EFNEP:
Assessing the Evaluation Tools and Impact of the Program Amongst Participants in Ohio

An Undergraduate Honors Thesis

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ABSTRACT

The Expanded Food and Nutrition Education Program (EFNEP) is a federally funded program to assist people with limited resources in developing knowledge and skills about food and nutrition. The program targets youth and low-income families with children. EFNEP programs exist throughout counties in all 50 states and US territories. It has been shown to be an effective program in improving food practices and dietary intake.

EFNEP is evaluated by the changes in the baseline questionnaires and post-intervention questionnaires filled out by the participants. Two of the questionnaires which are pertinent to my research are the EFNEP Behavior Checklist (BC) and 24 hr recall. The BC is a 10 question form asking participants about recent food related behaviors. The 24 hr recall is a detailed record of the foods eaten by the participant in a 24 hr time period. The 24 hr recall allows for an analysis of the nutrient intake of the individual.

There are 11 counties in Ohio which have EFNEP programs. This research will use the data subsets from all 11 counties, for the 2005 and 2006 fiscal years. The Ohio EFNEP program is facilitated through The Ohio State University Extension, Department of Nutrition. Funds for the research are provided through the Ohio EFNEP program budget.

The goal of this research is to determine which questions on the BC are sensitive enough in evaluating EFNEP, and which are not. Sensitivity was assessed through determining the association of the food behaviors (BC) and actual behavior (dietary intake) interpreted from nutrient analysis. This will create a framework for further research on which questions need to be changed to accurately assess food behaviors as reported in the 24 hr recall. The advantage of using the BC is that it is shorter, less expensive, and easier to apply than a 24 hr recall, making it faster to administer and more understandable for the participants to take.

Statistical analysis was performed using a Paired T-Test of the mean scores from the pre- and post- BC and pre- and post- 24 hr recall to determine changes upon completion of the program. To determine the correlation of the BC and 24 hr recall, a one-way analysis of variance (ANOVA) was applied.

The Ohio EFNEP has been successful in bringing about positive changes in participants in both food behaviors and diet. Although changes are positive, the diets of participants at exit are still below DRI/Food Guide Pyramid recommendation for many of the nutrient and food groups.

Many nutrition related BC questions had a significant relationship with the 24 hr recall. Questions from the core 10 BC as well as Additional BC questions were related to specific nutrients, adding value to ability of the BC to assess diet. However, there were also BC questions that did not show the expected relationship to the nutrient addressed in the question. Select questions of the BC may be useful to discriminate between the groups of participants consuming the lower and higher amount of select nutrients relative to their self-reported food behaviors.

The BC must be continuously evaluated to improve the evaluation tools used to assess EFNEP. Although it is able to measure change in the participants, when used alone the core 10 BC and additional questions from this research would not be able to completely assess diet independent of 24 hr recall.

INTRODUCTION

The Expanded Food and Nutrition Education Program (EFNEP) is a United States Department of Agriculture (USDA) Cooperative State Research, Education, and Extension Service (CSREES) funded program to assist people with limited resources in the areas of diet, personal development, and practical skills pertaining to food and nutrition. As of 2004, 35 years since it began, EFNEP programs covered 800 counties in the 50 states and territories of the United States, including American Samoa, Micronesia, Northern Marianas, Puerto Rico, and the Virgin Islands.[1]

The program consists of a series of lessons over several months; including a hands-on, learn by doing approach. The objectives of the lessons are that the participants acquire the knowledge, skills, and attitudes that allow them to change behavior towards a nutritionally sound diet. The lessons also emphasize personal development in areas of nutrition, well-being, and improving the total family diet. Practical skills to support these objectives are taught, encompassing food production, preparation, storage, safety and sanitation, and management of food budgets and other resources such as food stamps.

EFNEP targets low-income youth and families with young children. In 2004, there were 378,206 youth, 157,809 adults, and indirectly 578,366 family members reached through the program. The EFNEP program in Ohio reached 5042 families in the adult program. The total number of members in these families was 18,486. The evaluation for the Ohio EFNEP program showed that 82% of participants improved in one or more nutrition practices taught in EFNEP over the course of the program. [2]

EFNEP has been successful in the past in improving food practices and dietary intake. In 2004, a nationwide evaluation of the program showed that 84% of participants improved one or more food resource management practices, 89% improved in one or more nutrition practices, and 68% improved in one or more food safety practices.

The EFNEP program is evaluated using the Evaluation Reporting Systems (ERS). Evaluations are prepared by comparing the dietary intakes of participants to the Recommended Dietary Allowances (RDA) and Food Guide Pyramid. Behavior changes are also measured and taken into account for the final evaluation.[3]

The Nutrition component of the ERS holds the data from the 24 hr recall of the participants, with analysis of their nutrient intake. The Behavior Checklist (BC) is used to evaluate the impact of EFNEP on participants self-reported behavior change. The BC is also used to assess improvements in the areas of food resource management, nutrition practices, and food handling and safety.

The 24 hr recall is an assessment tool in which the participants are interviewed individually, listing detailed descriptions of all foods eaten in the previous 24 hr period. The process takes approximately 30 minutes,[4] and food models are also used in this procedure. (24 hr recall can be found in Appendix A.)

The EFNEP BC is an optional part of the ERS. It consists of 10 core questions related to food behaviors, and a checklist on a likert scale of 5, ranging from “do not do” to “almost always”. (EFNEP BC can be found in Appendix B.)

STATEMENT OF PURPOSE

The purpose of this research will be to evaluate the "short" tool, or the EFNEP Behavior Checklist (BC), in and its correlation to the 24 hr recall. The goal of this research is to provide information regarding changes to the BC that are needed to increase the effectiveness of the program. Another purpose is to develop a more accurate evaluation of EFNEP. The benefits of a more effective program for the participants include increased knowledge and application of positive nutrition choices. These benefits also provide increased cost benefit of the program, making it positive for both the government and the participants. Spending on the EFNEP programs each year is approximately 60 million dollars. In 1999 the cost benefits found in Iowa and Virginia were $10.64 and $10.75, respectively, saved for each dollar spent on the program.[5] [6]

If the BC were a sensitive enough tool to accurately assess the participants' changes in food behavior, the BC could be administered independent of the 24 hr recall. The advantage of using the BC is that it is shorter, less expensive, and easier to apply than a 24 hr recall, making it faster to administer and more understandable for the participants to take.

In evaluating the correlation of the short tool with the 24 hr recall, the goal of this research is to determine which questions on the BC are sensitive enough in evaluating EFNEP, and which are not. Sensitivity will be assessed through determining the association of the food behaviors (BC) and actual behavior (dietary intake) interpreted from nutrient analysis. This will create a framework for further research on which questions need to be changed to accurately assess food behaviors as reported in the 24 hr recall.

Another goal of this research is to determine if Ohio EFNEP was effective in bringing about change in participants. Both BC and 24 hr recall will be the basis to determine what areas had the most change.

SUMMARY OF RELATED WORK

Development of the EFNEP BC

The core 10 questions of the EFNEP behavior checklist used currently were released in 1996 after the previous 15 question checklist was reduced. The original 15 checklist was used from 1993 to 1997. The purpose of this tool was to evaluate the food and nutrition behaviors which lacked evaluation in the ERS methods, including the 24 hr recall, and various questions already in the ERS. Questions regarding fat and fiber were reduced since the nutrient analysis (24 hr recall) portion already provides this data. The salt related question was kept since it was the only measure of sodium intake.[7] The checklist was developed through collection of behavior assessment tools already in use from different states, for the reason that use of similar indicators would make the newly developed checklist comparable to those in use. Other resources used were: published instruments, Glady's Block simplified Fat Screener, NHANES, and FRAC Community Childhood Identification Project (CCHIP).[8] Diet quality, food resource management, food handling/preparation, and mastery of living/self esteem were the four domains chosen for the checklist. The pilot checklist was evaluated by statistical analyses using Cronbach's alpha analysis, and result of pre- and post- tests. Cronbach's coefficients tested for internal reliability of questions related to preparation methods, fat, salt, and food selection. The questions were eliminated if they did not contribute to reliability. For pre- and post- tests, the means and frequencies of control and treatment groups were compared.

The checklist was further reduced to 10 questions, and replaced the 15 question checklist in 1997. The purpose of the reduction was to streamline the tool, creating the same format for all questions, and to group them by domain for easier comprehension. Some questions were dropped due to low pre- post- change, or cause of confusion.[9]

External Validation Studies

There were three nutrition related questions on the core 10 question EFNEP behavior checklist utilized nationally. Similar question have been validated as a part of various Food Behavior Checklists. Two questions from Townsend et al. [10] were validated against a 24 hr recall and biological values, and pertain to question 7 on the EFNEP survey. The EFNEP BC asks, "When deciding what to feed your family, how often do you think about healthy food choices?" Townsend's survey asks, "Would you describe your diet as excellent, very good, good, fair, or poor?" This question belonged to the subscale of diet quality, and had an excellent correlation with serum carotenoids, servings of fruit, vitamin C, was a stable and sensitive to change, and equal among ethnicities. The other question from Townsend was, "Do you eat low-fat instead of high-fat foods?" This question was intended to measure fat intake, but instead showed change in the fruit and vegetable subscale. Thus, the question was removed completely from the because of possible confusion by the educators if it was placed in the appropriate subscale.

Townsend also validated a question similar to question 9 from the EFNEP survey, "How often do you use the "Nutrition Facts" on the food label to make food choices?" The comparable question was in a subscale for diet quality, and asked "When shopping, do you use Nutrition Facts on the food label to choose foods?" The diet quality subscale also showed correlation with serum arytenoids, (servings of fruit and vegetable, vitamin and mineral intake,) vitamin A and C, fiber, sensitive to change, and equal among ethnicities.

Question 10 (EFNEP) asks "How often do your children eat something in the morning within 2 hours of waking up?" Similar questions appeared on the test administered in a study of youth EFNEP. The first question was a part of the food selection subscale, and the second from nutrition knowledge. The questions were: "I ate breakfast or a snack before school today." "I am skipping breakfast today, but skipping meals is not good for you because…. (choice of 2 answers)." Both questions showed and improvement in pre/post test scores.[11]

Development of Food Behavior Checklists

In 1990 the Nutrition Cancer Prevention Program of California Department of Health Services developed the first Food Behavior Checklist (FBC) nutrition assessment instrument. The purpose of the FBC was to measure food use related to adopting a lower-fat, higher-fiber diet.[12] It consisted of 19 simple yes and no questions. Kristal et al. revealed in the validation study an excellent agreement between the FBC and 24 hr recall. The items on the FBC found to have poor agreement were the items which required detailed knowledge about food composition. Studies show that behavior change can be measured by "Behavior specific antecedents to behavior change."[13]

There are three ways in which the items on the FBC are validated: face and content, criterion validity, and convergent. Validity is defined as the extent to which a measuring instrument measures what it is intended to measure.[14] Criterion validity is usually measured by a biological measure, and convergent validity, in our case, will be determined using the mean of 24 hr recalls. Studies in the past have shown positive correlations of the FBC and 24 hr recalls.[15] Murphy et al reported a positive association for fruits, vegetables, and dairy. These items also

had a significant correlation with Food Guide Pyramid servings of those found in the 24 hr recall. The fat and cholesterol behavior items had a lower correlation, with only 5 out of 14 significantly correlated when compared to the 24 hr recall.[16]

Because of the constant research being conducted, the need for additional questions in the EFNEP BC arises. In order to construct a valid BC to be used as a tool to evaluate the EFNEP program, questions may be removed, added, or modified. The nationwide EFNEP program uses a standard 10 question BC, and states can independently add optional questions after getting them approved. There is a Master Question Database which allows states to select up to 15 questions to add to their state or county checklist. These questions include questions dropped from the pilot test, and questions which were suggested when creating the pilot test.

Tailoring food behavior checklists to its target audience and program has been the interest of various studies. Townsend et al noted their FBC as having a low respondent burden, one reason being its consideration of the participant's reading level. The EFNEP BC is at a 4th grade reading level, making it realistic for the low-income population targeted by EFNEP, including non-native speakers of English. The BC is also tailored to the manner of the EFNEP program, which is usually in groups. The BC can be administered in group situations, taking 10 to 20 minutes[17], while a 24 hr recall requires a one on one environment, probing questions from the paraprofessional, and food model examples.

Additional Behavior Checklists

Two additional studies evaluating behavior checklists were the California Food Behavior checklist and Modified Food Habits Questionnaire.[18] These studies compared the Food Behavior/Habits Checklists to a 24 hr recall. In these studies, the reliability for the checklist was 0.8 to 0.92, the correlation with the 24 hr recall 0.28 to 0.41, and change over 6 sessions $p \leq .05$.[19] The studies focused on low-income subjects, which is significant when applying the finding to EFNEP, which is meant to address low-income populations. [20]

Short tool evaluation

Short tools are most often evaluated by validation against another assessment method. In a literature review of 265 studies of instruments to evaluate nutrition education, Contento et al found the tools to evaluate dietary behavior were correlated to the criterion, with a score of 0.6 to 0.7.[21]

Cade et al conducted a large scale literature review of 227 studies worldwide which pertained to the validation of Food Frequency Questionnaire (FFQ), a commonly used short tool.[22] The review presented that 17% of studies compared the FFQ against biomarkers, and the majority were compared against another assessment method such as a 24 hr recall. Almost half (102) of the studies reviewed were from the U.S., which can be interpreted that the finding of this review are likely to be culturally appropriate for the U.S. There were more tests for fat/energy intake than fruit/vegetable intake. Finally, the size of the study on average had no effect on the results. This is significant when considering how to account for errors due to small sample size.

An Ideal EFNEP BC

In multiple studies, particular factors to be considered for an EFNEP checklist are discussed.[23] [24] These include the creation of a tool appropriate for group setting, sensitive to small change, suitable for a diverse audience, acting as a teaching tool, quick and easy to

administer, suitable for limited literacy, addressing program objectives, fit for the length of intervention, internally consistent, and most importantly, validation and reliability. Visually significant characteristics are large font, images of real foods, bright colors, and white space to make the survey seem less overwhelming.[25]

METHODS

This research project will analyze data from EFNEP programs throughout Ohio. The Ohio EFNEP programs are coordinated by The Ohio State University Extension, Department of Nutrition. The goal of Ohio EFNEP is to improve the diet and health of low-income Ohio families with young children, and low-income youth.[26]

The EFNEP BC and 24 hr recall are the evaluation tools containing data to be analyzed. These questionnaires are administered before and after the subjects participate in the EFNEP program. The data is a subset of the Ohio EFNEP program summary, analyzed from the participants' pre test (at entry) and post test (upon completion of the program) collected from enrolled participants. The data set used for my research has been collected from all 11 Ohio EFNEP counties. My research will analyze data from Ohio EFNEP programs for the fiscal year 2005 (October 1, 2004 to Sept 30, 2005) and fiscal year 2006 (October 1, 2005 to September 30, 2006). Approximately 4,000 homemakers participate in the Ohio program each year.

To determine the correlation of the BC and 24 hr recall, multiple methods of analysis were applied. All analysis were applied to compare pre- and post- tests of the BC and 24 hr recall, and the BC pre- test to the 24 hr recall pre- test, continuing with the comparison of post-tests. The software used for statistical analysis was SPSS 14.0.

The Paired T-Test was used to assess if the mean scores for the pre and post-test BC and the pre and post-test 24 hr recall were statistically different. The test also should show if participants had improvements in diet and diet related behaviors upon completing the program, as well as the magnitude of change in mean scores.

Pearson correlations were applied to attain the linear relationship between two variables, the BC and 24 hr recall. The similarities of the correlations for each nutrition related question and related nutrient category from the 24 hr recall will be compared to each other.
The cross-tabulation shows the trend of categories answered in the pre- and post- BC. A Pearson chi-square test was used to determine the likelihood of the observed results against the expected result.

A one-way analysis of variance (ANOVA) test was performed for cross-analysis between the BC and 24 hr recall. Each nutrition related BC question was compared to a relevant nutrient category from the 24 hr recall, for both pre- and post- data. Nutrient categories showing significance at both entry and exit relevant to the BC question were considered for further analysis.

After review of the results of the ANOVA test, internal analysis was carried out to determine if the BC categories of responses showed discriminatory data when compared against each other. Frequency tests were conducted on BC questions showing significance during the ANOVA test. These tests should show mean and standard deviation of responses for each category of the BC for both pre-and post-tests.

RESULTS

There were a total of 4351 participants who completed the core 10 question EFNEP BC and 24 hr recall at both entry and exit. There were 1128 responses to 5 out of the 6 nutrition related additional BC questions (Q41, 42, 44, 47, 48), and 32 responses to the other (Q49). The average age of participants was 30.56, and 81.7% were female.

From the core BC and additional questions, 9 total questions were considered to be related to the diet and nutrition lessons taught in EFNEP (see Appendix C). The following results address only these 9 BC questions. T-test results suggest 8 out of these 9 questions showed a positive behavior change between mean scores at entry and exit. Questions 9, 41, 42, 47, and 48 showed a mean change in response between 0.5 and 1.0. All other nutrition related questions showed a change in mean reported behavior of less than 0.5. Question 48 had the highest increase in mean reported behavior of 0.917.

The mean scores of the BC represent categories of the BC likert scale. The mean for Question 49 remained in category 1 ("do not do") at both entry and exit. The mean for remaining nutrition related questions at entry ranged from 1 to 3, and at exit ranged from 2 to 3. There were no questions with mean responses that belonged to 4 or 5 at either entry or exit. The highest mean score at both entry and exit was Question 7 (3.22, 3.52).

In the evaluation of the 24 hr recall, 18 nutrient/food categories were considered. All categories showed an increase in consumption from entry to exit except for the categories "other" (added fats and sugars), alcohol, and fat, which all showed a decrease.

The mean intake of the 24 hr recall was compared to the Dietary Reference Intake (DRI) range for women and men and the USDA Food Guide Pyramid recommendations. Categories falling below DRI range for women and men/USDA Food Guide Pyramid at both entry and exit were: dairy/calcium servings, vegetable servings, bread servings, fruit servings, calories, calcium, and fiber. Mean iron intake at entry and exit (9.553 mg, 10.283mg) was lower than the DRI for women, but not for men. Protein and carbohydrate means were higher than the DRI range for women and men at both entry and exit.

Mean change was calculated as a percentage of the DRI or USDA Food Guide Pyramid servings. Nutrient categories with a mean change in intake of 10% or greater than the DRI range for men and women/ USDA Food Guide Pyramid servings were: dairy/calcium servings, vegetable servings, fruit servings, calories, protein, vitamin A, vitamin C, and vitamin B6. The nutrients with the highest changes (as a percentage) were: fruit, calories, vitamin A, and vitamin C. Mean increase for vegetable intake was 0.4178 servings, and a 0.47026 serving increase for fruit. The USDA Food Guide Pyramid recommends 3-5 vegetables servings and 2-4 fruit servings daily.

When the BC and 24 hr recall were cross-analyzed, six out the nine BC questions appeared as having a statistically significant relationship ($p \leq 0.05$) to nutrient/food categories from 24 hr recall at both entry and exit. All 3 nutrition related questions from the core 10 BC had a relation to one or more nutrient categories. The questions relating to 3 or more nutrients were Question 7 and Question 41. The questions, nutrients with which they were analyzed, and breakdown of nutrients which had a statistically significant relationship are as follows:

Q7-had a relationship to vegetable servings, fruit servings, protein; did not have a relationship to calories, fat, calcium/dairy servings

Q8- had a relationship to fruit servings; did not have a relationship to iron, fat, vegetable servings, fiber
Q9- had a relationship to other (added fats and sugars); did not have a relationship to calories, fat, protein, fiber
Q41- had a relationship to vegetable servings, calories, fruit servings, fat; did not have a relationship to vitamin A, fiber
Q47- had a relationship to calories, calcium; did not have a relationship to fat, calcium/dairy servings
Q48- had a relationship to fruit servings, vitamin C; did not have a relationship to vegetable servings, calories, fiber

Questions showing no significance:
Q42- did not have a relationship to fat, calories, vegetable servings
Q44- did not have a relationship to calories, dairy/calcium servings, carbohydrates, calcium, vitamin C, fiber, fruit servings, vegetable servings
Q49- did not have a relationship to fiber, vitamin B6, carbohydrates, vegetable servings, bread servings

Cross-tabulation showed a trend of lower number of respondents reporting 1 and 2 on the BC at exit when compared to entry. Question 7 and Question 41 had a lower number of respondents reporting 1, 2, and 3. The exceptions to this trend were: Question 44, which had a lower response rate in categories 1, 3, 4, 5, Question 49, which had a lower response rate in categories 1, 3.

Internal analysis of the results of the ANOVA analysis showed no instances when all five categories of the BC likert scale discriminated from each other. The question at entry which the likert scale could discriminate fruit intake into more than two groups was Question 48. At exit, there were four questions which showed discrimination into more than 2 groups. These were: Question 7 for fruit servings; Question 41 for fruit servings, calories, fat; Question 47 for calcium; Question 48 for fruit servings.

DISCUSSION

The result from the BC and 24 hr recall suggest EFNEP lessons facilitate positive change in nutrition related behaviors and diet, with desirable changes in mean scores; particularly fruit consumption. “Consideration of healthy food choices” was the behavior reported as being practiced the most at both entry and exit. It is important to consider the level of change seen at exit in concluding if the EFNEP lesson was a strong influence on this behavior. This data suggests that there was not a large change in response after the intervention. However, it is important to understand that on average participants believe the behavior they are practicing the most is “considering healthy food choices” before and after the intervention.

The two questions with a highest rate of change were the additional questions regarding fruit and vegetable consumption. These are messages which are emphasized by EFNEP and appear to be effective in influencing behavior change. The topics which appear to have less behavior change are: considering healthy food choices, preparation of food without salt, reducing consumption of regular soda, and consumption of whole wheat bread. Reasons for the small magnitude of self-reported behavior change may be related to emphasis placed on these lesson

messages, or stage of the participant in behavior change. Another possibility is that the participant has a better understanding of the question at exit, and had not answered "accurately" at entry, resulting in little change seen in the data. The topic of whole wheat bread consumption was likely to have showed little change due to the small sample size (n=32).

All questions (except the one related to whole wheat bread) had a decrease in number of respondents answering "do not do" and "seldom" at exit when compared to entry. This is desirable for all but one question regarding regular soda consumption, in which case it would have been ideal to see an increase in these answers, but was not the case. For the rest of the questions, this shows a positive movement of patterns in behaviors. However, none of the mean scores at exit were the highest ("most of the time" and "almost always"), indicating that there is still room for improvement in the program to target these higher scores.

The 24 hr recall showed desirable changes in all of the nutrient/food categories. All of the data did not show an increase in numbers, but the nutrients with decreases were those which that was the desired result (added fats and sugars, alcohol, fat). Although the changes were desirable, the average intake of many nutrients was still below the DRI/Food Guide Pyramid recommendations. Since the average intake at entry is low, it may be difficult to bring all nutrient intakes to the DRI /Food Guide Pyramid recommendations; however it is another area which could continue to be developed. Questions which could be considered are if length in interventions relates to the degree of change, and if a longer program would be beneficial. Also, would focusing lessons even more on these particular nutrients bring about more change?

The categories with the highest change as a percent of DRI /Food Guide Pyramid servings were fruit servings, calories, vitamin A, and vitamin C. Mean calories were lower than the DRI, so it is desirable to see an increase. However, with growing concerns of obesity, messages regarding adequate caloric intake should be taught carefully. Fruit and vegetable intake increased close to half of a serving on average. EFNEP programs appear to be effective to bring about these diet changes, but again, improvements of a larger magnitude would be ideal.

The relationship of the BC questions to 24 hr recall nutrient categories showed some questions to relate to the nutrients as expected, some as having no relationship to any nutrient, or being related to an unexpected nutrient.

Question 7 addressed healthy food choices, and was related to vegetable servings, fruit servings, and protein. These foods would be associated with a healthful diet, and the question seemed to be an effective in understanding related components of the diet.

Question 41 asked "*Do you eat more than one kind of vegetable*?", and also appeared to be effective in understanding general aspects of ones diet, as well as relating to the food group (vegetables) directly addressed by the question. Question 48 was also related to the food group (fruit) directly addressed in the question, as well vitamin C which was likely a result of the fruit consumption.

The question regarding use of "Nutrition Facts" (Q9) related only to "other (added fats and sugars)", although it might be expected that this question would relate to more nutrient categories.

Question 48 ("*Do you use lower fat milk*?") did not relate to fat as might be expected and/or targeted by the question, although it did relate to calories and calcium. This brings about the question of whether or not this is an effective message in lowering total fat in the diet, or an effective question to detect change in type of milk consumed. The relationship of this question to calories and calcium instead of fat suggest that the people using lower fat milk are also consuming more of it.

The additional questions "*Do you take the skin off chicken before eating*?" (Q42) and "*Do you drink regular soda everyday*?" (Q44) did not relate to any nutrient categories. The question regarding taking the skin off chicken would be expected to relate to fat, but perhaps chicken with skin is not a frequent enough food to show a significance relationship to fat intake. Regular soda consumption would expect to have a relationship to carbohydrates and calories, unless it is considered as an energy source when being consumed. This is still an important topic to address in EFNEP, that regular soda is a source of empty calories.

Two out of the three questions from the core 10 BC were related to categories that may have a lurking variable. The question "*How often do you prepare foods without adding salt*?" (Q8) was related only to fruit. Sodium intake is not included in the 24 hr recall, making this the only question regarding sodium. It is possible that people who are aware of preparing food with salt are more conscious/make an effort in general about their diets and thus eat more fruit.

Internal analysis suggested that the BC likert scale was effective in discriminating nutrient intake between the higher and lower behavior categories. At entry the likert scale categories could be discriminated into two groups in all but one nutrient to BC question pair. The BC was more effective in doing so at exit, although there were never any instances of discriminating nutrient intake in all 5 likert scale categories. These results introduce the possibility of changing the BC to a yes/no checklist, since the likert scale was indicative of higher and lower nutrient intake in the majority of questions.

The BC appears to be useful to measure change in behaviors EFNEP participants. However, the BC and additional questions did not all represent the nutrient categories that seemed relevant, or related to none at all. In order to make the BC a tool which can be administered independently of the 24 hr recall, changes would need to be made to some questions, and questions may need to be added or removed.

Another option requiring further research would be to change the BC from a likert scale to a yes/no questionnaire, which would simplify and reduce confusion about the likert scale. The drawbacks of this type of questionnaire is that it may not be as sensitive to change, and does not indicate level of behavior when answering "yes".

CONCLUSION

The Ohio EFNEP has been successful in bringing about positive changes in participants in both food behaviors and diet. Although changes are positive, the diets of participants at exit are still below DRI/Food Guide Pyramid recommendation for many of the nutrient and food groups.

Most of the nutrition related BC questions had a significant relationship with the 24 hr recall. Questions from the core 10 BC as well as Additional BC questions were related to specific nutrients, adding value to ability of the BC to assess diet. They were most often related to fruit and vegetable servings. The two additional BC questions which were directly related to the food group categories in the questions, and would be beneficial to keep in the questionnaire were: "*Do you eat more than one kind of vegetable*?" and "*Do you eat more than one kind of fruit*?" However, there were also BC questions that did not show the expected relationship to the nutrient addressed in the question. If the BC is going to be used independently of the 24 hr recall, these questions would need to be reevaluated, removed, or reworded.

Select questions of the BC may be useful to discriminate between the groups of participants consuming the lower and higher amount of select nutrients relative to their self-

reported food behaviors. The BC did not show a significant difference for all five categories on the likert scale as indicators of diet. This brings about a point for further research, as to the necessity of a five point likert scale, and if it could be simplified without significantly affecting results.

The BC must be continuously evaluated to improve the evaluation tools used to assess EFNEP. Although it is able to measure change in the participants, used alone the core 10 BC and additional questions from this research would not be able to completely assess diet independent of 24 hr recall.

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