

DISSERTATION

USE OF THE 24-HOUR DIETARY RECALL TO EVALUATE DIETARY INTAKE  
OF PARTICIPANTS IN THE EXPANDED FOOD AND NUTRITION EDUCATION  
PROGRAM

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## ABSTRACT

### USE OF THE 24-HOUR DIETARY RECALL TO EVALUATE INTAKE OF PARTICIPANTS IN THE EXPANDED FOOD AND NUTRITION EDUCATION PROGRAM

#### **Purpose**

The primary purposes of this research were to identify and document the collection methodology of the 24-hour dietary recall (24HR) used in the Expanded Food and Nutrition Education Program (EFNEP), to assess if the recall as collected by trained EFNEP paraprofessionals is similar to a recall collected by professionals and document if participation in EFNEP results in a change in dietary quality of participants.

#### **Methods**

A three-phase plan was implemented to investigate the 24HR, as utilized by EFNEP, to document change in dietary intake as a result of program participation of low-income adults. The first phase identified current recall practices in EFNEP in all US states and six US territories through a nationwide survey of program coordinators. The survey's focus was to provide information on recall period, number of passes for the recall, class setting, educational background of the paraprofessional educators, and training practices of the educators and coders.

Phase 2 was an exploratory cross-over study in two states comparing same day 24HR collected by trained paraprofessional educators and by a registered dietitian nutritionist (RDN). The recalls were collected in a one-on-one setting using a validated multiple pass method, the same script, same collection material and coded by one blinded coder.

Phase 3 was a secondary analysis of 24HR recall information to compare change in diet quality due to participation in EFNEP. This phase compared exit minus entry data from FY 2013-2014 EFNEP participants as available from the national EFNEP reporting system.

## **Results**

Results from the survey established inconsistent collection of the 24HR in the responding 53 programs. Most programs use multiple collection periods (previous day vs previous 24 hours), about a third of the programs do not use a consistent number of passes in recall collection; less than a fifth of the programs exclusively use the validated 5-pass method; most paraprofessionals receive 8 or less hours of training on recall collection and over 6 different training programs are used; most programs use multiple coders.

Phase 2 results documented no difference in the recalls in the two states when compared by interviewer (paraprofessional vs RDN) or between individual interviewers. There were significant differences in four nutrients (energy, total fat, saturated fat and solid fats and added sugars) based on recall order with a higher intake in the second recall compared to the first. There were differences in several intakes based on interview by site, with 2 nutrients higher when collected by the RDN in Colorado and one nutrient higher in recalls collected by the paraprofessional in North Carolina.

Phase 3 documented a change in diet quality in EFNEP participants over the course of the program. HEI-2005 scores significantly increased, and this increase was documented in all defined demographic groups.

## **Conclusions and Implications**

Accurate and consistent data collection is required to ensure valid program evaluation. The wide variation in reported collection, training and coding practices raises concerns about the

reliability and fidelity of the 24HR data collected by EFNEP paraprofessionals as well as the appropriateness of combining data from multiple programs. To improve consistency and reliability of 24HR results, EFNEP national leadership could establish standardized methods for training, data collection and data entry for the 24HR in EFNEP's ongoing endeavor to accurately document change in dietary intake due to program participation.

In this limited study comparing results from paraprofessionals and an RDN, paraprofessionals collected 24HR that were similar to recalls collected by an RDN when collected in a one-on-one setting, with standardized collect methods. Due to the limited number of participants, programs and interviewers, further studies are necessary to confirm these results. If confirmed, the recalls collected by the paraprofessional will provide more reliable evidence of dietary change due to program participation and information on dietary quality of low-income adults. Utilizing paraprofessionals rather than RDNs may allow for the collection of reliable recalls while allowing the RDNs to focus their expertise on the interpretation and application of research or clinical findings as well as program management and supervision.

Participation in EFNEP did result in improved diet quality based on a positive change in HEI-2005 scores during the time of participation. This improvement was seen across all defined demographic groups yet the degree of change varied. The information from the HEI-2005 data, in particular the component data based on demographic groups, may allow individual EFNEP leadership to tailor its specific program to the needs of its participants, allowing a customized curriculum based its population needs.

These overall results illustrate EFNEP's positive effect on the participants' diets over the course of the program. Therefore, EFNEP is meeting its goal and objectives to assist limited

resource individuals and families to obtain the knowledge, skills and attitudes to change behaviors resulting in improvement in nutritional intake by the individual and family.

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## CHAPTER 1. LITERATURE REVIEW

### **Recognition of Hunger in America**

Recognition of hunger in America during the 1960's prompted action by the U.S. federal government, including funding for several studies by Cooperative Extension, to investigate approaches to address the nutritional needs of poor families, particularly those in the urban areas.<sup>1</sup> The model that emerged advocated for the use of Extension staff to teach nutrition to low-income families in the home environment. In 1969, recommendations based on the results of these studies were the foundation for the Expanded Food and Nutrition Education Program (EFNEP).<sup>2,3</sup>

At the onset of the program, the primary nutritional concerns facing the low-income population were hunger and under-nutrition.<sup>1,4</sup> Nutritional intake in the target population has changed in the past 40 years such that the present nutritional concerns have shifted to a focus on over consumption of energy dense, low nutrient dense foods.<sup>5</sup> These changes in dietary intake have contributed to a rise in obesity as well as an increase in the early onset of chronic diseases, such as type 2 diabetes mellitus and cardiovascular diseases.<sup>6,7</sup>

The obesity epidemic has had significant consequences on the physical and economic health of our country.<sup>8,9</sup> This warrants intervention for at-risk populations to safely and effectively reduce obesity, lessen the early development of chronic disease and improve nutritional intake. Currently, EFNEP is uniquely positioned to provide interventions through the classes it provides in all 50 states and 6 U.S. territories, reaching the at-risk low-income population.<sup>10</sup>



Goals of EFNEP have expanded to include assisting limited resource families to obtain the knowledge, skills and attitudes to change behaviors resulting in improvement in nutritional intake.<sup>11</sup> The classes cover topics related to safe meal preparation and storage, food procurement on a limited budget, nutritionally sound diets, and increased physical activity.<sup>11</sup> As the program expanded to provide more classes to a growing number of participants, EFNEP began using paraprofessional educators to teach the classes.

Program evaluation began in the 1970s when staff from the House Committee on Agriculture required accountability.<sup>12</sup> The program had to demonstrate achievement of established goals and objectives. The program leaders evaluated possible evaluation techniques and selected a two-pronged approach to measure change in nutritional behavior: one measured change in dietary intake based on pre/post 24-hour dietary recalls, the second used behavioral questionnaires. Participants complete these evaluation tools before and again after program participation.

This project focuses on the evaluation of the 24-hour dietary recall (24HR) component of EFNEP program evaluation. Is the 24HR, as administered by paraprofessional educators in EFNEP, a reliable tool to assess dietary intake in the EFNEP population?

### **History of the Evaluation of Food Intake**

Collection of food intake data in the United States goes back to 1894 when the US Congress mandated the US Department of Agriculture (USDA), Office of Experiment Stations, to collect information on dietary intake in its effort to establish nutritional recommendations. The early studies were small in scale; some were conducted in specified states and were therefore not representative of the national population.<sup>13</sup>

In these first studies, researchers used a food-inventory record to determine the weight and cost of foods used by the family.<sup>13</sup> All foods used by the family in a week's time period were determined by weighing food in the home at the beginning of the week, weighing food brought into the home during the week and weighing food still in the home at the end of the week; this data was used to calculate food usage. This became too intrusive and costly so it was replaced by the food-list recall in the 1930s. For this method, the respondent, usually the female homemaker, recalled the quantities of foods used by the household during the preceding week. Over the next 35 years, the limitations of the family-list inventory became apparent. Some of these limitations included inability to estimate discarded foods, unknown division of food among family members, spoilage of food products, foods brought into the home and not consumed as well as foods given to pets.

The food-list recall was used in the Family Spending and Saving in Wartime Survey in 1942, in the Food Consumption of Urban Families Survey of 1948, and the Household Food Consumption Survey (HFCS) in 1955. These nationwide surveys conducted by the USDA assessed dietary patterns of households and/or individuals; multiple surveys were conducted over the next 60 years, e.g., the Continuing Survey of Food Intakes by Individuals (CSFII) occurred in 1985-86, 1989-91 and 1994-95.<sup>13</sup> Over time these surveys changed as methodology and technology changed. In the HFCS of 1965, a 24-hour dietary recall was incorporated into the protocol along with the food-list recall. The 24-hour dietary recall required respondents to remember and report all foods and beverages eaten in the preceding day or in the preceding 24 hours.<sup>14</sup> This was the first time that data on food intake by individuals were included in USDA surveys.<sup>12</sup>

At the same time as the USDA was collecting intake data, the National Health Survey Act was passed in 1956, which provided legislative authorization for the continuing survey of statistical data on the amount, distribution and effects of illness and disability in the United States.<sup>15</sup> To comply with the 1956 act, the National Center for Health Statistics (NCHS) conducted several surveys to collect this information; these three National Health Examination Surveys (NHES) were conducted between 1960 and 1970. These surveys focused on chronic diseases and growth of children and youth. Beginning in 1970, a new focus was introduced into the survey due to the increased interest in the correlation between diet and health. Under the directive of the Secretary of the Department of Health, Education and Welfare, the National Nutrition Surveillance System was instituted by NCHS to measure the nutritional status of the US population and changes that may occur over time. The surveys included clinical observations and professional assessments as well as the recording of food intake patterns<sup>13</sup>.

The food intakes of individuals provided new information on diets of individual household members. This baseline data elucidated much interest, so the survey was expanded to include more participants, more questions and all seasons; the survey was renamed the Nationwide Food Consumption Survey (NFCS). The NFCS in 1987-89 incorporated the 24HR and a 2-day diet record in data collection. The food record method required the respondent record all foods and beverages as eaten during a specified time period.<sup>16</sup> Collection of both the food-list and the expanded individual reports resulted in heavy respondent burden and low response rates. The food list was dropped from subsequent surveys due to a shift in the practice of increased food intake away from home, a need for more individual diet quality information as well a low response rate from previous surveys.<sup>12</sup>

The CSFII, 1989-1991, was conducted using two days of food records and a 24HR. Also in 1989, the Diet and Health Knowledge Survey (DHKS) was initiated; the focus of this survey was to understand the link between food selection and knowledge, attitudes and behaviors (Tippett et al., 1999).

In 1971, the National Nutrition Surveillance System was combined with NHES to form the National Health and Nutrition Examination Survey (NHANES). Four surveys were conducted starting in 1971.<sup>17</sup> Then in 1999, NHANES began collecting continuous data. Each year approximately 7000 participants are randomly selected from residents across the country.<sup>18</sup> In 2002, the two nationwide dietary surveys, CSFII and NHANES, were fully integrated into the new survey called “What We Eat in America” (WWEIA).<sup>19</sup> The WWEIA dietary intake component of NHANES utilizes the 24-hour dietary recall (24HR) methodology to assess dietary intake.<sup>20</sup>

These were not the only large-scale studies that collected data on dietary intake. In 1948, under the direction of the National Heart Institute in conjunction with Boston University, the Framingham Heart Study began investigating the general causes of heart disease and stroke because the death rates from cardiovascular disease were steadily increasing. Measurement of food intake in Framingham Heart Study was first published in 1962 as the initial studies did not include dietary intake evaluation.<sup>21</sup> The Observing Protein and Energy Nutrition (OPEN) Study, sponsored by the National Cancer Institute, was conducted between July 1999 and March 2000.<sup>22</sup> These are only two of many studies that have collected food intake information in the past century.

## **Evaluation of Nutrient Content of Food**

Evaluation of the nutrient content of food goes back to the early 1800s when food composition tables were compiled in Europe.<sup>23</sup> In 1896, Atwater and Woods published tables of nearly 2600 foods stuffs in the bulletin called “The Chemical Composition of American Food Material.” Within four years, 4,000 new foods were added and revised editions were published up until 1906.<sup>24</sup> These tables were used until 1940 when “Proximate Composition of American Food Materials” was published.<sup>25</sup> In 1950, the USDA published the Handbook No. 8 “Composition of Foods – Raw, Processed, Prepared.” This book contained food values for energy, protein, carbohydrate, fat and fiber content and data on 11 micronutrients.<sup>26</sup> The tables in Handbook No. 8 were revised and expanded into a series of publications through 1992. These tables have been compiled as part of the USDA Nutrient Database for Standard Reference and electronically maintained.<sup>27</sup>

These tables were incorporated by the USDA into the Dietary Intake Data System as part of the Food Research Group; the system was developed to increase the quality and efficiency for evaluating dietary surveys and research projects.<sup>28</sup> The data bank contains over 7,200 foods and includes 65 nutrient values for each food.<sup>29</sup> The Food and Nutrient Database for Dietary Studies (FNDDS) is used to analyze dietary information for NHANES and WWEIA surveys.<sup>27</sup>

The Web-based Nutrition Education Evaluation and Reporting System (WebNEERS) is used to record quantitative data collected in EFNEP; this system uses the FNDDS system for dietary evaluation of 24-hour dietary recalls of its participants. Other studies have used other food data bank applications such as DietDay; this diet program was used in the OPEN Study. The food values in this program are based on USDA values, with expansion to include product-labeling information and mixed dishes.<sup>30</sup>

Other agencies maintain food databases. The Nutrition Coordinating Center, University of Minnesota, developed the Nutrition Data System for Research (NDSR) database. This dietary analysis application software is available for researchers for the collection and analysis of dietary data. The software is based on the USDA Nutrient Database for Standard Reference as primary source of information of nutrient composition of foods in the NDSR. The software contains brand name foods and ethnic foods commonly available in the United States. If data on a food content is not available from the USDA tables, other resources are utilized, such as scientific journal articles on food content, in order to obtain nutrient content of foods for the NDSR databank.<sup>31</sup>

### **Evaluation of Dietary Intake**

Accurate food intake records and nutrient content data are essential for evaluation of nutrient intake. Evaluation of nutrient intake of a group or population is used for multiple purposes including nutritional interventional studies, establishment and evaluation of fortification/enrichment programs as well as association of nutrient/food intake with the risk of non-communicable diseases, such as obesity, type-2 diabetes mellitus, coronary artery disease, hypertension and cancer. Due to the complexity of nutritional behaviors, evaluating dietary intake is fraught with limitations and restrictions. The challenge, then and now, is to identify the best method/s to evaluate the quantity of nutrient/food intake.

#### **Direct Observation Methodology**

The most accurate method to evaluate food intake is by direct observation and it is most often accomplished in a research setting.<sup>32</sup> This technique provides a precise estimation of intake but also requires the maximum amount of resources as the subjects are observed in a controlled

setting. Direct observation, as well as biomarker studies, discussed later, are used to validate other dietary evaluation techniques.<sup>32-35</sup>

An example of a dietary intake observational study is the OPEN Study. The study was designed to assess dietary measurement error by comparing results from direct observation and self-reported dietary intake data. The study was conducted from July 1999 to March 2000 and included 484 men and women, aged 40-69 years old, living in Montgomery County, Maryland.<sup>22</sup>

### **Biomarkers**

Since the late 1990s, researchers have investigated the identification and use of dietary biomarkers to evaluate nutrient intake.<sup>36,37</sup> Only a few nutritional biomarkers demonstrate strong correlation between nutrient intake and the concentration of specific compounds in blood, urine, adipose or other tissues.<sup>38-40</sup> Some biomarkers, such as serum carotenoids, reflect long-term dietary intake status while others, like urinary sodium, can mirror recent dietary consumption.<sup>38</sup> Doubly labeled water and urine urea nitrogen (UUN) are unbiased recovery biomarkers of total energy expenditure and protein intake, respectively.<sup>41,42</sup>

Doubly labeled water (DLW) is a technique to calculate energy expenditure in free living subjects with virtually no interference with normal daily routine. Water is enriched with stable isotopes of deuterium (<sup>2</sup>H) and oxygen-18 (<sup>18</sup>O). The <sup>18</sup>O is eliminated from the body as carbon dioxide and water; the deuterium is eliminated as water. Subjects are required to collect timed urine samples over a specified number of days. The difference in elimination rate between the isotopes is reflective of carbon dioxide production. Energy expenditure can be calculated using standard equations based on the elimination rates. This technique has been shown to be accurate to 1% with coefficient of variation of 2-12% when compared to indirect calorimetry.<sup>41</sup>

UUN is a well-accepted biological marker of protein intake as there is a strong correlation between daily protein intake and daily urine nitrogen excretion. Use of UUN as a biomarker for protein intake depends on the assumption that protein intake is constant over a period of time and there is not accumulation of protein due to growth, repair or loss of muscle tissue due to illness, starvation or weight loss.<sup>42</sup>

Since most of the nutritional biomarkers require collection of bodily fluids, these assessment methods of nutrient intake are generally expensive to collect and analyze. Also, biomarkers are specific to a particular nutrient and, therefore, not reliable indices for multiple nutrients. One advantage is that biomarkers do not suffer from self-reporting errors, an obstacle in many other dietary assessment tools.<sup>22</sup>

### **Self-reported Intake**

Self-reported or interviewer-administered methods offer a more practical process for the evaluation of dietary intake. These methods have been reviewed extensively.<sup>15,36</sup> All self-reporting methods have limitations. Often, respondents do not attend to the food they eat, do not recall all foods consumed and have difficulty estimating portion sizes.<sup>43</sup> Factors such as gender, weight status, social desirability, literacy skills and personality characteristics have resulted in bias in reported intake.<sup>35,44,45</sup>

Three standard types of self-reporting dietary intake are most generally used: food records also called a food diary, food frequency questionnaires (FFQ), and 24HR.<sup>14</sup> Each method has strengths and limitations.

### **Food Record**

Food records have the potential to provide the most accurate quantitative information on self-reported food intake. For this reason, it is referred to as the ‘gold standard’ and the



technique to which other collection methods are often compared.<sup>14</sup> The food record method requires the respondent to record all foods and beverages eaten during a specified time period.<sup>16</sup> The amount of each food consumed is recorded at time of consumption. This method can minimize reporting error due to inattention and memory.<sup>46</sup> Error due to estimation of portion size can be diminished if foods are weighed/measured prior to consumption. The respondents require paper and pen available throughout the day to record food. The respondents need a high level of motivation and literacy, which may limit the use in some populations.<sup>46</sup> Dropout rates increase with consecutive days of recording.<sup>48</sup>

Collection and analysis of food records is costly and time intensive as staff are required to train participants in collection and are necessary for data entry and data analysis. This methodology is not plausible for certain studies, such as large cohort studies. In an effort to reduce cost of collecting this dietary data without affecting validity and reliability, alternative methodologies were developed and evaluated over the past 50 years.

### **Food Frequency Questionnaire (FFQ).**

Out of the need for a self-administered and inexpensive tool for evaluation of dietary intake, Stefanik and Trulson developed the first food frequency questionnaire.<sup>49</sup> First described in 1962, various FFQs have been used to estimate the mean occurrence of food intake.<sup>4</sup> A FFQ usually asks the respondent to recall intake over a specific period of time, such as a month or year.<sup>14</sup> Food frequency and, sometimes, portion size, are collected but little other information on the foods consumed is collected, including food combinations and methods of preparation.

FFQs ask closed-ended questions on incidence of intake and usual portion size of foods eaten. They typically require 30-60 minutes to complete, are often self-administered and results can be electronically tabulated through web-based programs; they are therefore economical for

large cohort studies and require minimal respondent burden.<sup>50,51</sup> However, the FFQ relies on the respondent to report on frequency and portion size over an interval of time. Depending on the time interval, summarizing results can be problematic if the diet was not stable. Such intake variation may be due to intentional or non-intentional modification due to pregnancy, illness or economic concerns, or due to seasonal variation in availability and cost of specific foods.<sup>51</sup> Also, overall memory of dietary intake deteriorates as retention interval increased suggesting participants may report a more generic diet and not specific dietary intake.<sup>52</sup>

Due to variation in food supply, dietary habits, culture, demographics and economics between populations, there is no universally accepted FFQ. FFQ instruments have been developed for different populations; three examples are the Southwest Food Frequency Questionnaire developed by the University of Arizona, with specific questions for the Latino and Native Americans diets, a questionnaire established for the Universiti Sains Malaysia birth cohort study and the questionnaires developed within Western Europe as part of the European Prospective Investigation into Cancer and Nutrition (EPIC).<sup>53-55</sup>

Recent research has identified limitations of the use of FFQ as a standard tool for dietary assessment. The OPEN Study compared performance of a well-designed FFQ, a 24HR, DLW, and UUN collection. The FFQ was found to have low validity for total energy and protein intake (attenuation factor of 0.04 and 0.16 respectively) suggesting poor correlation to DLW and UUN. Therefore, the FFQ has limited utility as a dietary assessment tool when compared to biomarkers.<sup>50</sup>

In the Women's Health Initiative, biomarkers for energy utilization and protein consumption were compared to an FFQ in 544 participants. The participants tended to underreport energy intake by 32% and protein intake by 15%. This underreporting was more

pronounced in younger women and those with a higher body mass index. Hispanics and Blacks underreported more than Caucasians.<sup>56</sup>

Shorter questionnaires focus on limited nutrients or food groups; these are referred to as screeners. They have a shortened food list, take 5-15 minutes to complete and reflect intake of specific nutrients or food groups.<sup>57</sup> Their limitations include lowered specificity as compared to a FFQ and greater measurement error.<sup>58,59</sup>

### **24 Hour Dietary Recalls**

The 24HR requires respondents to remember and report all foods and beverages eaten in the preceding day or in the preceding 24 hours.<sup>14</sup> To minimize issues of reactivity, the recall is administered without prior notice. Use of an administrator reduces literacy barriers. Memory and attention issues will affect responses as actual memory can start to decay within an hour of a meal.<sup>60</sup> Respondents may have difficulty distinguishing between what is normally eaten and what was actually eaten and portion size consumed.<sup>35</sup>

The 24HR provides information from a single day. Multiple studies have looked at the number of days necessary to provide valid and reliable information of intake due to day-to day variability in food intake. Up to 4-6 days of 24HR along with some FFQ questions appears to be considered optimal for collection of dietary intake data.<sup>61-63</sup> A key use of the 24HR is for group evaluation; the average intake of large groups, such as used in the OPEN Study and EFNEP, is not affected by within-person variation due to the decreased margin of error associated with large sample size.<sup>14</sup>

A 24HR interview can take approximately 30-45 minutes to complete and require another 30 minutes to code.<sup>14</sup> Training, coding, processing and quality control requirements have limited the use of 24HR in large scale studies.<sup>50</sup>

Well-trained interviewers are crucial in the collection of the 24HR. Ideally, registered dietitians/nutritionists with an education in foods and nutrition conduct the recalls in a one-on-one setting. Registered dietitians/nutritionists more accurately estimated energy intake based on weighed food records when compared to non-dietitians suggesting training, familiarity with foods and record keeping resulted in more reliable data.<sup>16,63</sup> Training in the collection of the recall is extensive; interviewers for the National Health and Nutrition Examination Survey have 25 hours of training, while interviewers for the Women's Health Initiative have 32 hours and those in the OPEN Study receive 32 hours.<sup>21,64,65</sup>

Multiple studies have documented considerable uncertainty in accuracy of 24HR in free-living populations. Using a single pass, subject-recorded data, women significantly under-reported energy intake with 24HR in one observational study and the under-reporting was due to failure to report between-meal snack foods.<sup>32</sup> In other studies with interviewer-administered data, thin men over-reported protein intake and the women participants tended to under-report energy intake and the degree of under-reporting was significantly greater than that of men.<sup>36,44</sup>

With these known conflicting results of accuracy of 24HR, the USDA Agricultural Research Service (ARS) focused research to increase the quality and efficiency of food intake surveys. The result was a method that improved overall dietary recall and reduce participants' burden by using multiple steps (or passes) in the interview process with prompts to help respondents remember and describe the foods they consumed. The methodology prompted the respondent to recall food intake using three reviews, or passes, of the day's intake.<sup>65</sup> This method was modified over the next decade to include a total of five passes which allowed more opportunity for respondents to remember and report additional foods without increasing

respondent frustration.<sup>28</sup> The recall is collected in a one-on-one setting, one respondent and one interviewer, and the interviewer records the recall.

Observational studies have validated the five-pass methodology in adult men and women. In the study by Conway et al women overestimated their energy and carbohydrate intake by only 8-10%.<sup>35</sup> Obese women more accurately reported food intake as compared to normal or overweight women. In another observational study, there was no difference between actual and recalled intakes of energy, protein, carbohydrates or fats in normal, overweight and obese men (Conway et al, 2004). When the five-pass method was compared to reference biomarkers, on average, men underreported energy intake by 12-14% when compared to DLW and underreported protein intake by 11-12% based on UUN recovery.<sup>22</sup> In the same study, women underreported energy by 16-20% and protein by 11-15%, as compared to DLW and UUN recovery. The self-reported intake, as documented in these studies, continues to underestimate 24-hour dietary intake when compared to observational studies and biomarkers. As observational studies are impractical in most scenarios besides limited research studies, the five pass method is considered a valid method for estimating energy and protein intake in free living adults.<sup>33</sup> Since 2002, this five pass methodology has been used by US Department of Health and Human Services, NCHS, and for the WWEIA survey in NHANES.<sup>35</sup>

In 2006, the National Cancer Institute (NCI), in collaboration with the USDA, developed the automated self-administered 24HR (ASA24) process that employs computer technology to collect and evaluate the multiple pass 24HR via the internet.<sup>66</sup> The ASA24 allows administration of the multiple day recalls as part of large-scale studies.<sup>67</sup> The program is freely available to researchers, clinicians and educators and offers a less expensive alternative to the paper-based recall when computer access is readily available. The validity has been documented among

black and white adults and when compared to 4-day diet records.<sup>66,68</sup> The program is available in English or Spanish, can be used with adults and children and is available for use with Canadian participants. Australian and French-Canadian versions are under development.<sup>69</sup>

### **Evaluation of Dietary Intake in Low-Income Population**

Evaluation of dietary intake has been tested primarily in white, well-educated middle-class adults; there are limited studies in low-income adults.<sup>70,71</sup> Many of the established methods for dietary intake evaluation have not been studied in the low-income population and may not demonstrate specificity/sensitivity in this population.

Holmes et al. reported on four dietary assessment methods in low income English households in 2007. Respondents were primarily white (48%) and all lived in the most deprived neighborhoods in London. Researchers compared 3 dietary survey methods to a weighed inventory method. The 24HR and food checklist yielded higher estimates of energy and nutrient intake and the recall was recommended as the most appropriate method for a national study of diet in the low income household population in the United Kingdom.<sup>47</sup>

Comparison of three-pass method of the 24HR in low-income population resulted in poor correlation between recall results and DLW. Energy intake was underreported by 17% and underreporting was strongly associated with increased adiposity and inversely associated with the ability to read and spell.<sup>72</sup>

Scott et al, evaluated the three-pass 24HR method in low-income food service workers as compared to direct observation for one meal. The participants' lunch meal was observed by trained staff. Estimated intake was based on standard serving size minus assessed plate waste. The staff returned the following day and collected recall information from the participants on

their lunch intake from the previous day. The results showed no difference in reported/observed intake for the one meal.<sup>73</sup>

Food frequency questionnaires have been tested in the low-income population. Test-retest results in low-income Latina mothers demonstrated correlations ranging between 0.40 and 0.55 for 3 month and one year time frame, respectively. These authors recommend oral administration of the questionnaire and multiple administrations to enhance consistency of results.<sup>74</sup> A FFQ demonstrated reproducibility for most nutrients in Brazilian low-income workers when compared to multiple 24HR.<sup>75</sup>

An eight-nutrient FFQ was validated in 1989 and expanded to 25 nutrients in 1999 for use in the low-income pregnant population.<sup>76</sup> There was wide variation in mean correlations in the 25 nutrients with the original eight showing higher correlation when compared to the initial study. Fourteen percent of their population (n=101) were excluded due to exceedingly high reported energy intake. This may suggest a high proportion of this population is unable to complete the FFQ accurately. Screeners have been used to assess adherence to dietary recommendations in low income populations but studies on the validation and reliability of screeners in this population were not found.<sup>77</sup>

### **Expanded Food and Nutrition Education Program**

The Expanded Food and Nutrition Education Program (EFNEP) is a unique program designed to assist the low income audience in acquiring the knowledge and skills necessary for planning, procurement, and preparation of nutritionally sound diets, resulting in improved total family diet and nutritional well-being with the long term goal of improved health and chronic disease prevention.<sup>11</sup> EFNEP is annually funded through Congressional legislation and is administered by the National Institute of Food and Agriculture of the U.S. Department of

Agriculture in cooperation with State Cooperative Extension Services in all 50 states and in American Samoa, Guam, Micronesia, Northern Marianas, Puerto Rico, and the Virgin Islands.<sup>10</sup> Federal funds allocated for fiscal 2015 year exceeded \$67.9 million.<sup>10</sup>

EFNEP is implemented by the Cooperative Extension System through Land-Grant Universities.<sup>11</sup> In fiscal year 2017, EFNEP reached 108,216 adults and 366,327 youth directly and close to 340,000 family members indirectly.<sup>78</sup> Eighty-two percent of the participants who reported income, were at or below the poverty level, earning \$24,600 a year or less for a family of four. EFNEP participants are from diverse backgrounds; at least 71% are minorities.<sup>78</sup>

At the program's inception, the classes were taught by extension agents in a one-on-one setting. This allowed the educator to evaluate participant's needs and modify the program to meet those needs.<sup>79</sup> However, due to the cost of teaching in this setting, the one-on-one setting was a critical impediment in meeting the program enrollment goals as documented in the 1979 federal evaluation.<sup>2</sup> Small groups were recommended as cost effective alternative and group classes continue today. In 2015, 96% of participants were enrolled in group classes while only 6% were taught exclusively in a one-on-one setting.<sup>80</sup>

In an effort to expand the program on a limited federal budget, the program began using extension aides.<sup>81</sup> These aides were indigenous to the population served by EFNEP, trained by extension agents and supervised by agents in the field. This followed the New Career program which was initiated in the 1960's that offered entry-level jobs to individuals to provide valuable social services and at the same time provided opportunity for jobs and incomes in underserved areas.<sup>81</sup> The aides, currently referred to as paraprofessional educators, continue as the front-line educators in EFNEP.



## **Program Overview**

The Dietary Guidelines for American and the Physical Activity Guidelines for Americans are the framework for EFNEP's science-based core curriculum.<sup>11</sup> The classes are delivered in a series of 6 - 12 or more lessons over several weeks to months and address four core areas: diet quality and physical activity, food resource management, food safety and food security. Through a holistic learning process, program participants learn to choose and eat a variety of foods in appropriate quantity.<sup>80</sup> They acquire skills to increase physical activity to improve health and lessen the risk for chronic disease. Adult participants learn food resource management practices regarding selecting, purchasing, preparing and storing foods in an effort to increase availability of healthy foods. Class presentations address safe food handling practices to reduce the risk of food borne illnesses and ways to use emergency and non-emergency food assistance programs to ensure household food security. The hands-on approach allows the participants to gain practical skills essential to make positive behavior changes. Through EFNEP, participants also experience improved self-worth, recognizing that they influence improvement in their family's health.<sup>10</sup>

## **Program Evaluation**

The 24HR has been used to monitor change in dietary intake due to participation in EFNEP since the program's beginning.<sup>82</sup> Over the years, various behavior/knowledge questionnaires have been utilized to measure change in knowledge, skills, practices and behavior of participants as a result of participation in the program. Currently participants complete the behavior checklist with a minimum of 10 standard questions and the 24-hour dietary recall (24HR) at the start of the program and again at the program's completion. The results are coded and the information is inputted into the Web-based Nutrition Education Evaluation and Reporting System (WebNEERS). The difference in pre/post 24HR is used to evaluate change in

nutrient/food group intake due to participation in the program.<sup>83,84</sup> In FY 2015, 89% of graduates who had completed pre and post intervention recalls demonstrated a positive change in consumption in one or more food groups, including consuming an extra 3/4 cup of fruits and vegetables every day.<sup>78</sup>

Multiple methods are used to collect the 24HR in EFNEP classes.<sup>84-87</sup> In a one-on-one class, the paraprofessional records the recall; in group settings, the participant records the recall as directed by the educator.<sup>85</sup> Research on validity of 24HR as collected in a group setting is limited.<sup>73</sup>

The identical collection methodology is not consistent in all EFNEPs. Some programs collect recalls from the previous day, some from the previous 24 hours; some use the single pass method while others use the five-pass method. Also, programs use different training programs when teaching the paraprofessional to collect the 24HR and for data entry staff to use WebNEERS.<sup>87</sup> It is unclear if the collection and coding process results in valid and reliable 24HR data.

### **Role of the Paraprofessional Educator in EFNEP**

In the 1960s, studies documented a mounting shortage of health care workers due to population growth, increased demand for services, expansion of prepaid health insurance plans and expanded care to those with high needs, such as the disabled, aged, and the poor.<sup>81,89</sup> Several approaches were proposed to meet this increased manpower need. There was a movement to transfer specific functions and responsibilities from professional staff to non-professional staff, thus establishing new health agency staffing patterns in neighborhood/communities with the greatest need.

Health care agencies had employed health aides and similar auxiliary health workers in the 1950's. The aides received training and supervision from professional staff. This model was successful in delivering basic services in multiple settings including the Navaho Reservation in Arizona, the Native Americans and Eskimos living north of the 60<sup>th</sup> parallel and migrant farmworkers in Florida.<sup>88</sup>

Health care administrators recognized opportunities to expand manpower in poor communities and provide jobs through education of indigenous individuals living in these underserved areas all while supplementing the role of the professional staff.<sup>89</sup> This allowed provision of essential services and jobs in underserved/high need neighborhoods. This bridged the gap between the community need and the professional services availability.

Through government legislation, action was taken to help meet this manpower need. The use of health service aides expanded in the 1960's with the passage of the Federal Migrant Health Act in 1962. The mandates included provisions for training programs and creation of new types of paraprofessional roles. Agencies offered entry-level jobs to individuals who could provide valuable social services in at-risk areas, and also gave the aides an opportunity for jobs and income, what has been called the "double social utility," or the New Career Movement. Besides the use in community health agencies, aides were being used in the classroom, home care settings and hospitals.<sup>81</sup> Aides assisted in many programs including a migrant health programs in California, a successful program for tuberculin testing project in Pittsburgh and a maternity and infant care project in Denver. Professional staff perceived positive impacts with the incorporation of the health aide in community and health agency. The aides promoted better working relationships between health staff and community members.<sup>88</sup>

At EFNEP's inception, professional extension staff provided education, usually in the client's home, with the specific assignment to help educate the client on topics of nutrition and were allowed to modify the program to meet the client's specific needs. Over time, the program was charged to expand to more clients on a limited federal budget. EFNEP, like many health services as discussed above, began utilizing the health aide model, with the aide receiving training and supervision by professional staff. These aides were offered entry-level jobs, were indigenous to the target population, and provided valuable services to underserved areas, mimicking the New Career Movement.<sup>81</sup>

The EFNEP aides, currently referred to as paraprofessionals or paraprofessional educators, continue to be crucial to the program's educational success. The paraprofessional educators provide a series of hands-on, interactive lessons to program participants. They also recruit participants from low-income families in their communities, from neighborhood contacts, former participants and community organizations and agencies. Though a cornerstone of the success of EFNEP, the paraprofessional educators require considerable in-service training, mentoring and support from university and locally-based professional staff.<sup>11</sup> Overall, EFNEP paraprofessionals have a high job satisfaction and low intention to leave, based on perceptions of program value, work relationships and participation in significant job decisions.<sup>90</sup>

### **Research Question**

Given the programmatic changes that have been implemented over the past 45 years in EFNEP, it is imperative to evaluate the efficacy of the tools used to assess the program's effectiveness. One concern with the current evaluation methodology is whether the evaluation tools used, in particular, the 24HR, as currently implemented, are valid and reliable tools to evaluate changes in dietary intake due to participation in the current EFNEP environment.

Based on previously mentioned research, the 24HR has been validated in the one-on-one setting, using the five-pass method, as recorded by a trained professional, or through the use of an automated five pass program.<sup>22,34,35</sup> Yet this is not the most common setting for collection of the 24HR in EFNEP. Each university or state has the option to modify the standard recall procedure to meet its requirements based on population or group needs. There is lack of fidelity in the training for and collection of the 24HR in EFNEP based on a survey sent to EFNEP coordinators.<sup>87</sup> Programs collect the 24HR information in varying group sizes, while some sessions are provided in one-on-one setting.<sup>85,86</sup> Other inconsistencies in data collection include: recalls are collected for the previous day or previous 24 hours; the recalls are collected in small groups (2-10 participants) or large groups (greater than 20 members); 24HR are recorded by participants or paraprofessional educator; training programs required less than four hours to more than eight hours.<sup>87</sup>

In light of the lack of fidelity in collection methodology, this project is designed to document if the 24 HR, as collected by EFNEP, is a reliable tool to evaluate change in dietary intake as a result of participation in EFNEP.

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## CHAPTER 2. COLLECTION METHODS FOR THE 24-HOUR DIETARY RECALL AS USED IN THE EXPANDED FOOD AND NUTRITION EDUCATION PROGRAM

### **Introduction**

The Expanded Food and Nutrition Education Program (EFNEP) is a federally funded program that provides nutrition education to low-income families through community-based classes taught by paraprofessionals (peer educators) who are often indigenous to the population being served. The classes cover topics related to diet quality and physical activity, food resource management, food safety and food security.<sup>1</sup> In fiscal year 2015, 75 EFNEP programs reached 191,351 adults and 377,702 youth directly and approximately 340,000 family members indirectly.<sup>2</sup>

The programs are administered by the land-grant institutions in every state, the District of Columbia, and the 6 U.S. territories.<sup>1</sup> Eighteen states have multiple EFNEP administrative units as these states have more than 1 land-grant university. EFNEP is divided into 7 tiers based on funding for the purpose of communication, program planning and reporting purposes.<sup>3</sup>

The US Department of Agriculture's Office of Management and Budget requires federal departments to evaluate programs' ability to achieve established goals and objectives annually.<sup>4</sup> One goal of EFNEP is to assist limited resource individuals and families to obtain the knowledge, skills and attitudes to change behaviors resulting in improvement in nutritional intake by the individual and family.<sup>1</sup> The methods used to evaluate EFNEP include the 24-hour dietary recalls (24HR) and a behavior checklist that assesses the frequency of performing certain behaviors (using a shopping list, washing hands before preparing food) in each of the 5 topics

required to be taught: diet quality, physical activity, food resource management, food safety and food security.<sup>5-7</sup>

The 24HR has been used in large population studies since the 1960s<sup>8</sup> and by EFNEP since its inception in the late 1960s.<sup>9</sup> The 24HR requires respondents to remember and report all foods and beverages eaten in a 24-hour period.<sup>10,11</sup> The trained interviewer asks what was eaten during the 24-hour period and probes for detailed description of foods and quantities before moving on to the next eating occasion. When EFNEP provided the program 1-on-1 in participants' homes, a single pass method was used to collect the dietary recall.<sup>9</sup> In 1980, the program began offering the lesson series in group settings as a more cost-effective delivery system. There is no evidence to suggest that modification of the 24-hour recall collection for group settings was addressed with this change in venue (M. Townsend, PhD, written communication, 2016).

In the 1990's, multiple pass methods were developed and refined by the US Department of Agriculture, including 3 and 5 pass methods.<sup>12</sup> These methods allow the respondents to remember and report additional foods when compared to the single pass method. The 3-pass method included a quick list, for an uninterrupted listing of foods and beverages consumed during the day, detailed questions to prompt the description of foods and amounts eaten aided by the use of food models and measuring guides, and a review. Over time this was expanded to the 5-pass method which added 2 passes: forgotten foods (categories of foods that are frequently forgotten), and time and occasion when foods were consumed. Observation studies validated the 5-pass methodology in adults when collected in a 1-on-1 setting.<sup>11,13</sup>

Since 2002, the 5-pass method has been used by the US Department of Health and Human Services, National Center for Health Statistics for the What We Eat in America

(WWEIA) survey as part of the National Health and Nutrition Examination Survey (NHANES).<sup>14</sup> Over time, a multiple pass method replaced the single pass method in some EFNEPs though the time of this change is not documented. As the national guidelines do not stipulate methodology for 24HR collection, only the expectation that the 24HR be collected at the start and end of the program, each program selects its own collection method, e.g., a 5-pass<sup>15</sup>, a single pass method,<sup>16</sup> the use of the previous day,<sup>15</sup> or previous 24 hours.<sup>17</sup>

Well-trained interviewers are crucial for collection of the 24HR. Ideally, nutrition professionals with a formal education in nutrition collect the recall.<sup>8,18</sup> Paraprofessional educators collect the 24HR in EFNEP; most paraprofessionals do not have nutrition degrees but receive training on 24HR collection after being employed by EFNEP.<sup>19</sup>

EFNEP paraprofessionals obtain a 24HR from participants before the first lesson of EFNEP and again after completion of the program. The results from the 24HR are coded and entered into the Web-based Nutrition Education Evaluation and Reporting System (WebNEERS). WebNEERS provides a variety of reports that allows EFNEP to evaluate behavior change based on program participation.<sup>20</sup> This secure data management and reporting system, developed in 2012 to manage EFNEP data, permits the program to capture the participants' 24HR and other self-reported behaviors related to the core content areas in EFNEP. Outputs from WebNEERS describe nutrient/food group content of the 24HR. The difference in pre/post responses of the 24HR is aggregated at the state and national level to assess dietary changes as a result of program involvement.<sup>5,7</sup>

The goal of this study was to identify current EFNEP practices for the collection of the 24HR to assess the fidelity with which dietary data are collected. Consistent collection procedures are required to ensure valid data to document the effectiveness of EFNEP.



## Methods

### Procedure and Participants

This nationwide cross-sectional study used a survey of state program coordinators to investigate current 24HR collection procedures. Institutional Review Board approval from Colorado State University was obtained prior to survey distribution. (Appendix A) The survey included 32 questions to identify 24HR collection period (previous day or previous 24 hours), methods used for collection of the recall (single or multiple pass), setting of the recall (1-on-1 or group), and group size. (Appendix B) Questions addressed tier classification, training of the paraprofessionals and coders, the number of coders, and educational background of the paraprofessionals. Answers were generally multiple choice or check all that apply but included options to skip questions or provide comments.

Two nutrition professors and 2 EFNEP professional staff members reviewed the survey for content, clarity and time requirement for completion. An online pilot survey was completed by a sample of EFNEP staff and nutrition professionals; survey content and format were modified based on responses from the pilot survey. This process established the content and face validity of the survey.

To increase response rates, several techniques outlined by Ansell et.al.<sup>21</sup> were used including advanced notification by a personalized introductory letter sent by a familiar individual, an explanation of the project, the relevancy of the survey to the respondents, the survey anonymity and a \$10 gift card. Several reminders were also sent during the collection period. (Appendix C)

The survey was electronically sent to all 75 program coordinators via a national EFNEP listserv. The introductory letter with the survey requested the survey be completed by the EFNEP

staff member responsible for training the paraprofessional educators on collection of the 24HR. One response was requested from each program. (Appendix C) The survey was open for 3 weeks beginning in August 2013 and reopened for 1 week in October 2013 as multiple coordinators were unable to complete the survey during the first period. A thank you letter and gift card were sent to respondents. (Appendix D)

### **Data analysis**

The responses were tallied using an Excel spreadsheet (Redmond, WA, 2012) and analyzed in SPSS (version 21.0, IBM, Inc, Armonk, NY, 2012). Analyses included descriptive statistics and, as data were nominal or ordinal, Fisher's Exact test was used to compare proportion of responses across tiers. Fisher's Exact test was used to account for the small sample size within tiers.

### **Results**

A total of 75 EFNEP coordinators received the electronic survey. Fifty-nine responses were received after the first contact; 8 responses were received with the second mailing for a total of 67 responses. Multiple surveys were received from 7 programs. In 3 of those programs, responses were substantially different and, therefore, were excluded from analysis. The surveys from the other 4 programs contained consistent responses and 1 survey per program was included in the analyses for a total of 53 surveys (representing 53 programs). EFNEP is categorized into 7 tiers based on annual federal funding. Responses from all 21 programs in the top 3 tiers (highest funding) and 59% of the programs in the lower 4 tiers are included in results.

Respondents indicated the percentage of their program educators who had a high school degree (HS) or General Education Diploma (GED), 2-year degree, 4-year degree or advanced degree. EFNEP recommends hiring paraprofessional educators with HS/GED though many

educators continue their schooling after employment with EFNEP. Of the 49 programs reporting on the education level of their educators, 43% indicated that  $\geq 75\%$  of their educators had a HS/GED, 28% reported that 50-74% of their educators had HS/GED, 16% reported 25-49% with HS/GED and 12% reported  $<25\%$  of their educators had HS/GED.

EFNEP classes are taught in group and 1-on-1 settings. Fourteen percent of programs conducted some recalls in a 1-on-1 setting. Eighty-five percent of programs collected recalls in group settings which had 2 to  $> 20$  participants; 8% of respondents did not identify collection settings.

Survey questions addressed various aspects of 24HR data collection and entry (Table 2.1). Across EFNEP, about half (24 of 53) of the programs commonly collect dietary recall data based on “yesterday’s intake,” a third (19 of 53) based on “previous 24 hours” and a fifth (10 of 53) have no standardized time period. However, more than half (53%) the programs were inconsistent in their data collection time frame, particularly in tiers 3,4,5 and 6 in which over 62% of the responding programs did not have a standardized time frames for data collection.

Few programs (17%) consistently follow the validated 5-pass method for data collection although those programs report using the 5-pass method in both 1-on-1 and group settings (Table 2.1). The more common approach is to use 2-4 passes which in itself (in part due to the wording of the response option) implies inconsistent methodology; tiers differed in the number of passes used in group setting ( $p<0.05$ ). As with the data collection period, tiers 3, 5 and 6 reported less standardization in the number of passes used.

Educators as well as local and regional support staff complete data entry. The larger programs (tiers 1-3) and tier 6 relied more on regional/state support staff. The number of people doing data entry varied widely across programs ( $p<0.06$ ). A few programs (14%) used 1 person

to enter all data; about a third of programs (34%) used 2-5 people and the rest used 6 to over 20 individuals to enter data. Of those programs relying on local support staff (54%) typically used 6-10 people while those programs who relied on educators to enter data were more likely (54%) to use more than 11 people.

The larger tiers generally devoted more time to training for data collection and entry, although few programs spent more than 8 hours training for data collection (12%) or entry (6%). Half the programs (53%) spent 4-8 hours on training for data entry and 41% spent 4-8 hours on training for data collection. However, 41% or 47% devoted fewer than 4 hours to data entry and collection, respectively.

The training programs used also varied. The *Oklahoma State University Extension Training Program* was the preferred program used by 49% of respondents; other preferred programs included those developed by Cornell University (9%), Louisiana State University (7%), University of Wyoming (2%), Rutgers (2%) and University of Wisconsin (2%). Twenty-nine percent of respondents used unspecified programs or had developed their own. Table 2.1 compares some components of the training programs used by WWEIA, the Oklahoma State University Extension and Cornell University and predominate EFNEP practices. The training protocols used by 49% of the programs teach the 5-pass methodology for the 24HR yet only 17% of programs use this method in a group setting. EFNEP practices are not consistent with the training provided to the paraprofessionals nor consistent with the training and collection of the 24HR in WWEIA (What We Eat in America, National Center for Health Statistics/National Health and Nutrition Examination Survey, written communication, January 2013).

## Discussion

The goal of the survey was to identify current EFNEP practices for the collection of the 24HR to assess the fidelity with which the dietary data are collected. The 53 programs represented in the data received 92% of all federal EFNEP funds and reached 94% of EFNEP clients in 2013, when the survey was distributed.<sup>22</sup> Therefore, responses from this survey reflect EFNEP practices.

The reasons for the inconsistencies in data collection are not apparent from survey responses. It could be influenced by many factors including resources availability at individual programs. Larger tier programs have more resources, often have a more centralized administration and dedicated data coders; all potentially allowing for more consistency in collection protocols. On the other hand, smaller programs, such as those in tier 7, have fewer staff which may reduce variations. The inconsistencies might be due to individual program needs based on changing participant demographics and needs over the past 50 years. The national administration should address these inconsistencies and work towards implementing consistent methodology for recall collection to ensure accurate data collection to evaluate change in dietary intake due to program participation.

Well-trained interviewers are crucial in 24HR collection.<sup>8</sup> Most studies report using interviewers with an educational background in nutrition.<sup>8,18</sup> Studies have not documented that HS/GED prepared paraprofessionals, such those employed by EFNEP (more than 70% of programs reported the majority of their educators had only HS/GED), collect a recall that is comparable to one collected by an interviewer with a degree in nutrition or related field.

EFNEP paraprofessionals collect 24HR in multiple settings. Most programs (85%) collect recalls in group settings. The 24HR, 5-pass method is valid in a 1-on-1 setting with

adults.<sup>10,11,13</sup> It has not been validated in a group setting. One study did validate the recall collection in a group versus individual setting for 1 meal using 3-pass method with food service workers.<sup>6</sup> That study's results suggest the group recall method may be effective in estimating intake of macronutrients and limited micronutrients but the study was limited by a small number of participants, an evaluation of only 1 meal, and use of a 3-pass versus a 5-pass methodology.<sup>6</sup>

Survey responses suggest inconsistency in collection methodology. Sixty-five percent of programs use 1 method for recall collection, but that methodology varies from single pass, 2-4 passes to 5 passes. There are multiple studies that have used the 3 pass method for the collection of the 24HR. Since the United States Department of Agriculture developed and validated the 5-pass method, it has become the preferred method in large scale studies, such as the *Observational Protein and Nutrition Survey (OPEN)*<sup>18</sup> and *WWEIA*.<sup>14</sup> The 5-pass method is currently the only validated method.<sup>11,13</sup>

The collection periods in the responding EFNEP surveys are not consistent across or within many programs. Large scale dietary studies, such as the *WWEIA*, the *Continuing Survey of Food Intakes of Individuals*, and the *OPEN* survey use the previous day for recall collection.<sup>14,18,23</sup> Fewer studies use the previous 24 hours (previous 24 hours period defined as starting at time of recall, and going back 24 hours).<sup>24,25</sup> Only about a quarter of the survey respondents (n=12) exclusively use the previous day for collection, the method consistent with the majority of published studies. This study documented inconsistencies in collection periods, including the use of previous day, previous 24 hours and unspecified time periods. This is a concern because different collection periods are aggregated together to evaluate intake for a 24-hour period.

Coding of the 24HR and entering this data into WebNEERS is managed differently across programs. Some programs only have 1 coder while over half (n=28) of the programs use 6 or more coders. Coding training ranges from less than 4, and up to 8 hours for 94% of the programs. Though not part of the survey, it is unclear if the same coder completes the paired pre/post recalls. Variability in nutrient estimates in one study ranged between 7-94% when intakes were coded by 33 different dietitians.<sup>26</sup> Inconsistent training on data entry and the use of multiple coders may introduce errors into the data and result in flawed conclusions in regard to the effectiveness of EFNEP.

The use of educators to enter 24HR data has several advantages, e.g. clerical staff are not needed to enter data. Educators are entering data directly into WebNEERS and have the opportunity to contact participants to fill in missing data. There are drawbacks as well including a possible conflict of interest as improvements in the dietary intake are a reflection on the educator's teaching ability (job performance). Educators may be less consistent in data entry as coding data is a minor portion of their job responsibilities.

Recall training protocols vary from program to program. Fifty-eight percent of programs use the training program developed by Oklahoma State University Extension (teaches the 5-pass method for 24HR collection) exclusively or in combination with other training programs. The Cornell University training program, uses the previous 24 hours, with a 3-pass method and requires only 6 hours for training (M. Scott-Pierce, MBA, written communication, 2016) (Table 2.2). Only 10% of programs spend > 8 hours for initial recall collection training. This is in contrast to studies that allot  $\geq 30$  hours for formal interviewer recall training.<sup>18,27</sup> This raises concerns regarding the quality and consistency of data collection by interviewers with 8 hours or less of training.

Accurate and consistent data collection is required to ensure valid program evaluation. Large scale studies, such as NHANES, OPEN and WWEIA, that utilize the 24HR to assess dietary intake, use the 5-pass method in a 1-on-1 setting, collect data about the previous day's intake, and train collection staff for over 25 hours.<sup>14,18,28</sup> EFNEP recalls are collected in group or 1-on-1 settings, use the previous day or previous 24 hours, and use single or various multiple pass methods, resulting in inconsistent collection of the 24HR among and within the EFNEP sites.

### **Implications for research and practice**

The findings from this study raise concerns about the lack of fidelity in collection of 24HR in EFNEP and should prompt the national leaders to revisit the way recalls are conducted and used. Current data may not approximate absolute individual dietary values nor reflect change with subsequent recalls when validated methods are not used. The data do provide broad insights into eating patterns of EFNEP participants and relative changes in those patterns. Despite the issues raised in this study, the 24HR data may still be useful in EFNEP evaluation although efforts should be made to strengthen recall protocols.

EFNEP is charged with evaluating its ability to meet program goals; one evaluation measure used is the 24HR. Survey responses suggest wide variation in collection methods which may result in inconsistent data. Standardized protocols should be established and implemented for 24HR methodology including consistent training of paraprofessionals and data entry staff. Although EFNEP is a nutrition education program with limited time and resources that can be dedicated to evaluation, methods could be strengthened by aligning, where possible, with methods used by national surveillance programs, e.g., WWEIA. This alignment might include consistently using “yesterday” as the collection period, using 5 passes, and establishing



standardized protocols across programs. These changes should be included in the national *EFNEP Policies*<sup>29</sup> as programmatic expectations.

Future research should establish if the 5-pass 24HR, as collected by a paraprofessional, is an appropriate method to evaluate nutrient intake since the methodology has been previously validated using nutrition professionals as interviewers. This could be established first in a 1-on-1 setting and then in group settings because the majority of EFNEP'S 24HR are collected in group settings. The 5-pass format is appropriate for the EFNEP populations as it has outperformed a food frequency questionnaire in populations with great intra-individual dietary variability, which reflects EFNEP participants.<sup>30</sup>

Coding practices were not addressed in this research; only training time was included in the survey. As different coders and practices resulted in different recall result, future research should document coding practices including training materials and comparison of recall results completed by paraprofessionals and professionals if similar training and practices are followed.<sup>26</sup>

If the 24HR as collected by EFNEP paraprofessionals does not provide reliable results, other dietary evaluation approaches appropriate for a nutrition education program should be considered. One option would be to use more rigorous dietary data collection methods with a smaller, but representative, sample of EFNEP participants. Better data from fewer participants would increase confidence in evaluation outcomes. Another option would be to determine if the automated self-administered 24-hour recall (ASA24)<sup>32</sup> could be an appropriate method for EFNEP evaluation. This automated version of the 5-pass method is available in English and Spanish for adults.<sup>32</sup>

Although this research has identified concerns with the way in which 24HR are collected, EFNEP should be commended for its ongoing efforts to strengthen the evaluation of this national

program. EFNEP has devoted the time and resources to develop an on-line reporting system, WebNEERS, for collecting and aggregating data for state and national reporting and is also supporting current comprehensive efforts to develop and validate a new behavior checklist. All of these evaluation endeavors will benefit from expectations of more consistency in evaluation protocols across sites and ongoing fidelity checks to protect the quality of the data.

**Table 2.1** Selected 24-Hour Dietary Recall Procedures According to EFNEP<sup>a</sup> Tier<sup>b</sup> Category

Collection period <sup>c</sup>	Tier 1 (n=5)	Tier 2 (n=8)	Tier 3 (n=8)	Tier 4 (n=6)	Tier 5 (n=8)	Tier 6 (n=8)	Tier 7 (n=10)	All (n=53)
Yesterday	40 (60)	25 (50)	12 (38)	–	(50)	38 (62)	40 (50)	23 (45)
Last 24 h	20 (40)	38 (50)	25 (50)	33 (50)	25 (38)	–	30 (30)	24 (36)
Not standardized	40	38	62 (12)	67 (50)	75 (12)	62 (38)	30 (20)	53 (19)
Passes, n <sup>c,d</sup>								
1			(38)		12 (25)	12 (38)	50 (60)	13 (26)
2–4	60 (80)	38 (62)	38 (38)	50 (50)	25 (50)	38 (38)	10 (10)	34 (43)
5	20 (20)	38 (38)	–	33 (33)	12 (12)	12 (12)	10 (10)	17 (17)
Not standardized	20	25	62 (25)	17 (17)	50 (12)	38 (12)	30 (20)	36 (13)
Passes in group setting, n <sup>c,d</sup>								
1	–	–	12 (38)		(25)	12 (50)	56 (67)	13 (29)*
2–4	60 (80)	38 (62)	38 (50)	33 (33)	50 (62)	25 (38)	33 (33)	38 (50)
5	20 (20)	38 (38)	–	50 (0)	12 (12)	12 (12)	–	17 (17)
Not standardized	20	25	50 (12)	17 (17)	38	50	11	31 (4)
Data entry personnel								
Educator	20	38	25	40	50	38	88	44
Local support staff	40	25	25	60	25	25	–	26
Regional/state staff	40	38	50	–	25	38	12	30
Number entering data								
1	–	–	12	–	12	38	22	14**
2–5	20	38	38	17	25	12	78	34
6–10	40	25	12	33	25	38	–	23
11–20	–	–	25	17	38	12	–	14
>20	40	38	12	33	–	–	–	15
Time for recall training, h								
<4	40	25	43	33	50	62	67	47
>4, ≤8	20	62	57	50	38	25	33	41
>8	40	12	–	17	12	12	–	12
Time for data entry training, h								

<4	20	38	38	33	29	67	56	41
>4, ≤8	80	62	62	67	71	17	22	53
>8						17	22	6

<sup>a</sup> EFNEP indicates the *Expanded Food and Nutrition Education Program*.

<sup>b</sup> EFNEP programs are categorized into 7 tiers based on annual funding with tier 1 receiving the most funding. The number of programs in each tier are tier 1 (5), tiers 2-4 (8 each), tier 5 (10), tier 6 (12) and tier 7 (24).

<sup>c</sup> For the number of survey questions, respondents had the option to check all the applied (the most common option); The first percentage reflects the proportion indicating those options. If respondents checked >1 option, they were asked to indicate their most common practice, indicated by the percentage in parenthesis.

<sup>d</sup> Reflects specific dietary collection method in group settings, all of which have clients recording their own intakes.

\*  $p < 0.03$  for most common number of passes in group setting across tiers according to Fisher's Exact Test

\*\*  $p < 0.06$  for number of people entering data across tiers according to Fisher's Exact Test

**Table 2.2** Comparison of the methodology for the 24 HR included in 3 training programs and current EFNEP practices

Recall Methods	24 HR Training Programs			
	Oklahoma State University <sup>33</sup>	Cornell University <sup>a</sup>	WWEIA <sup>3</sup> 4,b	EFNEP Practices (%) <sup>c</sup>
Collection method in group setting				
Single pass				29%
2-4 passes		x		50%
5 passes	x		x	17%
Not standardized or multiple methods used				4%
Collection period				
Previous day	x		x	45%
Previous 24 hours		x		36%
Not standardized or multiple methods used				19%
Training for 24 HR collection, h				
< 4				47%
> 4, ≤ 8	x	x		41%
> 8			x	12%

EFNEP indicates *Expanded Food and Nutrition Education Program*

<sup>a</sup> M. Scott-Pierce, MBA, written communication, May 2016.

<sup>b</sup> National Center for Health Statistics/National Health and Nutrition Examination Survey, written communication, 2013.

<sup>c</sup> Percentage of 53 programs that reported as the most common practice in their program.

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CHAPTER 3. SIMILAR 24-HOUR DIETARY RECALL RESULTS FROM LOW-INCOME  
ADULT WOMEN WHEN COLLECTED BY PARAPROFESSIONAL NUTRITION  
EDUCATOR OR REGISTERED DIETITIAN NUTRITIONIST

**Introduction**

Recognition of hunger in America during the 1960's prompted action by the U.S. Federal Government to investigate ways to address the nutritional needs of poor families, particularly those in urban areas.<sup>1</sup> In 1969, recommendations based on the results of these studies were the foundation for the Expanded Food and Nutrition Education Program (EFNEP).<sup>2,3</sup>

EFNEP continues today as a unique program designed to assist the low income audience in acquiring the knowledge and skills necessary to plan, procure, and prepare nutritionally sound diets with the intent of improving the total family diet and nutritional well-being.<sup>4</sup> EFNEP is funded annually through Congressional legislation and administered by the National Institute of Food and Agriculture of the U.S. Department of Agriculture in cooperation with State Cooperative Extension Services in all 50 states and six U.S territories.<sup>5</sup>

Since the program began in 1969, EFNEP has used paraprofessional nutrition educators to deliver the program. These paraprofessional (peer) educators, are typically indigenous to the populations served by EFNEP, required to have a high school diploma or equivalent, and are trained and supervised by professional extension staff.<sup>4</sup> These paraprofessional educators continue as EFNEP front-line educators and receive extensive training on teaching techniques, curricula content, and program evaluation data collection.<sup>6,7</sup>

EFNEP evaluation is based upon a two-pronged approach to measure changes in nutritional behaviors: one measures change in dietary intake based on 24-hour dietary recalls

(24HR), the second uses a health behaviors questionnaire to measure change in areas of food safety, food resource management, food security, physical activity, and nutrition practices.<sup>3,7</sup> Participants complete both assessments before and after program participation.<sup>7</sup>

Well-trained interviewers are crucial in the collection of the 24HR. Historically, RDNs or professionals with an education in nutrition conducted recalls in a one-on-one setting.<sup>8</sup> These professionals more accurately estimated energy intake based on weighed food records when compared to non-dietitians suggesting nutrition training, familiarity with foods and record keeping resulted in a more reliable estimate of energy intake.<sup>9</sup> Interviewers with at least a Bachelor's degree in relevant subject matter, e.g., health or nutrition, received 32 hours of formal training in the Observing Protein and Energy Nutrition (OPEN) Study.<sup>10</sup> Interviewers for the National Health and Nutrition Examination Survey (NHANES) have educational backgrounds in nutrition or health studies or experience in nutrition research and complete 32 hours of formal training in collecting recalls, while interviewers for the Eating at America's Table Study had at least a Bachelor's degree in nutrition, health or home economics, had 32 hours of recall training and were supervised by staff nutritionists.<sup>11,12</sup> Because of the training and use of professional staff, collection of the traditional 24HR is expensive and often impractical for large research studies and community nutrition program evaluation.

Over the past 40 years, the 24HR has been refined to improve the validity of dietary recall data. The United State Department of Agriculture's (USDA) Agricultural Research Service developed the multiple pass method to increase the quality and efficiency of food intake surveys. This method uses multiple steps (or passes) in the interview process with prompts to help respondents remember and describe the foods consumed.<sup>13,14</sup> The current methodology includes five passes which allows more opportunity for respondents to remember and report additional

foods without increasing respondent frustration.<sup>15</sup> The multiple pass method was used by NHANES, the OPEN study and the Eating at America's Table study.<sup>10,12-14</sup>

The multiple pass method has been validated in the one-on-one setting with intakes recorded by a trained professional.<sup>13,14</sup> Yet this is not the most common methodology for collection of the 24HR in EFNEP. In a high percentage of classes, the recall is collected in a group setting with the paraprofessional educators guiding the process for a participant-recorded recall.<sup>16</sup> Over 70% of programs reported the majority of their paraprofessional educators have a high school education or passed a general education development (GED) test. However, the multiple pass method has not been validated when collected in a group setting or when directed by high school graduate/GED prepared paraprofessional educators. Because of these limitations, it is unclear if the recalls, as currently collected by EFNEP paraprofessional educators, provide appropriate data for evaluation of EFNEP.

This exploratory study was designed to determine if well-trained EFNEP paraprofessional educators, using the standardized, valid five-pass method, can collect and record a 24HR comparable to one collected and recorded by an RDN in a one-on-one setting. It is essential to determine if the 24HR as collected by the paraprofessional provides an accurate evaluation of participants' intake so that any differences in the pre/post 24HRs reflect a change in intake based on program participation. Although this study was confined to an EFNEP context, if paraprofessional-collected recalls are comparable to recalls collected by an RDN, this would suggest that, in other settings, the RDN's expertise could be better utilized for evaluation of recall results and more advanced aspects of the RDN's scope of practice.

## **Methods**

### **Study Design**

This cross-over exploratory study compared the 24HR collected by paraprofessional educators to a 24HR collected by an RDN in a one-on-one setting. Institutional Review Board approvals from Colorado State University and North Carolina State University were obtained. (Appendix E) All participants received and signed informed consent forms prior to the first recall collection. (Appendix F)

### **Population**

A convenience sample of subjects in Colorado were recruited from EFNEP classes by the paraprofessional educator of the class. These subjects agreed to come early and stay after a class for the recalls. (Appendix G) The participants in North Carolina were recruited from EFNEP classes and agreed to come to a central location for recalls. Subjects received monetary compensation (\$20) for participation. Subjects signed receipt upon receiving the gift card. (Appendix H)

### **Data Collection**

Data collection occurred in Colorado over a 20-month period, beginning in January 2014. The lengthy time frame was due to the need to accommodate class schedules within a close geographic proximity to the data collectors. Data collection in North Carolina occurred over a three-day period in March 2015 to allow the professional to travel to the state and collect the recalls at a central location.

Subjects were randomized in a cross-over design to receive the paraprofessional- or RDN-administered recall first. The recalls in Colorado were collected before the beginning and after the second EFNEP class which was at least an hour in length. The second class was

selected as its focus is meal planning and grocery shopping and, therefore, nutrition was not discussed. The recalls in North Carolina were collected at a regional EFNEP office. The second recall collection started at least one hour after completion of the first one to replicate the time between recalls when collected before and after the EFNEP classes in Colorado.

Three experienced paraprofessional educators from EFNEP staff in Colorado (2) and North Carolina (1) and the same RDN collected the recalls. These paraprofessional educators received initial training on dietary recall collection during new employee training. At each site, both the RDN and paraprofessional educators received two hours of refresher training on the USDA 5-step multiple pass method prior to data collection using the Oklahoma State University Extension recall training,<sup>17</sup> which is the most often used training protocol in EFNEP.<sup>16</sup> The paraprofessional educators and RDN collected participant recalls from the previous day using identical scripts, based on the multiple pass method, and visual aids to prompt for detailed food consumption information. (Appendix I,J) Recalls were recorded by the paraprofessional educator and the RDN using pen and paper on a standardized form. (Appendix K)

### **Data Analysis**

All recalls were entered into the national EFNEP web-based Nutrition Education Evaluation and Reporting System (WebNEERS)<sup>18</sup> by one staff member in the Department of Food Science and Human Nutrition, Colorado State University who was blinded to data collector and recall order. WebNEERS uses the Food and Nutrient Database for Dietary Studies system for dietary evaluation of the recalls; it contains over 7,200 foods and includes 65 nutrient values for each food.<sup>19</sup> Intake of dietary supplements was not asked and therefore not included in 24HR

A mixed model analysis was used to compare means between interviewers, while accounting for period and site. The response variable was the recorded quantity for a particular

nutrient or food group. A separate mixed model analysis was performed for each response variable using Statistical Analysis Software (SAS) version 9.4, SAS Institute Inc., Cary, North Carolina.<sup>20</sup> Fixed effects included interviewer (paraprofessional or RDN), site, interviewer by site interaction, and order (first or second recall). Subject was included as a random effect to account for repeated measures. Statistical significance was set at  $p < 0.05$ . Since some responses were not normally distributed, Wilcoxon signed rank test was also used to compare data collected by different interviewers. Intraclass correlation (ICC) and Spearman correlation coefficients were calculated to determine interrater agreement.

## **Results**

A total of 41 diet recall pairs were collected from female EFNEP participants or EFNEP eligible individuals, 19 in Colorado and 22 in North Carolina. Nutrient and food group data, including mean, standard error, median and quartiles, are listed in Table 3.1. Alcohol and seafood results are not included as only seven or eight respondents, respectively, consumed either on the day of data collection.

Results (Table 3.2) demonstrated no significant difference in interviewer (paraprofessional vs RDN). Results of the Wilcoxon tests (not shown), but like the mixed model results, were not significantly different between individual interviewers.

Table 3.2 shows the correlation values (ICC and Spearman) between interviewers. All the ICC values are  $> 0.72$  except for vitamin A and D (0.49 and 0.59 respectively). All Spearman correlations are  $> 0.75$  except for protein foods at 0.69.

There were significant differences in four variables, based on order of recall. The second recall had higher reported intake in energy, total fat, saturated fat and solid fats and added sugars (Table 3).

There were significant differences ( $p < 0.05$ ) in several intakes based on interviewer by site. The recalls collected by the RDN in Colorado had higher intakes (mean (se)) in dairy (0.6 cups (0.2)) and vitamin D (2.1  $\mu\text{g}$  (0.8)); in North Carolina, the recalls collected by the paraprofessional educator were higher in Vitamin B<sub>6</sub> (0.4 mg (0.2)).

### **Discussion**

The goal of the study was to compare the 24HR data collected by a paraprofessional educator to those collected by an RDN in a one-on-one setting with the same EFNEP-eligible participants. The recall methodology, recording tools and data entry staff were consistent. The cross-over design allowed for the control for recall order and the use of a single coder ensured standardized recall data entry. Refresher instruction increased the likelihood that consistent recall collection procedures were followed by paraprofessional educators and the RDN.

Results from this preliminary study demonstrate that a 24HR collected by a trained paraprofessional educator is similar to a 24HR collected by the RDN from female EFNEP-eligible participants using established multiple pass methodology with a single person doing all data entry. Of note, only four of the 27 variables from the second recall were higher than the first recall. This may suggest the 60-minute lag time in this cross-over design was an insufficient washout time between recalls to control for memory. Research on the ideal lag time between dietary interviews is lacking. Test-retest reliability on quality of life questions from the US Behavioral Risk Factor Surveillance System was moderate to excellent when the retest questions were administered about two weeks after initial contact.<sup>21,22</sup> However, 24 HR must be collected on the same day to allow for direct comparison of intakes.

These results are applicable to the professional practice of nutrition and dietetics. Dietetics is a broad discipline that includes varied areas of expertise, including integration of



food science, nutrition, management, communication, biological, physiological, behavioral and social sciences associated with achievement and maintenance of health.<sup>23</sup> The expanding role and responsibility of the RDN requires practitioners to define the scope of their practice. With the recent validation of the standardized five pass collection methodology for the 24HR,<sup>11-14</sup> the results of this study support the reassignment of recall collection from the RDN to a well-trained paraprofessional. Implications for this reassignment of responsibilities include expanding use of paraprofessional educators in research and practice and cost savings for 24HR data collection while maintaining data quality.

Realignment of data collection responsibilities from the RDN to the well trained paraprofessional educator aligns well with the Academy of Nutrition and Dietetics' Scope of Practice for the Registered Dietitian Nutritionist.<sup>23,24</sup> Within these guidelines, the Scope of Practice Decision Tool assists RDNs in determining if an activity is within their scope of practice based on changing roles and new opportunities for providing quality food and nutrition services.<sup>24</sup> The revised guidelines support the RDN identifying responsibilities and activities in their scope of practice and focusing their resources, based on knowledge, skills and competence, to better serve client or research needs. Based on the results of this introductory study, it appears the RDNs could justify realigning their responsibilities from actual 24HR collection and instead focus on the design, implementation and evaluation of community nutrition programs.<sup>23,24</sup>

### **Limitations and Future Directions**

This study included a relatively small number of participants from two states, three paraprofessional educators, and only a single RDN. Thus, results may have limited generalizability. Four of the 27 variables were higher in the second recall suggesting a longer lag time between recalls is needed to mitigate this effect.

In 2006, the National Cancer Institute, in collaboration with the USDA, developed the automated self-administered 24HR (ASA24) process that employs computer technology to collect and evaluate the multiple pass 24HR via the internet.<sup>25</sup> The ASA24 is currently available in Spanish and is accessible through mobile devices.<sup>26</sup> This product is a freely available web-based tool for the collection of high quality dietary intake information from large groups.<sup>27</sup> The ASA24 food data base currently has limited options for foods commonly eaten by culturally diverse populations. Based on discussions with program coordinators at National EFNEP and SNAP-Ed meetings, these culturally diverse groups are often unable to find common dietary items in the database, limiting the current ASA24's value to community nutrition programs.

The results from this study suggest recalls collected by trained paraprofessional educators are comparable to those collected by RDNs in the one-on-one setting. Programs with national reach, such as EFNEP, cannot be expected to have the resources necessary to establish the methodological rigor of large-scale research studies. However, for any dietary recall collection, adequate training and standardized collection methods are imperative, particularly if shifting to the paraprofessional educator for data collection. EFNEP and other community-based nutrition/health programs that use paraprofessional educators should implement consistent dietary collection methodology and training for the 24HR collection.

### **Conclusions**

While the ASA24 may be the future of dietary recall collection and evaluation, the interviewer-administered recall continues to be part of NHANES and other research and educational programs such as EFNEP. Therefore, continued evaluation of the reliability of a paraprofessional-collected 24HR in one-on-one settings is warranted to ascertain if the results from this study are reproducible with other paraprofessional educators and RDNs within EFNEP

nationally and in other settings. Ultimately, researchers should investigate the accuracy of collecting recalls in group settings commonly used by EFNEP and other community nutrition programs.<sup>16</sup>

While more research is needed to confirm the results, this study suggests a paraprofessional educator can collect a similar 24HR to the recall collected by an experienced RDN when the paraprofessional educator is adequately trained and follows standard methodology. Utilizing paraprofessionals rather than RDNs may allow for the collection of more recalls and also allow the RDNs to focus their expertise on the interpretation and application of research or clinical findings as well as program management and supervision.<sup>23,24</sup>

**Table 3.1.** The means (standard error), medians, and quartiles (Qs) of energy, macronutrients, micronutrients and food groups of adult female EFNEP participants (n=41) from 24HR collected by the paraprofessional nutrition educators and the Registered Dietitian Nutritionist (RDN)

Nutrient/Food Group	Interviewer			
	Paraprofessional		RDN	
	Mean (se)	Median (Q1/Q3)	Mean (se)	Median (Q1/Q3)
Food Energy (kcal)	2231(142)	2122 (1503/2753)	2266 (165)	1869 (1547/2809)
Carbohydrates (g)	285 (21)	244 (210/362)	292 (24)	239 (193/371)
Protein Nutrient (g)	89 (6)	88 (66/110)	88 (6)	78 (67/111)
Total Fat (g)	83 (6)	77 (46/119)	85 (7)	81 (54/102)
Saturated fat (g)	29 (3)	24 (15/37)	295 (2)	24 (19/38)
Total Fiber (g)	19 (2)	18 (13/24)	20 (2)	19 (12/25)
Sodium (mg)	3906 (299)	3645 (2367/4910)	3835 (269)	3507 (2478/4724)
Potassium (mg)	2905 (243)	2799 (1853/3730)	2963 (266)	2769 (1945/3467)
Iron (mg)	18 (1)	17 (12/23)	18 (2)	16 (11/20)
Calcium (mg)	956 (116)	730 (485/1133)	992 (128)	723 (547/1300)
Vitamin C (mg)	132 (18)	88 (45/214)	142 (21)	94 (50/207)
Folate (mg)	758 (105)	550 (381/795)	761 (95)	586 (383/822)
Vitamin A (µg)	570 (62)	500 (242/805)	698 (107)	552 (320/817)
Vitamin D (µg)	4.2 (0.5)	3.5 (1.8/5.3)	5.1 (0.8)	4.1 (2.3/6.3)
Vitamin E (mg)	8.6 (1.3)	6.0 (4.0/11.5)	8.6 (1.1)	6.0 (4.0/12.0)
Vitamin B12 (µg)	7.3 (1.4)	5.1 (2.5/8.0)	7.4 (1.3)	5.2 (3.7/8.3)
Vitamin B6 (mg)	2.8 (0.3)	2.2 (1.4/3.0)	2.6 (0.3)	2.1 (1.4/2.7)
Total Grains (oz.)	7.8 (0.6)	7.7 (5.0/10.2)	8.1 (0.7)	7.4 (5.1/9.7)
Whole Grains (oz)	1.4 (0.3)	0.8 (0/2.0)	1.3 (0.3)	0.6 (0.0/2.1)
Refined Grains (oz.)	6.4 (0.6)	6.3 (3.3/8.5)	6.8 (0.7)	6.6 (3.1/8.5)
Fruits (cups)	1.4 (0.2)	1.0 (0.3/2.1)	1.5 (0.3)	0.8 (0.3/2.1)
Dairy (cups)	1.6 (0.3)	1.0 (0.5/2.1)	1.8 (0.3)	1.1 (0.6/2.3)
Vegetables (cups)	1.9 (0.2)	1.7 (0.5/2.9)	1.8 (0.2)	1.5 (0.9/2.3)
Protein Foods (oz eq)	6.6 (0.5)	6.9 (4.4/8.3)	6.3 (0.5)	6.0 (3.5/8.4)

Cholesterol (mg)	296 (28)	255 (178/418)	296 (30)	238 (158/395)
Oils (gm)	16 (3)	10 (5/28)	18 (3)	10 (5/28)
SoFAS (kcal) <sup>a</sup>	507 (42)	446 (309/627)	509 (45)	431 (289/634)

<sup>b</sup> Solid fats and added sugars

**Table 3.2** The mean intake of energy, macronutrients, micronutrients and food groups from adult female EFNEP participants collected (n=41) by the Registered Dietitian Nutritionist minus mean energy, macronutrients, micronutrients and food groups collected by the paraprofessional nutrition educator.

<b>Nutrient/Food Group</b>	<b>Interviewer Effect mean (se)</b>	<b>p value<sup>a</sup></b>	<b>ICC<sup>b</sup></b>	<b>SpearCorr<sup>c</sup></b>
Energy (kcal)	40 (72)	0.58	0.8729	0.871
Carbohydrate (g)	8 (9)	0.41	0.912	0.856
Protein (g)	-1 (4)	0.80	0.798	0.783
Total Fat (g)	2 (4)	0.53	0.800	0.815
Saturated Fats (g)	0 (2)	0.94	0.773	0.792
Fiber (g)	1 (1)	0.59	0.715	0.754
Sodium (mg)	-72 (186)	0.70	0.792	0.847
Iron (mg)	0 (1)	0.85	0.878	0.787
Calcium (mg)	40 (52)	0.45	0.906	0.816
Potassium (mg)	72 (112)	0.53	0.899	0.861
Vitamin C (mg)	11 (14)	0.46	0.743	0.832
Folate (mg)	5 (38)	0.89	0.934	0.846
Vitamin A (µg)	121 (86)	0.17	0.494	0.797
Vitamin D (µg)	1.0 (0.6)	0.07	0.593	0.806
Vitamin E (mg)	0.0 (0.8)	0.95	0.822	0.852
Vitamin B12 (µg)	0.1 (0.3)	0.69	0.966	0.829
Vitamin B6 (mg)	-0.2 (0.1)	0.16	0.915	0.870
Total Grains (oz.)	0.4 (0.4)	0.30	0.804	0.894
Whole Grains (oz)	0.0 (0.1)	0.98	0.893	0.889
Refined Grains (oz.)	0.4(0.3)	0.23	0.865	0.905
Fruits (cups)	0.1 (0.2)	0.41	0.782	0.812
Dairy (cups)	0.2 (0.1)	0.14	0.849	0.892
Vegetables (cups)	-0.1 (0.1)	0.66	0.766	0.812
Protein Foods (oz equiv.)	-0.4(0.4)	0.35	0.716	0.693
Cholesterol (gm)	0.0 (16)	0.99	0.858	0.861
Oils (gm)	2 (2)	0.30	0.685	0.821
SoFAS (kcal) <sup>d</sup>	1 (27)	0.97	0.791	0.812

<sup>a</sup> p < 0.05 was considered statistically significant

<sup>b</sup> Interclass Correlation

<sup>c</sup> Spearman Correlation

<sup>d</sup> Solid fats and added sugars

**Table 3.3.** Mean difference (second recall minus first recall) in energy, macronutrients, micronutrients and food groups from two 24HR collected one hour apart by either a paraprofessional nutrition educator or Registered Dietitian Nutritionist from adult female EFNEP participants (n=41)

<b>Nutrient/Food Group</b>	<b>Order Effect Mean (se)</b>	<b>p value<sup>a</sup></b>
Energy (kcal)	177 (72)	0.02
Carbohydrate (g)	18 (9)	0.06
Protein (g)	5 (4)	0.18
Total Fat (g)	11 (4)	0.01
Saturated Fats (g)	4 (2)	0.02
Fiber (g)	1 (1)	0.40
Sodium (mg)	245 (186)	0.20
Iron (mg)	0.0 (1)	0.57
Calcium (mg)	69 (52)	0.19
Potassium (mg)	86 112	0.45
Vitamin C (mg)	-7 (14)	0.64
Folate (mg)	-7 (38)	0.85
Vitamin A (µg)	145 (86)	0.10
Vitamin D (µg)	0.1 (0.6)	0.84
Vitamin E (mg)	0.3 (0.7)	0.68
Vitamin B12 (µg)	0.0 (0.3)	0.99
Vitamin B6 (mg)	0.1 (0.1)	0.48
Total Grains (oz.)	0.6 (0.4)	0.11
Whole Grains (oz)	0.1 (0.1)	0.57
Refined Grains (oz.)	0.6 (0.3)	0.10
Fruits (cups)	-0.2 (0.2)	0.24
Dairy (cups)	0.2 (0.1)	0.26
Vegetables (cups)	0.0 (0.1)	0.80
Protein Foods (oz. equiv.)	0.3 (0.4)	0.53
Cholesterol (gm)	25 (15)	0.11
Oils (gm)	2 (2)	0.29
SoFAS (kcal) <sup>b</sup>	69 (27)	0.01

<sup>a</sup> p < 0.05 was considered statistically significant

<sup>b</sup> Solid fats and added sugars

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CHAPTER 4. CHANGE IN HEI-2005 DIETARY SCORES OF LOW-INCOME ADULTS  
AFTER PARTICIPATION IN THE EXPANDED FOOD AND NUTRITION  
EDUCATION PROGRAM

**Introduction**

The Expanded Food and Nutrition Education Program (EFNEP) is designed to assist the low-income audience in acquiring the knowledge and skills necessary to plan, procure, and prepare nutritionally sound diets; the intent is to improve the total family diet and nutritional well-being.<sup>1</sup> EFNEP is funded annually through Congressional legislation and administered by the National Institute of Food and Agriculture of the U.S. Department of Agriculture in cooperation with State Cooperative Extension Services in all 50 states and six U.S territories.<sup>2</sup> The program is delivered in a series of 8-12 classes, primarily in group settings.<sup>1</sup>

Program evaluation began in the 1970s when the House Committee on Agriculture required the program to demonstrate achievement of established goals and objectives.<sup>3</sup> To meet this requirement, EFNEP began collecting 24-hour dietary recalls (24HR) from participants at entry and again at exit of the program to assess change in dietary intake as a result of program participation. Unlike recalls collected in research settings, where the recalls are collected and recorded by professionals in a one-on-one setting, EFNEP paraprofessionals guide the participants to record their own recalls in group settings; recalls are typically coded by multiple staff members.<sup>4</sup> Results from these recalls are reported annually and include information on changes in nutrient and food group consumption.<sup>2</sup> More recently EFNEP began calculating and reporting the Healthy Eating Index (HEI) scores at entry and exit as well as score changes (exit minus entry).<sup>5</sup>

The Healthy Eating Index (HEI) is a summary measure of diet based on two perspectives: adequacy (dietary components to promote) and moderation (dietary components to limit).<sup>6,7</sup> The score is based on adherence to the Dietary Guidelines for Americans (DGA), i.e., the greater the adherence, the greater the number of points awarded. The first HEI was based on the 1990 DGA and had ten components with a maximum score of 100. As the DGA changed, the HEI was modified to reflect such changes. The DGA 2005 included an emphasis on diet quality including whole grains, whole fruits, various types of vegetables, specific types of fats and included the concept of ‘discretionary calories’ (Table 4.1). The HEI-2005 standards were created based on a density approach as they are expressed as a percent of energy intake, or per 1000 kcalories.<sup>8</sup> The validity and reliability of the HEI-2005 were evaluated using dietary recalls from NHANES data and exemplary menus.<sup>9</sup>

Though available for over 20 years, the HEI has been infrequently used to evaluate nutrition intervention programs. Glanz et al. studied diet quality changes of participants in the Nutrition Advice Study, which consisted of a 1-hour educational session followed by eight weeks of motivational email messages and biweekly mailings.<sup>10</sup> HEI-2005 scores demonstrated an increase of 5.0 points in the intervention group versus 2.0 points in the control group. However, in a family-based intervention study, HEI-2005 entry/exit scores did not change after completion of a home-based ten-month behavioral intervention.<sup>11</sup> In a six-month church-based diet and physical activity intervention, both intervention and control groups demonstrated significant increases in overall HEI-2005 of 3.2 and 3.4 points, respectively.<sup>12</sup>

Guenther and Luick reported a median change of 6.1 points in HEI-2005 scores of EFNEP participants (n=3,388) in eight mountain region states.<sup>13</sup> In 2015, Weatherspoon et al.

reported an improvement of 2.3 points in mean HEI-2005 scores for Michigan participants (n=2,387) in Supplemental Nutrition Assistance Program-Education and EFNEP programs.<sup>14</sup>

The information presented here summarizes HEI-2005 scores from EFNEP participants, obtained through the web-based Nutrition Education Evaluation and Reporting System (WebNEERS) 2013-2014.<sup>15</sup> (Note: EFNEP did not begin to use the HEI-2010 until fiscal year 2017.) The primary objective of this study was to compare the change in HEI-2005 (calculated as exit minus entry) from EFNEP participants in these two years. A secondary objective was to compare change in individual HEI-2005 components based on age, education, gender and race/ethnicity. Therefore, the null hypotheses are: 1) there is no difference in HEI-2005 scores of EFNEP participants due to participation in the program (exit minus entry); 2) there is no difference in change in total HEI-2005 scores of EFNEP participants due to participation in the program based on selected demographics and 3) there is no difference in change in HEI-2005 component scores of EFNEP participants due to participation in the program based on selected demographics parameters.

## **Methods**

### **Study Design and Population**

This study was a secondary analysis of the 24HR recall information collected from EFNEP participants from October 2012 through September 2014. The data were obtained through a Freedom of Information Act request to the US Department of Agriculture for the EFNEP 2013 and 2014 annual data set in WebNEERS. (Appendix L) The data were preexisting and deidentified when provided for this review; therefore, institutional review board approval was not required as per US Department of Health and Human Services guidelines.<sup>16</sup>

Participants completed a 24HR at the start of the program and again at the end using paper forms under the guidance of the paraprofessional educator. Collection practices are not consistent across programs.<sup>4</sup> However, since this study primarily compares the difference between entry/exit 24HR, it is presumed the collection practices within a specific class of participants were consistent.

EFNEP staff entered participants' information, including demographic information and entry/exit 24HR, into WebNEERS. The Food and Nutrient Database for Dietary Studies (FNDDS, version 3.0) was used for dietary evaluation of 24HR during fiscal years 2013-2014.<sup>15</sup> WebNEERS provides a variety of reports and summary data including the demographics of the participants and component HEI-2005 scores and changes at the individual level in HEI-2005 based on exit minus entry recall data.

### **Data Preparation**

WebNEERS calculated HEI-2005 scores of the 24HR based on conformance to the 2005 Dietary Guidelines for Americans.<sup>15</sup> The HEI-2005 are recommendations for types and amounts of foods to eat based on energy intake and include recommendations of foods to eat more of (adequacy groups) and those to eat less of (moderation groups). As the density intake of the nine adequacy groups (total fruits, whole fruits, total vegetables, dark green and orange vegetables and legumes, total grains, whole grains, milk, meat and beans, and oils) increase so does the HEI-2005 score increase. As the density intake of the three moderation groups intake (saturated fats, sodium and solid fats, alcoholic beverages and added sugar) increases, the HEI score decreases.<sup>8,9</sup>

Prior to analysis, the large (n=135,021) EFNEP entry/exit HEI data set was imported and cleaned, and categorical variables were established for demographic predictor variables of

interest. Cleaning consisted of filtering for duplicates and deleting if only a single entry/exit recall existed or for invalid values, including components scores not summing to total HEI score. Categorical variables for study demographics were based on data from similar studies with removal of some participants, including those under 19 or over 70 years of age based on data sets from other studies, including EFNEP and meta-analysis studies.<sup>13,17</sup>

Race/ethnicity was divided into four categories: White, non-Hispanic; Black, non-Hispanic; Other race, non-Hispanic; and Hispanic. If the participant identified as Hispanic, then that individual was placed in the Hispanic category which included White, Hispanic; Black, Hispanic; and non-specified Hispanic.

The evaluation of change in HEI-2005 included all records with valid HEI entry/exit/change data and valid responses in all component scores (n = 122,961). Observations with missing demographic data were removed from the analysis models (n = 97,522). Thus, two sample sizes were considered: one with a total of n = 122,961 with valid entry and exit data, and a subset of the first, (n = 97,522) which had valid entry and exit data and complete demographic information.

## **Data Analysis**

Statistical analysis was performed in R version 3.4.0 using the car and lsmeans packages.<sup>17</sup> Paired t-tests were used to test overall and component HEI changes. While some component scores may not be normally distributed, the paired t-test is appropriate given the large sample size and symmetric distribution of the differences.

A linear model was fit separately for total HEI and the 12 HEI components. The response variable is change in HEI-2005 score (exit minus entry). Predictor variables include age group (19-30, 31-50, 51-70), education (4 levels), gender (women, men) and race/ethnicity

(White, Black, Other race, Hispanic). In addition, for the total HEI model, entry HEI score was included as a covariate. Similarly, for the subcomponent HEI models, the corresponding component entry HEI score was included as a covariate. Tukey adjustment used in cases where more than two groups were compared. In order to account for multiple testing for the 12 component models, a Bonferonni adjusted ANOVA F-test was calculated. In the case of  $p > 0.05$ , all pairwise comparisons for that component model term were considered non-significant.

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## Results

Almost half of the EFNEP participants in this sample were between the age of 31 and 50 years, over 70% had at least a high school diploma or equivalent, a third were Hispanic, and 84% were women. Table 4.2 presents other characteristics of the sample along with changes in HEI-2005 scores adjusted for entry based on demographic characteristics (changes discussed below).

Table 4.3 presents the summary statistics for entry, exit, and change in HEI-2005. The mean (sd) HEI scores at entry were 51.1 (13.7), 56.5 (13.7) at exit, and change of 5.4 (16.7) after completion of the program ( $p < 0.05$ ). Nine component scores increased to varying degrees with the largest increase (1.1 points) in solid fats, alcoholic beverages and added sugars (SoFAAS); this increase reflects a decrease in intake of this component. Three component scores slightly decreased over the program - total grains, oils, and sodium (a decrease in sodium reflects an increase in mean sodium intake). The largest proportional increases (in relationship to the entry score and maximum sub-score) were total fruit (0.9 point increase; 43% greater than entry and 18% of maximum sub-score of 5), whole fruit (0.9 point increase; 50% greater than entry and 18% of maximum sub-score of 5) and whole grains (0.5 point increase; 56% greater than entry and 10% of maximum sub-score of 5).



The change (se) in HEI-2005 scores was significantly greater as age increased, with increasing education, and in women (Table 4.2). Women improved total HEI scores by over 6 (0.06) points while men only saw a 4.3 (0.12) point increase. Hispanics' HEI change was the greatest (8.3 (0.09)) among the race/ethnic groups, followed by Other race (6.1(0.15)), Whites (4.3(0.09)) and Blacks, with only a 2.4 (0.09) point change.

Table 4.4 lists the changes in HEI component scores adjusted for entry score and based on demographics. This offers an overview of how the different demographic groups responded to the information provided in EFNEP. Because of the large number of participants, most changes, when comparing within groups, were significantly different, with a limited number of groupings demonstrating no difference. Therefore, the same superscript in the table denotes non-significant differences in the same demographic/component group.

As age increased, participation in EFNEP resulted in an increase of HEI-2005 component scores for total fruits; whole fruits; total vegetables; dark green and orange vegetables and legumes; whole grains; meat and beans; saturated fats; and SoFAAS. Total grains, milk, and sodium scores decreased as age increased. (Table 4.4)

Change in component scores varied based on educational level. Change in six component scores did not differ between those with some college or less education (total fruits; total vegetables, dark green and orange vegetables and legumes; meat and beans, saturated fats; and SoFAAS). There was no difference based on education in the milk component. Those participants with a college degree or higher had improved scores in eight component scores: total fruit; whole fruit; total vegetables; dark green and orange vegetables and legumes; whole grains; oils; saturated fats; and SoFAAS when compared to the other three education groups.

Female participants' intake of nine components showed a greater improvement than male participants. There was no difference in change in oils and total grains. Both genders had a decrease in component score in sodium, but women had a smaller decrease (-0.30 vs -0.59).

The increase in Hispanics' HEI was due to an improvement in all components except for total grain, oils, and sodium. One-fourth of the 8.3-point change seen with Hispanics was attributed to a 2.1-point increase in SoFAAS score while total fruit, whole fruit, and milk all increased by at least 1 point.

All race/ethnicity groups had a decrease in sodium score while all groups increased SoFAAS scores with the greatest increase in Hispanics and Other groups. Whole grain intake increased in all groups with the greatest score increase in the Hispanic and Other groups. Black's mean milk score decreased, in contrast to the other race/ethnic groups that increased milk scores.

## **Discussion**

Results of this study provide insight into the change in dietary quality of EFNEP participants as well as implications for future program emphasis. Based on previous study, the 24HR is not collected consistently across and within EFNEP programs.<sup>4</sup> For this study, it was presumed that the entry/exit recalls were collected using the same methodology and thus the change in HEI scores (exit minus entry) reflect change in diet due to participation in EFNEP.

Participation in EFNEP resulted in improved dietary quality of the participants based on a mean change in HEI-2005 score of 5.4 points, over the time of the program. The HEI-2005 is based on nutrient density so the change in scores reflect overall improvement in diet quality of participants as energy intake and components scores are independent of each other.<sup>8</sup> This significant change occurred across all demographic groups (Table 4.2).

Based on unadjusted values, 32% of the HEI-2005 score increase was from increased fruit (whole and total) scores while 17% of the change was from an increase in vegetable scores (total and dark green and orange vegetables and legumes). Increase in milk scores contributed 17% of the improved overall score. SoFAAS increased by 1.1 points (20% of total increase), which indicates a relative decrease in consumption. These positive and relatively large changes might reflect the emphasis placed on these food groups in the most commonly used EFNEP curricula.<sup>23</sup> The HEI component scores that had the greatest need for improvement (< 30 % of maximum sub-score at exit) were Dark Green and Orange Vegetables and Legumes, Whole Grains, Saturated Fat, and Sodium.

Oils and sodium scores decreased. The decrease in sodium score suggests sodium intake per 1000 kcal went up, which is consistent with previous studies in which sodium is negatively correlated with other components and total HEI scores. As intake of total grains, total vegetables, and meat and bean component scores increased, sodium density increased due to sodium's wide distribution in these foods, naturally occurring or due to processing, resulting in a lower sodium HEI score.<sup>9,12</sup> Relative to oils, EFNEP curricula typically discuss reducing fats, sugar and sodium in a single lesson,<sup>23</sup> limiting the time available to differentiate the recommendations on types of fat versus amounts.

When evaluated by demographic characteristics, the adjusted change in HEI-2005 scores increased as age increased. The oldest group (51-70 years) had over a 6.2-point increase while the youngest a 4.3 change in score. This young age group has the most to gain by improving diet quality as they have the longest time to modify possible development of chronic diseases.

As education increased, so did the change in HEI-2005 score (Table 4.2). Results in Table 4.4 offer insight on how participants with varied education responded to the information

provided in the EFNEP curriculum. Change in nine of the 12 components was similar in three education demographic groups, those with some college or less. These results suggest EFNEP promotes improved diet quality in low-income participants with differing educational backgrounds.

Women improved HEI scores by over 6 points while males only saw a 4.3-point increase (Table 4.2). The EFNEP population in these two years was 84% female and this may influence the difference seen in the change in HEI scores. Possible causes for this discrepancy are unclear. It may be due to curriculum delivery and class-focused discussion aimed at the major participants, i.e., tailoring messages to female participants.

The mix of participants based on reported race/ethnicity was around 30% in each of White, non-Hispanic; Black, non-Hispanic, and Hispanic, while the Other race, non-Hispanic group is 8% of total participants. All groups increased their final score with the Hispanics' HEI change being the greatest (8.3), followed by Others (6.1), Whites (4.3) and Blacks, with only a 2.4-point change (Table 4.3). All demographic groups realized an increase the SoFAAS score. The reduction of SoFAAS intake, hence the increase in the score, is important in all population groups. As HEI-2005 combines added sugars with alcohol and solid fat intake, it is not clear if the increased SoFAAS score is the result of decrease in added sugars or all three components. With the high incidence of obesity in America, this increase in the SoFAAS composite score in all demographic groups, indicating a relative decrease in intake of these discretionary calories, is a favorable outcome from EFNEP participation.

If participants maintain the improved diets as reflected in the HEI changes, they may experience improved health. Recent systematic reviews investigated the pooled estimates of diet quality and all-cause mortality or incidence of chronic diseases.<sup>17,24</sup> In these reviews as well as

other epidemiology studies, there is an inverse association between HEI scores and all-cause mortality and incidence of chronic diseases including cardiovascular disease, coronary heart disease, stroke, Type 2 diabetes in men and cancer (head and neck, esophageal, colorectal, gastric, lung) in both women and men, and prostate cancer in men.<sup>25-32</sup> Research also suggests that higher HEI-2005 scores are associated with improved prognosis and lower death rates after a diagnosis of breast cancer.<sup>33,34</sup> Unfortunately, there is limited data on dietary intake post-EFNEP participation to document if the improvement in diet quality found in this study continues after program completion.<sup>35</sup>

There is limited information of the significance of this level of change. Any increase, even at the change documented from this study, reflects improved dietary intake of low-income participants who tend to have poorer diets than the higher income population.<sup>36</sup>

### **Strengths and Limitations**

This study offers insight into the change in dietary quality due to national EFNEP participation. The large number of matched 24HR allows comparison of change in overall dietary quality and in individual HEI-2005 components. While EFNEP provides publicly available HEI summaries in its Adult Diet Summary Report and Tier data, to our knowledge, comparisons of the total EFNEP population have not been reported before.

Collection of the 24HR in EFNEP dates to the programs founding in 1969.<sup>3</sup> Data collection and coding procedures are under local program control and not standardized for all 76 programs. Most recalls are collected in group settings; all educators do not use the standardized five-pass method; and participants record their own recalls on paper.<sup>4</sup> This is in contrast to the validated, multiple pass method used in various research protocols, such as NHANES and Observing Protein and Energy Nutrition Study.<sup>37-40</sup> Since the difference score was used to

evaluate change in quality, it was assumed the same method was used for both recalls and the difference in data collection methods across programs is mitigated. Also, the lack of a control group does not allow conclusive understanding of the degree of improvement in diet quality due to EFNEP participation, particularly as it relates to the influence of social desirability in the responses.

The main limitation of the 24HR is that respondents may not report all foods consumed accurately due to various reasons including memory, attention to food preparation and interview setting. The primary use of the 24HR is to evaluate average intake of a group as means are unaffected by within-person variation.<sup>41</sup>

### **Implication for Practice and Future Research**

The EFNEP population is low-income and includes members of diverse demographic groups. This study provides information on changes in dietary quality based on demographics and individual HEI-2005 component scores large enough to discern differences between groups. These differences could be used by EFNEP program leaders to modify program content to address identified dietary needs of specific sub-groups. For example, program leaders might use the HEI results to enhance an education on milk, other dairy products, and soy beverages in classes targeting a Black population.

As recall collection varies within and among programs,<sup>16</sup> consistent use of the five-pass methodology is recommended for EFNEP. Better adherence to existing 24 HR training materials and guidelines or development of new training materials that stress consistent data collection and coding protocols are needed to support the fidelity of 24HR collection within EFNEP.<sup>40, 42</sup>

Current collection of the 24HR in EFNEP occurs primarily in group settings with the participant recording intake as directed by the paraprofessional.<sup>4</sup> This method has not been

validated although a recent study reported that well-trained paraprofessionals can collect comparable recalls to those collected by professionals in one-on-one settings with the interviewers recording the recalls.<sup>43</sup> Future research could investigate if the recall collected in a group, as recorded by the participant when directed by a paraprofessional, is comparable to recalls collected in a one-on-one setting.

EFNEP could strengthen confidence in reported dietary changes by taking steps to improve fidelity in collection and coding methodology for the 24HR and by examining the validity of group 24HRs. Practitioners and researchers might consider accessing the WebNEERS data to investigate dietary patterns among subgroups of the low-income population and to identify pertinent topics for nutrition education; this data base has information on the diets of over 100,000 low-income individuals annually.

EFNEP participants reported successfully improving diet quality during program participation.<sup>2</sup> It is unclear if these changes continue after program completion. Follow up studies are required to document if these changes are maintained and if other dietary changes are implemented after the program. Twenty-four-hour dietary recalls collected over time would further document the sustained impact of EFNEP on dietary intakes in the low-income population.

### **Conclusion**

In summary, our results indicate that EFNEP participants improved their diet quality over the period of program participation based on change in HEI-2005. This improvement was evident in nine of 12 HEI-2005 subcomponents and across all demographic characteristics. With increasing incidence of chronic diseases and known correlations between diet quality and

disease, improving diet quality of the low-income population continues to be a priority. EFNEP is uniquely positioned to address this challenge.<sup>45</sup>



**Table 4.1.** Healthy Eating-2005 components and standards for scoring.<sup>a</sup>

Component (Max Score)	Criteria for minimum score (per 1000 kcal)	Criteria for maximum score (per 1000 kcal)
<b>Adequacy</b>		
Total Fruit <sup>b</sup> (5)	0 cup eq	≥ 0.8 cup eq
Whole Fruit <sup>c</sup> (5)	0 cup eq	≥ 0.4 cup eq
Total Vegetables (5)	0 cup eq	≥ 1.1 cup eq
Dark Green and Orange Vegetables and Legumes <sup>d</sup> (5)	0 cup eq	≥ 0.4 cup eq
Total Grains (5)	0 oz eq	≥ 3.0 oz eq
Whole Grains (5)	0 oz eq	≥ 1.5 oz eq
Milk <sup>e</sup> (10)	0 oz eq	≥ 1.3 cup eq
Meat and Beans <sup>f</sup> (10)	0 cup eq	≥ 2.5 oz eq
Oils <sup>g</sup> (10)	0 cup eq	≥ 12 g
<b>Moderation</b>		
Saturated Fat <sup>h</sup> (10)	≥ 15 % of energy	≤ 7% of energy
Sodium <sup>i</sup> (10)	≥2.0 g	≤ 0.7 g
Calories from Solid Fats, Alcoholic Beverages and Added Sugars (20)	≥ 50% of energy	≤ 20% of energy
<b>Total</b>	<b>0</b>	<b>100</b>

<sup>a</sup> Intakes between the minimum and maximum levels are scored proportionately, except for Saturated Fat and Sodium (see note h,i).

<sup>b</sup> Includes 100% fruit juice.

<sup>c</sup> Includes all forms except juice.

<sup>d</sup> Includes legumes only after meat and beans standard is met.

<sup>e</sup> Includes all milk products, such as fluid milk, yogurt, cheese and soy beverages.

<sup>f</sup> Includes legumes only if the meat and beans standard is otherwise not met.

<sup>g</sup> Includes non-hydrogenated vegetable oils and oils in fish, nuts and seeds.

<sup>h</sup> Saturated Fat gets a score of 8 for intake levels that reflect the 2005 Dietary Guidelines, 10% of energy from Saturated Fats. Saturated Fat intake between 7% and 10% and between 10% and 15% are prorated linearly.

<sup>i</sup> Sodium gets a score of 8 for intake levels that reflect the 2005 Dietary Guidelines, for 1.1 g sodium/1000 kcal. Sodium intake between 0.7 and 1.1 g per 1,000 kcal and between 1.1 and 2.0 g per 1,000 kcal are prorated linearly.

**Table 4.2.** Mean entry and exit total HEI-2005 scores and change in HEI-2005 scores, adjusted for entry score and demographic characteristics, from EFNEP participants in 2013-2014. (n = 97,522)

Demographics	N (%)	Mean Entry Score	Mean Exit Score	Adjusted Change <sup>b</sup> (se)	CI
<b>Age (yr)</b>					
19 to 30	38,416 (39)	49.6	55.3	4.3 (0.09)	4.1-4.5
31 to 50	45,256 (47)	51.9	57.4	5.4 (0.08)	5.2-5.5
51 to 70	13,850 (14)	53.0	58.0	6.2 (0.12)	6.0-6.4
<b>Education<sup>b</sup></b>					
< grade 12	26,849 (28)	51.3	56.9	4.6 (0.09)	4.4-4.8
HS grad or GED	38,996 (40)	50.3	56.0	4.9 (0.08)	4.7-5.1
Some College/AA	23,384 (24)	51.3	56.5	5.2 (0.10)	5.0-5.4
College Grad/Post Grad	8,293 (8)	54.6	59.4	6.5 (0.15)	6.2-6.8
<b>Gender</b>					
Women	84,069 (84)	51.5	57.1	6.3 (0.06)	6.2-6.5
Men	13,453 (17)	48.8	53.8	4.3 (0.12)	4.0-4.5
<b>Race/Ethnicity</b>					
White	30,127 (31)	49.2	55.2	4.3 (0.09)	2.3-2.6
Black	27,541 (28)	48.3	53.3	2.4 (0.09)	8.1-8.5
Hispanic	31,793 (33)	54.9	60.6	8.3 (0.09)	4.1-4.5
Other	8,061 (8)	53.2	58.0	6.1 (0.15)	5.8-6.4

<sup>a</sup> Adjusted change is based on a linear model adjusting for entry HEI as well as demographic information, hence change does not match the simple difference of exit – entry. All the adjusted change means are significantly different from the other means in the same column and demographic group ( $p < 0.05$ ).

**Table 4.3.** Summary statistics for HEI-2005 component mean scores at entry and exit for EFNEP participants in 2013-2014. (n = 122,961)

<b>Component (Max Score)</b>	<b>Entry</b>	<b>Exit</b>	<b>Change (se)<sup>1</sup></b>	<b>p value<sup>a</sup></b>
<b>Total (100)<sup>b</sup></b>	51.1	56.5	5.4 (0.05)	< 0.001
<b>Adequacy</b>				
Total Fruit <sup>c</sup> (5)	2.1	3.0	0.9 (0.01)	< 0.001
Whole Fruit <sup>d</sup> (5)	1.8	2.7	0.9 (0.01)	< 0.001
Total Vegetables (5)	3.1	3.6	0.5 (0.01)	< 0.001
Dark Green and Orange Vegetables and Legumes <sup>e</sup> (5)	0.9	1.3	0.4 (0.01)	< 0.001
Total Grains (5)	4.3	4.3	-0.0 (0.00)	< 0.001
Whole Grains (5)	0.9	1.4	0.5 (0.01)	< 0.001
Milk <sup>f</sup> (10)	4.5	5.4	0.9 (0.01)	< 0.001
Meat and Beans <sup>g</sup> (10)	8.4	8.7	0.3 (0.01)	< 0.001
Oils <sup>h</sup> (10)	4.7	4.6	-0.1 (0.01)	< 0.001
<b>Moderation</b>				
Saturated Fat <sup>i</sup> (10)	2.2	2.5	0.3 (0.01)	< 0.001
Sodium <sup>j</sup> (10)	2.9	2.7	-0.2 (0.01)	< 0.001
SoFAAS <sup>k</sup> (20)	15.5	16.6	1.1 (0.02)	< 0.001

<sup>1</sup> Change in HEI-2005 score is exit minus entry score.

<sup>a</sup> Based on paired t-test.

<sup>b</sup> Intakes between the minimum and maximum levels are scored proportionately, except for Saturated Fat and Sodium (see note i, j).

<sup>c</sup> Includes 100% fruit juice.

<sup>d</sup> Includes all forms except juice.

<sup>e</sup> Includes legumes only after meat and beans standard is met.

<sup>f</sup> Includes all milk products, such as fluid milk, yogurt, cheese and soy beverages.

<sup>g</sup> Includes legumes only if the meat and beans standard is otherwise not met.

<sup>h</sup> Includes nonhydrogenated vegetable oils and oils in fish, nuts and seeds.

<sup>i</sup> Saturated Fat gets a score of 8 for intake levels that reflect the 2005 Dietary Guidelines, 10% of energy from Saturated Fats. Saturated Fat intake between 7% and 10% and between 10% and 15% are prorated linearly.

<sup>j</sup> Sodium get a score of 8 for intake levels that reflect the 2005 Dietary Guidelines, for 1.1 g sodium/1000 kcal. Sodium intake between 0.7 and 1.1 g per 1,000 kcal and between 1.1 and 2.0 g per 1,000 kcal are prorated linearly.

<sup>k</sup> Calories from Solid Fats, Alcoholic Beverages and Added Sugars

**Table 4.4** Mean changes (se) in HEI-2005 components score adjusted for entry and age, education, gender and race/ethnicity from EFNEP participants in 2013-2014.<sup>a</sup> (n = 97,522)

	N (%)	Total Fruit	Whole Fruit	Total Vegetables	DrkGrn OrgVeg <sup>b</sup>	Total Grains	Whole Grains	Milk	Meat and Beans	Oils	Saturated Fat	Sodium	SoFAAS <sup>c</sup>	Overall
<b>Maximum Possible Score</b>		5	5	5	10	10	10	10	10	10	10	10	20	100
<b>Age (yr)</b>														
19 to 30	38,416 (39)	0.73 (0.01)	0.67 (0.02)	0.31 (0.01)	0.32 (0.01)	0.00 (0.01)	0.40 (0.01)	0.76 (0.03)	0.29 (0.02)	-0.14 <sup>x</sup> (0.03)	0.25 (0.03)	-0.34 (0.02)	1.00 (0.03)	4.29 (0.09)
31 to 50	45,256 (47)	0.77 (0.01)	0.82 (0.01)	0.50 (0.01)	0.50 (0.01)	-0.02 (0.01)	0.50 (0.01)	0.58 (0.02)	0.46 <sup>x</sup> (0.02)	-0.11 <sup>x</sup> (0.02)	0.53 (0.02)	-0.44 (0.02)	1.33 (0.03)	5.37 (0.08)
51 to 70	13,850 (14)	0.90 (0.02)	0.95 (0.02)	0.60 (0.02)	0.62 (0.02)	-0.11 (0.01)	0.62 (0.02)	0.47 (0.03)	0.50 <sup>x</sup> (0.02)	0.00 <sup>x</sup> (0.04)	0.71 (0.04)	-0.56 (0.03)	1.64 (0.04)	6.21 (0.12)
<b>Education<sup>d</sup></b>														
< grade 12	26,849 (27)	0.76 <sup>x</sup> (0.02)	0.81 <sup>x</sup> (0.02)	0.46 <sup>x</sup> (0.01)	0.42 <sup>x</sup> (0.01)	0.00 <sup>x</sup> (0.01)	0.42 <sup>x</sup> (0.01)	0.57 <sup>x</sup> (0.03)	0.38 <sup>x</sup> (0.02)	-0.44 (0.03)	0.43 <sup>x</sup> (0.03)	-0.42 <sup>x</sup> (0.02)	1.19 <sup>x</sup> (0.03)	4.58 (0.09)
HS grad or GED	38,996 (40)	0.77 <sup>x</sup> (0.01)	0.76 <sup>y</sup> (0.01)	0.45 <sup>x</sup> (0.01)	0.42 <sup>x</sup> (0.01)	-0.02 <sup>x</sup> (0.01)	0.43 <sup>x</sup> (0.01)	0.64 <sup>x</sup> (0.02)	0.42 <sup>x,y</sup> (0.02)	-0.11 (0.02)	0.41 <sup>x</sup> (0.02)	-0.48 <sup>y</sup> (0.02)	1.22 <sup>x</sup> (0.03)	4.90 (0.08)
Some College/AA	23,384 (24)	0.77 <sup>x</sup> (0.02)	0.79 <sup>x,y</sup> (0.02)	0.44 <sup>x</sup> (0.01)	0.45 <sup>x</sup> (0.01)	-0.06 <sup>y</sup> (0.01)	0.53 (0.01)	0.60 <sup>x</sup> (0.03)	0.42 <sup>x,y</sup> (0.02)	0.02 (0.03)	0.47 <sup>x</sup> (0.03)	-0.45 <sup>x,y</sup> (0.02)	1.28 <sup>x</sup> (0.03)	5.21 (0.10)
College Grad/Post Grad	8,293 (9)	0.89 (0.02)	0.90 (0.03)	0.53 (0.02)	0.62 (0.02)	-0.09 <sup>y</sup> (0.01)	0.64 (0.02)	0.60 <sup>x</sup> (0.04)	0.47 <sup>y</sup> (0.03)	0.20 (0.05)	0.67 (0.04)	-0.44 <sup>xy</sup> (0.03)	1.61 (0.05)	6.47 (0.15)
<b>Gender</b>														
Women	84,069 (86)	0.98 (0.01)	1.04 (0.01)	0.53 (0.01)	0.56 (0.01)	-0.05 <sup>x</sup> (0.01)	0.57 (0.01)	0.78 (0.02)	0.30 (0.01)	-0.09 <sup>x</sup> (0.02)	0.62 (0.02)	-0.30 (0.01)	1.46 (0.02)	6.33 (0.06)
Men	13,453 (14)	0.62 (0.02)	0.59 (0.02)	0.41 (0.02)	0.39 (0.02)	-0.03 <sup>x</sup> (0.01)	0.44 (0.02)	0.43 (0.03)	0.54 (0.02)	-0.07 <sup>x</sup> (0.04)	0.37 (0.03)	-0.59 (0.03)	1.19 (0.04)	4.25 (0.12)
<b>Race/Ethnicity</b>														
White	30,127 (31)	0.47 (0.02)	0.60 (0.02)	0.46 <sup>x</sup> (0.01)	0.35 (0.01)	0.02 (0.01)	0.50 (0.01)	1.02 (0.03)	0.19 (0.02)	0.38 (0.03)	0.00 <sup>x</sup> (0.03)	-0.47 (0.02)	0.70 (0.03)	4.31 (0.09)
Black	27,541 (28)	0.56 (0.02)	0.41 (0.02)	0.34 (0.01)	0.42 (0.01)	-0.05 <sup>x</sup> (0.01)	0.32 (0.01)	-0.15 (0.03)	0.48 <sup>x</sup> (0.02)	-0.07 <sup>x</sup> (0.03)	-0.04 <sup>x</sup> (0.03)	-0.40 (0.02)	0.54 (0.03)	2.43 (0.09)
Hispanic	31,793 (33)	1.23 (0.02)	1.15 <sup>x</sup> (0.02)	0.57 (0.01)	0.54 (0.01)	-0.08 <sup>x</sup> (0.01)	0.61 <sup>x</sup> (0.01)	1.27 (0.03)	0.55 (0.02)	-0.07 <sup>x</sup> (0.03)	0.81 (0.03)	-0.19 (0.02)	2.07 <sup>x</sup> (0.03)	8.28 (0.09)
Other	8,061 (8)	0.92 (0.02)	1.09 <sup>x</sup> (0.03)	0.49 <sup>x</sup> (0.02)	0.61 (0.02)	-0.06 <sup>x</sup> (0.01)	0.59 <sup>x</sup> (0.02)	0.28 (0.04)	0.46 <sup>x</sup> (0.03)	-0.58 (0.05)	1.20 (0.04)	-0.71 (0.03)	1.98 <sup>x</sup> (0.05)	6.13 (0.15)

<sup>a</sup> For each HEI component model, a Bonferroni adjusted ANOVA F-test was calculated. In the case of  $p > 0.05$ , all pairwise comparisons for that component model term were considered non-significant.

<sup>b</sup> Dark Green and Orange Vegetables and Legumes

<sup>c</sup> Calories from Solid Fats, Alcohol and Added Sugars

<sup>d</sup> HS grad or GED = High school diploma or general education diploma; Some College/AA = Some college or Associate of Arts degree; College Grad/Post Grad = College graduate degree or post graduate work.

<sup>x,y</sup> Means in the same column/demographic group with the same superscript are not significantly different from each other ( $p > 0.05$ )

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## CHAPTER 5. CONCLUSIONS AND IMPLICATIONS

### **EFNEP Goals and Objectives**

Almost 50 years ago, the federal government funded the first year for the Expanded Food and Nutrition Education Program (EFNEP) to address the growing concern over hunger and undernutrition.<sup>1</sup> The goals and objectives have changed over these years as the Dietary Guidelines for Americans (DGA) have changed, yet the program's focus remains on food and nutrition education for low-income adults.<sup>2</sup> In more recent years, the program emphasizes healthful eating to avoid or reduce the risk of chronic diseases as the incidence of chronic diseases, overweight and obesity has increased in most demographics, particularly in the low-income population.<sup>3,4</sup>

The current program goals and objectives include assisting limited resource families to obtain the knowledge, skills and attitudes to change behaviors resulting in improvement in nutritional intake.<sup>5</sup> EFNEP utilizes a two-prong approach to evaluate if the program meets these established goals and objectives: one, the 24-hour recall (24HR), measures change in dietary intake, and the second, the behavior checklist, measures change in behaviors in the constructs of food safety, food resource management, food security, nutrition practices and physical activity. Participants complete these tools before and again after program participation. The comparison of the two responses, one at entry and one at exit, documents change in dietary intake and behavior over the program duration. The data from these tools provide information on the nutrient intake of participants as well as behavioral changes in response to material provided in the program.<sup>6</sup> As this work addresses only the 24HR, the behavior check list will not be included in this discussion.

Since the program funding began in 1969, EFNEP has grown to include 76 programs in all 50 states and 6 US territories.<sup>6</sup> Each program is administered at a land-grant university through funding from the federal government.<sup>6</sup> Each program has administrative staff who direct individual programs within the universities. Over the years, these programs developed distinct policies and procedures to meet program goals. This has resulted in variance in program delivery, including collection methods for the 24HR.<sup>2,7</sup> The first phase of this research sought to investigate the fidelity of data collection of the 24HR across all programs.

### **Survey of Current Practice**

In October 2013, an electronic survey was sent to all EFNEP coordinators to identify current practices for the collection and coding of the 24HR, educational background of the staff administering the 24HR, training of the staff who collect and code the 24HR, and class size. Methods, results and discussion of this study are included in Chapter 2 of this dissertation. To summarize the findings from the survey, most 24HR are collected in a group setting, using a non-standardized collection period or methodology, and are collected by paraprofessionals who receive varied recall training.<sup>7</sup> The lack of fidelity in collection and coding practices should prompt national leaders to standardize collection and training methodology. If this was implemented, the 24HR results may be a more reliable measure of change in dietary intake due to program participation and support aggregation of program data that is central to documenting program effectiveness.

### **Paraprofessional vs Professional Collection of 24HR**

Based on the results of the survey, greater than 75% of EFNEP educators, referred to as paraprofessionals, had a high school or graduate equivalent degree and most received less than eight hours of training on recall collection.<sup>7</sup> This is in contrast to large national nutrition

surveys, such as the National Health and Nutrition Examination Study, where the recalls are collected by nutrition or health professionals who received over 24 hours of recall training.<sup>8</sup> To investigate if a paraprofessional educator can collect a 24HR that is similar to a 24HR collected by a professional, phase two of the project compared the 24HR collected by well-trained experienced paraprofessionals to 24HR collected by an experienced professional in a one-on-one setting using the same validated collection methodology.

The results of this research are provided in Chapter 3 of this work.<sup>9</sup> Though the numbers of the recalls were small (n=41), with only three paraprofessionals and one nutrition professional collecting the 24HR in two states, the results suggest a well-trained paraprofessional, using an established validated recall method, in a one-on-one setting, collected a 24HR that is similar to the 24HR collected by a Registered Dietitians Nutritionists (RDN). This preliminary study should be replicated in more states with more paraprofessionals/professionals to support or refute the results.

With replication of this research, if the results are similar, it is reasonable to suggest the well-trained paraprofessional educator is capable of collecting 24HRs from EFNEP participants similar to 24HR similar to those collected by an RDN or other nutrition professionals. As discussed in Chapter 3, this is in line with the recent release of the updated Scope of Practice from the Academy of Nutrition and Dietetics for the RDN.<sup>10</sup> As defined by the Academy, the revised guidelines support the RDN identifying responsibilities and activities in their scope of practice and focusing their resources, based on knowledge, skills and competence, to better serve client or research needs. Based on the results of this introductory study, it appears the RDNs could focus on the design, implementation and evaluation of community nutrition programs while the paraprofessional collects the 24HR data.

## **Change in Diet Quality**

Annually, EFNEP reports the impact of the program on participants, including change in intake of nutrients and food groups.<sup>6</sup> Over the intervening decades since the inception of EFNEP, the evaluation of dietary intake has moved from assessing individual nutrient and food group intake to evaluating diet quality. In the 1990's, the USDA's Center for Nutrition Policy and Promotion developed an instrument to assess overall diet quality.<sup>11</sup> The Healthy Eating Index (HEI) is a single summary measure of diet quality based on two perspectives: adequacy (dietary components to promote) and moderation (dietary components to limit). Dietary intake is scored based on adherence to the Dietary Guidelines for Americans (DGA), the greater the adherence, the greater the number of points awarded. As the DGA changed, the HEI is modified to reflect such changes. The DGA 2005 included an emphasis on diet quality including whole grains, whole fruits, various types of vegetables, specific types of fats and addressed the concept of 'discretionary calories' based on energy intake.<sup>12-14</sup>

EFNEP began reporting HEI-2005 scores of the 24HR in 2010. With this information available, phase 3 looked at the change in diet quality due to participation in EFNEP during FY 2013-2014. Methods, results and discussion of this evaluation are part of Chapter 4 of this dissertation. In summary, participation in EFNEP resulted in improved dietary quality of the participants based on a mean change in HEI 2005 score of 5.4 ( $\pm 16.2$  sd) points, over the time of the program. This significant change also occurred across all demographic groups.

## **Implication of Research**

With increasing incidence of chronic diseases and the established correlation between diet quality and some diseases, it is critical to educate the general population about the importance of improved diet quality.<sup>15-18</sup> EFNEP is uniquely positioned to teach low-income

participants in ways to improve overall diet quality as the program reached over 108,000 adults and over 366,000 youths in all 50 states and 6 US territories in 2017.<sup>6</sup>

Based on the results presented here, EFNEP national administration should standardize collection practices for the 24HR using the validated multiple pass method. These changes should include consistently using “yesterday” as the collection period, using five passes, and establishing standardized protocols for 24HR and training across programs. Including these programmatic expectations in the EFNEP policies would establish using a validated method for 24HR collection and align EFNEP with other national surveillance programs, e.g., What We Eat in America.<sup>8</sup>

Results from the survey identified variance in coding training and personnel. Different coders resulted in varied recall results, even when RDNs were the coders.<sup>19</sup> Future research could identify best practice for training and coding for the 24HR and include such practices in the national standards for EFNEP data processing.

Currently, collection of the 24HR in EFNEP occurs primarily in group settings with the participant recording intake as directed by the paraprofessional.<sup>7</sup> This method has not been validated nor shown to be comparable to 24HR collected by well-trained professional interviewers in one-on-one settings with the professional recording the recall. Future research could investigate if the recall collected in a group, as recorded by the participant and as directed by a paraprofessional, is similar to recalls collected by validated methods.

If validated collection practices are implemented consistently in all programs, the 24HR results will be comparable to other national dietary studies, such as WWEIA and National Cancer Institute-American Association of Retired Persons dietary studies.<sup>8,17,18</sup> EFNEP data would provide valuable dietary information on low-income adults across most age, education,

gender and race/ethnicity demographics, thus expanding the information on this population for use in future educational programs, across multiple disciplines. For example, program coordinators may use the data to enhance the focus on calcium-rich food consumption in classes with a high Black demographic population. This would foster dietary education based on specific group needs.

Program length varies from eight to 12 weeks.<sup>2</sup> It is unclear if the dietary changes implemented during the program continue after completion of the program and over the following years. Currently, EFNEP participants are not followed after completion of the program. Going forward, one option is for EFNEP national program administrators to integrate recent advancements in recall technology for class use and for post-program collection of 24HR.

In 2006, the National Cancer Institute (NCI), in collaboration with the USDA, developed the automated self-administered 24HR (ASA24®) process that employs computer technology to collect and evaluate the multiple pass 24HR via the internet.<sup>20</sup> The ASA24 is currently available in multiple languages and is accessible through mobile devices.<sup>21,22</sup> This product is a freely available web-based tool for collection of high quality dietary intake information from large samples. EFNEP could be utilize the ASA24 during the program and for follow up. This web-based program will allow participants to input recall data after completion of the program and at defined future intervals. Program administrators would document continued changes in diet quality intake and report such information to stakeholders.

### **Conclusions**

EFNEP provides food and nutrition education to low-income adults. One tool in the program evaluation is the 24HR; this tool is collected at the start and at the completion of the program. The change in dietary intake is based on the 24HR collected at completion of the

program minus the 24HR recorded at the start of the program. Since the recalls are collected using the same methods at both times in the classes, the difference between the two 24HR is suggested to be a reasonable reflection of individual's dietary change.

Unfortunately, the collection practices of the 24HR lack fidelity across the 76 EFNEP programs and are not consistent with validated procedures.<sup>9</sup> Therefore, it is unclear if recalls from different programs can be aggregated together to provide an accurate evaluation of the national EFNEP results. It is, therefore, recommended that national program administrators implement and require standardized procedures for collection of the dietary data that is central to the documentation of program effectiveness.

Although the 24HR practices warrant standardization, the current program data support an improvement in dietary intake due to program participation. This improvement is only evaluated over the 8-12 weeks of the program participation. With recent development of internet-based recall technology, repeated collection of recalls after completion of the program could provide further documentation of program influence on dietary quality following program participation.<sup>20-22</sup> The short-term changes are important to document but sustained improved diet quality may provide more information on the association on diet and chronic diseases in this low-income population.

If the 24HR collection is standardized, data from the recalls, not just the difference in recalls, will provide vast dietary information on a demographic group, low-income adults, who tend to have poorer diet quality and higher incidence of certain chronic diseases.<sup>3,4</sup> This information may assist in program curriculum development and evaluation, with the final goal of sustained improved dietary quality in program participants.



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**APPENDIX A. COLORADO STATE UNIVERSITY INSTITUTIONAL REVIEW BOARD**  
**APPROVALS FOR SURVEY**

**NOTICE OF APPROVAL FOR HUMAN RESEARCH**

**DATE:** June 11, 2013  
**TO:** Baker, Susan, 1571 Food Sci and Human Nutrition  
Auld, Garry, 1571 Food Sci and Human Nutrition, Melby, Chris, 1571 Food Sci and Human Nutrition, Gills,  
Susan, 1571 Food Sci and Human Nutrition  
**FROM:** Barker, Janell, Coordinator, CSU IRB 1  
**PROTOCOL TITLE:** The Evaluation of the Use of an 24 Hour Dietary Recall as a Measure of Change in Nutrient Intake in  
Participants in EFNEP (Expanded Food and Nutrition Education Program)  
**FUNDING SOURCE:** Dept. Funding  
**PROTOCOL NUMBER:** 12-3880H  
**APPROVAL PERIOD:** Approval Date: June 11, 2013 Expiration Date: June 04, 2014

The CSU Institutional Review Board (IRB) for the protection of human subjects has reviewed the protocol entitled: The Evaluation of the Use of an 24 Hour Dietary Recall as a Measure of Change in Nutrient Intake in Participants in EFNEP (Expanded Food and Nutrition Education Program). The project has been approved for the procedures and subjects described in the protocol. This protocol must be reviewed for renewal on a yearly basis for as long as the research remains active. Should the protocol not be renewed before expiration, all activities must cease until the protocol has been re-reviewed.

If approval did not accompany a proposal when it was submitted to a sponsor, it is the PI's responsibility to provide the sponsor with the approval notice.

This approval is issued under Colorado State University's Federal Wide Assurance 00000647 with the Office for Human Research Protections (OHRP). If you have any questions regarding your obligations under CSU's Assurance, please do not hesitate to contact us.

Please direct any questions about the IRB's actions on this project to:

Janell Barker, Senior IRB Coordinator - (970) 491-1655 [Janell.Barker@Colostate.edu](mailto:Janell.Barker@Colostate.edu)  
Evelyn Swiss, IRB Coordinator - (970) 491-1381 [Evelyn.Swiss@Colostate.edu](mailto:Evelyn.Swiss@Colostate.edu)

Barker, Janell

Barker, Janell

Approval is for a maximum of 150 participants using the electronic cover letter. Documentation of consent is waived under 117(c)(2). Any change to the protocol or documents must be submitted for review prior to implementation.

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**Approval Period:** June 11, 2013 through June 04, 2014  
**Review Type:** EXPEDITED  
**IRB Number:** 00000202  
**Funding:** 1571 Food Sci and Human Nutrition

**NOTICE OF APPROVAL FOR HUMAN RESEARCH**

**DATE:** December 11, 2013  
**TO:** Baker, Susan, 1571 Food Sci and Human Nutrition  
Auld, Garry, 1571 Food Sci and Human Nutrition, Melby, Chris, 1571 Food Sci and Human Nutrition, Gills,  
Susan, 1571 Food Sci and Human Nutrition  
**FROM:** Barker, Janell, Coordinator, CSU IRB 1  
**PROTOCOL TITLE:** The Evaluation of the Use of an 24 Hour Dietary Recall as a Measure of Change in Nutrient Intake in  
Participants in EFNEP (Expanded Food and Nutrition Education Program)  
**FUNDING SOURCE:** Dept. Funding  
**PROTOCOL NUMBER:** 12-3880H  
**APPROVAL PERIOD:** Approval Date: December 11, 2013 Expiration Date: June 04, 2014

The CSU Institutional Review Board (IRB) for the protection of human subjects has reviewed the protocol entitled: The Evaluation of the Use of an 24 Hour Dietary Recall as a Measure of Change in Nutrient Intake in Participants in EFNEP (Expanded Food and Nutrition Education Program). The project has been approved for the procedures and subjects described in the protocol. This protocol must be reviewed for renewal on a yearly basis for as long as the research remains active. Should the protocol not be renewed before expiration, all activities must cease until the protocol has been re-reviewed.

If approval did not accompany a proposal when it was submitted to a sponsor, it is the PI's responsibility to provide the sponsor with the approval notice.

This approval is issued under Colorado State University's Federal Wide Assurance 00000647 with the Office for Human Research Protections (OHRP). If you have any questions regarding your obligations under CSU's Assurance, please do not hesitate to contact us.

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Janell Barker, Senior IRB Coordinator - (970) 491-1655 [Janell.Barker@Colostate.edu](mailto:Janell.Barker@Colostate.edu)  
Evelyn Swiss, IRB Coordinator - (970) 491-1381 [Evelyn.Swiss@Colostate.edu](mailto:Evelyn.Swiss@Colostate.edu)

Barker, Janell

Barker, Janell

Amendment approval is to conduct 20 interviews with participants that are already in the EFNEP program by adding food recall activities before and after their usual program using the approved consent and recruitment materials as well as the questions to be asked.

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**Approval Period:** December 11, 2013 through June 04, 2014  
**Review Type:** EXPEDITED  
**IRB Number:** 00000202  
**Funding:** 1571 Food Sci and Human Nutrition

**APPENDIX B. SURVEY TO EFNEP COORDINATORS**

Dear EFNEP Coordinators,

I am a graduate student at Colorado State University in the Department of Food Science and Human Nutrition. I am working with Susan Baker, EdD, and Garry Auld, PhD, RD, at Colorado State University and Nancy Betts, PhD, RD, at Oklahoma State University.

I am asking for your voluntary participation in an electronic survey regarding the EFNEP 24-hour dietary recall process in your state/territory. It should take approximately 10 minutes to complete the survey. Responses will be anonymous to the degree permitted by the technology being used. If you choose to complete the survey, you may stop participation at any time and you may decide to not answer any specific question. There are no negative consequences if you choose not to participate.

IF YOU ARE NOT THE PERSON IN YOUR STATE WHO IS RESPONSIBLE FOR THE TRAINING OF PARAPROFESSIONALS ON THE 24-HOUR DIETARY RECALL COLLECTION, PLEASE FORWARD THIS SURVEY TO THE INDIVIDUAL WHO IS RESPONSIBLE FOR THIS ACTIVITY. There are also a few questions on the WebNEERS management system so other staff may need to be consulted.

The survey will be open for 3 weeks. Only one response from each institution will be accepted.

As a thank you for your participation, we will send you a \$10 gift card to Starbucks. Please follow the link at the end to the survey to submit your information so we can mail the gift card to you. You will also have an option to allow us to contact you directly if we have questions in the future. The information for the gift card and the follow-up calls will be processed separately from the survey so the survey continues to remain anonymous.

If you have any questions about the research, please contact me, Susan Gills, at [susan.gills@colostate.edu](mailto:susan.gills@colostate.edu), Garry Auld at [garry.auld@colostate.edu](mailto:garry.auld@colostate.edu) or Susan Baker at [susan.baker@colostate.edu](mailto:susan.baker@colostate.edu). If you have any questions regarding your rights as a research subject, contact Janell Barker at the CSU Institutional Review Board (IRB) at 970-491-1553.

Please print or save a copy of this page for your records.

SUBMISSION OF THE SURVEY WILL BE INTERPRETED AS YOUR INFORMED CONSENT TO PARTICIPATE AND THAT YOU AFFIRM THAT YOU ARE AT LEAST 18 YEARS OF AGE.

Thank you in advance for completing the survey and your participation in this research.

Susan Gills, MS, RDN

Start of survey: [First section]

Thank you for taking this survey on the 24-hour dietary recall. You may check as many answers for each question as fit your situation. First, we would like to gather some background information.

1. In your state EFNEP program, what collection period is used for the collection of the 24-hour recall? **Check all that apply.**
  - A. Starting with the first thing eaten yesterday, record all food and drink for 24 hours.
  - B. Starting at the time of class and going backwards in time, record all food and drink eaten in the past 24 hours
  - C. Other, please specify (Comment box)



2. If you checked more than one option in question 1, which option is most common?
- A.
  - B
  - C
3. In your state, what method(s) is/are used for the collection of the 24-hour recall? **Check all that apply.**
- A. **Single pass method:** Paraprofessional educator uses a single pass method whereby the educator goes through entire 24-hour period in sequence of eating occasions, asking for detailed data as educator goes, e.g., specific meal (details on amounts, preparation, etc.), then the snack (detail), and continues through entire 24-hour period.
  - B. **Multiple pass with 2-4 passes:** Paraprofessional educator uses a multiple pass method whereby the educator goes through entire 24-hour period asking for all foods and amounts (quick list), then goes through entire 24-hour period 1-3 more times to capture forgotten foods, time and occasions, details and review (amounts, preparation) and a final review.
  - C. **Multiple pass with 5 passes:** Paraprofessional educator uses a multiple pass method whereby the educator goes through entire 24-hour period asking for all foods and amounts (quick list), then goes through entire 24-hour period 4 times to capture forgotten foods, time and occasions, details and review (amounts, preparation) and a final review.
  - D. Other, please specify (Comment box)
4. If you checked more than one option in question 3, which option is most common?
- A
  - B
  - C
  - D
5. To the best of your recollection, what **percent** of your paraprofessional educators have no more than a/an
- High school degree or GED
  - Associate degree (AA, AS)
  - College degree (BA, BS)
  - Advanced degree (MA, MS)
  - Other, please specify

[New Section of survey] Now we will ask more specific questions about the data collection.

6. How do your EFNEP paraprofessional educators collect 24-hour dietary recalls when teaching in a **one-on-one setting**? **Check all that apply.**
- A. We do not teach in the one-on-one setting.
  - B. **Single pass method, educator records intake:** Paraprofessional educator uses a single pass method whereby the educator goes through entire 24-hour period in sequence of eating occasions, asking for detailed data as the educator goes, e.g., specific meal (detail on amounts, preparation, etc.), then the snack (detail), and continues through entire 24-hour period.

- C. **Single pass method, client records intake:** Paraprofessional educator uses a single pass method whereby the educator goes through entire 24-hour period in sequence of eating occasions, asking for detailed data as the educator goes, e.g., specific meal (detail on amounts, preparation, etc.), then the snack (detail), and continues through entire 24-hour period..
  - D. **Multiple pass with 2-4 passes, educator records intake:** Paraprofessional educator uses a multiple pass method whereby the educator goes through entire 24-hour period asking for all foods and amounts (quick list), then goes through entire 24-hour period 1-2 more times to capture forgotten foods, time and occasions, details and review (amounts, preparation) and a final review.
  - E. **Multiple pass with 2-4 passes, client records intake:** Paraprofessional educator uses a multiple pass method whereby the educator goes through entire 24-hour period asking for all foods and amounts (quick list), then goes through entire 24-hour period 1-2 more times to capture forgotten foods, time and occasions, details and review (amounts, preparation) and a final review.
  - F. **Multi-pass with 5 passes, educator records intake:** Paraprofessional educator uses a multiple pass method whereby the educator goes through entire 24-hour period asking for all foods and amounts (quick list), then goes through entire 24-hour period 4 times to capture forgotten foods, time and occasions, details and review (amounts, preparation) and a final review.
  - G. **Multi-pass with 5 passes, client records intake :** Paraprofessional educator uses a multiple pass method whereby the educator goes through entire 24-hour period asking for all foods and amounts (quick list), then goes through entire 24-hour period 4 times to capture forgotten foods, time and occasions, details and review (amounts, preparation) and a final review.
  - H. Other: Please specify (comment box)
7. If you checked more than one option above in question 6, which option is most common?
- B
  - C
  - D
  - E
  - F
  - G
  - H
8. In the one-on-one setting, when does the paraprofessional educator ask probing questions?
- A. After all foods/beverages are recorded for the 24 hour period.
  - B. After all foods/beverages are recorded for each meal or snack.
  - C. Both
9. How do your EFNEP paraprofessionals/educators collect 24-hour recalls when teaching in a **group setting**? **Check all that apply.**
- A. We do not teach in group settings.
  - B. **Single pass method, client records intake:** Paraprofessional educator uses a single pass method whereby the educator goes through entire 24-hour period in sequence of eating occasions, asking for detailed data as the educator goes, e.g., specific meal (detail on

amounts, preparation, etc.), then the snack (detail), and continues through entire 24-hour period.

- **C. Multiple pass with 2-4 passes, client records intake:** Paraprofessional educator uses a multiple pass method whereby the educator goes through entire 24-hour period asking for all foods and amounts (quick list), then goes through entire 24-hour period 1-3 more times to capture forgotten foods, time and occasions, details and review (amounts, preparation) and a final review.
- **D. Multi-pass with 5 passes, client records intake:** Paraprofessional educator uses a multiple pass method whereby the educator goes through entire 24-hour period asking for all foods and amounts (quick list), then goes through entire 24-hour period 4 times to capture forgotten foods, time and occasions, details and review (amounts, preparation) and a final review.
- E. Other: Please specify (comment box)

10. If you checked more than one option above in question 9, which option is most common?

- B
- C
- D
- E

11. In your state, what is the setting for the 24-hour recall? **Check all that apply.**

- A. One paraprofessional educator and one client.
- B. A group setting with one paraprofessional educator and 2-12 clients.
- C. A group setting with one paraprofessional educator and 13-20 clients.
- D. A group setting with two paraprofessional educators and 13-20 clients.
- E. A group setting with one paraprofessional educator and more than 20 clients.
- F. A group setting with two paraprofessional educators and more than 20 clients.
- G. Other; please specify (Comment box)

12. If you checked more than one option in question 11, which option is most common?

- A
- B
- C
- D
- E
- F

13. In your state, are other EFNEP staff members or volunteers, other than the paraprofessional educators, involved in the collection of 24-hour recalls?

- Yes,
- No
- If yes, please specify. (Comment box)

14. After the 24-hour recall information is entered into web-NEERS, do participants receive the "One Day Food Recall Summary" form?

- Yes , always
- Yes, sometimes
- No
- If yes, please share in detail how the 'One Day Food Record Summary' form is used in your program. (comment box)

[New section] Now we will have a few questions about data entry procedures.

15. Who enters the 24-hour recall information into the web-NEERS management system? **Check all that apply.**

- A. Each paraprofessional educator enters the data the educator collected.
- B. Support staff at local (county) level
- C. Support staff at regional (multi-county) level
- D. Support staff at the state (university) level
- Other, please specify. (Comment box)

16. If you checked more than one option in question 15, which option is most common?

- A
- B
- C
- D

17. How many different people enter 24-hour recall information into the Web-NEERS system in your state?

- 1
- 2-3
- 4-5
- 6-10
- 11-20
- 20 or more

18. Of the total number of people who enter 24-hour recall information into the Web-NEERS system, indicate below how many people are at each location:

- University
- Regional/multi-county
- County
- Other (specify location and number) Comment box

[New section of survey] Finally, a few questions on the training of your staff.

19. What training program do you use to train the paraprofessional educators in your state for collection of the 24-hour dietary recall? **Check all that apply.**

- A. The 24-Hour Food Recall, An Essential Tool in Nutrition Education, In-Service Training Program - Oklahoma State University Extension
- B. Eat Smart – Louisiana State University
- C. Nutrition Education Process Manual –Rutgers University, New Jersey
- D. Navigating for Success –Cornell University, New York
- E. Cent\$ible Nutrition Program Initial Training Manual, University of Wyoming
- F. WNEP - Independent Study Course, University of Wisconsin
- G. Other, please specify. (Comment box)

20. If you checked more than one option in question 19, which option is most common?
- A.
  - B
  - C
  - D
  - E
  - F
  - G
21. How long is the initial training for the **collection** of 24-hour dietary recalls in your program?
- A. Less than 4 hours.
  - B. Greater than 4 hours but less than or equal to 8 hours.
  - C. Greater than 8 hours.
  - Other: Please specify (comment box)
22. Do you have refresher training (review of the process at some point after **initial** training) for your paraprofessional educators on how to **collect** the **24-hour dietary recalls**?
- A. We do not have 24-hour recall refresher training.
  - B. Paraprofessional educators receive 24-hour recall refresher training every 6 months.
  - C. Paraprofessional educators receive 24-hour recall refresher training every year.
  - D. Paraprofessional educators receive 24-hour recall refresher training every 2 years.
  - E. Other: please specify (comment box)
23. What methods are included in the training process for **collection** of the recall? **Check all that apply.\***
- A. Lecture
  - B. DVD
  - C. Practice recalls taken
  - D. Props (cups plates, etc.) are available during training
  - E. Paraprofessional educators are trained in group setting
  - F. Paraprofessional educators are trained in one-on-one setting.
  - G. Other, please specify. (Comment box)
24. How long is the initial training time for the **data entry** process of the 24-hour recalls in your program?
- A. Less than 4 hours.
  - B. Greater than 4 hours but less than or equal to 8 hours.
  - C. Greater than 8 hours.
  - Other: Please specify (comment box)
25. Do you have refresher training (review of the process at some point after **initial** training) for **data entry** on how to enter 24-hour dietary recall data?
- A. We do not have data entry refresher training
  - B. Staff doing the data entry receive data entry refresher training every 6 months.
  - C. Staff doing the data entry receive data entry refresher training every year.
  - D. Staff doing the data entry receive data entry refresher training every 2 years.
  - E. Other: please specify (comment box)
26. What training strategies are included in the training process for data entry staff? **Check all that apply.**
- A. Lecture
  - B. Practice entering data into web-NEERS
  - C. Data entry staff is trained in group setting
  - D. Data entry staff is trained in one-on-one setting.
  - E. Other, please specify. (Comment box)

Are you willing to have us contact you to obtain additional information?

- Yes. Please follow this link. At completion of the link you will be directed to a link to receive your gift card (*link for personal information*)
- No. Please follow this link for your gift card. (*link for gift card*)

Thank you for taking the time to complete this survey.

Susan Gills, MS, RDN

**APPENDIX C. INTRODUCTORY LETTER TO EFNEP COORDINATORS REGARDING  
THE SURVEY AND FOLLOW UP EMAILS**

Dear Colleagues,

Below is an email and electronic survey from one of my graduate students, Susan Gills. Susan is investigating EFNEP's use of the 24-hour recall as a measure of dietary intake. Her doctoral research is a component of the NC1169 EFNEP Multi-State Research Project. **The survey should be completed by the EFNEP staff member who is responsible for training your paraprofessional educators on how to collect the 24-hour dietary recall. If you are not that person, please forward this survey on to that person and encourage them to complete it.** The more states that respond to the survey, the greater the level of confidence we can have in the recommendations we will make to our program leaders. As a thank you, we will send a \$10.00 Starbucks gift card to the person who submits the survey.

Thank you in advance for you participation!

### **Susan**

Susan S. Baker, EdD  
Associate Professor/Extension Specialist  
Expanded Food and Nutrition Education Program (EFNEP)  
Supplemental Nutrition Assistance Program-Education (SNAP-Ed)  
Dept. of Food Science and Human Nutrition  
101 Gifford, Campus Box 1571  
Colorado State University  
Fort Collins, Co. 80523-1571  
Email: [Susan.Baker@colostate.edu](mailto:Susan.Baker@colostate.edu)  
Phone: (970) 491-5798  
Fax: (970) 491-8729  
<http://www.efnep.colostate.edu>  
<http://www.snaped.colostate.edu>  
<http://www.eatingsmartbeingactive.com>  
<http://www.fshn.caahs.colostate.edu>  
<http://www.ext.colostate.edu>



Dear EFNEP Coordinators,

I am a graduate student at Colorado State University in the Department of Food Science and Human Nutrition. I am working with Susan Baker, EdD, and Garry Auld, PhD, RD, at Colorado State University and Nancy Betts, PhD, RD, at Oklahoma State University.

I am asking for your voluntary participation in an electronic survey regarding the EFNEP 24-hour recall process in your state/territory. It should take approximately 10 minutes to complete the survey. Responses will be anonymous to the degree permitted by the technology being used. If you choose to complete the survey, you may stop participation at any time and you may decide to not answer any specific question. There are no negative consequences if you choose not to participate.

**If you are not the person in your state that is responsible for the training of paraprofessionals on the 24-hour recall collection, please forward this survey to the individual who is responsible for this activity.** There are also a few questions on the NEERS management system so other staff may need to be consulted.

The survey will be open for 2 weeks. Only one response from each institution will be accepted.

At the end of the survey, you will be prompted to submit your name and address. This information will be processed separately from the survey so that the survey continues to remain anonymous.

As a thank you for your participation, we will send you a \$10 gift card to Starbucks. Please follow the link at the end to the survey to submit your information so we can mail the gift card to you.

If you have any questions about the research, please contact me, Susan Gills, at susan.gills@colostate.edu, Garry Auld at garry.auld@colostate.edu or Susan Baker at susan.baker@colostate.edu. If you have any questions regarding your rights as a research subject, contact Janell Barker at the CSU Institutional Review Board (IRB) at 970-491-1553.

Please print or save a copy of this page for your records.

*I have read the above information and agree to participate in this research project. Submission of the survey will be interpreted as my informed consent to participate and that I affirm that I am at least 18 years of age.*

Thank you in advance for completing the survey and your participation in this research.

Susan Gills, MS, RDN

***Follow up email: To be sent 7 and 14 days after initial survey email.***

To: State/Territory Coordinators for EFNEP  
Subject: Reminder for survey on collection of EFNEP 24-hour dietary recalls.  
From: Susan Baker

*Last week (Two weeks ago), I sent you survey on the collection of the 24-hour dietary recall in EFNEP. If you have completed the survey, thank you for your assistance. If you have not, the survey and gift card will be available until (three weeks after initial email), 2013.*

*Please follow the attached link for the survey. (LINK for survey)*

*Thank you in advance for completing the survey.*

**Susan**

Susan S. Baker, EdD  
Associate Professor/Extension Specialist  
Expanded Food and Nutrition Education Program (EFNEP)  
Supplemental Nutrition Assistance Program-Education (SNAP-Ed)  
Dept. of Food Science and Human Nutrition  
101 Gifford, Campus Box 1571  
Colorado State University  
Fort Collins, Co. 80523-1571  
Email: [Susan.Baker@colostate.edu](mailto:Susan.Baker@colostate.edu)  
Phone: (970) 491-5798  
Fax: (970) 491-8729  
<http://www.efnep.colostate.edu>  
<http://www.snaped.colostate.edu>  
<http://www.eatingsmartbeingactive.com>  
<http://www.fshn.caahs.colostate.edu>  
<http://www.ext.colostate.edu>

**APPENDIX D. THANK YOU LETTER FOR SURVEY COMPLETION WITH GIFT**

**CARD**

November 11, 2013

Dear Survey Respondent,

Thank you for completing the EFNEP 24-hour recall survey that was sent to your institution. I appreciate the time and effort necessary to participate in the survey.

Enclosed is your Starbucks gift card.

Sincerely,

Susan Gills, MS, RDN  
Graduate Student, Food Science and Human Nutrition  
Colorado State University  
Fort Collins, Colorado 80523

**APPENDIX E. COLORADO STATE UNIVERSITY INSTITUTIONAL REVIEW BOARD  
APPROVALS COLLECTION OF THE 24-HOUR DIETARY RECALLS FROM EFNEP  
PARTICIPANTS**

NOTICE OF APPROVAL FOR HUMAN RESEARCH

DATE: January 07, 2014  
TO: Baker, Susan, 1571 Food Sci and Human Nutrition  
Auld, Garry, 1571 Food Sci and Human Nutrition, Melby, Chris, 1571 Food Sci and Human Nutrition, Gills,  
Susan, 1571 Food Sci and Human Nutrition  
FROM: Barker, Janell, Coordinator, CSU IRB 1  
PROTOCOL TITLE: The Evaluation of the Use of an 24 Hour Dietary Recall as a Measure of Change in Nutrient Intake in  
Participants in EFNEP (Expanded Food and Nutrition Education Program)  
FUNDING SOURCE: Dept. Funding  
PROTOCOL NUMBER: 12-3880H  
APPROVAL PERIOD: Approval Date: January 07, 2014 Expiration Date: June 04, 2014

The CSU Institutional Review Board (IRB) for the protection of human subjects has reviewed the protocol entitled: The Evaluation of the Use of an 24 Hour Dietary Recall as a Measure of Change in Nutrient Intake in Participants in EFNEP (Expanded Food and Nutrition Education Program). The project has been approved for the procedures and subjects described in the protocol. This protocol must be reviewed for renewal on a yearly basis for as long as the research remains active. Should the protocol not be renewed before expiration, all activities must cease until the protocol has been re-reviewed.

If approval did not accompany a proposal when it was submitted to a sponsor, it is the PI's responsibility to provide the sponsor with the approval notice.

This approval is issued under Colorado State University's Federal Wide Assurance 00000647 with the Office for Human Research Protections (OHRP). If you have any questions regarding your obligations under CSU's Assurance, please do not hesitate to contact us.

Please direct any questions about the IRB's actions on this project to:

Janell Barker, Senior IRS Coordinator - (970) 491-1655 [Janell.Barker@Colostate.edu](mailto:Janell.Barker@Colostate.edu)  
Evelyn Swiss, IRB Coordinator - (970) 491-1381 [Evelyn.Swiss@Colostate.edu](mailto:Evelyn.Swiss@Colostate.edu)

Barker, Janell

Barker, Janell

Amendment approval is to increase the compensation to \$35 and to have a paraprofessional conduct the recruitment using the revised recruitment script.

---

Approval Period: January 07, 2014 through June 04, 2014  
Review Type: EXPEDITED  
IRB Number: 00000202  
Funding: 1571 Food Sci and Human Nutrition

**NOTICE OF APPROVAL FOR HUMAN RESEARCH**

**DATE:** June 09, 2014  
**TO:** Baker, Susan, 1571 Food Sci and Human Nutrition  
Auld, Garry, 1571 Food Sci and Human Nutrition, Melby, Chris, 1571 Food Sci and Human Nutrition, Gills, Susan, 1571 Food Sci and Human Nutrition  
**FROM:** Barker, Janell, Coordinator, CSU IRB 1  
**PROTOCOL TITLE:** The Evaluation of the Use of an 24 Hour Dietary Recall as a Measure of Change in Nutrient Intake in Participants in EFNEP (Expanded Food and Nutrition Education Program)  
**FUNDING SOURCE:** Dept. Funding  
**PROTOCOL NUMBER:** 12-3880H  
**APPROVAL PERIOD:** Approval Date: June 04, 2014 Expiration Date: June 03, 2015

The CSU Institutional Review Board (IRB) for the protection of human subjects has reviewed the protocol entitled: The Evaluation of the Use of an 24 Hour Dietary Recall as a Measure of Change in Nutrient Intake in Participants in EFNEP (Expanded Food and Nutrition Education Program). The project has been approved for the procedures and subjects described in the protocol. This protocol must be reviewed for renewal on a yearly basis for as long as the research remains active. Should the protocol not be renewed before expiration, all activities must cease until the protocol has been re-reviewed.

If approval did not accompany a proposal when it was submitted to a sponsor, it is the PI's responsibility to provide the sponsor with the approval notice.

This approval is issued under Colorado State University's Federal Wide Assurance 00000647 with the Office for Human Research Protections (OHRP). If you have any questions regarding your obligations under CSU's Assurance, please do not hesitate to contact us.

Please direct any questions about the IRB's actions on this project to:

Janell Barker, Senior IRB Coordinator - (970) 491-1655 [Janell.Barker@Colostate.edu](mailto:Janell.Barker@Colostate.edu)  
Evelyn Swiss, IRB Coordinator - (970) 491-1381 [Evelyn.Swiss@Colostate.edu](mailto:Evelyn.Swiss@Colostate.edu)

Barker, Janell

Barker, Janell

Approval is to recruit up to 103 participants (84 surveys participants and 19 dietary recall interviews) with the recruitment and consent materials. The above-referenced project was approved by the Institutional Review Board with the condition that the attached consent form is signed by the subjects and each subject is given a copy of the form. NO changes may be made to this document without first obtaining the approval of the Committee.

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**Approval Period:** June 04, 2014 through June 03, 2015

**Review Type:** EXPEDITED



*Knowledge to Go Places*

**NOTICE OF APPROVAL FOR HUMAN RESEARCH**

**DATE:** May 12, 2015  
**TO:** Baker, Susan, 1571 Food Sci and Human Nutrition  
Auld, Garry, 1571 Food Sci and Human Nutrition, Melby, Chris, 1571 Food Sci and Human Nutrition, Gills,  
Susan, 1571 Food Sci and Human Nutrition  
**FROM:** Swiss, Evelyn, Coordinator, CSU IRB 1  
**PROTOCOL TITLE:** The Evaluation of the Use of an 24 Hour Dietary Recall as a Measure of Change in Nutrient Intake in  
Participants in EFNEP (Expanded Food and Nutrition Education Program)  
**FUNDING SOURCE:** Dept. Funding  
**PROTOCOL NUMBER:** 12-3880H  
**APPROVAL PERIOD:** Approval Date: June 04, 2015 Expiration Date: June 03, 2016

The CSU Institutional Review Board (IRB) for the protection of human subjects has reviewed the protocol entitled: The Evaluation of the Use of an 24 Hour Dietary Recall as a Measure of Change in Nutrient Intake in Participants in EFNEP (Expanded Food and Nutrition Education Program). The project has been approved for the procedures and subjects described in the protocol. This protocol must be reviewed for renewal on a yearly basis for as long as the research remains active. Should the protocol not be renewed before expiration, all activities must cease until the protocol has been re-reviewed.

If approval did not accompany a proposal when it was submitted to a sponsor, it is the PI's responsibility to provide the sponsor with the approval notice.

This approval is issued under Colorado State University's Federal Wide Assurance 00000647 with the Office for Human Research Protections (OHRP). If you have any questions regarding your obligations under CSU's Assurance, please do not hesitate to contact us.

Please direct any questions about the IRB's actions on this project to:

IRB Office - (970) 491-1553; [RICRO\\_IRB@mail.Colostate.edu](mailto:RICRO_IRB@mail.Colostate.edu)  
Evelyn Swiss, IRB Coordinator - (970) 491-1381; [Evelyn.Swiss@Colostate.edu](mailto:Evelyn.Swiss@Colostate.edu)



Swiss, Evelyn

Approval to recruit the remaining 84 (survey participants) with the approved recruitment and consent materials. The above-referenced project was approved by the Institutional Review Board with the condition that the approved consent form is signed by the subjects and each subject is given a copy of the form. NO changes may be made to this document without first obtaining the approval of the IRB.



**APPENDIX F. PARTICIPANT CONSENT FORMS FOR THE COLLECTION OF THE 24-  
HOUR DIETARY RECALLS FROM EFNEP PARTICIPANTS**

## Consent to Participate in a Research Study Colorado State University

**TITLE OF STUDY:** An Evaluation of the 24-Hour Recall, as Administered by Paraprofessional Educators, as a Reliable Tool to Assess Dietary Intake of Adult Participants in the Expanded Food and Nutrition Education Program

**PRINCIPAL INVESTIGATOR:** Susan Baker, Food Science and Human Nutrition (FSHN), EdD,  
Fax: 970.491.7252 Email: [susan.baker@colostate.edu](mailto:susan.baker@colostate.edu)

**CO-PRINCIPAL INVESTIGATOR:** Susan Gills, MS, RDN, a FSHN doctorate student, Email:  
[susan.gills@colostate.edu](mailto:susan.gills@colostate.edu)

**WHY AM I BEING INVITED TO TAKE PART IN THIS RESEARCH?** You are being asked to be part of this study because you are a participant in the EFNEP classes.

**WHO IS DOING THE STUDY?** The people doing this research are part of the Food Science and Human Nutrition department at Colorado State University.

**WHAT IS THE PURPOSE OF THIS STUDY?** The purpose of this study look at the collection process for the 24-hour dietary recall.

**WHERE IS THE STUDY GOING TO TAKE PLACE AND HOW LONG WILL IT LAST?** We plan collection to take between 30 to 45 minutes for each recall, so a total of 1 to 1 ½ hours. One recall will be collected before your EFNEP class and one will be collected after the class.

**WHAT WILL I BE ASKED TO DO?** We will ask you questions about foods that you ate yesterday. You just need to remember what was eaten and answer the questions as you are asked.

**ARE THERE REASONS WHY I SHOULD NOT TAKE PART IN THIS STUDY?** If you are younger than 18 years of age you should not take part in this study

**WHAT ARE THE POSSIBLE RISKS AND DISCOMFORTS?**

- There are no known risks associated with taking part in this recall collection.
- It is not possible to identify all potential risks in research procedures, but the researcher(s) have taken reasonable safeguards to minimize any known and potential, but unknown, risks.

**ARE THERE ANY BENEFITS FROM TAKING PART IN THIS STUDY?** There are no direct benefits for taking part in this study. However, we hope to use the information obtained from this work to improve the program for future participants.

**DO I HAVE TO TAKE PART IN THE STUDY?** Your participation in this research is voluntary. If you decide to participate in the study, you may withdraw your consent and stop participating at any time without penalty or loss of benefits to which you are otherwise entitled.

**WHO WILL SEE THE INFORMATION THAT I GIVE?** We will keep private all research records that identify you, to the extent allowed by law.

Your information will be combined with information from other people taking part in the study. When we write about the study to share it with other researchers, we will write about the combined

Page 1 of 2 Participant's initials \_\_\_\_\_ Date \_\_\_\_\_

CSU#: 13-4265H APPROVED: 12/11/2013 * EXPIRES: 7/14/2014
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## **Consent to Participate in a Research Study Colorado State University**

**TITLE OF STUDY:** An Evaluation of the 24-Hour Recall, as Administered by Paraprofessional Educators, as a Reliable Tool to Assess Dietary Intake of Adult Participants in the Expanded Food and Nutrition Education Program

**PRINCIPAL INVESTIGATOR:** Susan Baker, Food Science and Human Nutrition (FSHN), EdD,  
**Fax:** 970.491.7252 **Email:** [susan.baker@colostate.edu](mailto:susan.baker@colostate.edu)

**CO-PRINCIPAL INVESTIGATOR:** Susan Gills, MS, RDN, a FSHN doctorate student, Email:  
[susan.gills@colostate.edu](mailto:susan.gills@colostate.edu)

**WHY AM I BEING INVITED TO TAKE PART IN THIS RESEARCH?** You are being asked to be part of this study because you are a participant in the EFNEP classes.

**WHO IS DOING THE STUDY?** The people doing this research are part of the Food Science and Human Nutrition department at Colorado State University.

**WHAT IS THE PURPOSE OF THIS STUDY?** The purpose of this study look at the collection process for the 24-hour dietary recall.

**WHERE IS THE STUDY GOING TO TAKE PLACE AND HOW LONG WILL IT LAST?** We plan collection to take between 30 to 45 minutes for each recall, so a total of 1 to 1 ½ hours. One recall will be collected before your EFNEP class and one will be collected after the class.

**WHAT WILL I BE ASKED TO DO?** We will ask you questions about foods that you ate yesterday. You just need to remember what was eaten and answer the questions as you are asked.

**ARE THERE REASONS WHY I SHOULD NOT TAKE PART IN THIS STUDY?** If you are younger than 18 years of age you should not take part in this study

**WHAT ARE THE POSSIBLE RISKS AND DISCOMFORTS?**

- There are no known risks associated with taking part in this recall collection.
- It is not possible to identify all potential risks in research procedures, but the researcher(s) have taken reasonable safeguards to minimize any known and potential, but unknown, risks.

**ARE THERE ANY BENEFITS FROM TAKING PART IN THIS STUDY?** There are no direct benefits for taking part in this study. However, we hope to use the information obtained from this work to improve the program for future participants.

**DO I HAVE TO TAKE PART IN THE STUDY?** Your participation in this research is voluntary. If you decide to participate in the study, you may withdraw your consent and stop participating at any time without penalty or loss of benefits to which you are otherwise entitled.

**WHO WILL SEE THE INFORMATION THAT I GIVE?** We will keep private all research records that identify you, to the extent allowed by law.

Page 1 of 3 Participant's initials \_\_\_\_\_ Date \_\_\_\_\_

CSU#:12-3880H  
APPROVED: 06/04/2014 \* EXPIRES: 06/03/2015



Page 3 of 3 Participant's initials \_\_\_\_\_ Date \_\_\_\_\_

CSU#12-3880H  
APPROVED: 06/04/2014 \* EXPIRES: 06/03/2015

## Consent to Participate in a Research Study Colorado State University

**TITLE OF STUDY:** An Evaluation of the 24-Hour Recall, as Administered by Paraprofessional Educators, as a Reliable Tool to Assess Dietary Intake of Adult Participants in the Expanded Food and Nutrition Education Program

**PRINCIPAL INVESTIGATOR:** Susan Baker, Food Science and Human Nutrition (FSHN), EdD,  
**Fax:** 970.491.7252 **Email:** [susan.baker@colostate.edu](mailto:susan.baker@colostate.edu)

**CO-PRINCIPAL INVESTIGATOR:** Susan Gills, MS, RDN, a FSHN doctorate student, Email:  
[susan.gills@colostate.edu](mailto:susan.gills@colostate.edu)

**WHY AM I BEING INVITED TO TAKE PART IN THIS RESEARCH?** You are being asked to be part of this study because you are a participant in the EFNEP classes.

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**WHAT IS THE PURPOSE OF THIS STUDY?** The purpose of this study look at the collection process for the 24-hour dietary recall.

**WHERE IS THE STUDY GOING TO TAKE PLACE AND HOW LONG WILL IT LAST?** We plan collection to take between 30 to 45 minutes for each recall, so a total of 1 to 1 ½ hours. One recall will be collected before your EFNEP class and one will be collected after the class.

**WHAT WILL I BE ASKED TO DO?** We will ask you questions about foods that you ate yesterday. You just need to remember what was eaten and answer the questions as you are asked.

**ARE THERE REASONS WHY I SHOULD NOT TAKE PART IN THIS STUDY?** If you are younger than 18 years of age you should not take part in this study

**WHAT ARE THE POSSIBLE RISKS AND DISCOMFORTS?**

- There are no known risks associated with taking part in this recall collection.
- It is not possible to identify all potential risks in research procedures, but the researcher(s) have taken reasonable safeguards to minimize any known and potential, but unknown, risks.

**ARE THERE ANY BENEFITS FROM TAKING PART IN THIS STUDY?** There are no direct benefits for taking part in this study. However, we hope to use the information obtained from this work to improve the program for future participants.

**DO I HAVE TO TAKE PART IN THE STUDY?** Your participation in this research is voluntary. If you decide to participate in the study, you may withdraw your consent and stop participating at any time without penalty or loss of benefits to which you are otherwise entitled.

**WHO WILL SEE THE INFORMATION THAT I GIVE?** We will keep private all research records that identify you, to the extent allowed by law.

Page 1 of 3 Participant's initials \_\_\_\_\_ Date \_\_\_\_\_

CSU#:12-3880H APPROVED: 06/04/2015 * EXPIRES: 06/03/2016
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Your information will be combined with information from other people taking part in the study. When we write about the study to share it with other researchers, we will write about the combined information we have gathered. You will not be identified in these written materials. We may publish the results of this study; however, we will keep your name and other identifying information private.

We will make every effort to prevent anyone who is not on the research team from knowing that you gave us information, or what that information is. For example, your name will be kept separate from your research records and these two things will be stored in different places under lock and key. Although researchers will keep information confidential, we cannot guarantee that other participants will.

The only exceptions to this are if we are asked to share the research files for audit purposes with the CSU Institutional Review Board ethics committee, if necessary. In addition, for funded studies, the CSU financial management team may also request an audit of research expenditures. For financial audits, only the fact that you participated would be shared, not any research data.

**WILL I RECEIVE ANY COMPENSATION FOR TAKING PART IN THIS STUDY?** You will receive \$25 compensation for taking part in this study. You will receive the gift card after you complete the second recall.

**WHAT IF I HAVE QUESTIONS?**

Before you decide whether to accept this invitation to take part in the study, please ask any questions that might come to mind now. Later, if you have questions about the study, you can contact the investigator, Susan Gills at [susan.gills@colostate.edu](mailto:susan.gills@colostate.edu).

If you have any questions about your rights as a volunteer in this research, contact the CSU IRB at: [RICO\\_IRB@mail.colostate.edu](mailto:RICO_IRB@mail.colostate.edu); 970-491-1553. We will give you a copy of this consent form to take with you.

**WHAT ELSE DO I NEED TO KNOW?** The recall will be written on specified forms. These forms will be used to enter the diet recall into a computer program that will evaluate the foods for nutrient content. The recall forms will be destroyed after 3 years.

Your signature acknowledges that you have read the information stated and willingly sign this consent form. Your signature also acknowledges that you have received, on the date signed, a copy of this document containing 2 pages.

\_\_\_\_\_  
Signature of person agreeing to take part in the study                      Date

\_\_\_\_\_  
Printed name of person agreeing to take part in the study

\_\_\_\_\_  
Name of person providing information to participant                      Date

\_\_\_\_\_  
Signature of Research Staff

Page 2 of 3 Participant's initials \_\_\_\_\_ Date \_\_\_\_\_

CSU#12-3880H  
APPROVED: 06/04/2015 \* EXPIRES: 06/03/2016



Page 3 of 3 Participant's initials \_\_\_\_\_ Date \_\_\_\_\_

CSU#:12-3880H  
APPROVED: 06/04/2015 \* EXPIRES: 06/03/2016

**IRB Authorization Agreement**

Name of Institution or Organization Providing IRB Review: Colorado State University

OHRP Federalwide Assurance (FWA) #: 00000647

IRB Registration #: 00000202

Name of Institution Relying on the Designated IRB: North Carolina State University

OHRP Federalwide Assurance (FWA) #: 00003429

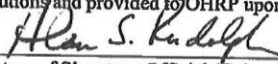
The Officials signing below agree that *North Carolina State University* may rely on the designated IRB for review and continuing oversight of its human subject research described below:

This agreement is limited to the following specific protocol(s):

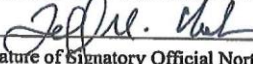
Name of Research Project: The Evaluation of the Use of a 24 Hour Dietary Recall as a Measure of Change in Nutrient Intake in Participants in EFNEP (protocol # 12-38880H)

Name of Principal Investigator: Susan Baker, EdD (CSU); Lorelei Jones (NCSU)  
Sponsor or Funding Agency: None  
Award Number, if any: None

The review and continuing oversight performed by the designated IRB will meet the human subject protection requirements of North Carolina State University's FWA. The IRB at Colorado State University will follow written procedures for reporting its findings and actions to appropriate officials at North Carolina State University. Relevant minutes of IRB meetings will be made available to North Carolina State University upon request. North Carolina State University remains responsible for ensuring compliance with the IRB's determinations and with the terms of its OHRP-approved Assurance. This document must be kept on file at both institutions and provided to OHRP upon request.

  
\_\_\_\_\_  
Signature of Signatory Official (Colorado State University) 3/23/2015  
Date

Print Full Name: Alan S. Rudolph, Ph.D., MBA  
Institutional Title: Vice President for Research & Institutional Official

  
\_\_\_\_\_  
Signature of Signatory Official North Carolina State University) 3/17/2015  
Date

Print Full Name: Jeffrey Check, Ph.D.  
Institutional Title: Associate Vice Chancellor for Research, Innovation and Economic Development

IRB Authorization Agreement

**APPENDIX G. RECRUITMENT SCRIPTS FOR PARTICIPANTS FOR THE 24-HOUR  
RECALL STUDY**



Dear Study Participant,

I am requesting your participation in a research project regarding the collection of a 24-hour dietary recall. You will be requested to complete two recalls; each recall may take up to 45 minutes to complete. The recalls will be directed by two different staff members, but must be completed on the same day and at least 30 minutes apart. You will receive a \$35 gift card at completion of the second recall.

The information that you provide on the 24-hour recall surveys will be used by Colorado State University for research purposes. This research poses no risks or benefits to you. Your confidentiality will be protected at all times.

The recalls will not be linked to your name or other identifying information. The recalls will remain in a locked file cabinet in the program director's office. Your information will be combined with information from other participants. When we write about the research and share the results with other researchers, we will write about the combined information we have gathered. You will not be identified in these written papers. We may publish the results of this study, but your name and contact information will remain confidential.

If you do not want the information you provide in the recalls to be used for research purposes, you can contact the Susan Gills at the number below to withdraw your participation in this research.

As stated above, there are no risks or benefits involved with this research. If you have further questions about this study, please contact the graduate student involved with the project, Susan Gills, at 303-530-0876.

Sincerely,

Susan Baker

Associate Professor/Extension Specialist

By signing below, you affirm that you understand the project, agree to participate in the 24-hour recall study and affirm that you are at least 18 years of age.

Name: \_\_\_\_\_

Print Name \_\_\_\_\_

**APPENDIX H. RECEIPT OF GIFT CARD FOR 24-HOUR FOOD RECORD PROJECT**

**Receipt of Gift Card for 24 Hour Food Record Project**

I, \_\_\_\_\_, received a \$20 gift card for participating in a CSU research project about the EFNEP 24-hour recall.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

---

**Receipt of Gift Card for 24 Hour Food Record Project**

I, \_\_\_\_\_, received a \$30 gift card for participating in a CSU research project about the EFNEP 24-hour recall.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

---

**APPENDIX I. SCRIPT FOR COLLECTION OF THE 24-HOUR RECALL**

## 24-Hour Food Recall

### The Five Steps

*Before you get started conducting food recalls in your class, put the food recall kit out on the table(s) in the classroom where the participants can see and touch the items. Encourage participants to use the items in the recall kit to determine the amounts of food eaten.*

#### Step 1: The Quick List

- Ask participants to write down everything they remember eating yesterday starting with what they ate after they got up in the morning. This is just a list of items eaten, not amounts.

#### Step 2: Forgotten Foods

- After the participants have completed the quick list, read the forgotten foods questions. Pause at least 10 sec after each question to allow participants to think about each question.
- This is an important step to make sure as many of the foods actually eaten get recorded.

#### Forgotten Foods Script

Many people often forget eating some of the foods listed below.

Read the following to participants after they have completed their quick list of foods. Read each line separately and give the participant(s) enough time to think. Ask the participant(s) to record any food items they may have forgotten.

“There are some foods people tend to forget they ate.”

1. Did you have any crackers, breads, rolls or tortillas you may have forgotten about?
2. How about any hot or cold cereals?
3. Do you remember adding cheese as a topping on vegetables or on a sandwich?
4. Did you have any chips, candy, nuts or seeds?
5. How about any fruit eaten with meals or as a snack?
6. What about coffee, tea, soft drinks or juices?
7. Did you have any beer, wine, cocktails, brandy or any other drinks made with alcohol that you may have forgotten?

#### Step 3: Time and Occasion

- Remind participants that sometimes we eat at times other than typical meal and snack times and we may not always remember these foods.
- Review the list of possible time and occasions that participants may have eaten foods they forgot about.
  - *Give participants time after each question to think about their answer and add any foods to their list.*



## Time and Occasion List

Think back over the last 24 hours and try to remember if you ate or drank anything during these common activities.

Did you eat anything...

1. First thing in the morning
2. Late at night
3. Did you eat anything because you needed to take medicine or were because you weren't feeling well (queasy)? (Medication, sickness, Blood sugar levels, morning sickness etc.)
4. While driving
5. While watching TV
6. At a desk or while working on the computer
7. At a school, community or church event
8. At a sporting event
9. While cooking or cleaning up meals for your family, this includes even those little bits you may have taken.
10. To celebrate (birthday parties, anniversaries, quinceañeros, graduations, baby showers etc.)
11. While shopping or running errands
12. While at a meeting or work related event

### Step 4: Details

- Using your 24 hour recall toolkit, have participants add details to their recalls.
- This includes amounts eaten of each food, brands of foods, and finding out about all ingredients in mixed dishes. Below are examples of questions you can ask to get more details. You are not limited to these questions:
  - How was that prepared? (for example, was the chicken fried, roasted or baked).
  - What toppings or condiments did you put on the food? (for example, gravy on mashed potatoes; butter, sour cream, bacon on a baked potato; butter/jam on toast; cream/sugar in coffee; ketchup on French fries; mustard/mayo on sandwiches, etc.)
  - Was the grain whole grain or refined grain? (white or wheat bread; brown or white rice; corn, white or whole wheat tortilla).

### Step 5: Final Probe

- Ask participants to review their food recalls and add anything they may have missed.
- Ask them to review the details they have added to be sure they are correct.

**APPENDIX J. CONTENTS OF VISUAL AID BOX FOR COLLECTION OF THE 24-HOUR  
RECALL**

## Adult 24-Hour Food Recall Kit

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- **Measuring Cups:**
  - 1 Set Dry Ingredient Measuring Cups
  - 8-oz. Plastic Measuring Cup for Liquids
  
- **Measuring Spoons:**
  - 1 Tablespoon
  - 1 Teaspoon
  - ½ Teaspoon
  - ¼ Teaspoon
  
- **Bowls, plastic:**
  - 12 oz.
  - 20 oz.
  
- **Plates, plastic:**
  - 6 inch
  - 7 ¼ inch
  - 9 inch
  - 10 ¼ inch
  
- **Cups, plastic:**
  - 4 oz. Cup or 5 oz. Cup—marked to show 4 oz. amount
  - 6 oz.
  - 9 oz.
  - 12 oz. (hard to find)
  - 16 oz.

- 24 oz.
  - 32 oz. (hard to find, use a fast food cup)
- 
- Deck of Cards
  - Tennis Ball
  - Plastic Ruler, 6 inch works well and fits in box
  - Food shapes on a ring to simulate slice of pizza, 1" cube of cheese, etc.
  - 9-Volt Battery (1 ½ oz natural cheese on label)
  - Pizza Food Model (Dairy Council) 2 slices
  - Plastic container with tight fitting lid OR large zip-lock bag filled with 2 to 3 cups rice. Rice may be used as an example for measuring more dense foods such as mashed potatoes and oatmeal.
  - Plastic container with tight fitting lid OR large zip-lock bag filled with 2 to 3 cups of dried beans. Beans may be used for foods that are loosely packed, such as cereal or vegetables.

**APPENDIX K. RECORD FORM FOR THE 24-HOUR RECALL COLLECTION**

# THINK ABOUT AND TELL ME WHAT YOU HAVE BEEN EATING!

Recall Taker Name: ██████████

Participant Name: \_\_\_\_\_

Recall #: ██████████

Tell me what you ate yesterday starting with when you first woke up?

Breakfast	How much?		How much?
Snack			
Lunch			
Snack			
Dinner			
Snack			

**APPENDIX L. CORRESPONDENCE FOR FOIA DATA, FY 2013-2014 EFNEP DATA  
FROM WEBNEERS**

**From:** [dwayne.watson@colostate.edu](mailto:dwayne.watson@colostate.edu) [mailto:[dwayne.watson@colostate.edu](mailto:dwayne.watson@colostate.edu)]

**Sent:** Friday, October 09, 2015 11:22 AM

**To:** reefoia

**Cc:** [dwayne.watson@colostate.edu](mailto:dwayne.watson@colostate.edu)

**Subject:** REE FOIA Request

Requester's Name: Dwayne Watson

Address: 1571 Campus Delivery Fort Collins, CO 80523-1571

Phone Number: 9704912555

E-mail Address: [dwayne.watson@colostate.edu](mailto:dwayne.watson@colostate.edu)

Subject: EFNEP individual foods item data for FY 13 & 14 from the WebNEERS system. Similar data to the "fooditems" table in the NEERS 5 system.

Location/Person Name: Stephanie Blake

Requested Start Date: FY 13

Requested EndDate: FY 14

Requester Type: Educational or noncommercial scientific institution. You may be charged only for duplication costs, minus the first 100 pages.

Agreed to Pay Applicable Fees: Yes

Maximum Amount: \$30



**From:** Hutchison, Stasia [mailto:Stasia.Hutchison@ARS.USDA.GOV]  
**Sent:** Tuesday, November 10, 2015 7:11 AM  
**To:** Watson,Dwayne <Dwayne.Watson@colostate.edu>  
**Subject:** FOIA 2016-REE-00225-F

Dwayne Watson

Colorado State

This is in response to your Freedom of Information Act (FOIA) request dated October 9, 2015, for information concerning 2013 and 2014 EFNEP data. Your request was received in this office on October 13 and assigned FOIA No. 2016-REE-00225-F.

Specifically, you requested:

EFNEP individual foods item data for FY 13 & 14 from the WebNEERS system. Similar data to the "fooditems" table in the NEERS 5 system.

I have received the information responsive to your request and am mailing the CD to you today.

If you have any questions concerning your request, please contact this office at 301-504-1655 or via email at [stasia.hutchison@ars.usda.gov](mailto:stasia.hutchison@ars.usda.gov).

Sincerely,

Stasia Hutchison