by phone were asked about the urine and fecal samples in order to explain the protocols. For the four other evaluation methods, participants completed a Likert scale for each method.

² Based on Likert response scale where 1 = no; 2 = probably not; 3 = probably yes; 4 = yes.

Given the small sample from only three states and low response rates, any conclusions from this research should be viewed with caution. In addition, the respondents were likely not representative of all EFNEP graduates as they presumably had more stable living arrangements (they could be found) and, perhaps, had a more positive EFNEP experience which could increase their willingness to respond.

However, it certainly appears that cold contacts would not give a high or representative response with this audience. Of the approaches, those for which the educator directly contacted the graduates (phone or text) seemed to provide a better response rate, perhaps reflecting an established positive relationship. Educators often provide their phone numbers to participants early in the class series so that participants recognize the number and answer the phone call. Participants are often unwilling to answer unknown numbers. This may be why response rates were higher when educators initiated the contact from their phones.

On a more positive note, of those reached (albeit a non-representative sample), most expressed a willingness to complete a variety of evaluations including several biometric measures.

The findings suggest that there may be a potential for finding graduates and collecting objective, long-term data that could be used to further establish the benefits of EFNEP participation.

Additional testing of approaches to reach graduates, e.g., by alerting them at the end of the program about future attempts to reach them, maintaining some form of contact following the class series, and/or the use of incentives should be investigated.

SECONDARY DATA ANALYSES OF NATIONAL EFNEP DATA YEARS 2007-2014

EFNEP is the only USDA national nutrition program with a nationwide data collection system. Researchers collaborated to clean the data from the Nutrition Education Evaluation and Reporting System and the Web-Based Nutrition Education Evaluation and Reporting System (WebNEERS).⁵ The resulting large data set can be used to answer research questions on direct nutrition education outcomes.

The purpose of this project was to summarize national EFNEP data over multiple years and conduct a feasibility study to assess outcomes over time.

Project design included analysis of national EFNEP data from years 2007-2014 including demographics of participants and outcome measures from the 10-question behavior checklist (questionnaire) and 24-hour dietary recalls. Data included all EFNEP participants (n = 512,899) from 2007-2014 who had complete pre- and post-test data (behavior checklist and recalls). Main outcome measures were race/ethnicity, education level and, from the dietary recalls, Healthy Eating Index (HEI), fruit and vegetable intake and, from the 10-question behavior checklist

⁵ Web-Based Nutrition Education Evaluation and Reporting System (WebNEERS).
<https://nifa.usda.gov/tool/webneers>

in use during those years, 3 scales: food resource management, food safety, and nutrition. Data analysis included descriptive statistics, dependent t-test comparisons of pre- and post-data, and frequency patterns of outcomes by state across time.

EFNEP participants self-identified as 30% White, 30% Black, and 30% Hispanic. Those identifying as Hispanic often did not select a race. The NIFA Northeast Region (22%) and NIFA Western Region (5%) have fewer Blacks while the NIFA Southern Region has a higher percentage (42%). The NIFA Western Region has a higher percentage of Hispanic participants (57%). About one-third of all participants have less than a high school education.

The HEI is a summary measure of diet based on adequacy (dietary components to increase) and moderation (dietary components to decrease). This measure is updated according to current Dietary Guidelines every five years. HEI 2005 was used in this analysis. Pre- to post-education differences included a gain in HEI 2005 of 1-12 points (70% ranged from 3-7 pts); increases in fruit and vegetable intake ranged from a half to one serving. Consistent, modest increases were seen in behavior checklist subscale scores – mostly a 0.5-1 point increase on a 5-point scale. Consistent pre-education scores and difference scores (post minus pre) within states were seen over eight years for both the behavior checklist and the 24-hour recall for HEI 2005.

While the varied demographics of EFNEP participants may present challenges for educators, it appears that positive outcomes are consistent across land-grant university EFNEP programs and time. EFNEP participants improved their diet quality over the period of program participation based on positive changes in 9 of 12 HEI 2005 sub components. While there is limited evidence in the research literature to document the significance of the level of change noted in the feasibility study, any increase in HEI reflects improved dietary quality. Improved diet quality is an indicator of improved health. Comparisons of HEI change among the national EFNEP population have not been previously included in impact reporting.

EFNEP's national database, which includes a large number of individuals, multiple years of data with many variables, is an asset that has not been fully examined. This feasibility study offers additional evidence that EFNEP is achieving its mission to produce measurable improvements in health, obesity, nutrition (food behavior), and physical activity-related outcomes of interest to USDA.

SUB-AWARD: YOUTH PARTICIPATORY ACTION RESEARCH – A PSE INTERVENTION

Youth Participatory Action Research (YPAR) is a practice-based intervention, as noted in the 2014 SNAP-Ed PSE Strategies and Intervention Toolkit.⁶ YPAR is currently used in some SNAP-Ed projects where it has resulted in meaningful youth-driven policy, systems, and environmental change. This intervention is based on the socio-ecological framework. The purpose of this project was to compile a YPAR Evaluation Manual and set of evaluation instruments for use with YPAR. It included the development of a protocol to conduct a Baseline End-of-Year Youth Survey Reliability Study. The project was planned to strengthen the evidence base of an existing PSE intervention.

An evaluation toolkit was compiled based on the Youth Engagement Intervention in California.⁷ The toolkit includes overview of the development of the evaluation tools, instructions for use of data collections tools and the

⁶ SNAP-Ed PSE Strategies and Intervention Toolkit. <https://snapedtoolkit.org/>

⁷ YPAR. <https://www.cdph.ca.gov/Programs/CCDPHP/DCDIC/NEOPB/Pages/YouthEngagement.aspx>

suggested evaluation process for YPAR. The toolkit will benefit programs implementing YPAR by providing a systemic approach to program evaluation. A protocol to assess reliability of specific evaluation tools was developed; continued research is poised to be initiated when additional funding is available. Additional information on YPAR can be found at <http://yparhub.berkeley.edu/>.

SUB-AWARD: SUGAR-SWEETENED BEVERAGE INTAKE AMONG EFNEP PARTICIPANTS – AN EVALUATION USING THE NATIONAL EFNEP DATABASE

The purpose of this project was to evaluate the impact of the EFNEP class series on sugar-sweetened beverage (SSB) intake in the NIFA Western Region (WR). Analysis compared the quantity, quality, and cost of foods between recalls including SSBs.

A secondary analysis of the 2014 EFNEP WR 24-hour recall data set was completed. Specifically, a pre- to post-EFNEP class series comparison was made of the quantity and cost of sugar-sweetened beverages (SSB) consumed by EFNEP participants. The change in diet quality at the population level as estimated by the Healthy Eating Index 2010 (HEI-2010) was also determined.

Diet recall data and demographics for the 2014 EFNEP participants were imported into a SAS statistical program. Analysis was limited to adult female participants and cases that had matched pre- and post-intervention recalls.

Each diet recall included individual food items coded with a USDA Agriculture Research Service Food and Nutrient Database for Dietary Studies (FNDDS) food code number. The HEI is a measure of diet quality summed from 12 sub-scores based on reported food consumption. The USDA Center for Nutrition Policy and Promotion has a food price database for the FNDDS food codes, based on 2003-2004 food prices. Prices were inflation-adjusted to 2016 and merged with the EFNEP database.

The sample included 9,987 cases. At pre, 68% of cases did not report SSB intake. Across all pre-recalls, the SSB energy intake accounted for 5.9% of calories, however, among those that did report SSB intake, SSBs accounted for 15.1% of calories. Median energy intake was 13% higher among SSB consumers than non-consumers in the initial recall. At the post, 77% of cases did not report SSB intake. Across all post-intervention recalls, the SSB energy intake accounted for 2.4% of calories reported. Among those that did report SSB intake, SSBs accounted for 6.8% of calories. Median energy intake was 24% higher among SSB consumers than non-consumers.

Fifty-seven percent of participants did not report SSB intake in either recall; 12% of participants reported SSB intake in both recalls. Mean SSB intakes were 259 vs. 241 kcal/d (pre/post), although the data was highly skewed.

In paired comparisons, caloric intake from SSBs dropped from pre- to post-recall, showing some positive effect of EFNEP on decreasing SSB consumption. At the population level, there was little effect on SSB-based median caloric intake when comparing pre- and post-recalls. However, when making paired comparisons, there was a significant reduction in energy from SSBs following EFNEP. The effect of EFNEP, as estimated by pre- to post-score change, indicates improvements in both Total HEI and Solid Fats and Added Sugar scores, confirming improved diet quality as a result of EFNEP participation.

SUB-AWARD: EVALUATION OF A NOVEL, LOW-COST, LOW-BURDEN, SCALABLE TECHNOLOGY FOR EVALUATING EFNEP AND SNAP-ED EFFECTIVENESS

The primary objective of this study was to evaluate a novel use of technology for assessing the long-term effectiveness of SNAP-Ed and EFNEP in an inexpensive and scalable way that would not burden program

participants. This technology would detect changes in grocery purchases using customer loyalty cards to identify households and would quantify expenditures on food groups of interest.

Twelve EFNEP and SNAP-Ed nutrition educators in Utah recruited a total of 60 program participants. Participants filled out a short survey, which included their grocery loyalty card number or other identifying information that could be used to identify their household's purchases. The researchers' plan had been to assess changes in fruit, vegetable, whole grain, and dairy grocery expenditures before and after participating in the nutrition education program. However, delays in securing grocery store data resulted in the grant ending before data were delivered.

The process evaluation found that it was feasible to recruit SNAP-Ed and EFNEP participants who shop at stores operated by our grocery store partner; however, it also revealed that more time than had been anticipated was needed for participant recruitment, that paperwork should be further simplified and minimized, and that dedicated data collection staff should be considered instead of having educators collect data.

MULTI-DISCIPLINARY METHODS FOR EFFECTIVE, SUSTAINABLE, AND SCALABLE EVALUATIONS OF NUTRITION EDUCATION PROGRAMS (RNECE LONGITUDINAL RESEARCH STUDY)

**Utah State University led this project. Although this project was not completed by the RNECE – West, Utah is within the Western Region and reporting on this project was done through the RNECE – West. Below is a summary of the project. A separate detailed report will be submitted by Utah State University once the research is completed.*

The overarching rationale for this grant was that for EFNEP and SNAP-Ed to be effective and sustainable, rigorous evaluation tools are needed. The two parts of the grant assessed such tools.

First, the feasibility of using the Automated Self-Administered 24-Hour Dietary Assessment Tool (ASA24) to assess the diets of women who are SNAP eligible was determined in a controlled environment. This study evaluated the accuracy of ASA24 recalls completed under two conditions: independently and with assistance. Women served themselves from a buffet; amounts taken as well as plate waste were unobtrusively weighed to enable calculation of true intake for three meals. The following day, women completed ASA24-2016 independently (n=148) or with assistance from a trained paraprofessional in a small group (n=154). Regression modeling was used to examine differences by condition (independent or assisted) in agreement between true and reported foods; energy, nutrient and food group intakes; and portion sizes. Study participants who completed ASA24 independently versus with assistance reported matches for 71.9% and 73.5% (p=0.26) of items truly consumed, respectively. Exclusions (consumed but not reported) were highest for lunch (at which participants consumed about twice the number of distinct foods/beverages compared to breakfast and dinner). Commonly excluded foods were additions to main dishes (e.g., tomatoes in salad). On average, excluded foods contributed 43.6 grams/46.2 kcal and 40.1 grams/43.2 kcal among those in the independent and assisted conditions, respectively. Gaps between true and reported intake were different between conditions for iron and folate. Within conditions, significant gaps were observed for protein, vitamin D, and meat (both conditions); vitamin A, iron, and magnesium (independent); and folate, calcium, and vegetables (assisted). For foods and beverages for which matches were reported, no difference in the gap between true and reported portion sizes was observed (p=0.22). ASA24 performed relatively well among women with low-incomes; however, accuracy was somewhat lower than previously observed among adults with a range of incomes. The provision of assistance did not significantly impact accuracy. A study of the feasibility of the ASA24 in the field is currently underway using data collected from EFNEP programs in three states.

In the second objective, a tool assessing for the diet quality of household grocery food purchases was developed and evaluated. Household food purchases are potential indicators of the diet quality of the home food

environment, and grocery purchase behavior is a main focus of USDA nutrition education programs; therefore, an objective measure of grocery purchases is needed. The Grocery Purchase Quality Index-2016 (GPQI-2016) was developed and then evaluated by using the Healthy Eating Index- 2015 (HEI-2015) as the reference standard. In 2012 the USDA Economic Research Service conducted the National Household Food Acquisition and Purchase Survey.⁸ Members of participating households recorded all foods acquired for a week. Foods purchased at stores were mapped to the 29 food categories used in USDA Food Plans, expenditure shares were estimated, and GPQI-2016 scores were calculated. USDA food codes, provided in the survey database, were used to calculate the HEI-2015. All households in the 48 contiguous states were eligible for the survey. The analytic sample size was 4276 households. The Spearman's correlation coefficient for the total GPQI-2016 score and the total HEI-2015 score was 0.70. For the component scores, the strongest correlations were for Total and Whole Fruit (0.89-0.90); the weakest were for Dairy (0.67), Refined Grains (0.66), and Sweets & Sodas/Added Sugars (0.65) ($p < 0.01$ for all). Regression models revealed that both the GPQI-2016 and the HEI-2015 were significantly different among subgroups of households in expected directions. Overall, the GPQI-2016, estimated from a national survey of households, performed similarly to the HEI-2015. The tool has potential for evaluating nutrition education programs and retail-oriented interventions when the nutrient content and gram weights of foods purchased are not available. A study of the feasibility of using the GPQI-2016 in the field is currently underway using data collected from EFNEP and SNAP-Ed programs in six states.

SUMMARY

From 2014 to 2018, a collaboration of researchers and nutrition educators in the USDA NIFA Western Region worked to strengthen two of the nation's most important nutrition education programs through the Regional Nutrition Education Centers of Excellence (RNECE) Initiative. Two USDA agencies, the National Institute of Food and Agriculture and the Food and Nutrition Service, led the effort in six centers. RNECE – West contributed to research studies to strengthen the science of nutrition education and obesity prevention strategies. A summary of contributions is listed below:

- *Long-Term Follow-Up Evaluation of EFNEP* – Completed a long-term impact (6 and 12 months post-graduation) feasibility study of adult EFNEP audiences on self-reported behaviors and biometric measurements including blood pressure, HbA1c, and BMI. The study successfully showed that EFNEP participants were willing to be assessed on biometric measures and that these measures can be accurately collected in diverse community settings.
- *Food Pantry Environmental Scan* – Developed a Healthy Food Pantry Assessment Toolkit, including a validated healthy food pantry assessment tool (e-scan), implementation guide, webinar and resource guide, for use by food pantries and their SNAP-Ed/EFNEP partners. Using this assessment tool in food pantries can increase healthy food offerings which may result in healthier diets for food pantry clients.
- *Behavior Checklist (BCL) Validation in Conjunction with NC2169 and the EFNEP Behavior Checklist Committees*– Contributed to the reliability and validity testing of new evaluation questions (nutrition, food resource management, and food security domains) for the national EFNEP program, resulting in the EFNEP Food and Physical Activity Questionnaire. Programs using this tool can have confidence that the

⁸ US Department of Agriculture, Economic Research Service. FoodAPS National Household Food Acquisition and Purchase Survey. <https://www.ers.usda.gov/data-products/foodaps-national-household-food-acquisition-and-purchase-survey/>. Updated March 28, 2018. Accessed April 30, 2018.

tool reflects current dietary recommendations and provides valid and reliable results to assess program effectiveness that can be provided to stakeholders.

- *Testing of Methods to Reach Program Graduates Long-Term* – Discovered effective methods of following up with EFNEP and SNAP-Ed direct education graduates for the purposes of long-term follow-up evaluation. The results suggest that there is a potential for finding graduates and collecting objective, long-term data that could be used to further assess the benefits of EFNEP participation.
- *Summary of Secondary Data Analyses of National EFNEP Data Years 2007-2014* *Secondary Analysis of EFNEP National Data* – Cleaned and formatted a national EFNEP data set covering 8 years with 500,000 matched pairs that is now available to other researchers. National data reflected pre- to post-gains on the Behavior Checklist and 24-hour recall that were consistent across year and state, suggesting that EFNEP continues to be an effective influence on participants' behaviors.
- *Sub-Award: Youth Participatory Action Research (YPAR) – A PSE Intervention* – Public Health Institute developed an Evaluation Toolkit and Data Collection Guide to explain the evaluation and data collection processes and provide instructions for the completion of the forms. Local project sites will be able to use this toolkit to document the activities and outcomes of a YPAR project in their community.
- *Sub-Award: Sugar-Sweetened Beverage Intake among EFNEP Participants – An Evaluation Using the National EFNEP Database* – Found that participation in EFNEP resulted in the reduction of sugar sweetened beverage consumption by adult participants. Sugar sweetened beverages are significant contributors to overweight and obesity.
- *Sub-Award: Evaluation of a novel, low-cost, low-burden, scalable technology for evaluating EFNEP and SNAP-Ed Effectiveness* – Assessed the feasibility of an innovative method for using technology to assess grocery store purchases before and after nutrition education programming.
- *Multi-disciplinary methods for effective, sustainable, and scalable evaluations of nutrition education programs (RNECE Longitudinal Research Study, Utah State University)* – Completed a controlled feeding trial to test validity of the Automated Self-Administered 24-hour Recall (ASA24) for use with the low-income population. Developed an online training and in-person training curriculum to teach paraprofessional educators how to use the ASA24 with their participants. Pilot-tested the use of ASA24 in the field to gather data from participants. Developed and evaluated the Grocery Purchase Quality Index-2016: a tool for assessing overall diet quality of grocery purchases. Developed natural language methodology to reduce the level of effort needed for manual coding of grocery purchase data.

RNECE – West was able to successfully collaborate with program leaders, practitioners, and researchers in nutrition, physical activity and public health disciplines across 13 states to strengthen the science and enhance dissemination of nutrition education and obesity prevention strategies and interventions that produce measurable improvements in health, obesity, nutrition (food behavior), and physical activity-related outcomes of interest to USDA. Funding mechanisms are needed to support ongoing research in these areas for limited resource audiences.

Appendices

APPENDIX A
**Personnel, Committees, and
Subawardees
RNECE – West**

RNECE – WEST PERSONNEL

Colorado State University

Susan Baker, EdD – Director

Garry Auld, PhD – Evaluation Specialist

Katie McGirr, MS, RDN – Center Manager

Brigid McDonnell, MPH – Project Manager Coordinator

Dwayne Watson – Budget & Technical Support

Marie Walsh, MPH – Food Pantry E-Scan Project

Chris Melby, DrPH – Biometric Data Collection Trainer for Long-Term Evaluation Project

Amanda Boostrom, MS, RDN, CLEC – Long-Term Evaluation Project Staff

Ben Gowan, MS – Long-Term Evaluation Project and Testing of Methods

Lauren Rhoades, MS, RD – Long-Term Evaluation Project and Environmental Barriers Project

Washington State University

Karen Barale, MS, RD, CD, FADA – Co-Director

Alexandra Bush-Kaufman, MPH, RDN – Food Pantry Environmental Scan (E-Scan) Project

Catalina Aragon, MS, CN – Long-Term Evaluation, Food Security Validation, Washington Coordinator

Jill Armstrong-Shultz, PhD – Extension Specialist

Mattie Sobotka, MS, RDN, CEP – Washington Long-Term Evaluation Project

Mary Kay Erickson, RN – Washington Long-Term Evaluation Project

Margaret Williams, RN – Washington Long-Term Evaluation Project

RNECE – WEST STEERING COMMITTEE

Nancy Betts, PhD
Oklahoma State University

Jan Carroll, PhD
Colorado State University

Leslie Cunningham-Sabo, PhD, RD
Colorado State University

Carrie Durward, PhD
Utah State University

Kathy Gunter, PhD
Oregon State University

Marilyn Morrissey
Colorado State University

Joanne Littlefield, PhD
Colorado State University

Rachel Novotny, PhD, RDN, LD
University of Hawaii

Mary Kay Wardlaw, PhD
University of Wyoming

Ruth Willson
Colorado State University Extension

RNECE – WEST NUTRITION EDUCATION ADVISORY COMMITTEE

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Heidi LeBlanc, MS
Utah State University

Danita Martinez
Wyoming Department of Family Services

Mindy Meuli, MS, RD, LD
University of Wyoming

Amy Pezzani
Food Bank of Larimer County, Colorado

Marla Reicks, PhD
University of Minnesota

Elena Serrano, PhD
Virginia Polytechnic Institute and State University

Mary Wilson, MS, RDN, LD
University of Nevada

RNECE – WEST PSE ADVISORY COMMITTEE

Alice Ammerman, DrPH
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Iowa Department of Public Health

Aurora Buffington, PhD, RDN, LD
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Amy Ellings, BS, MPH
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*Puget Sound Educational Service District,
Washington State*

Erin Ulric, MPH
Colorado Department of Health and Environment

Stephanie Martinez
Arizona Department of Health Services

RNECE – WEST SUBAWARDEES

Public Health Institute of California –Youth Participatory Action Research; PI – Sharon Sugerman

University of Alaska Fairbanks – Sugar Sweetened Beverage Intake among EFNEP Participants: An Evaluation of the National EFNEP Database; PI - Bret Luick, PhD

Utah State University and University of Utah – Evaluation of a novel, low cost, low burden, scalable technology for evaluating EFNEP and SNAP-Ed; PI - Carrie Durward, PhD

APPENDIX B
Project Abstracts
RNECE – West

Long-Term Follow-Up Evaluation of *Eating Smart • Being Active*

Authors: Garry Auld, PhD, Susan Baker, EdD, and Katie McGirr, MS, RDN

Objectives: The objectives of this research (hereafter referred to as the “biometric study”) were to determine: 1) how participation in EFNEP affected several objective biometric measures – body mass index (BMI), blood pressure, and hemoglobin A1c (HbA1C); 2) if those biometric measures could be accurately collected in the varied community settings in which EFNEP classes take place; and 3) if EFNEP participants could be retained for the one year study.

Target Audience: Washington and Colorado EFNEP programs participated in the longitudinal biometric study that received IRB approval from Washington and Colorado State Universities.

Design: Free-living, EFNEP participants were recruited at their first EFNEP class and agreed to allow collection of the biometric measures at four time points: pre (at the first class), post (at the last class), 6 months post-classes, and 12 months post-classes. Participants received cash incentives of \$30 (pre), \$30 (post), \$50 (6 months), and \$50 (12 months).

Identical models of the clinical equipment were used at each time point and in each location to collect the biometric measurements including scales and stadiometers to calculate BMI, blood pressure machines, and HbA1c kits.

All persons collecting the biometric data received training on the equipment, participated in several supervised practice sessions, and completed a pilot test of data collection with groups of EFNEP participants who were not included in the study. Both inter-interviewer and intra-interviewer reliability were established and monitored over the course of the study.

Analysis: Data was entered into Excel data files and analyzed using the R statistical program. Analysis of covariance was used to assess changes over the four time points; covariates were age, education (some college or not) and ethnicity (Hispanic or not).

Results: The pre-demographic and biometric data of the 118 participants shows that 65 (55%) were from Colorado and 53 (45%) from Washington. Almost 20% had some college education and 71% self-identified as Hispanic. Their average BMI was 31.8, in the obesity category, while their average blood pressure was normal and HbA1c was 5.7 (borderline between normal and pre-diabetes).

For the 69 participants (58% retention) who had biometric measures at the four collection times, no changes were found for BMI or Systolic Blood Pressure (SBP) over the study. Compared to pre-measures, Diastolic Blood Pressure (DBP) significantly increased at 6 months (+3.25 mmHg to 78.0 mmHg, $p < .00$) and was not statistically higher at 12 months (+2.35 mmHg to 77.0 mmHg, $p < 0.06$). HbA1c was also significantly higher at the 6 and 12 month times, reaching 6.0 ($p < 0.02$ and < 0.01 , respectively).

We also examined changes within tertiles of each biometric measure compared to the pre-test. No differences were found for BMI. The upper SBP tertile had a significant increase at 6 months (4.4 mmHg, $p < 0.011$) that regressed to a non-significant difference at 12 months; the DBP for the upper tertile also significantly increased at 6 months (+3.3 mmHg, $p < 0.02$) that regressed to a non-significant difference at 12 months. There were no significant differences by tertile for the HbA1c measure.

Conclusions and Implications: No improvements were found for any of the four biometric measures over the course of the study. The slight increase in DBP and HbA1c, while statistically significant, would not be clinically significant, particularly since all BP measures were in the normal range. Thus, based on the findings, it does not appear that EFNEP participation improved participants' health status as indicated by the biometric measures. However, there was no comparison group in this study. It is possible that the maintenance of BMI, BP, and HbA1c could be a positive outcome if a comparison group's biometric measures got worse over time, which is possible given US population trends.

Relative to a "proof of concept," the study successfully showed that EFNEP participants were willing to be assessed on these measures, biometric measures could be accurately collected in diverse community settings, and a solid retention rate (58%) could be achieved with this low-income population using a relatively small monetary incentive and sharing with participants their personal biometric measurements. Thus, the overall study supports the potential for conduction of a larger EFNEP cost-effectiveness study that includes biometric measures and a comparison group.

Food Pantry Environmental Scan (Healthy Food Pantry Assessment Project)

Authors: Karen Barale, MS, RD, and Alexandra Bush-Kaufman, MPH, RD

Objective: The purpose of this project was to develop and test an environmental scan/observational survey known as an "e-scan" for the food pantry setting. Food pantries and food banks are regular partners with SNAP-Ed and EFNEP in the delivery of nutrition education and PSE interventions in local communities. Objectives of this project were to: 1) gather evidence of the shared best practices of food pantry partnerships in the NIFA Western Region; 2) develop and test an e-scan for the food pantry setting; and 3) disseminate the final e-scan with resources that were relevant to the target audience.

Target Audience: Local agencies that provide nutritional assistance at no-cost to clients, commonly known as "food pantries," and their SNAP-Ed and EFNEP community partners in the NIFA Western Region.

Theory/Prior Research/Rationale: The body of evidence supporting healthy retail interventions and observational evaluation form the basis of this work. The socio-ecological framework, as proposed by Story, Kaphingst, Robinson-O'Brien, and Glanz (2007), describes how physical settings may encourage or hinder the adoption of healthy nutrition and physical activity behaviors. As many people experiencing poverty restrict spending on food, the food pantry has become a regular venue where food is obtained making it an essential part of the community nutrition environment for this population. Thus, interventions directed at the environments where food is obtained, including the nutritional density of foods offered, may greatly improve health outcomes for people experiencing poverty.

Description: This project was designed in three phases. Phase one included in-depth semi-structured qualitative interviews with food pantry managers and EFNEP/SNAP-Ed implementers to determine current practices of "healthy food pantries" within the food assistance system of the NIFA Western Region. Phase two tested a draft pilot assessment tool in five states and included site visits to food pantry sites by a trained researcher who completed on-site cognitive interviews of the assessment tool content. Phase three was a field test of the food pantry environment with the assessment tool.

Evaluation: The pilot-tool was cognitively tested in follow-up interviews; the field-tool was evaluated by interrater and test-retest reliability.

Conclusions and Implications: The Healthy Food Pantry Assessment Toolkit includes the e-scan for food pantry settings; a training webinar; a Resource Guide; and an Instruction Guide. This toolkit can be used by local food pantries and their partner SNAP-Ed/EFNEP agencies to assess, identify, plan, implement, and re-assess interventions targeting this important food environment.

Behavior Checklist Validation in Conjunction with NC2169 and the EFNEP Behavior Checklist Committees

Authors: Garry Auld, PhD, Susan Baker, EdD, Karen Barale, MS, RD, CD and Katie McGirr, MS, RDN

Objectives: The objectives of this study, done in conjunction with the multi-state research group, NC2169 (now 3169): EFNEP Related Research, Program Evaluation and Outreach and the EFNEP Behavior Checklist Committees, were to 1) establish valid and reliable nutrition and food resource management (FRM) content domain questions for a food and physical activity behaviors questionnaire and 2) establish reliability and validity for food security content domain questions. RNECE – West collaborated with these groups to coordinate efforts ensuring that consistent methodologies were utilized across all research so that content domain questions could be combined into a final evaluation tool without duplication of efforts.

Target Audience: EFNEP and SNAP-Ed programs

Design:

Recruitment: Each stage of question testing was completed using convenience samples of English-speaking EFNEP or EFNEP-eligible participants in multiple states and each NIFA region of the US. Protocols were approved by the Institutional Review Board (IRB) at each university involved with data collection. Demographic information was collected for each stage of testing, including age, education, number of children in the home, race, and ethnicity.

Content validity: An expert panel, consisting of EFNEP state leaders, registered dietitians and content experts reviewed the literature to identify key concepts. In addition to this, a content analysis was conducted to assess the type, frequency, and depth of content related to each domain in the most widely used EFNEP adult curricula. A curriculum content analysis instrument was developed using indicators identified by the Community Nutrition Education Logic Model and the Dietary Guidelines for Americans (DGA) 2010. An expert panel individually reviewed the curriculum content for each domain then met to discuss their ratings. When differences in their ratings were encountered, reviewers discussed and reached consensus on a rating. Potential questions were identified from the literature or developed based on identified content areas.

Face Validity: Wording and format of the drafted items were reviewed for appropriateness by an expert panel prior to cognitive interviews with EFNEP participants. Professional program staff were trained to conduct cognitive interviews using a standard protocol and instructed to provide prompts to assess understanding and recall of information. For cognitive testing, EFNEP participants were recruited at program enrollment or completion. Each round of interviews led to refined wording of questions and response options and further cognitive interview

testing until items were easily understood and interpreted as intended by participants in different regions of the country. Participants received incentives valued at \$10 to \$20.

Construct Validity:

Nutrition: For questions in the nutrition content domain, scores were compared with mean intake from three 24-hour telephone-administered food recalls. Participants provided verbal assent and received an incentive valued at \$20.

Food Resource Management: For questions in the FRM content domain, EFNEP participants answered the FRM questions; within the 7-10 days, they participated in a telephone interview about grocery shopping behaviors. The interviews were coded and codes compared to the answers to the FRM questions. Participants provided verbal assent and received an incentive valued at \$20.

Food Security: A cross-sectional study design with EFNEP participants was used to administer the two food security items selected and the household and adult stage of the US Household Food Security Survey (HFSS) module. Participants provided verbal assent and received an incentive valued at \$20.

Overall Reliability: Reliability testing was conducted on the entire questionnaire, encompassing all domains. The test-retest method was used to assess the temporal stability reliability of the questions by giving the questionnaire to the same individuals on two separate occasions without an intervention, but with enough time between occasions for individuals to forget their initial responses. The retest was scheduled one month after initial testing since many low-income families receive monthly food assistance benefits (generally at the same time of the month) that could potentially affect food availability and access. Participants provided written consent (if required by university IRB) and received incentives valued at \$25 to \$30.

Overall Sensitivity: Sensitivity testing was conducted on the entire questionnaire, encompassing all domains. As part of normal class evaluation processes, EFNEP participants in eight states were recruited to completed the 32-question FPAQ at the beginning and end of class series.

Analysis

Content validity: For Nutrition, content validity was established by reviewing the three most frequently used curricula in EFNEP and DGA 2005. For FRM and Food Security, content validity was established by reviewing the three most frequently used curricula in EFNEP.

Face Validity: All cognitive interviews were audio recorded. Researchers listened to and typed detailed notes from each interview. Interview notes were separated based on EFNEP status (enrollment or program completion) and analyzed question-by-question for emerging themes in terms of differences in interpretation or difficulty answering questions and for suggested changes from participants. For each round of interviews, findings were reviewed by researchers to suggest revisions. Interviews, revisions to questions/responses, and subsequent rounds of interviews using revised questions/responses continued until the questions were easy to understand, interpreted as intended, and no new information was gleaned.

Construct Validity:

Nutrition: Multiple 24-hour recalls collected by phone were compared with answers to the nutrition questions.

Food Resource Management: A cross-sectional study design was used to administer the FRM items from the FPAQ and conduct in-depth telephone interviews about shopping behaviors with EFNEP participants. Answers

to the nine FRM items on the FPAQ, participant demographic information and availability for a telephone call were sent to researchers at Washington State University (WSU). A trained researcher called the participants in the following week to conduct in-depth phone interviews.

Food Security: Spearman's correlation coefficients were used to test the correlation of the score for adult food security from HFSS items with the scores of the two FPAQ food security items.

Overall Reliability: All statistical analyses were performed using SPSS software (SPSS Statistics version 22.0, IBM Corp., Armonk, NY, 2013). Participant responses for each instrument question were assigned a numeric score (1=one time a day, 2=two times per day, etc.). For test-retest assessment, participant scores from times 1 and 2 were compared using single measures intra-class correlation coefficient (ICC) and Spearman rank-order correlation. Participants were stratified by age (18-29 years, 30-39 years, 40-67 years) and race/ethnicity (Hispanic, non-Hispanic White, and Black) to assess whether responses differed across the groups using ANOVA. Paired t-tests with Bonferroni adjustment assessed differences between means from time 1 to time 2 scores for each instrument question. Additionally, nominal difference scores were calculated by subtracting time 2 from time 1 scores for each question, then combining the difference scores to: (-1=-6 to -2; 0=-1, 0 and +1; 1=2 to 6). The percentage of adults with nominal difference scores of 0 were noted, which provided an estimate of adults who reported similar responses at times 1 and 2.

Overall Sensitivity: Pre, post and difference means as well as p values for t-test and Wilcoxon test and internal correlation of post values were calculated.

Results

Participants in each testing stage were low-income, primarily women, from different regions of the US. The majority were young adults (18-39 years) and did not have a college degree, which aligns with the overall EFNEP population. Compared to national EFNEP data, lower proportions of Hispanic and higher proportions of White, non-Hispanic adults participated in testing. This difference may be due in part to the exclusion of Hispanic adults who did not speak English, because the questions were developed in English. National EFNEP data do not provide information on the percentage of non-English speaking Hispanic participants.

Nutrition

Content Validity: A panel of six nutrition experts determined which DGA nutrition recommendations were most important to teach the low-income population EFNEP serves. A second group of experts further prioritized which nutrition content areas should be evaluated in EFNEP. The EFNEP expert panel consisted of 21 researchers (state EFNEP program directors, national EFNEP program administrators, and academic researchers) from 15 states across the US.

Face Validity: Interviews were completed with 111 EFNEP participants in seven states through three rounds of revisions. Questions were re-worded based on themes that emerged in each round of interviews to improve question clarity and ease of understanding. Response options were revised to align with participants' internally-generated responses and recommendations. This process resulted in 14 questions covering the six nutrition content areas. There were no differences in the findings by region nor pre- versus post- EFNEP participation.

Reliability: Test-retest data were collected from 217 low-income adults in seven states throughout the US. Most of the reliability testing respondents were female (99%) with a mean age of 35.4 years. On average, respondents reported living with two children in the household. Most respondents identified as White (58%). Respondents

reported participation in the Supplemental Nutrition Assistance Program (SNAP) (6%), school meal programs (13%), and Special Supplemental Nutrition Program for Women, Infants and Children (WIC) 6%. Nominal difference scores (+1 difference between two time points) for each question showed >70% of adults reported similar responses for all questions between time one and two administrations (median=80.6%, range=72.4%-94.4%).

Paired t-tests showed no statistically significant differences in the means for any question between time one and two administration for all but one question.

Construct Validity: The construct validity testing for the nutrition items, using multiple 24-hour recalls did not support the nutrition items. However, there were several problems with the protocols: the recalls were not completed in a timely manner so that there was a different time frame for answering the nutrition items and the recalls; secondly, the recall interviewers failed to ask specific probing questions that would have clarified behaviors such as cooking at home versus eating out. Thus, the recalls, under the circumstances, were not an appropriate method to establish construct validity.

Food Resource Management

Content Validity: A Food Resource Management Work Group committee reviewed the literature from 2000-2013, identified and confirmed primary concepts and supporting strategies associated with FRM.

The primary strategies identified were budgeting, meal planning (planning menus, using foods on hand, decreasing food waste), shopping skills (using a grocery list, unit pricing, coupons) and cooking skills (food preparation at home). Supporting strategies included family budgeting, home food preservation, hunting and fishing, gardening, emergency planning and couponing. Existing FRM evaluation tools and questions found in the literature were also compiled and reviewed.

Face Validity: Three rounds of cognitive interviews were completed with 105 EFNEP participants in six states. During each round, questions were revised to improve question clarity and ease of understanding. Round One was conducted with 47 participants, testing 22 FRM items. Round Two was conducted with 32 participants, testing 11 FRM items. Round Three was conducted with 26 participants, testing 11 revised FRM items. Ten FRM items were recommended for reliability testing.

Reliability: Test-retest data are reported in the Nutrition section above. The FRM item “How often to you throw food away because it spoiled or expired before you could use it?” did not meet the reliability standard. It was eliminated, resulting in nine FRM items to be included in construct validity testing.

Construct Validity: Telephone interviews were conducted with 32 participants from Washington, Tennessee and New Jersey. The mean age of the participants was 32.8 years; all were female. Participants reported participation in the Supplemental Nutrition Assistance Program (88%), school meal programs (44%), and WIC (47%). Responses from both the FRM items and the interviews were collapsed into ordinal options for all the responses based on defined classifications from the Web-based Nutrition Education Evaluation and Reporting System (WebNEERS). Thus, responses were assigned into three categories: “meets recommendations”, “close to meeting recommendations”, and “does not meet recommendation”. Analysis is expected to be completed Spring 2019.

Food Security

Food security in the original EFNEP 10-question behavior checklist was measured by a single question: “How often do you run out of food before the end of the month?” While there are valid and reliable tools to measure household food insecurity such as the United States Household Food Security Survey (HFSS),⁹ these instruments are too long to be administered in an EFNEP class along with other behavioral measures. Content and face validity research studies were conducted by NC2169 researchers to select appropriate questions. This research is reported elsewhere.¹⁰ The final two items resulting from cognitive testing were “In the past month, how often did you eat less than you wanted so there was more food for your family?” (Item 1) and “In the past month, how often did you not have money or another way (such as SNAP, WIC, or a food pantry) to get enough food for your family?” (Item 2). Both items had Likert-type response options (1=Never; 2= Rarely (about 20% of the time or less); 3=Sometimes (about 40% of the time); 4=Often (about 60% of the time); 5=Usually (about 80%of the time); and 6 = Always).

Reliability: Test-retest data are reported in the Nutrition section above.

Construct Validity: Most of the respondents in the construct validity testing (n=85) were female (87%). The mean age of respondents was 35.4 years (± 11.82) and, on average, respondents reported living with two children in the household. Most respondents identified as White (68%). Federal assistance program participation was high with many respondents participating in SNAP (76%), school meal programs (69%), and WIC (41%). After completing the HFSS, one-third (33%) of the respondents were classified as food secure. The remaining 67% were classified as food insecure, with 39% reporting low food security and 28% reporting very low food security.

Higher scores on the HFSS were positively correlated with a higher score of item 1 ($r=0.532$; $p<.01$) and item 2 ($r=0.545$; $p<.01$). However, the highest correlation was observed when both items were analyzed together ($r=0.592$; $p<.01$).

Overall Sensitivity Testing

As part of normal class evaluation processes, 382 EFNEP participants in eight states completed the 32-question questionnaire at the beginning and end of class series. Eighty percent were female, mean age 37.4 years. Thirty-two percent identified as White, 23% Black; 41% identified as Hispanic but did not always indicate a race. Differences between pre- to post-means were significantly different for all items except “washing surfaces after cutting raw meat” and frequency of drinking “energy drinks,” indicating the 30 of 32 items were sensitive to change. The critical domain scales (Food Resource Management, Fruit/Vegetables, Nutrition, Physical Activity, and Food Security) showed significant pre- to post-differences according to t-tests and all but Dairy showed significant differences according to Wilcoxon tests. These critical domain scales had internal consistency values > 0.7 . Dairy, Sugar Sweetened Beverages, Cooking, and Food Safety scales had marginal internal consistency values < 0.6 . The results of the sensitivity testing in combination with the prior reliability and validity testing of the new items supports EFNEP’s use of Food and Physical Activity Questionnaire as an effective program evaluation tool

⁹ United States Household Food Security Survey – <https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/survey-tools.aspx>

¹⁰ Aragon, M. C., Barale, K. V., Walsh, J.R., Owens, N., Betz, N. (2019) Reliability & Validity Testing of Food Security Items in the EFNEP Food and Physical Activity Questionnaire. Submitted for review for Journal of the Academy of Nutrition and Dietetics.

Conclusions

This study contributed to the reliability and validity testing of new evaluation questions in three of five content domains (nutrition, food resource management, and food security) for the national EFNEP program. Validation testing of questions for the new evaluation tool involved collaborating with 34 states, representing all three of EFNEP's primary racial/ethnic groups and all geographic regions. This new tool will strengthen the evidence-base for nutrition education programs for low-income families.

Environmental Barriers to Healthful Dietary and Physical Activity Behaviors in the EFNEP Participant Population

Authors: Garry Auld, PhD and Lauren Rhoades, Graduate Student, Colorado State University

Objectives: To develop an understanding of 1) environmental barriers that directly impact dietary and physical activity (PA) behaviors in the Expanded Food and Nutrition Education Program (EFNEP) and SNAP-Ed participant populations, and 2) environmental changes that may encourage more healthful behaviors in this population.

Design: The authors conducted telephone focus groups (n=10) with paraprofessional educators. Focus groups used a semi-structured script reviewed by an expert panel and pilot-tested with a group of Colorado EFNEP educators.

Participants: EFNEP and/or SNAP-Ed paraprofessional educators (n=50) from 10 different US states representing all National Institute of Food and Agriculture regions.

Main Outcome Measures: Key themes and quotations relevant to environmental barriers experienced by this population and educator-generated ideas for solutions to target each barrier.

Analysis: Two reviewers independently coded each transcript then met to come to consensus on themes related to environmental themes and potential solutions.

Results: Concordant with existing literature, reduced availability, high costs, a lack of adequate transportation, and safety concerns emerged as key barriers to accessing and utilizing healthful dietary and physical activity resources within this population. The educators also provided valuable ideas for strategies to target each barrier. For example, potential solutions to the availability barrier include creating mobile farmers' markets, partnering with volunteer groups to provide free delivery of food from food banks or retailers to areas with limited access, working with alternative retailers (e.g. dollar stores) to offer produce in urban areas, providing free seeds to encourage home gardening, and facilitating development of or participation in community gardens.

Conclusions and Implications: Environmental barriers are complex, multifactorial, and often interrelated. Employing policy, systems, and environmental change (PSE) efforts in combination with direct nutrition and physical activity education is the most effective means of promoting healthful behavior change in the low-income population. Additional research is needed to understand how to best incorporate PSE into EFNEP/SNAP-Ed programs with the potential for including PSE activities for participants in direct education lessons.

Testing of Methods to Reach Program Graduates Long-Term

Authors: Garry Auld, PhD, Susan Baker, EdD, Katie McGirr, MS, RDN

Objectives: The objectives of this study were to determine 1) which, if any, follow-up method for contacting graduates was most effective and 2) graduates' willingness to complete additional assessments.

Target Audience: Three EFNEP programs participated in the study: Colorado, Kentucky, and West Virginia.

Design: In each state, we randomly assigned 120 graduates at both 6 and 12 months post-graduation to contact using one of six methods. Those methods were a phone call by their educator, a text from their educator, a phone call or text from the state office, and an email or postal mail from the state office. For the phone calls, three attempts were made to reach a graduate before dropping the "subject." To be clear, graduates were not aware that we would be contacting them, i.e., these were cold contacts.

Results: There was no clear pattern by state, time, or method but several points are worth considering. Only about 20% of the graduates were reached in total, suggesting cold contacts post-graduation are not particularly effective. Calls from the educator were the best way to reach participants (32% and 47% at 6 or 12 months, respectively) while educator texts reached about a fifth of participants. The success of phone calls from the state EFNEP office appeared to be more effective at 12 months (28%) than 6 months (13%) post-graduation although we cannot offer a rationale for this finding. Postal mail or text messages from the state EFNEP office were the least effective approaches. Relative to the second objective, more than half indicated they would, or probably would, complete the seven types of evaluations; 58-67% were willing to complete a questionnaire, dietary recall, interview, or allow BMI and blood pressure to be collected. Looking at the responses on the 4-point Likert scale, the average fell just under 3 (range 2.64-2.95), i.e., closer to "probably yes" than "probably not."

Conclusions and Implications: Given the small sample from only three states and low response rates, any conclusions from this study should be viewed with caution. In addition, the respondents were likely not representative of all EFNEP graduates as they presumably had more stable living arrangements (they could be found) and, perhaps, had a more positive EFNEP experience which could increase their willingness to respond.

However, it certainly appears that cold contacts would not give a high or representative response with this audience. Of the approaches, those for which the educator directly contacted the graduates (phone or text) seemed to provide a better response rate, perhaps reflecting an established positive relationship. Educators often have to provide their phone numbers to participants early in the class series so that participants recognize the number and answer the phone call. Participants are often unwilling to answer unknown numbers. This may be why response rates were higher when educators initiated the contact from their phones. On a more positive note, of those reached (albeit a non-representative sample), most expressed a willingness to complete a variety of evaluations including several biometric measures.

The findings suggest that there is a potential for finding graduates and collecting objective, long-term data that could be used to further establish the benefits of EFNEP participation. There is the need for more testing of approaches to reach graduates, e.g., by alerting them at the end of the program about future attempts to reach them, maintaining some form of contact post-program, and/or the use of incentives.

Summary of Secondary Data Analyses of National EFNEP Data Years 2007-2014

Authors: Garry Auld, PhD and Susan Baker, EdD, Colorado State University (RNECE – West)

Objective: To summarize national EFNEP data over multiple years and determine any trends in outcomes.

Design: Analysis of national NEERS and WebNEERS data from years 2007-2014 including demographics of participants and outcome measures from the behavior checklist and dietary recalls.

Participants: All EFNEP participants (n = 512,899) from 2007-2014 who had complete pre- and post-test data (recalls and behavior checklist).

Main Outcome Measures: Race/ethnicity, education level and, from the dietary recalls, Healthy Eating Index (HEI) scores, fruit and vegetable intake and, from the behavior checklist, three scales: food resource management, food safety, and nutrition.

Analysis: Descriptive statistics, dependent t-test comparisons of pre- and post-data, and frequency patterns of outcomes by state across time.

Results: EFNEP participants identified as 30% White, 30% Black, and 30% Hispanic. Those identifying as Hispanic often did not select a race. The West is much higher in Hispanic participants (57%). About one-third of all participants have less than a high school education. Pre- to post-differences included a gain in HEI of 1-12 points (70% ranged from 3-7 pts); increases in fruit and vegetable intake ranged from a half to one serving. Consistent, modest increases were seen in BCL subscale scores – mostly a 0.5-1 point increase on a 5-point scale. Consistent pre-test scores and difference scores (Post minus pre) within states were seen over eight years for both the BCL and the 24 HR recall (HEI total).

Conclusions and Implications: While the varied demographics of EFNEP participants may present challenges for educators, it appears that positive outcomes are consistent across land-grant university EFNEP programs and time. EFNEP participants improved their diet quality over the period of program participation based on positive changes in 9 of 12 HEI 2005 subcomponents. While there is limited evidence in the research literature to document the significance of the level of change noted in the feasibility study, any increase in HEI reflects improved dietary quality. Improved diet quality is an indicator of improved health. Comparisons of HEI change among the national EFNEP population have not been previously noted in impact reporting. EFNEP's database, which includes a huge number of individuals, multiple years of data, and large numbers of variables, is an asset that has not been fully examined.

Sub-award Project Abstracts

Two-Year Assessment of Youth Participatory Action Research – A PSE Intervention

Authors: Sharon Sugerman, Public Health Institute

Objective: Compile Youth Participatory Action Research (YPAR) Evaluation Manual and set of evaluation instruments for use with YPAR. Develop protocol for end-of-year Youth Survey Reliability Study and guidelines for Baseline End-of-Year Youth Survey Reliability Study.

Target Audience: EFNEP/SNAP-Ed eligible middle school students, adult mentors and EFNEP/SNAP-Ed implementers.

Theory/Prior Research/Rationale: The socio-ecological framework forms the basis for this work. The project was planned to strengthen the evidence base of an existing policy, system and environmental change (PSE) intervention. YPAR is a practice-based intervention according to the 2014 SNAP-Ed PSE Strategies and Intervention Toolkit. YPAR is currently used in some SNAP-Ed projects where it has resulted in meaningful youth-driven PSE efforts.

Description: An evaluation toolkit was compiled based on the Youth Engagement Intervention in California. The toolkit includes overview of the development of the evaluation tools, instructions for use of data collections tools and the suggested evaluation process for YPAR.

Evaluation: A protocol to assess reliability of specific evaluation tools was developed; the research can be initiated if additional funding is available in the future.

Conclusions and Implications: The evaluation toolkit compilation will benefit programs implementing YPAR by providing a systemic approach to program evaluation. Additional funding is needed to conduct the reliability research for specific tools.

Sugar-Sweetened Beverage Intake among EFNEP Participants – An Evaluation Using the National EFNEP Database

Authors: Bret Luick, PhD, University of Alaska Fairbanks

Objective: To evaluate the impact of Expanded Food and Nutrition Education Program (EFNEP) class series on sugar-sweetened beverage (SSB) intake in the NIFA Western Region (WR). Analysis compared the quantity, quality, and cost of foods between recalls including SSBs.

Target Audience: EFNEP participants in 2014 from the NIFA Western Region.

Description: A secondary analysis of the EFNEP WR 24-hour recall data set from 2014. Specifically, a pre- to post-EFNEP class series comparison was made of the quantity and cost of sugar-sweetened beverages (SSB) consumed by EFNEP participants. The change in diet quality at the population level as estimated by the Healthy Eating Index 2010 (HEI-2010) is also reported.

Methods: Diet recall data for the 2014 EFNEP participants were imported into a SAS statistical program. The data included demographics of participants. Analysis was limited to adult female participants and cases that had matched pre- and post-intervention recalls.

Each diet recall included individual food items coded with a USDA Agricultural Research Service (ARS) Food and Nutrient Database for Dietary Studies (FNDDS) food code number. The HEI is a measure of diet quality summed from 12 sub-scores based on reported food consumption. The USDA Center for Nutrition Policy and Promotion has a food price database for the FNDDS food codes, based on 2003-2004 food prices. Prices were inflation-adjusted to 2016 and merged with the EFNEP database.

Results: The sample included 9,987 cases. At pre, 68% of cases did not report SSB intake. Across all pre-recalls, the SSB energy intake accounted for 5.9% of calories, however, among those that did report SSB intake, SSBs accounted for 15.1% of calories. Median energy intake was 13% higher among SSB consumers than non-consumers in the initial recall. At the post, 77% of cases did not report SSB intake. Across all post-intervention recalls, the SSB energy intake accounted for 2.4% of calories reported. Among those that did report SSB intake, SSBs accounted for 6.8% of calories. Median energy intake was 24% higher among SSB consumers than non-consumers.

57% of participants did not report SSB intake in either recall; 12% of participants reported SSB intake in both recalls. Mean SSB intakes were 259 vs. 241 kcal/d (initial/final), although the data was highly skewed.

Conclusions and Implications: In paired comparisons, caloric intake from SSBs dropped from initial to final recall, showing some positive effect of EFNEP on decreasing SSB consumption. At the population level, there was little effect on SSB-based median caloric intake when comparing pre- to post-recalls. However, when making paired comparisons, there was a significant reduction in energy from SSBs following EFNEP. The effect of EFNEP, as estimated by initial to final score change, indicates improvements in both Total HEI and Solid Fats and Added Sugar scores.

Evaluation of a novel, low-cost, low-burden, scalable technology for evaluating EFNEP and SNAP-Ed Effectiveness

Authors: Carrie Durward, PhD, Utah State University; John Hurdle, PhD and Patricia Guenther, PhD, University of Utah

Objective: The primary objective of this study was to evaluate a technology for assessing the long-term effectiveness of SNAP-Ed and EFNEP in a novel, inexpensive, and scalable way that does not burden program participants. This novel technology detects changes in grocery purchases using customer loyalty cards to identify households, and can quantify expenditures on food groups of interest.

Target Audience: EFNEP and SNAP-Ed participants in Utah.

Methods: Twelve EFNEP and SNAP-Ed nutrition educators in Utah recruited a total of 60 program participants. Participants filled out a short survey, which included their grocery loyalty card number or other identifying information that could be used to identify their household's purchases. The researchers' plan had been to assess changes in fruit, vegetable, whole grain, and dairy grocery expenditures before and after participating in the nutrition education program. However, the difficulty encountered in working with the grocery store partner resulted in the grant ending before data were delivered by the grocery store partner.

Results/Conclusions/Implications: The process evaluation found that these study procedures are feasible, though more time than had been anticipated was needed for participant recruitment, that paperwork should be further simplified and minimized, and that dedicated data collection staff should be considered instead of having educators collect data.

Multi-Disciplinary Methods for Effective, Sustainable, and Scalable Evaluations of Nutrition Education Programs (RNECE Longitudinal Research Study)

Authors: Carrie Durward, PhD, Utah State University and Patricia Guenther, PhD, RD, University of Utah

Objectives: To assess two tools used to evaluate EFNEP and SNAP-Ed.

Design: Objective 1: First, the feasibility of using the Automated Self-Administered 24-Hour Dietary Assessment Tool (ASA24) to assess the diets of women who are SNAP eligible was determined in a controlled environment. This study evaluated the accuracy of ASA24 recalls completed independently and with assistance. Women served themselves from a buffet; amounts taken as well as plate waste were unobtrusively weighed to enable calculation of true intake for three meals. The following day, women completed ASA24-2016 independently (n=148) or with assistance from a trained paraprofessional in a small group (n=154). Regression modeling was used to examine differences by condition in agreement between true and reported foods; energy, nutrient and food group intakes; and portion sizes.

Objective 2: In the second objective, a tool assessing for the quality of household grocery food purchases was developed and evaluated. Household food purchases are potential indicators of the quality of the home food environment, and grocery purchase behavior is a main focus of USDA nutrition education programs; therefore, an objective measure of grocery purchases is needed. The Grocery Purchase Quality Index-2016 (GPQI-2016) was developed and then evaluated by using the Healthy Eating Index-2015 (HEI-2015) as the reference standard. In 2012 the USDA Economic Research Service conducted the National Household Food Acquisition and Purchase Survey. Members of participating households recorded all foods acquired for a week. Foods purchased at stores were mapped to the 29 food categories used in USDA Food Plans, expenditure shares were estimated, and GPQI-2016 scores were calculated. USDA food codes, provided in the survey database, were used to calculate the HEI-2015.

Results: Objective 1: Study participants who completed ASA24 independently versus with assistance reported matches for 71.9% and 73.5% (p=0.26) of items truly consumed, respectively. Exclusions (consumed but not reported) were highest for lunch (at which participants consumed about twice the number of distinct foods/beverages compared to breakfast and dinner). Commonly excluded foods were additions to main dishes (e.g., tomatoes in salad). On average, excluded foods contributed 43.6 grams/46.2 kcal and 40.1 grams/43.2 kcal among those in the independent and assisted conditions, respectively. Gaps between true and reported intake were different between conditions for iron and folate. Within conditions, significant gaps were observed for protein, vitamin D, and meat (both conditions); vitamin A, iron, and magnesium (independent); and folate, calcium, and vegetables (assisted). For foods and beverages for which matches were reported, no difference in the gap between true and reported portion sizes was observed (p=0.22). ASA24 performed relatively well among women with low-incomes; however, accuracy was somewhat lower than previously observed among adults with a range of incomes. The provision of assistance did not significantly impact accuracy. A study of the feasibility of the ASA24 in the field is currently underway using data collected from EFNEP programs in four states.

Objective 2: All households in the 48 contiguous states were eligible for the survey. The analytic sample size was 4276 households. The Spearman's correlation coefficient for the total GPQI-2016 score and the total HEI-2015 score was 0.70. For the component scores, the strongest correlations were for Total and Whole Fruit (0.89-0.90); the weakest were for Dairy (0.67), Refined Grains (0.66), and Sweets & Sodas/Added Sugars (0.65) (p<0.01 for all). Regression models revealed that both the GPQI-2016 and the HEI-2015 were significantly different among

subgroups of households in expected directions. Overall, the GPQI-2016, estimated from a national survey of households, performed similarly to the HEI-2015. The tool has potential for evaluating nutrition education programs and retail-oriented interventions when the nutrient content and gram weights of foods purchased are not available. A study of the feasibility of using the GPQI-2016 in the field is currently underway using data collected from EFNEP and SNAP-Ed programs in six states.

APPENDIX C

Presentations

RNECE – West

Conference Poster Presentations

- Auld, G., Baker, S., Batchelder, J. (April 2016). *Pilot Study for Assessing Moderate to Long-Term Outcomes of the Expanded Food and Nutrition Education Program (EFNEP)*. Annual Meeting of Experimental Biology (EB) 2016. San Diego, CA. (peer reviewed)
- Baker, S., Barale, K., Auld, G., McGirr, K., Bush-Kaufman, A. (February 2017). *Regional Nutrition Education Center of Excellence West*. 2017 Association of SNAP Nutrition Education Administrators (ASNNA) Conference. Arlington, VA.
- Barale, K. Bush-Kaufman, A., Walsh, M. 2017. Initial Development of a Scored Food Pantry Environmental Assessment E-scan. *Journal of Nutrition Education and Behavior*, 49 (7S1): S46-S47.
<https://doi.org/10.1016/j.jneb.2017.05.246>. (peer reviewed)
- Bush-Kaufman, A., Walsh, M., Aragón, M.C, Barale, K. 2017. Adaptation of Content Validity Index Methodology to Review a Resource Guide for Food Pantries. *Journal of the Academy of Nutrition and Dietetics*. 117(10):A146. (peer reviewed)
- Barale, K., Bush-Kaufman, A. 2018. The Healthy Food Pantry Assessment Tool. Academic Showcase, Washington State University, March 29, 2018. <https://s3.wp.wsu.edu/uploads/sites/1118/2018/03/2018-Academic-Showcase-and-GPSA-Research-Exposition-Summary-Booklet.pdf> (peer reviewed)
- Bush-Kaufman, A., Barale, K. Walsh, M., Sero, R. 2018. Exploratory Thematic Analysis of Strategies to Improve the Healthfulness of the Food Pantry Environment. *Journal of Nutrition Education and Behavior*, 50 (7S), S87. (peer reviewed)

Conference Oral Presentations

- Baker, S, and Barale, K. Regional Nutrition Education and Obesity Prevention centers of Excellence. What's in it for you? American Association of SNAP Directors - 40th Annual SNAP Education Conference, November 8, 2015. Seattle, WA.
- Baker, S, and Barale, K. RNECE – West Update. USDA – NIFA/FNS Briefing. December 17, 2015.
- Guenther, P.M., Evaluation of a novel, low cost, low burden, scalable technology for evaluating EFNEP and SNAP-Ed effectiveness. Presented at the annual meeting of NC 2169, October, 2015, Portland, ME.
- Hurdle JF. Nutritional Data Mining: measuring household grocery quality for clinical and public health applications Low burden, scalable tools to improve dietary health. Invited seminar, University Utah Department of Biomedical Informatics, Salt Lake City, UT. Sep 2015.
- Brewster, P.J., Guenther, P.M., Jordan, K.C., Hurdle, J.F. An innovative approach to assessing food purchase behavior. Presented at the 39th National Nutrient Databank Conference, May, 2016, Alexandria, VA. (peer reviewed)
- Guenther, P.M., Validating the Mobile ASA24 in the Low Income Population. Presented at the mid-year virtual meeting of NC 2169, June, 2016.

Hurdle JF. Nutritional Informatics: measuring household grocery quality for clinical and public health applications
Low burden, scalable tools to improve dietary health. Invited seminar, Oregon Health and Sciences University,
Portland, OR. Feb 2016.

Tran LT, Brewster PJ, Chidambaram V, Hurdle JF. Estimating USDA FPED Components Based on Grocery Sales Data:
Towards the Improvement of Dietary Quality Assessment of Grocery Purchases. National Nutrient Databank
Conference. Arlington, VA. May 2016. *(peer reviewed)*

Barale, K., Bush-Kaufman, A. "The Healthy Food Pantry Assessment Tool." FNS Western Region Quarterly SNAP-Ed
Call. April 20, 2017.

Bush-Kaufman, A. "The Healthy Food Pantry Assessment Tool." Western Region EFNEP Coordinators Meeting.
Fairbanks, AK. May 24, 2017.

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Communities." Hunger + Health Feeding America Blog.

<https://hungerandhealth.feedingamerica.org/2018/10/healthy-food-pantry-assessment-toolkit-evaluation-tool-local-food-pantries-communities/>. October 29, 2018.

APPENDIX D

Peer-Reviewed Publications

RNECE – West

Peer-Reviewed Publications

Murray, E., Auld, G., Inglis-Widrick, R., Baker, S. (2015) *Nutrition Content in a National Nutrition Education Program for Low-Income Adults: Content Analysis and Comparison to the US Dietary Guidelines*. *Journal of Nutrition Education and Behavior*, 47(6), 566-573.

Murray, E., Auld, G., Baker, S., Barale, K., Franck, K., Khan, T., Palmer-Keenan, D., Walsh, J. (2017) *Methodology for Developing a New EFNEP Food and Physical Activity Behaviors Questionnaire*. *Journal of Nutrition Education and Behavior*, 49 (9), 777-783.

Tran LT, Brewster PJ, Chidambaram V, Hurdle JF. (2017) An innovative method for monitoring food quality via assessment of healthfulness of consumers' grocery purchases. *Nutrients*. May 5;9(5).

Murray, E., Baker, S., Auld, G. (2018) *Nutrition Recommendations from the US Dietary Guidelines Critical to Teach Low-Income Adults: Expert Panel Opinion* *Journal of the Academy of Nutrition and Dietetics*. 118(2) 201-203, 205-210.

Bush-Kaufman, A., Barale, K., Aragón, M.C., Walsh, M. (2018) *Development and Testing of the Healthy Food Pantry Assessment Tool (HFPAT), an Observational Survey for Food Assistance Settings*. *Journal of Nutrition Education and Behavior*. <https://doi.org/10.1016/j.jneb.2018.10.004>.

APPENDIX E

Behavior Checklist Validation: Technical Report

TECHINICAL REPORT: BEHAVIOR CHECKLIST VALIDATION IN CONJUNCTION WITH NC2169

The objectives of this research were to 1) establish valid and reliable nutrition and food resource management content domain questions for a food and physical activity behaviors questionnaire and 2) establish reliability and validity for food security content domain questions. The work was done in conjunction with the multi-state research group, NC2169: EFNEP Related Research, Program Evaluation and Outreach and the EFNEP Behavior Checklist Committees and coordinated to prevent duplication of efforts.

The design of the project¹¹ was as follows:

At the beginning of the project, we surveyed EFNEP state program leaders to find out which curricula were used. The survey indicated that in 2014, three curricula were used in 46 out of 75 EFNEP programs and reached an estimated 78% of EFNEP adult participants: Eating Smart • Being Active (Colorado State University), Eating Smart and Moving More (North Carolina State University) and Healthy Food, Healthy Families (Texas A&M University).¹² Each curriculum was examined to determine what concepts were currently being taught. This provided a baseline for question development.

Recruitment: Each stage of question testing was completed using convenience samples of English-speaking EFNEP or EFNEP-eligible participants in multiple states and each NIFA region of the US. Protocols were approved by the Institutional Review Board (IRB) at each university involved with data collection. Demographic information was collected for each stage of testing, including age, education, number of children in the home, race, and ethnicity.

Content validity: An expert panel, consisting of EFNEP state leaders, registered dietitians and content experts reviewed the literature to identify key concepts. In addition to this, a content analysis was conducted to assess the type, frequency, and depth of content related to each domain in the most widely used EFNEP adult curricula. A curriculum content analysis instrument was developed using indicators identified by the Community Nutrition Education Logic Model¹³ and the Dietary Guidelines for Americans (DGA), 2010.¹⁴ An expert panel individually reviewed the curriculum content for each domain then met to discuss their ratings. When differences in their ratings were encountered, reviewers discussed and reached consensus on a rating. Potential questions were identified from the literature or developed based on identified content areas.

Face Validity: Wording and format of the drafted items were reviewed for appropriateness by an expert panel prior to cognitive interviews with EFNEP participants. Professional program staff were trained to conduct cognitive interviews using a standard protocol and instructed to provide prompts to assess understanding and recall of information. For cognitive testing, EFNEP participants were recruited at program enrollment or completion. Each round of interviews led to refined wording of questions and response options and further cognitive interview

¹¹ Murray E.K., Auld G., Baker S.S., Barale K., Franck K., Khan T., Palmer-Keenan D., and Walsh J. (2017) Methodology for Developing a New EFNEP Food and Physical Activity Behaviors Questionnaire. *Journal of Nutrition Education and Behavior*, 49(9):777-783. <http://dx.doi.org/10.1016/j.jneb.2017.05.341>

¹² Murray, E., Auld, G., Inglis-Widrick, R., Baker, S. (2015) *Nutrition Content in a National Nutrition Education Program for Low-Income Adults: Content Analysis and Comparison to the US Dietary Guidelines*. *Journal of Nutrition Education and Behavior*, 47(6), 566-573.

¹³ Community Nutrition Education Logic Model. USDA/NIFA Revision 3 of 2002 CNE Logic Model, February 2014. <https://nifa.usda.gov/sites/default/files/resource/CNE%20Logic%20Model%20-%20Detailed%20Version.pdf>

¹⁴ Dietary Guidelines for Americans. <https://health.gov/dietaryguidelines/2010/>

testing until items were easily understood and interpreted as intended by participants in different regions of the country. Participants received incentives valued at \$10 to \$20.

Reliability: Reliability testing was conducted on the entire questionnaire, encompassing all domains. The resulting questionnaire was named the Food and Physical Activity Questionnaire (FPAQ). The test-retest method was used to assess the temporal stability reliability of the questions by giving the questionnaire to the same individuals on two separate occasions without an intervention, but with enough time between occasions for individuals to forget their initial responses. The retest was scheduled one month after initial testing since many low-income families receive monthly food assistance benefits (generally at the same time of the month) that could potentially affect food availability and access. Participants provided written consent (if required by university IRB) and received incentives valued at \$25 to \$30 based on respective universities fund availability.

Construct validity:

Nutrition: For questions in the nutrition content domain, scores were compared with mean intake from 3, 24-hour telephone-administered food recalls. Participants provided verbal assent and received an incentive valued at \$20.

Food Resource Management (FRM): For questions in the food resource management content domain, EFNEP participants answered the nine FRM questions; within the 7-10 days, they participated in a telephone interview about grocery shopping behaviors. The interviews were coded by two researchers and codes compared to the answers to the FRM questions. Participants provided verbal assent and received an incentive valued at \$20.

Food Security: A cross-sectional study design with EFNEP participants was used to administer the two food security items from the FPAQ and compare them to the household and adult stage of the US Household Food Security Survey (HFSS) module¹⁵ Participants provided verbal assent and received an incentive valued at \$20.

Sensitivity: The 32-question FPAQ and demographic forms were completed by participants at the beginning and end of the class series as part of normal program processes in eight states. Deidentified data was analyzed to determine sensitivity to changes.

Analysis of the data occurred as follows:

Content validity: For Nutrition, content validity was established by reviewing the most often used curricula in EFNEP and DGA 2005. For Food Resource Management and Food Security, content validity was established by reviewing the same curricula.

Face Validity: All cognitive interviews were audio recorded. Researchers listened to and typed detailed notes from each interview. Interview notes were separated based on EFNEP status (enrollment or program completion) and analyzed question-by-question for emerging themes in terms of differences in interpretation or difficulty answering questions and for suggested changes from participants. For each round of interviews, findings were reviewed by researchers to suggest revisions. Interviews, revisions to questions/responses, and subsequent rounds of interviews using revised questions/responses continued until the questions were easy to understand, interpreted as intended, and no new information was gleaned.

Reliability: All statistical analyses were performed using SPSS software (SPSS Statistics version 22.0, IBM Corp., Armonk, NY, 2013). Participant responses for each instrument question were assigned a numeric score (1=one

¹⁵ US Household Food Security Survey (HFSS) module (<https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/survey-tools.aspx>).

time a day, 2=two times per day, etc.). For test-retest assessment, participant scores from the first and second tests were compared using single measures intra-class correlation coefficient (ICC) and Spearman rank-order correlation. These methods are generally used to assess test-retest reliability, though the ICC also assesses within subject agreement. ICC can be interpreted as: 0.00–0.10=virtually no agreement, 0.11–0.40=slight agreement, 0.41–0.60=fair agreement, 0.61–0.80=moderate agreement, and 0.81–1.0=substantial agreement. Spearman correlations are used to assess the association between two measures that may not have a linear relationship (question scores), and can be interpreted as: 0.00–0.10= very weak, 0.20–0.39=weak, 0.40–0.59=moderate, 0.60–0.79=strong, and 0.80–1.0=very strong. Participants were stratified by age (18-29 years, 30-39 years, 40-67 years) and race/ethnicity (Hispanic, non-Hispanic White, and Black) to assess whether responses differed across the groups using ANOVA. Paired t-tests with Bonferroni adjustment assessed differences between means from time 1 to time 2 scores for each instrument question. Additionally, nominal difference scores were calculated by subtracting time 2 from time 1 scores for each question, then combining the difference scores to: (-1=-6 to -2; 0=-1, 0 and +1; 1=2 to 6). The percentage of adults with nominal difference scores of 0 were noted, which provided an estimate of adults who reported similar responses at times 1 and 2.

Construct validity:

Nutrition: Multiple 24-hour recalls were collected by phone and compared with answers to the nutrition questions. The intention was to collect the recalls within seven to ten days of the completion of the survey questions.

Food Resource Management: A cross-sectional study design was used to administer the food resource management items from the FPAQ and conduct in-depth telephone interviews about shopping behaviors with EFNEP participants. Answers to the nine FRM items on the FPAQ, participant demographic information and availability for a telephone call were sent to researchers at Washington State University. A trained researcher called the participants in the following week to conduct in-depth phone interviews. Exclusion criteria included: not answering the telephone after three separate telephone calls, low English proficiency, or insufficient/inaccurate contact information.

Food Security: Spearman's correlation coefficients were used to test the correlation of the score for adult food security from the HFSS items with the scores of the two FPAQ food security items.

Sensitivity: Chronbach's alpha was used to test a priori scales; p values for pre- to post- differences were determined using both paired t-test and Wilcoxon rank sign test. In addition, means of difference (post minus pre), pre- and post-scores for each item along with the min/max, median, and quartiles 1 and 3 values were determined.

Results of Validation Testing

Participants in each testing stage were low-income, primarily women, from different regions of the US. The majority were young adults (18-39 years) and did not have a college degree, which aligns with the overall EFNEP population. Compared to national EFNEP data, lower proportions of Hispanic and higher proportions of White, non-Hispanic adults participated in testing. This difference may be due in part to the exclusion of Hispanic adults who did not speak English, because the questions were developed in English. National EFNEP data do not provide information on the percentage of non-English speaking Hispanic participants.

Nutrition

Content Validity: A panel of six nutrition experts determined which DGA nutrition recommendations were most important to teach the low-income population EFNEP serves. A second group of experts further prioritized which nutrition content areas should be evaluated in EFNEP. This EFNEP expert panel consisted of 21 researchers (state EFNEP program leaders, national EFNEP program administrators, and academic researchers) from 15 states across the US.

Face Validity: Interviews were completed with 111 EFNEP participants in seven states through three rounds of revisions. Questions were re-worded based on themes that emerged in each round of interviews to improve question clarity and ease of understanding. Response options were revised to align with participants' internally-generated responses and recommendations. This process resulted in 14 questions covering the six nutrition content areas. There were no differences in the findings by region nor pre- versus post-EFNEP participation.

Construct Validity: Sixty sets of pre-recalls and 30 sets of post-recalls were collected. The construct validity testing for the nutrition items, using multiple 24-hour recalls did not support the nutrition items. However, there were several problems with the protocols: the recalls were not completed in a timely manner so that there was a different time frame for answering the nutrition items and the recalls; secondly, the recall interviewers failed to ask specific probing questions that would have clarified behaviors such as cooking at home versus eating out. Thus, the recalls, under the circumstances, may not have been an appropriate method to establish construct validity.

Food Resource Management

Content Validity: A Food Resource Management Work Group reviewed the literature from 2000-2013, identified and confirmed primary concepts and supporting strategies associated with FRM.

The primary strategies identified were budgeting, meal planning (planning menus, using foods on hand, decreasing food waste), shopping skills (using a grocery list, unit pricing, coupons) and cooking skills (food preparation at home). Supporting strategies included family budgeting, home food preservation, hunting and fishing, gardening, emergency planning and couponing. Existing FRM evaluation tools and questions found in the literature were also reviewed.

The three most frequently used curricula across EFNEP nationally were reviewed to determine the type, frequency, and depth of FRM content. A curricula content analysis instrument, based on the tool used for the nutrition domain, was developed to capture all content related to FRM and to compare this content to recommended practices. Two researchers individually rated the curricula content, met to review their ratings and discussed discrepancies, then mutually agreed on how to rate each discrepancy. The results of the content analysis were compared with the FRM recommendations outlined by the FRM Work Group.

Face Validity: Three rounds of cognitive interviews were completed with 105 EFNEP participants in six states. During each round, questions were revised to improve question clarity and ease of understanding. Round One was conducted with 47 participants in Washington, Colorado, Maine, and Kentucky, testing 22 FRM items. Round Two was conducted with 32 participants in Washington, Maine, Florida and Nevada, testing 11 FRM items. Round Three was conducted with 26 participants in Washington, Colorado, and Tennessee, testing 11 revised FRM items. Ten FRM items were recommended for reliability testing.

Reliability: The FRM item “How often do you throw food away because it spoiled or expired before you could use it?” did not meet the reliability standard. It was eliminated, resulting in nine FRM items to be included in construct validity testing.

Construct Validity: Telephone interviews were conducted with 32 participants from Washington, Tennessee and New Jersey. Demographic information is shown in Table 5.

Table 5. Demographic Data of Food Resource Management Interview Respondents

Variable	Number (%) or Range (#)
Gender – Female	32 (100)
Age – Mean	32.81 (range 19-58)
Number of Children at Home	1.56 (range 0-3)
Race**	
American Indian or Alaskan Native	1 (3)
Black	9 (28)
White	24 (75)
Ethnicity	
Hispanic	4 (13)
Non-Hispanic	28 (87)
Education Group	
< Grade 12	7 (24)
HS or GED	13 (41)
Some College	11 (34)
College Grad	1 (0)
Participation in Public Assistance**	
SNAP	28 (88)
WIC	15 (47)
Free or Reduced-Price School Lunch or Breakfast	14 (44)
TEFAP	8 (25)
TANF	7 (22)
Head Start	2 (6)
Other assistance	3 (9)
Timing of EFNEP Class	
Early*	15 (47)
Late [†]	17 (53)
Curriculum	
<i>Eating Smart • Being Active</i>	21 (66)
<i>Eating Smart, Moving More</i>	11 (34)
State	
Washington	13 (41)
Tennessee	11 (34)
New Jersey	8 (25)
<p><i>GED</i> = General Education Development test or certificate completion, considered equivalent to a high school diploma in the USA <i>SNAP</i> = Supplemental Nutrition Assistance Program, also known as “Food Stamp Program” <i>TANF</i> = Temporary Assistance for Needy Families <i>TEFAP</i> = The Emergency Food Assistance Program, also known as “commodity food assistance”</p>	

WIC = Supplemental Nutrition Assistance for Women, Infants, and Children

**Participants may select more than one, therefore total \neq 32

*Early timing means the participant completed their questionnaire and interview within the first 4 EFNEP classes

†Late timing means the participant completed their questionnaire and interview after attending 5 or more EFNEP classes

At the time of the interview, 47% of the sample had completed four or fewer classes; the remainder completed 5 or more lessons. Responses from both the FRM items and the interviews were collapsed into ordinal options for all the responses based on whether individual responses met recommendations. Thus, responses were assigned into three categories: “met recommendations”, “close to meeting recommendations”, and “does not meet recommendations” based on WebNEERS classifications. These criteria for this ordinal scale are the same criteria used for the sensitivity analyses. Data analysis is ongoing and should be completed by Spring 2019.

Food Security

Food security in the original EFNEP 10-question behavior checklist was measured by a single question: “How often do you run out of food before the end of the month?” While there are valid and reliable tools to measure household food insecurity such as the United States Household Food Security Survey (HFSS),¹⁶ these instruments are too long to be administered in an EFNEP class along with other behavioral measures. Content and face validity research studies were conducted by NC2169 researchers to select appropriate questions. This research is reported elsewhere.¹⁷ The final two items resulting from cognitive testing were “In the past month, how often did you eat less than you wanted so there was more food for your family?” (Item 1) and “In the past month, how often did you not have money or another way (such as SNAP, WIC, or a food pantry) to get enough food for your family?” (Item 2). Both items had Likert-type response options (1=Never; 2= Rarely [about 20% of the time or less]; 3=Sometimes [about 40% of the time]; 4=Often [about 60% of the time]; 5=Usually [about 80%of the time]; and 6 = Always).

Construct Validity: Eighty-five participants, primarily female (87%) completed the study. The mean age of participants was 35.4 years (\pm 11.82) and, on average, they reported living with two children in the household. Most identified as White (68%). Federal assistance program participation was high with many participating in SNAP (76%), school meal programs (69%), and WIC (41%). After completing the HFSS, one-third (33%) of the participants were classified as food secure. The remaining 67% were classified as food insecure, with 39% reporting low food security and 28% reporting very low food security. Higher scores on the HFSS were positively correlated with a higher score of item 1 ($r=0.532$; $p<.01$) and item 2 ($r=0.545$; $p<.01$). However, the highest correlation was observed when both items were analyzed together ($r=0.592$; $p<.01$).

Reliability

Test-retest data were collected from 217 low-income adults in seven states throughout the US. Most of the reliability testing respondents were female (99%) with a mean age of 35.4 years. On average, respondents reported living with two children in the household. Most respondents identified as White (58%). Respondents reported participation in the Supplemental Nutrition Assistance Program (6%), school meal programs (13%), and

¹⁶ United States Household Food Security Survey – <https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/survey-tools.aspx>

¹⁷ Aragon, M. C., Barale, K. V., Walsh, J.R., Owens, N., Betz, N. (2019) Reliability & Validity Testing of Food Security Items in the EFNEP Food and Physical Activity Questionnaire. Submitted for review to the Journal of the Academy of Nutrition and Dietetics.

Special Supplemental Nutrition Program for Women, Infants and Children (WIC) 6%. Nominal difference scores (+1 difference between two time points) for each question showed >70% of adults reported similar responses for all questions between time 1 and 2 administrations (median=80.6%, range=72.4%-94.4%). Paired t-tests showed no statistically significant differences in the means for any question between time 1 and 2 administration for 32 of the 33 questions.

Overall Sensitivity

As part of normal class evaluation processes, 382 EFNEP participants in eight states completed the 32-question FPAQ (see question set below) at the beginning and end of classes series. The pre- and post-FPAQ, along with demographic data were analyzed.

Table 6. Sensitivity Testing – Demographic Characteristics (n = 382)

Variable	n (%)
Gender – Female	307 (80.4)
Age – Mean (sd)	37.4 (13.6)
Age Group	
< 19	20 (5)
19-30	111 (30)
31-50	175 (47)
51-70	62 (17)
> 70	4 (1)
Race/Ethnicity	
Black	85 (23)
White	119 (32)
Other	14 (4)
Hispanic ¹	153 (41)
Education Group	
< Grade 12	88 (24)
HS or GED	112 (31)
Some College	127 (35)
College Grad	35 (10)
State	
Colorado	31(8)
Florida	20 (5)
Kansas	9 (2)
Kentucky	16 (4)
New Jersey	197 (52)
Washington	59 (15)
Wisconsin	39 (10)
Wyoming	11 (3)

¹Participants selecting Hispanic ethnicity did not always identify a race.

Differences between pre- to post-means were significantly different for all items except “washing surfaces after cutting raw meat” and frequency of drinking “energy drinks,” indicating the 30 of 32 items were sensitive to change. Sensitivity to change and internal consistency were calculated for a priori scales. However, because items in some scales had different response options, responses for all items were rescored as a 3-point Likert scale: met

recommendations, close to meeting recommendations, did not meet recommendations, based on WebNEERs defined classifications. Scales from either the 20-core question set or the 32 total question set were tested. Some items were included in more than one scale. Results are shown in Table 7. The scales showed significant pre- to post-differences according to t-test. All but Dairy showed significant pre- to post-differences according Wilcoxon tests. The critical domain scales (Food Resource Management, Fruit/Vegetables, Nutrition, Physical Activity, and Food Security) had internal consistency values ≥ 0.7 . Dairy, Sugar Sweetened Beverages, Cooking, and Food Safety scales had marginal internal consistency values < 0.6 .

Table 7. Scales pre, post and difference, with values for the difference plus polychoric correlation for post values¹

Scale (Question #s)	Pre	Post	Difference	p t-test	p Wilcoxon	Correlation
	Mean (sd) ²					
Cook (16, 27)	2.2 (0.6)	2.3 (0.6)	0.07 (0.58)	0.02	0.03	0.60
Dairy (23,24,25)	1.3 (0.4)	1.4 (0.5)	0.06 (0.44)	0.02	0.55	0.58
FRM long (17-20; 28-32)	1.8 (0.5)	2.1 (0.6)	0.33 (0.56)	< 0.000	< 0.000	0.92
FRM short (17-20)	2.1 (0.7)	2.4 (0.6)	0.34 (0.69)	< 0.000	< 0.000	0.89
Fruit/Veg long (1-4, 21, 22)	1.6 (0.4)	1.8 (0.5)	0.17 (0.47)	< 0.000	< 0.000	0.82
Fruit/Veg short (1-4)	1.5 (0.5)	1.7 (0.5)	0.19 (0.54)	< 0.000	< 0.000	0.78
Nutrition + Cook	1.7 (0.3)	1.9 (0.3)	0.13 (0.33)	< 0.000	< 0.000	0.79
Nutrition long (1-6; 21-26)	1.7 (0.3)	1.8 (0.4)	0.13 (0.34)	< 0.000	< 0.000	0.76
Nutrition short (1-6)	1.7 (0.4)	1.8 (0.4)	0.18 (0.48)	< 0.000	< 0.000	0.72
Physical Activity (7-9)	1.5 (0.6)	1.8 (0.7)	0.32 (0.71)	< 0.000	< 0.000	0.76
SSB long (5, 6, 26)	2.3 (0.5)	2.3 (0.5)	0.07 (0.43)	< 0.000	< 0.000	0.50
SSB short (5, 6)	2.0 (0.6)	2.1 (0.6)	0.10 (0.57)	< 0.000	< 0.000	0.36
Food Safety (10-13)	2.1 (0.4)	2.2 (0.5)	0.15 (0.52)	< 0.000	< 0.000	0.61
Food Security (14, 15)	1.9 (0.8)	2.0 (0.8)	0.14 (0.80)	< 0.000	< 0.000	0.77
All Short (1-20)	1.8 (0.3)	2.0 (0.4)	0.19 (0.37)	< 0.000	< 0.000	0.87
All Long (1-32)	1.8 (0.3)	2.0 (0.3)	0.17 (0.32)	< 0.000	< 0.000	0.90

¹ Gadermann, Anne M., Guhn, Martin & Bruno D. Zumbo (2012). Estimating ordinal reliability for Likert-type and ordinal item response data: A conceptual, empirical, and practical guide. *Practical Assessment, Research & Evaluation*, 17(3). Available online: <http://pareonline.net/getvn.asp?v=17&n=3>

² Rounded to one decimal for means and two decimal places for difference

The results of the sensitivity testing in combination with the prior reliability and validity testing of the new items supports EFNEP's use of FPAQ as an effective evaluation tool for the program.

Conclusion

This study validated new evaluation questions in three of five content domains (nutrition, food resource management, and food security) for the national EFNEP program. Testing of questions for the new evaluation tool involved collaboration with 34 states, representing all three of EFNEP's primary racial/ethnic groups and all NIFA regions. This new tool will strengthen the evidence-base for nutrition education programs for low-income families.