DIETARY QUALITY AND DIETARY CHANGES OF EFNEP PARTICIPANTS:
1994-95 MICHIGAN STUDY

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ABSTRACT

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The central focus of this study was to assess the
dietary quality of 1994-95 Michigan EFNEP participants at
the time of entry (cross-section data, n=3866), and their
dietary changes upon the completion of the program
(longitudinal data, n=2454). Majority of subjects' diets
(59%) were classified at the time of entry as low dietary
quality (i.e., not including at least one serving from each
of the five major food groups, and deriving more than 30%
daily energy intake from fat). The low dietary quality was
associated with high intake of added fats and sugar and low
frequency of meal/snack consumption. Subjects whose diets
were classified as low dietary quality at the entry made two
positive dietary changes: increased consumption of five
major food groups and reduced percent of energy from fat.
Michigan EFNEP can further enhance its effectiveness in
improving dietary intake of its participants by targeting at
subjects with low quality diets.

ACKNOWLEDGMENTS

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Chapter One

INTRODUCTION

Introduction

The Expanded Food and Nutrition Education Program

(EFNEP) was initiated by USDA in 1968. The fundamental

objective of EFNEP is to provide nutrition education for

low-income people to improve the adequacy of their daily

diets and gain maximum nutritional benefits from their food

resources. Low-income homemakers with young children are

particularly targeted. The EFNEP employs indigenous

paraprofessionals to deliver its service. Rather than

providing food or food dollars like other food assistance

programs such as Food Stamps and the Supplemental Food

Program for Women, Infants, and Children (WIC), EFNEP

provides education to its participants about the importance

of good nutrition, knowledge about how to use available food

resources, and how to develop food related skills.

EFNEP is administered by the Cooperative State

Research, Education and Extension Service (CSREES), U.S. Department of Agriculture. Currently, EFNEP is operated through the Cooperative Extension System at land-grant universities in all 50 states and 6 US territories (American Samoa, Guam, Micronesia, Northern Marianas, Puerto Rico and the Virgin Islands (USDA, 1994).

As an ongoing nutrition education program, EFNEP requires continuous and careful evaluations to enhance the efficacy of the program with the targeted audience and to adjust the program accordingly. The EFNEP Evaluation/Reporting System (ERS), a computerized dietary assessment software, organizes information on demographics and dietary intakes of the participants that are collected by paraprofessionals during the educational program. ERS was developed by World Computer Systems, Inc. (14405 Laurel Place, Laurel Maryland 20707) under the contract with USDA. It has been used since 1993 for reporting EFNEP's impact to the USDA (ERS User's Guide). Previous reporting systems used by EFNEP were software programs called EFNEP I and EFNEP II (personal communication with Ingham county EFENP staff). Currently, ERS is in use in all states and all US territories except New York, South Carolina, the Virgin

Islands and Northern Marianas (personal communication with Wells Willis, EFNEP national program leader, USDA). To our best knowledge, no any other states or territories have used the ERS raw data in an integrated fashion for comprehensive program evaluation.

This research project was aimed at performing a Michigan in-depth EFNEP evaluation. The goals of this study are to provide an in-depth evaluation of the currently offered program and also to identify sensitive and effective tools to enhance the outreach and implementation of Michigan EFNEP in the future, such as defining most needy audiences, planning focused curriculum revision, and targeting paraprofessional training.

A statement of the problem

Over and under consumption of foods and nutrients persists among Americans. Results from USDA's 1994 Continuing Survey of Food Intakes by Individuals (CSFII) show that average intakes of women (20 years of age and older) are below Recommended Dietary Allowances (RDAs) for iron, zinc, vitamin B6, calcium, magnesium, and vitamin E. Further, CSFII 1994 indicated that U.S. women consume 32% of

calories from fat and 11% from saturated fat, and an average of only 14 g of dietary fiber/day (Cleveland et al., 1997). The National Cancer Institute recommends that people consume 20 to 30 g of dietary fiber daily. Data from USDA's 1989-90 CSFII show that Americans of basic income group (those individuals in all households were eligible to be interviewed) had inadequate intakes of vitamin B6, calcium, and zinc. Intakes of these nutrients by low income group (those with income at or below 130 percent of the poverty thresholds during the previous month) were lower than those by the basic income group. Both total fat and saturated fat intake exceeded the amount recommended by the Dietary Guidelines for Americans, with little difference by sex, age, income, or race (Frazao, 1996).

One of USDA's main concerns is hard-to-reach or at risk populations--those least likely to be aware of the diet-health links or to have adequate nutrition knowledge. Adults from low income families often experience social isolation due to underemployment, unemployment, lack of transportation, limited literacy, and lack of child care. In turn, socially isolated families also tend to be isolated from sources of information about nutrition, food selection,

preparation techniques, and menu planning (Conone, 1992).
For families with low incomes, the struggle to cope with
life's everyday problems takes precedence over health
promotion and disease prevention. These families are often
at high risk for health problems arising from the abuse of
alcohol and tobacco, a lack of exercise, and a poor diet
(Singleton, 1994).

EFNEP is a food and nutrition intervention program
designed to help low income families with children improve
the adequacy of their daily diets through increased
knowledge and skills, thus limiting the occurrence of
undernourishment and chronic diseases in this population.
An on-going evaluation on EFNEP is needed to identify areas
for future program refinement and policy recommendations.
Since the inception of EFNEP in 1968, many situations have
changed, including demographic characteristics of EFNEP
participants, dietary standards, nutrition knowledge, health
concerns, EFNEP reporting methods, food composition and
availability in the market. Thus an current evaluation with
accurate knowledge on the current situation is necessary.

In 1968, EFNEP strove to reduce malnutrition and hunger
for families living in poverty in the United States. In

1979, a federally mandated evaluation of EFNEP reported that many problems of actual hunger had abated. Compared to the EFNEP participants almost three decades ago, many of today's EFNEP participants are less isolated, more sophisticated and better educated. Increasing numbers of the EFNEP participants are also enrolled in other food assistant programs such as the Food Stamp program, WIC and Headstart (Chipman and Kendall, 1989).

The dietary standards used frequently for evaluation of EFNEP in previous studies were the Basic Four Food Groups and Recommended Dietary Allowances. The Food Guide Pyramid, released by the USDA in 1992, incorporates three key dietary concepts: variety, moderation, and proportionality. It is utilized by EFNEP for teaching, but has not been integrated into program evaluation. In the present study, we utilized the basic concepts of the Food Guide Pyramid and the Dietary Guidelines for Americans to evaluate each participant's overall dietary quality, and to assess the extent of their overall dietary changes.

For each reporting period (a fiscal year, which begins on September 1 of one year and ends on August 31 of the next year), summary reports and raw data generated by ERS are

exported to diskettes at county level and state level. These county and state-level summary reports contain only the aggregate total on participants' information: demographic characteristics (Appendix A: Summary of adult participant profiles); and descriptive statistics of the dietary changes between entry and exit of the program (Appendix B: Diet summary report). Although the summary reports reveal positive changes in intake of a few nutrients and food groups made by the participants as a group, little is known regarding specific dietary changes, who makes the changes, and to what extent the changes are made.

In the present study, the ERS raw data files from 1994-95 reporting period that were collected from 12 Michigan EFNEP counties and compiled into a EFNEP database during the summer of 1996. In-depth dietary evaluation were conducted by using this EFNEP database to address the needs of the current and dynamic situation.

Objectives

The specific objectives of this study were:

1. To identify factors differentiating the dropouts from the graduates.

2.   To describe meal and food intake patterns of Michigan
     EFNEP participants at the time of entry.

3.   To assess the overall quality of Michigan EFNEP
     participants' diets at the time of entry.

4.   To identify factors associated with low dietary quality
     at the entry.

5.   To determine whether initial dietary quality can
     predict the dietary changes in Michigan EFNEP.

Hypotheses

Objectives one, two, and three were descriptive data
analyses with no hypotheses testing. Our hypotheses for
objectives four and five were stated as follows:

1)   Subjects with high intakes of added fats and sugar have
     high risk of having diets with low dietary quality
     (defined in Working definitions of the terms in Page
     10).

2)   Subjects who consume less than three meals/snacks per
     day have high chance of having diets with low dietary
     quality.

3)   Initial dietary quality can predict the dietary changes
     of Michigan EFNEP participants.

Significance of the study

EFNEP is designed to make desirable behavior changes and skill development through educational activities. Evaluation of EFNEP should quantify the degree of desirable behavior changes and identify problematic areas, thus providing the basis for decision making, program planning and execution.

The significance of the study includes the following:

1. Explored meal and food intake patterns of Michigan EFNEP population. Identifying common food sources of Michigan EFNEP participants provides valuable information to EFNEP educators for program refinement and evaluation purposes.

2. Evaluated the EFNEP participants' dietary quality by comparing them to the current Dietary Guidelines for Americans and the Food Guide Pyramid. Assessed the relationship between dietary quality and participants' demographic, dietary and lifestyle variables.

3. Quantified the positive dietary changes made by EFNEP participants. Identified subgroups of the EFNEP population who benefited the most from the program. The findings of the study can be used to further enhance

the effectiveness of Michigan EFNEP by meeting the

needs and priorities of the people it serves.

Working definitions of the terms

<u>Dietary quality</u>: A binary outcome variable, which is based

on the rationale that the high dietary quality should

address the basic concepts of the Food Guide Pyramid and the

Dietary Guidelines for Americans. Two criteria were set for

the present study to assess the quality of participants'

diets: (1) including at least one serving from each of the

five major food groups as defined by the Food Guide Pyramid

(i.e., Grain-Vegetable-Fruit-Meat-Dairy = 1-1-1-1-1,

Schuette et al, 1996); and (2) limiting fat intake to ≤ 30%

daily energy intake (Dietary Guidelines for Americans,

1995).

Diets which failed to meet neither criteria were

considered as low dietary quality. Diets which met both

criteria were considered as high dietary quality.

<u>Dietary changes</u>: The reported changes in the EFNEP

participant's food consumption behavior that occurred

between the enrollment to graduation. Two dietary changes

are observed in our study: (1) change in consumption of five

major food groups, determined by subtracting the food group score at entry from that at exit; (2) change in consumption of fat, determined by subtracting the percent energy from fat at entry from that at exit.

<u>Food Group Score</u>: This was developed based on the Food Guide Pyramid. Score for one food group was calculated by actual intake of the food group in number of servings divided by minimum recommended number of servings for the food group (i.e., Grain-Vegetable-Fruit-Meat-Dairy = 6-3-2-2-2). The food group score was the sum of scores for five major food groups. A score larger than 1 was truncated at 1 for each food group to remove the influence of excessive intake of one or more food groups on the overall score. The food group score thus ranged from 0 to 5. For example, a participant's daily food group intake pattern is Grain-Vegetable-Fruit-Meat-Dairy = 8-2-1-2-2, then her food group score was calculated as $(8 \div 6) + (2 \div 3) + (1 \div 2) + (2 \div 2) + (2 \div 2) = 4.17$.

<u>"Other" food group</u>: It includes added fat and sugar. Each serving of an "other" food group was equivalent to approximately 35 calories (1 tsp fat or 2 tsp sugar). For example, 10 french fries contain 1.75 servings of "other" food group.

EFNEP participants: Low-income (at or below 185% Federal Poverty Income Guideline) homemakers/individuals living either in rural or urban areas, and responsible for planning and preparing the family's foods.

EFNEP database: The database used in the present study to produce in-depth dietary intake evaluation of Michigan EFNEP participants. It was built by using 1994-95 raw data from each Michigan County's ERS. Three data files (Adult.dbf, Recall.dbf and Meals.dbf) from 12 Michigan EFNEP counties were integrated into one database.

Chapter Two

RELATED LITERATURE

EFNEP evaluation studies

EFNEP is an on-going nutrition education program
targeted at low-income people in the United State.
Continuous and careful evaluations are necessary for
ensuring targeted populations are reached, demonstrating
program effectiveness and efficiency. In preciously
published EFNEP evaluation studies, researchers have
examined indicators for effectiveness of program, such as
attitude, nutrition knowledge, dietary intake, and food
practices which include food planning and purchasing, food
storage, and sanitation. Effectiveness of EFNEP has been
traditionally evaluated by analyzing changes of
participants' food consumption practices determined through
24-hour food recalls. Summary of some published EFNEP
evaluation studies are presented in Table 1.

Table 1. Previous studies of dietary changes and associated
factors in EFNEP population

References	Population	Main findings
Cox et al., 1995	Virginia Regular lessons (n=116) Tailored lessons (n=113) Control(n=110)	Subjects receiving the cancer-prevention lessons (tailored lessons) made more dietary changes than those receiving the EFNEP lessons only (regular lessons), and both made greater improvement than those receiving no nutrition lessons (control).
Brink and Sobal, 1994	New York n = 50	Participants retain their dietary improvement at 1 year follow-up.
Del Tredici et al., 1988	California EFNEP group (n = 335) Control group (n = 328)	After 6 months of instruction in the EFNEP group, there was a significant increase in food recall score for EFNEP group and no change in the control group. Dietary changes were positively associated with the length of the EFNEP visit (minutes), the number of visits, and certain instruction topics.

(Continues)

Table 1. (cont'd)

References	Population	Main findings
Amstutz and Dixon, 1986	Maryland n = 129	No association between dietary changes and 12 demographic/programmatic variables were found.
Brown and Pestle, 1981	Georgia n = 225	Teaching methods (one to one vs. Group) made no difference on dietary improvement. Number of visits were positively associated with increased diet scores.
Johnson and Nitzke, 1975	Wisconsin n = 169	The length of time people participated in the program (month) had a positive influence on Vitamin A intake.
Verma and Jones, 1973	Louisiana n = 433	Teaching methods (one to one vs. Group) had about the same effect on dietary changes. Number of visits were positively associated with increasing intake of two food groups (milk and bread/cereals).

Description of EFNEP participants

EFNEP has successfully addressed the nutrition education needs of low-income families with young children for nearly three decades. According to EFNEP National Synthesis Report (USDA, 1994), in Fiscal Year 1992, 51% of the families served by EFNEP had incomes under $438 (family size was not specified). 56% of EFNEP participants had 1 or 2 children at home. More than half of the EFNEP participants participated in food assistance programs such as Food Stamps, the Supplemental Food Program for Women, Infants, and Children (WIC). EFNEP participants lived in diverse communities: 26% EFNEP participants were from rural areas, and 74% were from suburbs or cities. EFNEP participants came from diverse ethnic background: 37% were African American, 36% were Caucasian, 23% were Hispanic, 3% were Asian or Pacific Islander, and 1% were American Indian.

EFNEP's traditional audiences have been hard-to-reach, difficult-to-teach, low-income urban and rural families. In the first decade of the program (1968-1983), indigenous paraprofessionals were instructed to canvas neighborhoods to assess families' financial need and to emphasize recruitment of families with children under five years of age (Armstrong

et al. 1992). Since 1983, the federal EFNEP guidelines have authorized state innovations in recruitment and program delivery to increase program efficiency and effectiveness. Interagency referrals, especially recruitment from other food assistance programs, were given greater emphasis. (EFNEP policies, 1983). Those changes of EFNEP policies had an effect on characteristics of EFNEP participants. Increasing numbers of participants were also enrolled in the Food Stamp program, WIC and Headstart (Armstrong et al.,1992). Walker et al.(1983) compared the participants in their study with traditional EFNEP participants in previous years, they found that participants in their study tended to be Caucasian, educated, frequently single-parents or dual-earner households being victims of temperate unemployment who had applied for public assistance. Researchers concluded that recruitment and teaching of clienteles from a low-income assistance network appears to be a cost-effective method for reaching large numbers of low-income clienteles. However, Armstrong et al. (1992) questioned whether recruitment from other agencies might limit the EFNEP's outreach to the most needy people, who had the poorest dietary status and lacked access to other support systems.

A special effort has been made by EFNEP to recruit pregnant teens and pregnant adult women because adequate nutrition of mothers can not only decrease the incidence of low birth weight babies but also support the health of the mothers and growth of the infants (Conone, 1992).

Attrition is considered a failure since participants leaving the program in half way do not receive the full benefit of the EFNEP. Reasons for dropping out of the program include returning to school, finding new employment, moving and other family concerns. Number of adults in the home did affect the dropout rate. Walker et al. (1983) reported that EFNEP participants who dropped out were more likely to live in a home with only one adult. Child care and other home responsibilities may have been a factor in decisions to drop out of the program.

Dietary adequacy of EFNEP participants

In order to ensure that EFNEP services target the most needy audiences, a number of EFNEP studies have examined social/demographic factors that could affect participants' dietary status. Observable characteristics most commonly used in assessing factors impacting on diet adequacy include

race, income, education level, family composition, residential pattern (urban, suburban, and rural), food assistance program participation, etc.

<u>Race</u>   Cox et al. (1995) reported that 54% to 70% EFNEP participants in their study had low mean intakes of dietary fiber (8 to 9 g/day), calcium (504 mg/day) and vitamin A (648 to 764 retinol equivalents). Cox et al. (1995) also reported that fat was the only nutrient for which the mean intake by black participants (37% Kcal from fat) was significantly higher than that of white participants (34% Kcal from fat), with both groups being above the recommended 30% kcal from fat. In contrast, Amstutz and Dixon (1986) observed higher consumption of foods from the "other" food group (fats, sweets, alcohol and other) by white participants than by nonwhite participants. The contrast might be due to the differences in the analytical methods. Cox et al (1995) reported fat intake as a single nutrient, calculated as % kcal from fat. Whereas, Amstutz and Dixon (1986) reported fat intake as a component of the "other" food group as defined in the Food Guide Pyramid (fat, added sugar, alcohol and other), calculated as number of servings. Thus fat contents were differ in two studies.

<u>Income</u>   Based on the empirical literature review, Morgan
(1986) provided the conclusion that income was a major
determinant of household food expenditure. There was also a
positive relationship between income and dietary status,
though it was not strong statistically. In a study
investigating dietary diversity among 1976-80 NHANES II
respondents, Kant et al. (1991) reported that food group
score[1] and serving score[2] showed a significantly positive
trend with increasing income and level of education in the
survey sample (n=11,658, age 19 to 74 years old). They
suggested that increasing purchasing power could increase
availability and afford ability of food for limited income
and limited formal education population groups.

However, another dietary assessment study which was
based on the 1987-88 NFCS (Nationwide Food Consumption
Survey) did not reveal a relationship between income and

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1. Food group score counted the number of food groups
consumed daily from a total of five groups-dairy, meat,
grain, fruit, and vegetable. One point was counted for each
food group consumed. Maximum score = 5.

2. Serving score evaluated every food recall for consumption
of at least two servings each from dairy, meat, fruit, and
vegetable groups and four servings from the grain group.
Four points were counted for each of the five groups.
Maximum score = 20.

dietary quality (Murphy et al, 1992). If a person's mean of the 3-day reported intakes were above 67% RDA for 15 nutrients (i.e., protein, vitamin A, vitamin E, vitamin C, thiamin, riboflavin, niacin, vitamin B6, folate, vitamin B12, calcium, phosphorus, magnesium, iron, and zinc) and percent energy form fat was below 30%, this person defined as having a high quality diet. They reported that income was not the predictor of dietary quality. The discrepancy of the findings between Kant et al (1991) and Murphy et al (1992) may be due to the differences between dietary data collection methods (one day 24-hour food recall vs. one day food recall plus two day food record), and the measurement of dietary quality (food group score and serving score based on food group consumption vs. two criteria based on nutrients intake).

Haines et al (1992) used data from 1985 CSFII to investigate whether differences in energy and nutrient intakes were present for women classified into different eating patterns. They found that women classified in "Fast Food eating pattern" (i.e., 40% to 50% of energy came from away-from-home sources, e.g., fast food locations and cafeterias) were predominantly young women, and women

classified in "Restaurant pattern" (i.e., 46% energy came
from restaurant eating) were predominantly high-income,
well-educated women. Both patterns represent the stereotype
of away-from-home consumption. Each is either high in intake
of total fat, saturated fat, cholesterol, and sodium, or low
in nutrient densities for dietary fiber, calcium, vitamin C
and folacin. In contrast, middle-income, moderately educated
and middle-aged women in "Home Mixed eating pattern" (i.e.,
70% energy consumed at home, 30% energy consumed away from
home) consumed the most healthful diets. Unemployed, low-
income, less educated women in "Home All pattern" (i.e.,
100% energy consumed at home) consumed neither the most nor
least healthful diet.

Two studies examined and found no relationships between
dietary adequacy and income of EFNEP participants at the
time of entry (Johnson and Nitzke, 1975 and Amstutz and
Dixon, 1986). These results might be due to the fact that
the income of this low-income population did not range
sufficiently to reveal a relationship.

<u>Education level</u>   Numerous studies with non EFNEP
participants report that education level has a significantly
positive impact on nutrition knowledge and food consumption

habits (Patterson et al., 1994; Murphy et al., 1992; Kant et al., 1991; Popkin et al., 1989). Rogers et al. (1995) assessed factors associated with poor dietary habits in a clinical population. They reported that patients with less than a 12th grade education were twice as likely to have low consumption of vegetables and fruits (less than 2 servings per day, respectively) as more highly educated patients.

In contrast, Haines et al. (1992) showed that well-educated, high-income women tended to be classified in "restaurant eating pattern", diets of which contained the highest overall fat density and low nutrient densities for dietary fiber and many of the micronutrient.

Several EFNEP studies have examined the relationship between participants' entry dietary quality and education. Amustutz and Dixon (1986) reported that participants with a low educational level (8th grade or less) consumed more servings from the "other" food group (fats, sweets, alcohol and other) than participants with a higher educational level (9th grade or above) based on the entry 24-hour food recall data. Brown and Pestle (1981) observed that participants with a low educational level (8th grade or less) had lower entry diet scores than participants with a higher

educational level (9th grade or above), but the difference were not statistically significant. Johnson and Nitzke (1975) reported no relationship between education level and dietary adequacy of their EFNEP participants. They suggested that the findings might be due to similar educational backgrounds of their participants.

In order to improve the efficacy of EFNEP education, a few studies addressed special needs of low-literacy participants in EFNEP. Hartman et al. (1994[a]) cautioned that years in school did not accurately predict reading ability for EFNEP participants in their study. They concluded that printed materials for this sub-population should be designed at a low-reading level. From focus group studies, Hartman et al.(1994[b]), alone with Boushey and Rauch (1989) have found that EFNEP participants preferred demonstration and hands-on activities to receive nutrition information rather than lectures.

<u>Family composition</u>   No relationship was found between EFNEP participants' dietary quality and their family size, and number of children at home (Amustutz and Dixon, 1986; Brown and Pestle, 1981).

<u>Residential patterns</u>   Several studies reported dietary

adequacy level at the entry by Nutrient Adequacy Ratios (NARs)(Johnson and Nitzke, 1975), and by diet scores (Brown and Ruth, 1981). They reported that EFNEP participants who lived on farms had higher dietary adequacy than those of urban and non-farm participants. These results might be due to the summer months when the studies were conducted. The availability and variety of foods from gardens and local farmers' markets had an impact on EFNEP participants who lived on farms.

<u>Food assistance program participation</u>   Morgen (1986) reported that a food stamp bonus and other food help (e.g., WIC and Meal Service) did have an positive effect on participants' food expenditure and reported dietary intake.

Armstrong et al (1992) conducted a multi year case study to evaluate the effects of changes in recruitment and instructional methods on dietary quality of EFNEP audiences. Participants who were recruited by paraprofessionals canvassing neighborhoods were called "traditional group." Of the 1989, in the tradition group, 68% received Food Stamps, and 39% were enrolled in WIC. Participants who were recruited though WIC and Headstart sites were called "modified group." Of the 1989, in the modified group, 35%

received Food Stamps, and 72% were enrolled in WIC. The participants from the modified group tend to have a higher initial dietary adequacy level than the participants in traditional group. This suggested that the diets of the participants from the modified group might have been positively influenced by nutrition education from WIC program.

Similarly, Walker et al (1983) found that the diets of EFNEP participants enrolled in other food assistance programs (e.g., food stamps, WIC etc.) showed less improvement because they were more adequate from the start.

In 1975, Johnson and Nitzke (1975) found no relationship between nutrient adequacy and the receipt of food stamps (30% of EFNEP participants in their study receiving food stamps), or participation in other welfare programs.

In summary, (1) EFNEP participants in previous studies had similar educational backgrounds and family incomes. Thus, the level of education and income for EFNEP population were not good predictors for the dietary adequacy level. (2) The EFNEP participants' dietary quality was not influenced by their family composition (family size, number of children

at home). (3) The entrance dietary adequacy level of EFNEP
participants who lived on farms tend to be higher than those
of urban and non-farm participants. (4) Other food
assistance programs in which EFNEP participants frequently
enrolled in have a positive influence on the dietary quality
of EFNEP participants.

Dietary changes of EFNEP participants and associated factors

A number of EFNEP studies have used multi-variate
statistical methods to evaluate hypotheses related to the
factors influencing participants' dietary changes. Dietary
changes have been predicted most commonly by income, food
assistance program participation, household composition,
education level, place of residency (e.g., urban, suburban,
and rural), race, ethnic origin, and programmatic factors
(e.g., teaching methods, education topics, frequency of
EFNEP visit, length of EFNEP visit).

EFNEP dietary assessment studies have shown positive
dietary changes of participants at the completion of the
program. Participants retained their dietary improvement at
various follow-up periods (6 months to 36 months): Brink and
Sobal (1 year follow-up, 1994), Torisky et al. (6-36 months

follow-up, 1989), Amstutz and Dixon (18 months follow-up,
1986), Brown and Pestle (1 year follow-up, 1981).

In addition to improvement of dietary intake, EFNEP
participants improved program-related knowledge (such as
food storage and sanitation, meal planning), resource-
management and decision making skills, and self-confidence
(Brink and Sobal, 1994; Bowens et al., 1995; Romers et al.,
1988; Anderson, 1988).

Amstutz and Dixon (1986) reported that dietary
improvement measured by changes in diet score could not be
predicted by any of the following participants'
characteristics: education, race, age of homemaker, presence
of adult male in the home, size of household, income, Food
Stamp participation, welfare status, initial diet scores,
months stayed in the program, and number of lessons
received. Significant reduction of intake of the "other"
food group (fats, sweets, alcohol and other) were reported
in the participants with the high initial servings from the
"other" food group.

Family composition is considered an external factor
influencing EFNEP participants' dietary improvement. Torisky
et al (1989) reported that EFNEP participants' dietary

improvement was not associated with selected family factors, such as family composition, family support and family diet control.

Del Tredici et al.(1988) concluded that dietary changes were determined by the length of the EFNEP visit(mean 80.5 ± 24.3 minutes), the frequency of EFNEP visits (mean 7.8 ± 3.9), and the EFNEP instruction topics (such as nutrition facts, selection and buying, cooking skills, economical preparation, food safety, and preservation).Even though these factors did not always directly influence diet scores, they directly increased participants' knowledge and attitudes, which in turn influenced diet scores. Three other studies agreed that the number of visits were positively associated with increased intake of certain food groups (Brown and Pestle, 1981; Johnson and Nitzke, 1975; Verma and Jones, 1973).

Programmatic variables such as curriculum and teaching methods (individual instruction or group teaching) have been studied in relation to EFNEP Participants' dietary changes. Cox et al. (1995) found that participants receiving tailored cancer-prevention lessons made more dietary changes than those receiving the EFNEP regular lessons only. Individual

instruction and group teaching had about the same effect on dietary changes, although group teaching methods reached more people (Walker, 1983; Brown and Pestle, 1981; Verma and Jones, 1973).

In summary, EFNEP evaluation studies show that the program has made positive changes in participants' dietary adequacy. Overall, dietary changes of EFNEP participants was not related to various demographic characteristics such as education, race, age, income, family composition, etc. This might be due to similar economic background and lifestyle of the EFNEP participants. A few researchers suggested that the number of visit and tailored curriculum had positive influence on dietary changes of participants.

Indices of overall dietary quality

Quantitative measurement for diet quality of a population which can address several important nutrition concepts of the current dietary recommendations and food guides is highly desirable for administration and evaluation of various nutrition education programs.

Kant (1996) compiled the diet quality indexes that have been reported in the literature into three major categories:

indexes derived from nutrients only; indexes based on foods or food groups; and indexes based on a combination of nutrients and foods.

A few early measures have focused on the nutritional adequacy of a single nutrient or combinations of nutrients for which the Recommended Dietary Allowances (RDA) are established. Such as the Index of Nutritional Quality (INQ, Sorenson et al., 1976), the Nutrient Adequacy Ratio (NAR, Gibson, 1990), the Mean Adequacy Ratio (MAR, Abdel-Ghany, 1978).

Researchers have also taken approaches for measuring overall dietary quality based on consumption of food groups. Guthrie and Scheer (1981) validated the use of a dietary score based on the Basic Four Food Groups[3] by comparing it to a nutrient adequacy score based on the actual 12 nutrient intakes[4] of 212 college students. The dietary score range from 0 to 12. Two points were given for each servings in

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3. The Basic Four Food Groups include: milk and milk products, meat and meat alternatives, fruit and vegetables, plus bread and cereals.

4. Twelve nutrients include: protein, calcium, zinc, magnesium, iron, Vitamin A, Vitamin B6, Vitamin B12, Vitamin C, thiamin, riboflavin, and folacin.

both milk and meat group. One point was given for each serving in both fruit/vegetable and bread/cereal groups. No extra points were given for serving numbers excess the recommendation. As the dietary score increased, the percentage of subjects obtaining 67% RDAs for 12 nutrients also increased. The authors concluded that the scoring method based on food grouping has the power to assessing dietary adequacy of the target population.

Kant et al. (1991) concluded that screening diets for food group consumption can quickly provide meaningful information about their quality. Authors reported that a food intake pattern in which respondents consumed foods from all five food groups (grain, vegetable, fruit, meat, and dairy) provided mean amounts of all the key nutrients (protein, vitamin C, vitamin A, vitamin E, vitamin B6, folate, zinc, iron, calcium, and potassium) at levels greater than or equal to the RDAs.

Schuette et al.(1996) proposed and validated the use of a food group score system for assessing nutritional inadequacy in 2489 college students. Authors evaluated diets containing at least one serving from the five major food group as defined in the Food Guide Pyramid by comparing to

MAR-6 score (iron, calcium, magnesium, vitamins A, C and B6). The sensitivity and specificity of this food group score system for screening nutritionally inadequate diets based on MAR-6 < 75% were 89% and 45% for college students. They suggested that the minimal number of servings of the Food Guide Pyramid food groups can be used as a quantitative tool for assessing nutritional inadequacy.

Within the last two to three years, a few indexes have been developed for assessment of dietary quality according to the Dietary Guidelines for Americans and the Food Guide Pyramid, namely, a high quality diet should be adequate in energy and nutrients and moderated of fat and sodium. The Healthy Eating Index (HEI; Kennedy et al, 1995) was developed based on a ten component system: five food groups (i.e., grains, vegetables, fruits, milk, and meat), four nutrients (i.e., total fat, saturated fat, cholesterol, and sodium), and a measure of variety in food intake. The Diet Quality Index (DQI; Patterson et al., 1994) was developed based on weighting of selected nutrients and food intake recommendations of the Food and Nutrition Board. Diets were assigned points which were summed across eight diet variables to score the index from zero (excellent diet) to

16 (poor diet). Both indexes were designed for use by researchers as indicators of overall diet quality. The requirement of quantitative estimation of nutrients and food groups makes both indices too complex to be useful.

In summary, a goal for nutrition intervention programs is to increase the nutritional quality of the participants' diets. All of the indices mentioned above are useful for evaluating certain aspects of diet quality. Continued endeavor is needed to ensure that a valid and reliable index which incorporates the recommendations of both the Food Guide Pyramid and the Dietary Guidelines for Americans. The index also needs to be simple for the quantitative procedures for routine evaluation of the efficacy of nutrition intervention programs.

Dietary assessment methods used by EFNEP

24-hour food recall which was used in present study has traditionally been the dietary assessment instrument for both describing initial dietary status of EFNEP participants and for measuring change in dietary practice resulting from EFNEP participation.

There are four main categories of nutritional

assessment techniques: anthropometric measurements,

biochemical analyses, clinic examinations and historical

dietary information. 24-hour food recall which provides diet

histories fits into the fourth categories. No one technique

alone is sufficient for assessing the nutritional status of

individuals or groups. Woteki (1992) has suggested that the

choice of dietary assessment method should be determined by

1) practicality in terms of respondent burden, 2) analysis

resources, and 3) reliability and validity.

In <u>The Expanded Food and Nutrition Education Program:</u>

<u>Historical and Statistical Profile</u> (USDA, 1979), the

following reasons are delineated for using 24-hour food

recall in EFNEP:

> The diet assessment methods used by EFNEP must be
> simple and brief. Program homemakers will not
> likely tolerate lengthy and involved questioning
> about their nutrition habits, nor will they submit
> to complicated biochemical and medical tests.
> Furthermore, the procedure has to be accurately
> applied by paraprofessional aides, who may not
> have the background to collect and interpret
> detailed information on nutrients in food
> consumed. The method has to serve as a measure of
> assessing progress during the homemaker's
> participation the program. This implies repeated
> diet assessments, which could not be feasible with
> complex assessment procedures. Hence, the use of
> the 24 Hour Dietary Food Recall.

Sanjur (1982) summarized the following strengths and weaknesses of the 24-hour food recall: its strengths include validity to provide estimates of the mean intakes of population groups, simple to use, requiring less effort and time on the part of the respondents, inexpensive, and useability with illiterate individuals. The weaknesses result from low reliability and validity to estimate the individual's typical daily food intake, the "flat-slope syndrome" (the tendency of large eaters to underestimate and small eaters to overestimate amounts eaten), reliance on honesty and memory of the subject, and lack of accurate quantitative information.

Axelson (1984) cautioned against repeatedly employing 24-hour food recall to measure dietary changes in nutrition education programs. Axelson observed that mean intake for most nutrients increased, although not significantly, from pre- to post-recall even when no nutrition intervention was conducted between the two recalls. The author suggested that the experience of the first food recall might accounted for some of the differences in post-food recall, and thus groups to be evaluated should not serve as their own controls. Either random assignments to control and experimental groups

or statistical treatment should be used to control for the unequal initial mean measurements of existing groups.

In EFNEP, 24-hour food recalls were completed by EFNEP participants prior to and after the nutrition intervention. Each 24-hour food recall was assigned a score by using a method of scoring developed by the Synectics Scoring System for the USDA Extension Service (Jones et al, 1975). The Synectics Scoring System is based on the concept of the Basic Four Food Groups. For an adult, the Basic Four Food Groups recommended the serving numbers were milk-meat-fruit/vegetable-bread/cereal = 2-2-4-4. Food and beverages that do not belong to one of the four food groups are classified as "other" food group (e.g., fats, sweets, and alcohol). The score derived from this scoring method has been called Synectics score, USDA score, food recall score, diet score, dietary score and dietary adequacy score by different EFNEP studies.

The score ranges from 0 to 100. A minimum of 0 servings expressed as a score of 0, and a maximum of 12 servings expressed a score of 100. The 12 servings signified the recommended number of servings for an adult from each of the four main food groups (i.e., Milk-Meat-Fruit/Veg-

Bread/Cereals with 2-2-4-4 pattern). No additional points were given for consuming more than the recommended number of servings in any of the food groups. For example, a diet with Milk-Meat-Fruit/Veg-Bread/Cereals = 1-2-2-4 pattern. The Synectics score = 9÷12x100 = 75. The higher scores represents the better nutritional adequacy of a diet. The weakness of the Synetics Scoring System is that each serving of the food groups was equally weighed in the final food group score, i.e. 1 serving of milk is given an equal weight as 1 serving of bread/cereal. Thus the food group which required more servings in a daily diet were weighed more in the final food group score.

The strength of "food group approach" for dietary assessment is obvious. People eat food not nutrients. The "food group approach" is consistent with the nutritional education efforts that encourage clients to improve their food intake practice. Its concept is easily understood by the general population. The scoring systems based on food groups provides a basic indicator of dietary balance.

The Food Guide Pyramid (USDA, 1992) which illustrates the key concepts of variety, moderation, and proportionality addresses many of the weaknesses of the Basic Four Food

Groups. The Basic Four Food Groups does not provide guidance for moderate consumption of fat, cholesterol, saturated fat, calories, salt, sugar, or alcohol which are related to diseases of overabundance such as obesity and coronary heart disease.

The USDA's Food Guide Pyramid has been utilized by EFNEP educators to teach clients how to put the Dietary Guidelines into action. The relevant instrument which can assess overall dietary quality should be utilized to evaluate the effectiveness of the EFNEP participants' dietary changes.

In summary, the Michigan EFNEP evaluation incorporated the following conclusions in research design: (1) The 24-hour food recall was considered suitable and valid for assessment of dietary intake of EFNEP participants. (2) The score assigned to a food recall, which based on the Basic Four Food Groups, was as good as analyzing nutrient content to assess a diet. (3) Scoring system based on food groups should be modified to address the concepts of Food Guide Pyramid.

Chapter Three

METHODOLOGY

Research design

The central focus of this research project was to evaluate the dietary quality of Michigan EFNEP participants, and to assess the dietary changes fostered by the program by using the concepts of the Food Guide Pyramid and the Dietary Guideline for Americans. A cross-sectional evaluation was performed to assess overall dietary quality of Michigan EFNEP participants at the time of enrollment (n= 3866, August, 1994 - September, 1995). A longitudinal evaluation research approach was chosen to study dietary changes of a subgroup called EFNEP graduates (n = 2454, August, 1994 - September, 1995).

Subjects

The subjects of the present study were 3866 female participants in EFNEP from 12 Michigan EFNEP counties

between 1994 and 1995 (Appendix C: Distribution of Michigan

EFNEP counties 1994-95). Data were collected by EFNEP

Evaluation/Reporting System (ERS) on demographic information

and dietary intakes by 24-hour food recalls at the beginning

and the end of the program.

Michigan EFNEP is administered through Michigan State

University Extension and managed by county-based MSU

Extension home economists. Low-income (at or below 185%

Federal Poverty Income Guideline) homemakers/individuals

living either in rural or urban areas, and responsible for

planning and preparing the family's foods were recruited.

Most of participants enrolled in the program voluntarily,

others enrolled in the program through selected cooperating

agencies, or through court order in cases of child custody.

Participants received instructions from EFNEP

paraprofessionals using Eating Right Is Basic (Third

Edition) curriculum. This curriculum was developed and

produced by Michigan State University Extension Service

(Appendix D: List of EFNEP curriculum content). Participants

who complete at least seven core lessons were eligible to

receive graduation certificates.

Approval for the study was obtained from the University

Committee on Research Involving Human Subjects (Appendix E:
UCRIHS approval). All information was kept strictly
confidential. Participants' names, phone numbers and mailing
addresses were deleted from the original files. No
respondent was identified individually in any way in the
final data presentation.

Approximately 5,000 families in Michigan participate in
the EFNEP annually. In 1994-95 fiscal year, sixteen Michigan
counties offered EFNEP to local low-income families.
Fourteen of sixteen used ERS to collect information on
demographics and dietary intake of the participants during
the educational program. Twelve counties provided complete
data. Thus, these 12 counties were included in present
study. These 12 Michigan EFNEP counties were: Berrien,
Dickinson, Genesee, Kalamazoo, kent, Muskegon, Oakland,
Saginaw, Sanilac, St. Clair, Washtenaw, and Wayne (Table 2).

For each fiscal year, there were three subgroups of
EFNEP participants: those who had met the objective of the
education (graduates), those who had withdrawn from the
program due to the reasons such as returning to school,
finding a job etc. (dropouts), and those who are still
participated in the program (continued participants).

Table 2. 1994-95 ERS raw data received from 16 Michigan
EFNEP countries

COUNTY	DATA PROBLEM	TOTAL	GRAD*	DROP*	CONT*
Berrien	OK	414	307	35	72
Dickinson	OK	30	21	3	6
Genesee	OK	376	270	52	54
Ingham	Incomplete data.				
Kalamazoo	OK	372	265	39	68
Kent	OK	448	283	104	61
Lenawee	Not using ERS at 1994-95				
Macomb	Incorrect reporting period				
Muskegon	OK	329	189	76	64
Oakland	OK	660	404	108	148
Saginaw	OK	425	278	38	109
Sanilac	OK	99	78	5	16
St. Clair	OK	73	61	1	11
Washtenaw	OK	172	81	44	47
Wayne	OK	766	449	139	178
Bay	Not using ERS at 1994-95				
Total	12 counties raw data	4164	2686	644	834
	12 counties-female data	3866	2454	621	791

*   GRAD, DROP, and CONT indicate graduates, dropouts, and
continued participants, respectively.

Our raw data included 4164 cases. We performed six steps procedure to eliminate 298 cases from the 1994-95 data set. The reminders were 3866 female subjects. The exclusion criteria for cases in the present study were: incomplete dietary record, age, gender, income, caloric intake (Table 3).

Table 3. Procedure for exclusion of cases from 1994-95 EFNEP database

Step	Procedure	Number excluded (n=298)
1.	Eliminate cases without 24-hour food recall at the time of entry	15
2.	Eliminate cases whose age was less than 13 years old.	16
3.	Eliminate cases whose monthly income > 185% Poverty index	37
4.	Eliminate cases that had no caloric intake or caloric intake above 4 standard deviation from the mean at the time of entry (i.e., 6048 Kcal/day).	25
5.	Eliminate graduate cases that had no caloric intake or caloric intake above 4 standard deviation from the mean at the time of exit (i.e., 6049 Kcal/day).	15
6.	Eliminate cases with male participants.	190

Data collection

The data for EFNEP participants were collected by paraprofessionals using two standardized forms: Adult Family Record (Appendix F) and 24-Hour Food Recall (Appendix G).

The Adult Family Record is normally completed by the participants during the first enrollment visit. Demographic data were recorded on participants and their families for: age, sex, pregnancy, nursing, race, place of residence, total household income last month, number of children (through age 19) at home and their ages, number of other adults in household, type of instruction (group or individual teaching), other assistance programs in which the family participates.

24-Hour Food Recall is normally completed by the participants with the help of paraprofessionals during the first enrollment visit and the last visit. Respondents report, as accurately as possible, the foods and drinks they have consumed in the 24-hour time period before the visit. Paraprofessionals in Michigan have been trained to maximize accuracy of the recall by establishing rapport at the beginning of the program; soliciting cooperation and confidence by explaining the purpose of the food recall;

asking follow-up questions about the food consumed; demonstrating the house measures such as glasses, cups, spoons, bowls and plates to help participants to estimates the amount of foods consumed; and verifying the reported food consumed by repeating the information and asking if everything has been included.

Each participant's information collected by the above two standardized forms were entered into ERS at the EFNEP county office by a trained clerical staff. The forms were frequently (but not consistently) checked prior to entry by an Extension Home Economist.

24-hour recalls were entered into ERS with the correct meal code, food name, and quantity of the food item. ERS defined meal code as: 1 - Morning meal or snack; 2 - Midmorning meal or snack; 3 - Noontime meal or snack; 4 - Afternoon meal or snack; 5 - Evening meal or snack; 6 - Late evening meal or snack. The Grams/Unit and the description of the unit size (e.g. ounce, slice, dozen) of the food item were used as a guide to the appropriate quantity for food items.

Foods database

The EFNEP ERS Foods Database contained the following nutrient values and servings of food groups for 1373 food items.

    Food ID
    Name of food item
    Unit of measure of item (ounce, each, slice, etc.)
    Gram weight of item
    Serving size of item

    Number of servings of bread
    Number of servings of fruit
    Number of servings of vegetables
    Number of servings of meat
    Number of servings of dairy/calcium products
    Number of servings of other foods (added fat and sugar)

    Number of calories
    Grams of protein
    Grams of fat
    Grams of carbohydrates
    Grams of fiber
    Grams of alcohol

    Retinol equivalents of vitamin A
    Milligrams of vitamin C
    Milligrams of calcium
    Milligrams of iron
    Milligrams of vitamin B6

The Foods Database was designed to be a "generic", reliable, concise for use in all EFNEP states and territories. The Foods Database includes about 1373 core foods. Nutrient values of most foods were taken from the USDA Handbook #8 series of the database from the Human Nutrition Information Service that was used to analyze the

Nationwide Food Consumption Survey. Foods were assigned to the Food Guide Pyramid food groups based on the definition and specifications of servings as stipulated by the US Department of Agriculture and Department of Health and Human Services. The Food Database was flexible permitting continuous updating of existing values and additions of new single or composite foods. Additional recipes, manufacturers' and ethnic food data were entered to make the database as complete as possible. Additional foods commonly eaten in the area can be entered into database by each state office. There were no missing values in the food database. Nutrients derived from supplements were not quantified and therefore were not included in the daily totals.

The Foods Database was indexed by food name. The food names are listed by categories, such as bread, beverages and juices, chicken, fish, beef, turkey, cereal, candy, soup, sandwiches and sauces. These foods were all listed with the category name first, then a comma, and then a more precise description (such as chicken, thigh, batter/fried). Food ID numbers were originally organized in alphabetical order by food name. Standard units included those for items, e.g., 1 apple, 1 sandwich, 1 slice etc., and those for measures

e.g., teaspoon, tablespoon, ounce, or cup. Since the weight

of "servings" of food are approximate, and the Food Guide

Pyramid gives broad definitions of serving sizes for classes

of foods, the Foods Database rounds the number of servings

to a unit of 1/4 serving (i.e. 1.02=1.00; 0.23=0.25;

0.78=0.75, etc). Where appropriate, ERS uses 0.33 and 0.67

to represent 1/3 and 2/3 respectively, and occasionally to

the nearest 0.10 serving unit.

Data processing

The ERS system data can be used in various ways. They

are used to provide the recall diagnostic reports as

feedback to participants and to generate summary reports of

the EFNEP unit for each designated reporting period. Used in

the present study are the raw back up data files from the

system database. Three data files (Adult.dbf, Recall.dbf and

Meals.dbf) backed up from each county were integrated into

one statewide database (Appendix H: Print outs of three ERS

raw data files).

> Adult.dbf -   contains participants' demographic and
>
> programmatic variables (from the Adult
>
> Family Record).

Recall.dbf -   contains information about the

recalls. For each recall, nutrients

values and the number of servings of the

food groups are listed as variables

(from 24-hour food recall).

Meals.dbf -   holds the quantities of each food item

consumed (from 24-Hour Food Recall).

In the EFNEP database, each case contains the complete information (i.e., demographic and dietary intake) for each participant. The original Recall.dbf file was split into entry recall file and exit recall file. Variables for an entry file were renamed as variables 1. Variables for an exit recall file were renamed as variables 2. These two files were then combined with the same cases, but with different variables. This newly combined recall file was then merged into Adult.dbf file to form one final integrated data set. Procedures of file transforming were repeated for all the backup diskette(s) from each of the Michigan EFNEP counties to create a EFNEP database.

Dietary quality was a binary outcome variable. The classification was based on the rationale that the high dietary quality should encompass the concepts of both the

Food Guide Pyramid and the Dietary Guidelines for Americans.

Two criteria set for the present study to assess the quality

of participants' diets are: (1) Including at least one

serving from each of the five major food groups as defined

by the Food Guide Pyramid (i.e., Grain-Vegetable-Fruit-Meat-

Dairy = 1-1-1-1-1); (2) Limiting fat intake to $\leq$ 30% daily

energy intake. Diets which failed to meet both criteria were

considered low dietary quality, and diets met both criteria

were considered high dietary quality in subsequent data

analysis.

In the present study, a diet with Mean Adequacy Ratio

MAR-5 score < 75 was defined as nutritionally inadequate. It

was less liberal than 67% of RDA, but not as stringent as

100% of RDA (Schuette et al.,1996). Five nutrients (i.e.,

calcium, iron, and Vitamin A, C, and B6) were used to

calculate MAR-5. These five nutrients were most often

lacking in American diets (CSFII 1994). Additionally,

vitamins A, vitamin C, calcium and iron are four micro

nutrients included in new food labels established by the

Food and Drug Administration regulations (Federal Register,

1993).

MAR-5 was calculated by the following two steps:

$$NAR = \frac{\text{actual nutrient intake}}{\text{recommended dietary allowance}} \times 100$$

$$MAR\text{-}5 = \frac{\text{sum of NARs for 5 nutrients}}{5}$$

NARs scores $\geq$ 100 was truncated at 100.

Dietary changes were the changes in the participants' food consumption behavior that occurred between the entry and graduation of the program. In our study, dietary changes were determined by two criteria: 1) change in consumption of five major food groups, which was determined by subtracting the entry food group scores from the exit food group scores; 2) change in consumption of fat, which is determined by subtracting the percent energy from fat at the entry from that at the exit. Desirable changes were an increase in food group score and a reduction in percent energy from fat.

Food group score (FGS) was developed based on the Food Guide Pyramid. Score for one food group was calculated by actual intake of the food group in serving numbers divided by minimum recommended servings for this food group. Food group score was the sum of scores for the five major food groups. A score larger than 1 was truncated at 1 for each

food group. The resulting final food group score were in an interval scale of numbers with decimals. Food group score ranged from 0 to 5. The equation for calculating the food group score was as following:

$$FGS = \sum_{n=1}^{5} \frac{\text{actual intake servings}}{\text{minimum recommended servings}}$$

Two levels of recommended number of servings for five food groups were used in our study based on participants' gender, age and maternal status (Table 4).

Table 4. Two levels of recommended number of servings for the five major food groups

	Bread-Veg-Fruit-Meat-Dairy	Participants	Age
level 1	6-3-2-2-2	Female Adult	25-99
level 2	6-3-2-2-3	Female Pregnant	0-99
		Female Nursing	0-99
		Pregnant & Nursing	0-99
		Female Young	0-24

Note: Diary products are the best source of calcium. The Food Guide Pyramid suggests 2 to 3 servings of milk, yogurt, and cheese a day--2 for most people, and 3 for women who are pregnant or breast-feeding, teenagers, and young adults to age 24.

For example, of a pregnant EFNEP participant's daily food group intake pattern was Bread-Veg-Fruit-Meat-Dairy =

8-2-1-2-3, her Food group score was calculated as

$(8 \div 6) + (2 \div 3) + (1 \div 2) + (2 \div 2) + (3 \div 3) = 1 + 0.67 + 0.5 + 1 + 1 = 4.17$.

The strength of the modified food group score used in our study is that each food group had the same weight in final food group score. i.e. 6 servings from the bread/grain group is equal weight as 2 servings from the fruit group, both earn score one. This was based on the assumptions that each food group had its own unique nutritional composition and thus made an equally significant contribution to nutrient adequacy. The food group score was used to measure the dietary adequacy level, and to describe the dietary changes after EFNEP participation.

Statistical analyses

Statistical analyses for objective one, objective two, objective three, objective four, and objective five were carried out by using SPSS 6.0 for Windows.

Objective one (graduates vs. dropouts):

Frequency distributions were generated to describe the characteristics of all Michigan EFNEP participants and subgroups. Pearson chi-square tests were performed to evaluate whether graduates and dropouts had the same

demographic characteristics in ethnic origin, age group, maternal status, family size, place of residence, and number of public assistance programs participation in. Pearson chi-square test was also performed to determine whether the percentage graduates and dropouts classified into four dietary quality groups were the same.

<u>Objective two</u> (food intake patterns):

Frequency distributions of skipping breakfast, lunch, and dinner were generated. The top 20 food items that contributed most intakes (in servings) of the five food groups (i.e., grain, vegetable, fruit, meat, and dairy) and "other" food group (i.e., added fat and sugar) were listed respectively.

The percent contribution provided by a particular food item j to a certain food group (e.g., grain) was given by:

$$\frac{\text{Total intake of a food group from food } j \text{ summed over all individuals}}{\text{Total intake of a food group from all foods summed over all individuals}} \times 100$$

Estimated by:

$$\frac{\sum_{i=1}^{3866} \sum_{k=0}^{K} \text{food group}_{ijk}}{\sum_{i=1}^{3688} \sum_{j=1}^{1373} \sum_{k=0}^{K} \text{food group}_{ijk}} \times 100$$

```
Where   i =     subjects, 1,2,...,3866;
        j =     food items, 1,2,..., 1373;
        k =     intake of food item j to that subject,
                0,1,2,...K (in servings);
    food group_{ijk} = serving numbers contained in serving k
                of food item j to subject i.
```

The percent contribution provided by a particular food item i to a nutrient (e.g., iron) was calculated by using the same formula above. The top 20 food items that contributed most the intakes (in g, or mg) of calcium, iron, vitamin A, vitamin C, vitamin B6, and fiber were also listed respectively.

Objective three (overall dietary quality):

Descriptive statistics of food groups, nutrients and food components were obtained for all Michigan EFNEP participants at the time of entry. Frequency distribution of four dietary quality sub-groups was obtained.

Objective four (factors associated with dietary quality):

Of a total of 3866 participants at the time of entry, 2287 participants' diets which met neither criteria were classified as low dietary quality(coded as 1), 183 participants' diets which met both criteria were classified as high dietary quality (coded as 0). 1396 participants who met only one criterion were not retained for the data

analysis of this objective.

For objective four, the dietary quality, was the dependent variable, with low quality diets and high quality diets as the risk (coded as 1) and referent levels (coded as 0), respectively. Our primary interest was to evaluate whether low dietary quality can be predicted by two undesirable food behaviors: (1) high intake of the "other" food group (i.e., 10 to 20 servings vs. $\leq$ 10 servings, and > 20 servings vs. $\leq$ 10 servings); and (2) low frequency of meals/snacks consumption (i.e., < 3 meals/day vs $\geq$ 3 meals/day) while controlling for energy intake in the model. We also investigated if the low dietary quality was associated with factors such as maternal status, race, participation in other food assistance programs, family size, place of residency, age, and income.

The association of factors investigated in our study with the dietary quality (1 = low quality, 0 = high quality) was determined by logistic regression. Odds ratios (ORs) and 95% confidence intervals (95% CI) were calculated to assess the strength and statistical significance of the associations. An odds ratio larger than one indicates a positive association and an odds ratio less than one

indicates a negative association. A 95% confidence interval that does not include the value of one denotes rejection of the null hypothesis that the odds ratio is 1.

A full interaction model of logistic regression was used to examine the relationship between the dietary quality and each of the undesirable food behaviors while controlling for the effect of confounding variables in the model. Two-way interactions between energy intake and two undesirable food behaviors plus age, race, and maternal status were included. The backward Likelihood-ratio test was used for determining variables to be removed from the model. The entry and removal criteria for stepwise variable selection were $p < 0.05$ and $p < 0.10$, respectively. The p-value < 0.05 was used to assess the significant association. To minimize the possibility of Type I errors, only interactions with associated probabilities of less than 0.01 were accepted.

The full interaction model is written in logit form.

Logit P(X) = α + $\beta 1$ intake of added fat and sugar

$\qquad$ + $\beta 2$ frequency of meals/snacks

$\qquad$ + $\gamma 1$ energy intake + $\gamma 2$ age + $\gamma 3$ race

$\qquad$ + $\gamma 4$ income + $\gamma 5$ maternal status

$\qquad$ + $\gamma 6$ place of residence

$$+ \gamma 7 \text{ participation in other food programs}$$

$$+ \delta 1 \text{ energy} \times \text{intake of added fat and sugar}$$

$$+ \delta 2 \text{ energy} \times \text{frequency of meals/snacks}$$

$$+ \delta 3 \text{ energy} \times \text{age}$$

$$+ \delta 4 \text{ energy} \times \text{race}$$

$$+ \delta 5 \text{ energy} \times \text{maternal status}$$

α- constant

βi- coefficient of primary factors

γi- coefficient of confounding variables

δi- coefficient of two-way interaction terms

When the energy intake was found interacting significantly with undesirable food behaviors, subjects were stratified into three energy intake groups to minimize these interactions. Subjects whose energy intake were below one standard deviation from the mean (< 803 Kcal) were classified as low energy intake group. Subjects whose energy intake were over one standard deviation from the mean (> 2596 Kcal) were classified as high energy intake group. Subjects whose energy intake were between plus and minus one standard deviation from the mean (803 Kcal - 2596 Kcal) were classified as moderate energy intake group.

The final main effect model was performed separately in

three energy intake sub-groups to estimate the group-specific association between the variables and dietary quality. For a comparison purpose, the final main effect model was also performed for all participants in three energy intake sub-groups. Backward Likelihood-ratio test was used for determining variables to be removed from the model. The p-value < 0.05 was used to assess the significant association.

The final main model is written in logit form as below:

Logit $P(X)$ = α + $\beta 1$ intake of added fat and sugar

$+ \beta 2$ frequency of meals/snacks

$+ \gamma 1$ energy intake $+ \gamma 2$ age $+ \gamma 3$ race

$+ \gamma 4$ income $+ \gamma 5$ maternal status

$+ \gamma 6$ place of residence

$+ \gamma 7$ participating in other food programs

α- constant

βi- coefficient of primary factors

γi- coefficient of confounding variables

Objective five (dietary changes):

ANOCOVA was conducted to determine whether average changes in food group score and percent energy from fat

differed among four dietary quality groups, when differences in energy intake and number of lessons completed were controlled. Paired t-tests were used to test whether the food group score, percent energy intake from fat, number of servings for each food group and energy intake of graduates differed between the time of entry and the time of exit. A significance level of $p < 0.05$ was selected to determine statistical differences.

Chapter Four

RESULTS

Subjects

Subjects included in the present study were 3866 female participants. As summarized in Table 5, age of the subjects ranged from 13 years old to 85 years old. Mean($\pm$SD) and median age was 28$\pm$8.5 and 27 years old, respectively. The majority of the subjects (87%) in the EFNEP were enrolled in at least one other public assistance program: Food Stamps (58.3%), Women, Infants & Children Supplement Food Program (57.9%), Aid to Families with Dependent Children (AFDC, 39%), Child Nutrition (School Lunch/breakfast, 23%), Head Start (20%), the Emergency Food Assistance Program (TEFAP, 10%), Food Distribution Program on Indian Reservations (FDPIR, 1%) and other public assistance programs (not specified, 14%) that require low income for eligibility.

The subjects in the study had an average household size of four people. The mean ($\pm$SD) and median monthly household income were 561\pm$484 and $488, respectively. Twenty two

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Table 5. Baseline characteristics of all subjects,
          graduates, and dropouts[a]

	All subjects %	Graduates %	Dropouts %
Ethnic Origin			
White	47.3	46.8	47.2
Black	39.9	39.3	40.9
Other[b]	12.9	13.9	11.9
Age Group[c] (yr)*			
13 - 14	0.7	0.8	0.5
15 - 18	11.8	12.6	11.8
19 - 24	26.9	24.6	33.0
25 - 50	59.1	60.6	53.3
51 - 85	1.4	1.6	1.4
Maternal Status			
Pregnant/Nursing	21.2	19.8	20.3
Non-pregnant/non-nursing	78.8	80.2	79.7
Family size			
1 - 2	22.5	22.9	22.9
3 - 5	64.6	64.1	65.4
6 +	12.9	13.0	11.8
Place of residence*			
Rural area (population < 10,000)	13.0	15.0	8.5
Towns/cities (pop. 10,000-50,000)	27.6	25.7	34.0
Central cities (population > 50,000)	59.4	59.3	57.5
Participation in public assistance programs			
None	13.3	14.5	9.0
At least one	86.7	85.5	91.0
Food stamps	58.3	57.1	65.9
WIC	57.9	54.8	61.8

a. All subjects (n=3866) at the time of entry (baseline)
    include graduates (n=2454), dropouts (n=621) and those who
    continued the program (n=791).
b. Other ethnic origin includes Hispanic (10.0%), Asian/Pacific
    Islanders (1.7%), and Native American (1.2%).
c. Age group classification corresponds to the age groups of
    RDA: 11-14 yr, 15-18 yr, 19-24 yr, 25-50 yr, and 50+ yr.
*. Graduates differed significantly from the dropouts in age
    distribution and place of residence (P<0.001, Pearson Chi-
    square test).

percent of the subjects reported their monthly household income of less than $10.

Factors differentiating the EFNEP dropouts from the graduates (Objective one)

The EFNEP participants were classified into three sub-groups: (1) those who had met the educational objectives (graduates, n=2454, 64%), (2) those who had withdrawn from the program (dropouts, n=621, 16%), and (3) those who were still enrolled in the program (continued, n=791, 20%). The majority of the graduates (67%) completed the program with 10 or fewer visits, whereas 32% completed with 11 - 20 visits, and less than 1 % completed with more than 20 visits.

Graduates and dropouts sub-groups were compared for demographic characteristics (e.g., ethnic origin, age group, maternal status, family size, place of residence, and number of public assistance programs participated). The graduates differed significantly from the dropouts in age distribution and place of residence (Table 5). Subjects aged 19 - 24 years old were more likely to drop out of the program rather than stay on. Subjects residing in the towns or cities (population 10,000 - 50,000) were more likely to drop out of

the program rather than stay on.

Dropout rates varied widely among the twelve Michigan EFNEP counties (1.5% - 25.6%, Table 6). Three counties with the highest dropout rates were Washtenaw County (25.6%), Muskegon County (23.7%), and Kent County (23.3%). These three counties had no common characteristics in age distribution and place of residence. In Muskegon County, Washtenaw County, and Kent County, percent of subjects residing in towns or cities (population 10,000 - 50,000) were 94.8%, 68.5%, and 16.5%, respectively. Comparing with 26.9% of total subjects in age group 19-24, Kent county had fairly large portion of its subjects in age group 19-24 year old (36.9%).

Dropouts indicated their reasons for dropping out of the program as: having lost interest (43%), moving (20%), taking a job (13%), family concerns (5%), and returning to school (3%). Sixteen percent of the dropouts indicated no specific reason. In Kent County, as high as 97.1% of dropouts gave the reason for dropping out of the program as lose of interest. Sixty five percent of dropouts in Washtenaw County and 45% of dropouts in Muskegon County also reported the same reason for dropping out.

Table 6. Programmatic factors for 12 Michigan EFNEP counties, 1994-95

County	# of Subjects	Dropout rate	% Dropouts cited "lost interest" as a reason for dropping out[a]	#Subjects per ppf[b]	Instruction Format		
					Group	Individual	Mixed
Washtenaw	168	25.6%	65.1%	84	44.0%	56.0%	0.0%
Muskegon	308	23.7%	45.2%	44	31.2%	55.2%	13.6%
Kent	442	23.3%	97.1%	55	11.5%	88.5%	0.0%
Wayne	695	19.3%	31.3%	63	86.8%	10.9%	2.3%
Oakland	640	16.4%	22.8%	71	40.5%	59.4%	0.2%
Genesee	322	15.0%	18.8%	25	60.6%	32.9%	6.5%
Kalamazoo	332	10.5%	22.9%	33	45.5%	43.1%	11.4%
Dickinson	30	10.0%	66.7%	30	16.7%	66.6%	16.7%
Berrien	361	9.7%	0.0%	45	63.4%	25.2%	11.4%
Saginaw	408	8.8%	58.3%	68	49.5%	41.2%	9.3%
Sanilac	92	5.4%	20.0%	46	53.3%	46.7%	0.0%
St. Clair	68	1.5%	0.0%	68	83.8%	16.2%	0.0%
Total	3866	16.0%	43.0%	53	51.0%	44.0%	5.0%

a. Besides "lost interest", dropouts indicated their reasons for dropping out of the program as: moving, taking a job, family concerns, returning to school and no specific reasons.

b. Number of subjects instructed by per paraprofessional (ppf).

In 1994-95 reporting period, Average number of subjects
served by a paraprofessional varied among the twelve
Michigan EFNEP counties (from n=25 to n=84). Michigan EFNEP
participants received instructions from paraprofessionals
most frequently in a group format (51%), followed by one-to-
one basis (44%) and mixed type of instruction formats (5%).

Based on entry 24-hour food recalls, percent of
graduates and percent of dropouts classified into four
dietary quality sub-groups were summarized in Table 7.

Table 7. Percent of graduates and percent of dropouts
          classified into four dietary quality groups based
          on entry 24-hour food recalls

Dietary quality group	Graduates (n=2454)	Dropouts (n=621)
Group 1 (met neither)	59%	62%
Group 2 (met only ≤ 30% fat)	26%	23%
Group 3 (met only 1-1-1-1-1)	10%	11%
Group 4 (met both)	5%	4%

Note: Group 1, graduates whose diets met neither criteria;
      Group 2, graduates whose diets met only dietary fat
      criterion (i.e., ≤ 30% fat);
      Group 3, graduates whose diets met only food group
      criterion (i.e., G-V-F-M-D = 1-1-1-1-1);
      Group 4, graduates whose diets met both criteria.

The percentage graduates and dropouts classified into
four dietary quality groups did not differ statistically

(Pearson Chi-square test, P>0.3). This means that the quality of graduates' diets did not differ from the quality of dropouts' diets at the time of entry.

Meal and food intake patterns of EFNEP participants at the time of entry (Objective two)

Percent of subjects who skipped breakfast, lunch, and dinner were 26%, 32%, and 24%, respectively. Twenty eight percent of subjects ate less than 3 meals/snacks at the time of entry. The subjects consumed an average of eight different food items daily with a range from one to 22.

Table 8 presents the top 20 food items that contributed the most number of servings in each of the five food groups (i.e., grain, vegetable, fruit, meat, and dairy) and "other" food group(i.e., added fat and sugar), the percent contribution of each food to total intake, and the percent subjects who consumed the food item.

The 20 major grain group contributors listed in Table 8 explained 45.5% of the total number of servings in the grain group. The single most important contributor was white bread (11.5% of total bread group), which was consumed second most frequently among all foods (25.8% subjects consumed it).

Combination dishes such as hot dogs, macaroni, spaghetti, pizza and sandwichs were among the top 20 food items that contributed the most number of servings in the grain group.

The 20 major vegetable group contributors listed in Table 8 explained 55.9% of the total number of servings in the vegetable group. Various white potato products such as french fries, mashed potato, and baked potato accounted for 25.2% of the total number of servings in the vegetable group.

The 20 major fruit group contributors listed in Table 8 explained 78.0% of the total number of servings in the fruit group.

The 20 major meat group contributors listed in Table 8 explained 39.7% of the total number of serving in the meat group. Chicken products accounted for 11.8% of the total number of servings in the meat group. Because meat was one of the main ingredients in some combination dishes (e.g.,spaghetti, hamburger, taco and sandwich), these food items were among the top 20 food items that contributed the most number of servings in the meat group as well as in the bread group.

The 20 major dairy group contributors listed in Table 8 explained 79.7% of the total number of servings in the dairy

Table 8.   Top 20 contributors of five major food groups and
"other" food group

Food items	% of the total number of servings	% of subjects consumed
Grain group		
BREAD, WHITE	11.5	25.8
HOTDOG ON BUN	3.0	4.7
MACARONI AND CHEESE	2.6	6.7
SPAGHETTI W/MEATBALLS,MEAT&TOM SAUCE	2.5	4.4
BREAD, WHOLE WHEAT	2.2	4.9
HAMBURGER 1/4 LB, W/O MAYO	2.2	4.9
PIZZA, MEAT & VEGETABLE	2.2	4.0
TACO OR TOSTADO W/BEEF & CHEESE	2.1	4.1
TORTILLA,CORN	1.9	2.2
SANDWICH, PEANUT BUTTER/JELLY	1.7	3.5
PANCAKES, PLAIN	1.6	3.3
RICE, WHITE CONVERTED, COOKED	1.6	3.1
SANDWICH, BOLOGNA	1.5	3.1
BAGEL	1.4	2.9
SANDWICH, HAM AND CHEESE	1.3	2.9
PIZZA, MEAT	1.3	2.9
SANDWICH, HAM	1.3	2.8
CEREAL, ANY TYPE, READY-TO-EAT	1.2	4.3
CEREAL, CORN FLAKES	1.2	5.2
CRACKER, SALTINE	1.2	3.6
Subtotal	45.5	
Vegetable group		
FRENCH FRIES, MCDONALDS	10.4	8.7
SALAD, LETTUCE W/.25 C TOMATO	4.1	7.8
POTATO, MASHED,CKD,W/FAT ONLY	4.1	5.0
TACO OR TOSTADO W/BEEF & CHEESE	4.0	4.1
CORN, CKD,ANY COLOR	3.8	5.8
BEANS, GREEN, FRZN, CKD	3.4	5.1
POTATO, FRNCH FRD FR FROZ,DEEP FRIED	3.2	5.1
POTATO, MASHED,W/MILK,NO FAT	2.4	3.1
SALAD, LETTUCE W/VEG(NO TOM/CAR)W/O DRES	2.4	3.7
PIZZA, MEAT & VEGETABLE	2.1	4.0
POTATO, HOME FRIES	2.0	2.1
BEEF, STEW W/POT,CAR,ONION,PEAS,GRAVY	1.9	1.6
POTATO, HASH BROWN,FROM FROZEN	1.8	2.3
CORN, ON COB	1.8	1.9
SPAGHETTI W/MEATBALLS,MEAT&TOM SAUCE	1.6	4.4
GREENS,COOKED,NO FAT	1.6	1.7
SOUP, VEGETARIAN VEGETABLE	1.5	*
POTATO, BAKED W/PEEL, W/O FAT	1.3	3.1
BEANS, STRING, CKD,	1.3	2.1
LASAGNA	1.2	1.9
Subtotal	55.9	

Table 8.(cont'd).

Food items	% of the total number of servings	% of subjects consumed
Fruit group		
JUICE, ORANGE CANNED UNSWEETENED	14.7	8.5
JUICE, APPLE	8.1	5.1
JUICE, ORANGE,FROZEN,UNSWT,W/WATER	8.1	5.2
APPLE, RAW, PEEL, SLICED	7.1	6.0
BANANA	6.8	5.9
JUICE, ORANGE,FRESH	5.9	4.7
JUICE, JUICY-JUICE	3.9	2.0
ORANGE, RAW	3.5	3.2
MELON,WATERMELON,RAW	3.4	1.1
JUICE, GRAPE, SWEETENED	2.6	2.5
GRAPE, RAW	2.5	*
DRINK, ORANGE JULIUS	1.9	*
MELON, CANTALOUPE(MUSKMELON),RAW	1.6	*
APPLESAUCE,STEWED APPLES,WO/SUGAR	1.3	*
CEREAL, RAISIN BRAN	1.3	1.0
PEACHES,CKD OR CAN,HEAVY SYRUP	1.2	*
APPLESAUCE,STEWED APPLES,W/SUGAR	1.1	*
PEACHES,RAW	1.0	*
STRAWBERRIES, RAW, WHOLE	1.0	*
JUICE, CRANBERRY W/SUGAR	1.0	*
Subtotal	78.0	
Meat group		
SPAGHETTI W/MEATBALLS,MEAT&TOM SAUCE	3.8	4.4
EGG, FRIED, SCRAMBLED W/O MILK	3.3	8.0
EGG, SCRAMBLED EGGS	3.0	6.9
CHICKEN, BBQ SAUCE, LEG AND THIGH	2.9	*
HAMBURGER 1/4 LB, W/O MAYO	2.5	4.9
TACO OR TOSTADO W/BEEF & CHEESE	2.3	4.1
CHICKEN, BREAST,W/SK,BDK/FRD W/FL	2.3	3.6
BEEF, STEAK	2.2	3.7
SANDWICH, TURKEY, APPROX 4 ½ OZ MEAT	1.9	2.1
CHICKEN, BREAST, ROASTED, 7 OUNCES	1.9	1.3
CHICKEN, LEG,BKD/FRIED W/FLOUR	1.7	3.2
CHICKEN, BREAST, NO SKIN, ROAST	1.6	3.1
BEEF, GOULASH W/NOODLES	1.5	1.1
PORK, CHOP,BREADED,FRIED	1.5	2.4
CHICKEN, WING,W/SK,BKD/FRD W/FLOUR	1.4	*
CHILI CON CARNE W/BEANS	1.3	*
SANDWICH, TUNA SALAD	1.2	2.2
BEEF, GROUND REGULAR	1.2	2.0
SANDWICH, BOLOGNA	1.1	3.1
HOTDOG ON BUN	1.1	4.7
Subtotal	39.7	

Table 8. (cont'd)

Food items	% of the total number of servings	% of subjects consumed
Dairy group		
MILK, WHOLE	23.3	25.5
MILK, LOW FAT 2%	12.9	12.8
MILK, CONDENSED,SWEETENED,UNDILUTED	8.4	3.8
MACARONI AND CHEESE	6.0	6.7
PIZZA, MEAT & VEGETABLE	3.8	4.0
CHEESE, CHEDDAR/AMERICAN TYPE-OUNCE	3.0	3.1
CHEESE, AMERICAN & SWISS PROCESSED	2.7	5.9
MILK, SKIM OR NONFAT	2.5	2.6
PIZZA, MEAT	2.3	2.9
ICE CREAM, REG, FLAVORS OTHER THAN CHOC	2.0	3.3
TACO OR TOSTADO W/BEEF & CHEESE	1.8	4.1
SANDWICH, HAM AND CHEESE	1.6	2.9
MILK, LOW FAT 1%	1.6	1.4
LASAGNA	1.5	1.9
CHEESE, MOZZARELLA,PART SKIM	1.2	*
YOGURT,FRUIT VARIETY,LOWFAT MILK	1.2	1.3
NACHOS WITH CHEESE	1.1	*
SANDWICH, SUBMARINE	1.0	1.6
CHEESEBURGER, 1/4 LB, W/O MAYO	0.9	1.5
MILK, CHOC,SKIM,MILK BASE	0.9	*
Subtotal	79.7	
"Other" food group (added fats and sugar)		
DRINK, SODA, COKE, ROOT BEER	12.4	28.4
MILK, CONDENSED,SWEETENED,UNDILUTED	7.6	3.8
CHIP, POTATO	6.0	10.8
MILK, WHOLE	3.3	25.5
MACARONI AND CHEESE	2.7	6.7
DRINK, KOOL AID	2.6	10.3
DRINK, SODA,FRT-FLAV,W/CAFFEINE	2.3	6.5
ICE CREAM, REG, FLAVORS OTHER THAN CHOC	2.0	3.3
FRENCH FRIES, MCDONALDS, SMALL	1.7	8.7
BACON	1.5	6.5
POTATO, FRNCH FRD FR FROZ,DEEP FRIED	1.5	5.1
DRINK, SODA, 7-UP, GINGER ALE	1.1	4.4
CAKE,CHOCOLATE,DEVIL'S FOOD,W/ICING	1.1	2.3
MILK, LOW FAT 2%	1.1	12.8
BUTTER	0.9	8.0
PIZZA, MEAT & VEGETABLE	0.8	4.0
CHEESE, AMERICAN & SWISS PROCESSED	0.7	5.9
SYRUP, PANCAKE	0.7	2.5
CHIP, TORTILLA	0.7	1.0
EGG, SCRAMBLED EGGS	0.7	6.9
Subtotal	51.4	

*   Less than 1% of subjects consumed this food item.

group. Whole milk and 2% low fat milk accounted for 36.2% of the total number of servings of dairy group. Cheese products and combination dishes with cheese were among the list of top 20 contributors.

Table 8 also lists the 20 major "other" group contributors, which explained 51.4% of the total number of servings in the "other" food group. Four soft drinks (coke/root beer, kool aid, fruit favored soda, and 7-up/ginger ale) on the list together provided 18.4% of the total number of servings in the "other" food group. Condensed/sweetened/undiluted milk was ranked as second major contributor in the "other" food group (7.6%), even though only small proportion of the subjects consumed it. This was due to its high sugar and fat content. Potato chips alone provided 6.0% of the total number of servings in the "other" food group. It was ranked as the third major contributor in the "other" food group.

Table 9 presents the top 20 food items that contributed most the intakes of calcium, iron, vitamin A, vitamin C, or vitamin B6. The percent contribution of each food to the total intake (in g, or mg), and the percent of total subjects consuming the food item were listed.

The 20 major calcium contributors listed in Table 9 explained 54.4% of the total intake of calcium. Whole milk,

which was consumed by 25.5% of the subjects, provided most
of the total calcium intake (13.6%). Combination dishes with
cheese provided 13.3% of calcium intake. Despite their low
content of the calcium, white bread, soft drinks, and kool
aid were among the 20 major calcium contributors, ranking
5th, 9th, and 14th, respectively. This was because of the
large proportion of the total subjects who consumed these
food items (25.8%, 28.4%, and 10.3% of total subjects,
respectively). Calcium provided by 1 slice white bread, 1
fluid ounce kool aid, and 1 fluid coke/root beer was 30, 6,
and 2 mg, respectively (ERS User's Guide, Version 3.0).

The 20 major iron contributors listed in Table 9
explained 29.6% of the total intake of iron. Six ready-to-
eat cereal products combined contributed 9.6% of the total
iron intake due to the fortification of nutrients. White
bread, which was consumed by 25.8% of subjects, was ranked
as the first single contributor (3.8% of total iron). 11.3%
of iron came from various combination dishes. Four food
items classified in the meat group were also among the list.

The 20 major vitamin A contributors listed in Table 9
explained 51.4% of the total intake of vitamin A. The first
three major vitamin contributors (liver, cooked carrots, and
raw carrots) were consumed by less than 3% of the subjects.
Food items classified in the vegetable group contributed

Table 9.   Top 20 contributors of five micro-nutrient intake
by food groups and food items

Food items	Rank	%total	%subjects
Calcium			
Dairy group			
MILK, WHOLE	1	13.6	25.5
MILK, LOW FAT 2%	2	7.6	12.8
MILK, CONDENSED,SWEETENED,UNDILUTED	3	5.6	3.8
CHEESE, CHEDDAR/AMERICAN TYPE-OUNCE	7	1.9	3.1
CHEESE, AMERICAN & SWISS PROCESSED	8	1.8	5.9
MILK, SKIM OR NONFAT	10	1.4	2.6
ICE CREAM, REG, FLAVORS OTHER THAN CHOC	16	1.1	3.3
MILK, LOW FAT 1%	18	0.9	1.4
YOGURT,FRUIT VARIETY,LOWFAT MILK	19	0.9	1.3
Combination dishes			
MACARONI AND CHEESE	4	5.0	6.7
PIZZA, MEAT & VEGETABLE	6	2.1	4.0
PIZZA, MEAT	11	1.4	2.9
SPAGHETTI W/MEATBALLS,MEAT&TOM SAUCE	12	1.4	4.4
TACO OR TOSTADO W/BEEF & CHEESE	13	1.3	4.1
SANDWICH, HAM AND CHEESE	15	1.1	2.9
LASAGNA	17	1.0	1.9
Grain group			
BREAD, WHITE	5	2.5	25.8
Meat group			
EGG, SCRAMBLED EGGS	20	0.8	6.9
Other group			
DRINK, SODA, COKE, ROOT BEER	9	1.7	28.4
DRINK, KOOL AID	14	1.3	10.3
Iron			
Grain group			
BREAD, WHITE	1	3.8	25.8
CEREAL, RAISIN BRAN	3	2.4	1.1
CEREAL, TOTAL	4	2.1	*
CEREAL, CAPTAIN CRUNCH	7	1.8	1.2
CEREAL, CHEERIOS	8	1.7	3.3
RICE, WHITE CONVERTED, COOKED	9	1.4	3.1
CEREAL, CORN FLAKES	16	0.8	5.2
CEREAL, FRUIT LOOPS	17	0.8	1.3
Combination dishes			
SPAGHETTI W/MEATBALLS,MEAT&TOM SAUCE	2	2.6	4.4
HAMBURGER 1/4 LB, W/O MAYO	5	1.9	4.9
MACARONI AND CHEESE	6	1.8	6.7
PIZZA, MEAT & VEGETABLE	10	1.3	4.0
TACO OR TOSTADO W/BEEF & CHEESE	11	1.1	4.1
HOTDOG ON BUN	12	1.0	4.7
LASAGNA	18	0.8	1.9
PIZZA, MEAT	19	0.8	2.9
Meat group			
CHILI CON CARNE W/BEANS	13	0.9	1.6
BEEF, STEAK	14	0.9	3.7
EGG, FRIED, SCRAMBLED W/O MILK	15	0.9	8.0
EGG, SCRAMBLED EGGS	20	0.8	6.9

Table 9. (Cont'd)

Food items	Rank	%total	%subjects
Vitamin A			
Meat group			
LIVER, BEEF, FRD OR BRLD, NO COATING	1	8.4	*
EGG, FRIED, SCRAMBLED W/O MILK	10	2.0	8.0
EGG, SCRAMBLED EGGS	13	1.9	6.9
Vegetable group			
CARROTS, COOKED	2	5.8	2.0
CARROTS, RAW, ONE CARROT	3	4.8	1.1
GREENS,COOKED,NO FAT	11	2.0	1.7
SWEETPOTATO, BOIL, MASHED	12	2.0	*
CARROTS, RAW, CUP	15	1.4	1.1
VEGETABLE, MIX, CANNED	19	1.2	1.3
VEGETABLE, MIX	20	1.1	*
Dairy group			
MILK, LOW FAT 2%	4	2.8	12.8
MILK, WHOLE	6	2.6	25.5
MILK, CONDENSED,SWEETENED,UNDILUTED	18	1.3	3.8
Combination dishes			
MACARONI AND CHEESE	5	2.7	6.7
BEEF, STEW W/POT,CAR,ONION,PEAS,GRAVY	16	1.4	1.6
SPAGHETTI W/MEATBALLS,MEAT&TOM SAUCE	17	1.3	4.4
Grain group			
CEREAL, TOTAL	7	2.4	*
CEREAL, CORN FLAKES	8	2.3	5.2
CEREAL, ANY TYPE, READY-TO-EAT	9	2.1	4.3
CEREAL, CHEERIOS	14	1.9	3.3
Vitamin C			
Fruit group			
JUICE, ORANGE CANNED UNSWEETENED	1	11.3	8.5
JUICE, ORANGE,FROZEN,UNSWT,W/WATER	2	6.8	5.2
JUICE, ORANGE,FRESH	3	6.5	5.9
ORANGE, RAW	5	2.9	3.2
JUICE-DRINK,FRUITADES,FRUITPUNCHES	6	2.5	1.6
JUICE, GRAPE, SWEETENED	8	2.2	2.5
JUICE, JUICY-JUICE	10	1.9	2.0
JUICE, CRANBERRY W/SUGAR	13	1.6	*
DRINK, ORANGE BRKFST DRK FROM FROZ CONC	14	1.1	*
DRINK, ORANGE JULIUS	15	1.1	*
Other group			
CHIP, POTATO	4	3.9	10.8
DRINK, KOOL AID	12	1.7	10.3
Combination dishes			
SPAGHETTI W/MEATBALLS,MEAT&TOM SAUCE	7	2.4	4.4
PIZZA, MEAT & VEGETABLE	11	1.9	4.0
HOTDOG ON BUN	16	1.0	4.7
Vegetable group			
FRENCH FRIES, MCDONALDS	9	2.0	8.7
GREENS,COOKED,NO FAT	17	1.0	1.7
POTATO, FRNCH FRD FR FROZ,DEEP FRIED	19	1.0	5.1
POTATO, MASHED,CKD,W/FAT ONLY	20	0.9	5.0
Grain group			
CEREAL, TOTAL	18	1.0	*

Table 9.   (Cont'd)

Food items	Rank	%total	%subjects
Vitamin B6			
Fruit group			
BANANA	1	3.2	5.9
JUICE, ORANGE CANNED UNSWEETENED	8	1.8	8.5
Other group			
CHIP, POTATO	2	2.5	10.8
Combination dishes			
SPAGHETTI W/MEATBALLS,MEAT&TOM SAUCE	3	2.2	4.4
TACO OR TOSTADO W/BEEF & CHEESE	18	1.1	4.1
HAMBURGER 1/4 LB, W/O MAYO	20	1.0	4.9
Vegetable group			
POTATO, MASHED,CKD,W/FAT ONLY	4	1.9	5.0
FRENCH FRIES, MCDONALDS, SMALL	7	1.8	8.7
POTATO, FRNCH FRD FR FROZ,DEEP FRIED	16	1.4	5.1
POTATO, MASHED,W/MILK,NO FAT	19	1.1	5.0
Grain group			
CEREAL, TOTAL	5	1.9	*
CEREAL, CORN FLAKES	6	1.9	5.2
CEREAL, ANY TYPE, READY-TO-EAT	10	1.7	4.3
CEREAL, CHEERIOS	12	1.6	3.3
CEREAL, CAPTAIN CRUNCH	13	1.5	1.2
Dairy group			
MILK, WHOLE	9	1.8	25.5
Meat group			
CHICKEN, BREAST,W/SK,BDK/FRD W/FL	11	1.7	3.6
CHICKEN, BREAST, NO SKIN, ROAST	14	1.5	3.1
CHICKEN, BBQ SAUCE, LEG AND THIGH	15	1.4	*
CHICKEN, BREAST, ROASTED, 7 OUNCES	17	1.4	1.3

* Less than 1% of subjects consumed this food item.

18.3% of total vitamin A intake. The four fortified cereals combined provided 8.7% of the total vitamin A intake.

The 20 major vitamin C contributors listed in Table 9 explained 54.7% of the total intake of vitamin C. 37.9% of total vitamin C came from the food items classified in the fruit group with canned orange juice leading the list. Potato chip, which was ranked as the number six most frequently consumed food item (consumed by 10.8% of subjects), was the fourth major contributor for vitamin C. One ounce of potato chips provided 12mg vitamin C (ERS User's Guide, Version 3.0).

The 20 major vitamin B6 contributors listed in Table 9 explained 34.4% of the total intake of vitamin B6. Banana was ranked as the number one most important contributor of vitamin B6 (3.2% of total). Potato chips were ranked as the number two (2.5% of total). One ounce of potato chips provided 0.14 mg vitamin B6 (ERS User's Guide, Version 3.0). Five specific cereals combined provided 8.6% of the total vitamin B6 intake of the Michigan EFNEP participants. White potato products provide 6.2% of vitamin B6. From the meat group, chicken contributed 6% of vitamin B6.

Table 10 lists 20 major fiber contributors. These 20 food items explained 32% of total intake of fiber. Potato chips, spaghetti with meatballs, and french fries were the

first three fiber contributors (3.2%, 2.6% and 2.6% of total

fiber, respectively). Fiber provided by 1 ounce of potato

chips, 1 cup spaghetti with meatballs, and 10 french fries

was 1.3, 3.4, and 1.7 g, respectively (ERS User's Guide,

Version 3.0).

Table 10. Top 20 contributors of dietary fiber by food
groups and food items

Food items	Rank	%total	%subjects
Other group			
CHIP, POTATO	1	3.2	10.8
TORTILLA,CORN	9	1.4	2.2
Combination dishes			
SPAGHETTI W/MEATBALLS,MEAT&TOM SAUCE	2	2.6	4.4
TACO OR TOSTADO W/BEEF & CHEESE	7	1.7	4.1
MACARONI AND CHEESE	8	1.6	6.7
PIZZA, MEAT & VEGETABLE (1/8 of 12" PIE)	10	1.4	4.0
CHILI CON CARNE W/BEANS	12	1.3	1.6
Vegetable group			
POTATO, FRNCH FRD FR FROZ,DEEP FRIED	3	2.6	5.1
POTATO, MASHED,CKD,W/FAT ONLY	5	2.0	5.0
CORN, CKD,ANY COLOR	11	1.4	5.8
POTATO, MASHED,W/MILK,NO FAT	14	1.2	3.1
VEGETABLE, MIX (CRN,LMA,GBNS,CAR,CK)	16	1.1	*
Bread group			
BREAD, WHOLE WHEAT	4	2.1	4.9
CEREAL, CHEERIOS	13	1.3	3.3
CEREAL, RAISIN BRAN	20	1.0	1.1
Fruit group			
APPLE, RAW, PEEL, SLICED	6	1.8	6.0
BANANA	15	1.2	5.9
ORANGE, RAW	18	1.0	3.2
Meat group			
BEANS, BAKED CND, W/SWEET SAUCE	17	1.1	1.1
BEANS, PINTO, CKD W/FAT	19	1.0	*

* Less than 1% of subjects consumed this food item.

Overall dietary quality of EFNEP participants at the time of entry (Objective three)

At the time of enrollment, only 16% of the subjects consumed at least one serving from each five major food groups of the Food Guide Pyramid (Table 11). Only 3.2% of the subjects consumed the minimum number of servings from each five major food groups recommended for their category (i.e., Grain-Veg-Fruit-Meat-Dairy = 6-3-2-2-2 for female aged 25 years or older; and 6-3-2-2-3 for female aged 24 years or younger; and pregnant/nursing female, all ages). Food groups which skipped most frequently by the subjects were fruit group(53%), followed by the dairy group (24%) and vegetable group (20%).

The average daily energy intake of all subjects at the time of enrollment was 1700 Kcal (Table 12). Carbohydrate, protein, and fat contributed 49%, 16% and 36% of the daily energy intake, respectively. Daily protein intake for pregnant/nursing, young female, and adult female was above or close to 100% RDA: 60-65, 59, and 63 g/day, respectively.

The average fiber density for all subjects (6 g/1000 Kcal) was only half of the recommended level (12.5 g/1000 Kcal). Intakes of energy, protein, carbohydrate, and fat of pregnant/nursing subjects were significantly higher than those of non-pregnant/non-nursing subjects ($p < .001$).

Table 11. Daily intake (in servings) of five major food
groups by the subjects at the time of entry
(n=3866)

Food groups	Mean±SD Median (servings)	Number of Servings[a]	Percent of subjects (%)
Grain	4.8±3.1	0	4.2
	4.3	0-1	5.8
		0-6	67.1
		≥ 6	32.9
Vegetable	2.5±2.7	0	20.0
	2.0	0-1	25.4
		0-3	62.8
		≥ 3	37.2
Fruit	1.0±1.7	0	53.0
	0.0	0-1	60.9
		0-2	79.7
		≥ 2	20.3
Meat	2.1±1.7	0	5.3
	1.9	0-1	21.9
		0-2	55.2
		≥ 2	44.8
Dairy	1.4±1.5	0	24.2
	1.0	0-1	44.7
		0-2	71.5
		≥ 2	28.5
		≥ 3	12.3
G-V-F-M-D[b]		1-1-1-1-1	15.6
		6-3-2-2-2(3)	3.2

a. The recommended minimum number of servings from each of
the five major food groups of Food Guide Pyramid are:
Grain-Veg-Fruit-Meat-Dairy = 6-3-2-2-2 for female adult
(25+ yr), and 6-3-2-2-3 for female young (< 24 yr) and
pregnant/nursing female (all age).
b. G-V-F-M-D represents Grain-Veg-Fruit-Meat-Dairy.

Table 12. Daily intake of macro-nutrients by pregnant/nursing subjects, young female
subjects, and adult female subjects

Macro Nutrients	Pregnant/Nursing n=820	Young Female 13-24 yr, n=1013	Adult Female 25-85 yr, n=2033	All n=3866
Energy(Kcal)				
mean±SD	1944±958	1664±886	1620±858	1700±896
median	1818	1502	1458	1538
Protein(g)				
mean±SD	76±40	66±39	66±39	68±40
median	72	59	60	62
% of Kcal	16	16	16	16
Carbohydrate(g)				
mean±SD	240±126	200±118	197±116	207±120
median	222	179	176	185
% of Kcal	49	48	48	48
Fats(g)				
mean±SD	78±47	68±44	65±43	68±44
median	70	59	56	60
% of Kcal	36	37	36	36
Fiber(g)				
mean±SD	12±9	9±8	10±8	10±8
median	9	8	9	9
g/1000 Kcal	6±4	6±4	7±5	6±4

Table 13. Daily intake of micro-nutrients by pregnant/nursing subjects, young female subjects, and adult female subjects

Micro Nutrients	Pregnant/Nursing n=820	Young Female 13-24 yr, n=1013	Adult Female 25-85 yr, n=2033	All n=3866
Calcium(mg)				
mean±SD	884±594	650±520	604±453	675±515
RDA	1200	1200	800	-
%(<75% RDA)[a]	57**	75**	60**	63
Iron(mg)				
mean±SD	14±10	11±7	11±8	12±9
RDA	30^P, 15^N	15	15$^{25-50yr}$, 10$^{50-85yr}$	-
%(<75% RDA)[a]	79**	65**	61**	65
Vit A(RE)				
mean±SD	983±1482	704±1177	861±1636	846±1498
RDA	800^P, 1300^N	800	800	-
%(<75% RDA)[a]	53**	63**	62**	60
Vit C (mg)				
mean±SD	105±108	81±99	76±86	84±95
RDA	70^P, 95^N	50$^{13-14yr}$, 60$^{15-24yr}$	60	-
%(<75% RDA)[a]	40**	47**	48**	46
Vit B6 (mg)				
mean±SD	1.7±1.1	1.3±0.9	1.3±1.0	1±1
RDA	2.20^P, 2.10^N	1.4$^{13-14yr}$, 1.5$^{15-18yr}$, 1.6$^{19-24yr}$	1.6	-
%(<75% RDA)[a]	58*	52*	55*	54

a. Percent of subjects whose intake was < 75% RDA.

* Percentages of subjects who reported intake < 75% RDA were significantly different among the three categories, p < 0.05.

** Percentages of subjects who reported intake < 75% RDA were significantly different among the three categories, p < 0.001

The average fiber density of the diets consumed by pregnant/nursing subjects (6.1 g/1000 Kcal) however was significantly less than that of the non-pregnant/non-nursing subjects (6.4±4.6 g/1000 Kcal, p<.05).

In our study, eighteen percent of the total subjects took nutrient supplements: 47% of pregnant/nursing subjects took nutrient supplements and only 10% of non-pregant/non-nursing subjects did. 22% of subjects aged 24 or younger took nutrient supplements, while 15% of subjects aged 25 or older took nutrients. However, nutrients derived from supplements were not included in the daily nutrient intake totals in the present study because they were not quantifiable. Based on 24-hour food recalls, for five nutrients (i.e., calcium, iron, vitamin A, vitamin C, and vitamin B6), the percentages of subjects who reported intake less than 75% RDA differed significantly among the three demographic sub-groups (Table 13). Calcium appeared to be a problematic nutrient for young females (13-24 yr), because 75% subjects in this category failed to meet 75% of RDA for calcium. Iron intakes were low for pregnant/nursing women with 79% of subjects in this category failing to meet 75% of the RDA. Overall, the percent subjects who had inadequate intakes (less than 75% RDA) ranged from 46% to 65% for the five nutrients.

The four sub-groups of dietary quality were further

validated by MAR-5 scores <75 for sensitivity and

specificity. Odds ratios of having MAR-5 score less than 75

were calculated (Table 14).

Table 14. Mean MAR-5 score, and Odds Ratios of having MAR-5
< 75 by four dietary quality groups

Dietary quality groups	n %	MAR-5[a] mean±SD	% (MAR-5<75)[b]	ORs[c] 95% CI
Group 1 (Met neither)	2287 59%	61±23	70	7.8 5.4-11.1
Group 2 (Met ≤ 30% fat only)	976 25%	56±25	74	9.4 6.5-13.7
Group 3 (Met 1-1-1-1-1 only)	420 11%	84±14	24	1.1 0.9-1.6
Group 4 (Met both)	183 5%	85±14	23	1.0

Note: Group 1, graduates whose diets met neither criteria;
Group 2, graduates whose diets met only dietary fat
criterion (i.e., ≤ 30% fat);
Group 3, graduates whose diets met only food group
criterion (i.e., G-V-F-M-D = 1-1-1-1-1);
Group 4, graduates whose diets met both criteria.
a. MAR-5 score = Average NAR scores for 5 nutrients:
calcium, iron, vitamin A, vitamin c, and vitamin B6.
NAR = (nutrient intake/RDA)x100. NAR >100 truncated at
100.
b. Percent of subjects whose MAR-5 < 75.
C. Odds Ratio of having MAR-5 < 75, plus 95% confidence
interval.

Sensitivity and specificity for the first criterion,

i.e., consume at least one serving from each of the five

major food groups, were 94% and 32%, respectively.

Sensitivity was defined as the proportion of subjects whose

dietary quality was low (by MAR-5) and who were classified as having low dietary quality by the first criterion. A high sensitivity was required to accurately classify subjects at nutritional risk by the criterion one. Specificity was defined as the proportion of participants whose dietary quality was high (by MAR-5) and were classified as high dietary quality by the first criterion.

Essentially, subjects in dietary quality group 1 and 2 were the subjects whose diets were inadequate by the first criterion (i.e., diets failed to included at least one serving from each of the five major food groups of the Food Guide Pyramid), regardless of fat contents of the diets. Subjects in dietary quality groups 3 and 4 were the subjects whose diets were above the first criterion (i.e., diets included at least one serving from each of the five major food groups of the Food Guide Pyramid), regardless of the fat content of diets.

In computation of odds ratio, dietary quality group 4 (i.e., met both criteria) was used as reference group. Odds of having MAR-5 < 75 for subjects in dietary quality group 3 (i.e., met only 1-1-1-1-1) did not differ from those for subjects in dietary quality group 4 (ORs = 1.1, 95% CI = 0.9, 1.6). Odds of having MAR-5 < 75 for subjects in dietary quality group 1 (i.e., met neither criterion) and dietary quality group 2 (i.e., met only ≤ 30% fat) were

significantly higher than those for subjects in dietary
quality group 4 (ORs = 7.8, 95% CI = 5.4, 11.1; and ORs =
9.4, 95% CI = 6.5, 13.7; respectively). More specifically,
subjects who met neither criteria were approximately 8 times
more likely to have MAR-5 score less than 75. Subjects who
met only ≤ 30% fat were approximately 9 times more likely to
having MAR-5 score less than 75.

In summary, the majority of subjects in our study had
relatively low quality diets at the time of entry. Only 5%
of subjects' diets contained at least one serving from each
of the major five food groups and ≤ 30% daily energy intake
from fat. Including at least one serving from each of the
five major food groups in the diet was significantly
associated with having MAR-5 score less than 75 with
sensitivity and specificity of 94% and 32%, respectively.
Intakes of calcium and iron were the most problematic
nutrients for young female subjects (13-24 yr), and
pregnant/nursing women, respectively.

Factors associated with low dietary quality (Objective four)
The fourth objective was to identify undesirable food
behaviors that were associated with the low dietary quality
diets classified by the objective three. Specially, we
hypothesized that low dietary quality diets were predicted
by (1) high intake of food from the "other" food group

(i.e., added fat and sugar, 10 to 20 servings and > 20 servings vs ≤ 10 servings, respectively); and (2) low frequency of consumption of meals/snacks consumption (< 3 meals/day vs ≥ 3 meals/day), while controlling for energy intake in the model. We also investigated if the low dietary quality was associated with demographic factors such as maternal status, race, participation in other social assistant program, family size, place of residency, age, and income.

In full interaction model of logistic analysis to predict the dietary quality, both undesirable food behaviors (i.e., high intake of food from the "other" food group and consumed less than three meals/snacks per day) were found to interact significantly with energy intake (p<.001). Subsequently, energy intake was controlled in the final main effect model by using three energy intake levels: low, moderate and high. Low energy intake level included subjects whose energy intake was less than one standard deviation below the mean (i.e., <803 kcal, 11%). Moderate energy intake level included subjects whose energy intake was between one standard deviation below and above the mean (i.e., 803-2596 Kcal, 75%). High energy intake level included subjects whose energy intake was more than one standard deviation above the mean (i.e., >2596 Kcal, 14%).

For the subjects whose diets were in the low energy

intake group, all diets (100%) were low in dietary quality on the basis of not including at least one serving of each from five major food groups and deriving > 30% of energy from fat. Low energy intake was thus a single most important predictor for low dietary quality of subjects in Michigan EFNEP participants.

For the subjects whose diets were in the high energy intake group, all variables examined were removed from the final main effect model. This means that low dietary quality was not be explained by any of variables examined for the diets in this high energy intake group.

For subjects whose diets were in the moderate energy intake group, both undesirable food behaviors (i.e., high intake of food from the "other" food group and consumption of less than three meals/snacks per day) increased significantly the odds for low dietary quality (p<0.05). Other variables that increased the odds for low dietary quality were: maternal status (non pregnant/non-nursing vs. pregnant/nursing) and race (white, black vs. other origin respectively). Adjusted odds ratios for factors associated with low dietary quality are summarized in Table 15 for subjects whose diets were in the moderate energy intake group and for all subjects included in the objective four study.

When the final main effect model was performed for

Table 15. Adjusted Odds Ratios[a] and 95% confidence intervals of factors associated with low dietary quality

Factors	Subjects whose diets were in the moderate energy intake group (n=1861)	All subjects in objective four study (n=2470)
Intake of		
"other" food group	8.4 (4.5, 15.8)	3.2 (1.9, 5.5)
> 20 servings	3.0 (1.9, 4.7)	1.5 (1.1, 2.3)
10 to 20 servings	1.0	1.0
≤ 10 servings		
Frequency of		
Meals/Snacks	2.6 (1.4, 4.7)	3.4 (2.0, 5.8)
< 3 meals/snacks	1.0	1.0
≥ 3 meals/snacks		
Maternal status		
Non Pregnant/Non nursing	2.3 (1.6, 3.3)	2.2 (1.6, 3.0)
Pregnant/Nursing	1.0	1.0
Race		
White	2.0 (1.2, 3.2)	2.0 (1.3, 3.0)
Black	2.0 (1.2, 3.3)	2.1 (1.4, 3.3)
Other	1.0	1.0

a. Adjusted for listed factors plus energy intake.

subjects whose diets were in the moderate energy intake group, those subjects who consumed between 10 to 20 servings of "other" food group (i.e., added fat and sugar) had three times higher odds for having low quality diets (adjusted OR=3.0, 95% CI=1.9, 4.7) than those who consumed ≤ 10 servings of other food group. Subjects who consumed more than 20 servings of "other" food group had approximately eight times higher odds for having low quality diets (adjusted OR=8.4, 95% CI=4.5, 15.8) than those who consumed ≤ 10 servings of other food group. Increased intake of foods from the "other" food group was clearly associated with increased risk of having low dietary quality. Subjects who ate less than three meals/snacks a day were approximately three times more likely to have low quality diets (adjusted OR=2.6, 95% CI=1.4, 4.7) than those who ate at least three meals a day.

Non pregnant/non-nursing subjects had approximately two times higher odds for having low quality diets (adjusted OR=2.3, 95% CI=1.6, 3.3) compared to those who were pregnant/nursing. Compared to other ethnic groups (Hispanic, Asian/Pacific Islander, American Indian/Alaskan Native), whites and blacks were approximately two times more likely to have low dietary quality (adjusted OR = 2.0, 95% CI = 1.2, 3.2; and adjusted OR = 2.0, 95% CI = 1.2, 3.3; respectively).

The final main effect model was performed for all subjects in the objective four study, and it produced similar results to those whose diets were in the moderate energy intake group. Both undesirable food behaviors plus maternal status and race were significantly associated with low dietary quality while controlling for energy intake. However, without classifying subjects into three energy intake levels, the precise relationship between factors with low dietary quality would be overlooked. In low energy intake group, low energy intake itself was a single important risk factor for low dietary quality. In high energy intake level, low dietary quality was not explained by any of the factors we investigated.

In summary, when the subjects whose energy intake was above or below one standard deviation from the mean were excluded (14% and 11%, respectively), we confirmed clearly the association between the two undesirable food behaviors and low dietary quality. Subjects with increased intake of food from the "other" food group had increased risk of low dietary quality due to a large proportion of their energy intake that came from added fats and sugars. Subjects who consumed less than three meals/snacks per day had high chance to have low quality diets due to reduced probability to eating a variety of foods.

Dietary changes by the EFNEP graduates (Objective five)

At the exit of the EFNEP, fewer graduates (40%) were classified into the low dietary quality group (i.e.,met neither criterion) than did at the time of entry (59%). More graduates (15%) moved into the high dietary quality group (i.e., met both criteria) at the time of exit than did at the time of entry (5%) (Table 16).

Table 16. Percentage of graduates classified into four dietary quality groups at the time of entry and exit (n=2454)

Dietary quality group	Entry	Exit
Group 1 (met neither)	59%	40%
Group 2 (met only ≤ 30% fat)	26%	17%
Group 3 (met only 1-1-1-1-1)	10%	28%
Group 4 (met both)	5%	15%

Note:Group 1, graduates whose diets met neither criteria; Group 2, graduates whose diets met only dietary fat criterion (i.e., ≤ 30% fat); Group 3, graduates whose diets met only food group criterion (i.e., G-V-F-M-D = 1-1-1-1-1); Group 4, graduates whose diets met both criteria.

Fourty three percent of graduates included at least one serving from each of the five major food groups in their diets at exit, compared to 15% graduates did so at entry. Only slightly more graduates (32%) limited fat intake to less than 30% daily energy intake at the exit than did at

the entry (31%). This means that the first criterion (i.e., met 1-1-1-1-1) was achieved more effectively by participants upon the completion of the program than the second criterion (i.e., met ≤30% fat).

As a group, consumption of the five food groups measured by the food group score increased significantly, while decreasing the percentage of energy intake from fat significantly (Table 17). We assessed the extent of dietary changes made between entry and exit of the EFNEP by the four dietary quality groups. We hypothesized that the graduates who failed to meet one or both dietary quality criterion at the time of entry would make more dietary changes at the time of exit than graduates who had met both dietary quality criterion at the time of entry.

The food group scores for graduates in the three dietary quality groups (group 1, group 2, and group 3) differed significantly between the entry and exit (p<.0001, Table 17). The exception was dietary quality group 4 (i.e., met both criteria). In both dietary quality group 1 (i.e., met neither criterion) and dietary quality group 2 (i.e., met only ≤ 30% fat), graduates failed to include at least one serving from each of the five major food groups in their diets at the time of entry. Graduates in both groups increased their food group scores significantly by increasing their consumptions of five food groups measured

Table 17. Average food group scores, food group servings, percent energy from fat, and energy intake for graduates by four dietary quality groups (n=2454)

Dietary quality groups	Entry mean±SD	Exit mean±SD	t-value
Group 1			
(Met neither, n=1443)			
Food Group Score (points)	2.6±0.8	3.6±0.9	30.23**
Grain (servings)	4.7±3.2	5.8±3.0	10.66**
Veg (servings)	2.4±3.0	3.4±3.1	9.43**
Fruit (servings)	0.5±1.3	1.6±2.0	17.74**
Meat (servings)	2.2±1.8	2.5±1.6	4.76**
Dairy (servings)	1.3±1.5	1.9±1.6	13.24**
Energy from fat (%)	40.7±7.0	35.6±8.6	-18.71**
Energy intake (Kcal)	1667±873	2011±877	11.61**
Group 2			
(Met only ≤ 30% fat, n=642)			
Food Group Score (points)	2.4±1.0	3.6±1.0	22.85**
Grain (servings)	4.3±3.0	6.2±3.1	11.84**
Veg (servings)	2.1±2.1	3.5±2.7	10.58**
Fruit (servings)	1.1±2.1	1.6±1.8	4.76**
Meat (servings)	1.4±1.3	2.3±1.7	10.50**
Dairy (servings)	1.0±1.4	2.2±1.9	14.42**
Energy from fat (%)	23.5±6.4	33.0±8.9	22.75**
Energy intake (Kcal)	1389±782	2056±955	14.93**
Group 3			
(Met only 1-1-1-1-1, n=256)			
Food Group Score (points)	4.2±0.6	3.8±0.9	-5.67**
Grain (servings)	5.8±2.8	5.9±2.8	0.42
Veg (servings)	3.8±3.2	3.4±2.2	-1.54
Fruit (servings)	2.2±1.2	1.9±2.1	-1.56
Meat (servings)	2.9±1.7	2.6±1.7	-2.11*
Dairy (servings)	2.3±1.3	2.2±1.6	-0.69
Energy from fat (%)	38.8±5.4	35.2±8.3	-5.89**
Energy intake (Kcal)	2287±860	2050±824	-3.73**
Group 4			
(Met both, n=113)			
Food Group Score (points)	4.2±0.5	4.0±0.8	-1.43
Grain (servings)	6.1±2.6	6.6±3.0	1.59
Veg (servings)	3.5±2.3	3.6±2.2	0.48
Fruit (servings)	2.8±2.1	2.5±2.0	-1.29
Meat (servings)	2.2±1.0	2.4±1.4	1.13
Dairy (servings)	2.6±1.8	3.0±2.2	1.41
Energy from fat (%)	25.4±4.0	32.2±8.1	8.49**
Energy intake (Kcal)	2167±831	2346±932	1.72
All graduates (n=2454)			
Food Group Score (points)	3.0±1.0	3.6±0.9	31.78**
Energy from fat (%)	35.3±10.1	34.7±8.7	2.23*
Energy intake (Kcal)	1682±887	2042±898	15.62**

* p<.05, ** p<.0001 by paired t-test between entry and exit

by serving numbers at exit. Graduates in dietary quality group 3 (i.e., met only 1-1-1-1-1) decreased their food group scores slightly, because they consumed less meat at exit than did at entry.

Graduates in both dietary quality group 1 (i.e., met neither criteria) and dietary quality group 3 (i.e., met only 1-1-1-1-1 criterion), had > 30% of energy from fat at the entry, decreased the percent energy intake from fat significantly at the end of the program (p<0.05). On the other hand, graduates in both dietary quality group 2 (i.e., met only ≤30% fat) and dietary quality group 4 (i.e., met both criteria), had ≤ 30% energy from fat at the entry, but increased the percent energy from fat significantly at the end of the program (p<0.05).

There was no significant change observed in energy intake for dietary quality group 4 (i.e., met both criteria). Energy intake increased significantly from the entry to exit in dietary quality group 1 (i.e., met neither criterion) and dietary quality group 2 (i.e., met only ≤30% fat). Energy intake decreased significantly in dietary quality group 3 (i.e., met only 1-1-1-1-1).

Overall, graduates who were initially in the low dietary quality group (i.e., group 1, met neither criterion) made more dietary changes in two positive directions than those in other groups. Graduates who were initially in

dietary quality group 1 not only increased their consumption of five major food groups but also decreased their intake of fat.

The average changes in food group score differed significantly among the four dietary quality groups, when controlling for changes in energy intake and number of EFNEP visits in the ANOCOVA model (Table 18). This finding confirmed our hypothesis that graduates with relatively low dietary quality at the time of entry made more positive dietary changes at the time of exit than those graduates whose dietary quality was high at the time of entry. Initial dietary quality can be used to predict the dietary changes.

Table 18. Dietary changes (mean±SD) of EFNEP graduates among four dietary quality groups

	Group 1[a] (n=1443)	Group 2[a] (n=642)	Group 3[a] (n=256)	Group 4[a] (n=113)	F[c]
Changes in FGS[b]	1.0±1.2	1.1±1.3	-.4±1.0	-.1±0.9	100.93**
Changes in % fat	-5.1±10.3	9.5±10.6	-3.6±9.7	6.8±8.5	312.22**

a. Group 1, graduates whose diets met neither criteria; Group 2, graduates whose diets met only dietary fat criterion (i.e., ≤ 30% fat); Group 3, graduates whose diets met only food group criterion (i.e., G-V-F-M-D = 1-1-1-1-1); Group 4, graduates whose diets met both criteria.
b. FGS stands for food group score. It ranges 0 - 5.
c. Controlling for changes of energy intake and number of EFNEP visits. ** P < .0001

Chapter Five

DISCUSSION, CONCLUSION, AND IMPLICATION

Discussion

In 1994-95, Michigan EFNEP made a positive impact on the dietary changes of its participants. As a group, consumption of the five food groups measured by the food group score increased significantly, while the percentage of energy intake from fat decreased significantly. The findings are consistent with EFNEP's documented success in helping families improve dietary adequacy (USDA, 1994).

As individuals, graduates improved their diets to different extent. Compared to participants who had relatively high quality diets at the time of entry, those who had low quality diets improved their diets to a greater degree by the time of exit. Previously, Kateregga (1981) pointed out that the EFNEP program in Michigan was not equally effective for all participants. In Kateregga's study, 54% graduates improved the food group scores after

the program, while the rest did not change or declined in scores. The author reported that the entry food group score was a crucial indicator of dietary improvement resulting from participation in EFNEP. Similarly, we also observed that participants whose initial food group scores were low tended to have the greatest improvement.

In a Maryland EFNEP study, Amstutz and Dixon (1986) found that the graduates, as a group, did not decrease their consumption of "fifth food group" of the Daily Food Guide (i.e., fats, sweets, and alcohol which are equivalent to the "other" food group of the Food Guide Pyramid). After partitioning the group into a high and a low consumption group of the "fifth food group", the authors found that the high consumption group decreased significantly the number of "fifth food group" servings upon the completion of the program. They did not report what happened to the low consumption group.

Previous studies failed to identify key demographic variables that may predict the dietary improvement of EFNEP participants (Amstutz and Dixon, 1986, Torisky et al., 1989). Although we know that participants as a group improve dietary adequacy, little is known as to who makes the

changes, and to what extent the changes are made. In our study, we took another approach. Instead of investigating directly the relationship between the dietary change and associated factors, we identified factors associated with the low dietary quality. This information is necessary to better understand EFNEP participants and for EFNEP to efficiently allocate its effort and resources.

We found that low dietary quality at the time of entry was significantly associated with two undesirable food behaviors when controlling for confounding variables (i.e., race, maternal status, and energy intake). These two undesirable food behaviors were high intake of added fat and sugar foods and low frequency of meals/snacks consumption.

The association between high fat intake and chronic disease condition is well established (The Surgeon General's Report, 1988). The direct linkage between high intake of added sugar and the development of health conditions such as diabetes, cardiovascular disease or high blood pressure has not yet been proved (NRC, 1989, Glinsmann et al., 1986; Bierman, 1979).

Concerns about high intake of added sugars are relative to increased incidence of dental caries and decreased

nutrient density of diets especially for people who have low energy needs (Dietary Guidelines for Americans, 1995; Food Guide Pyramid, 1992). Baghurst et al.(1992) and Lewis et al.(1992) have shown that people with a higher percentage of energy derived from added sugar in their diets had lower percentage of dietary energy from fat and lower intakes of micro-nutrients than did people with a relatively lower dietary energy from added sugars. Given the need to meet energy requirements, reduction in added sugars might lead to increased relative fat consumption unless guidance is provided. Both studies raised the caution that educational messages focusing on reduction of added sugar should be specific enough to provide the healthy food choices to replace the energy contributed by sugar.

In our study, all participants with low energy intake at the time of entry (i.e., energy intake below one standard deviation from the mean, i.e., < 803 Kcal) were classified into the low dietary quality group based on the two dietary quality criteria established for the present study: (1)including at least one serving from each of the five major food groups as defined by the Food Guide Pyramid (i.e., Grain-Vegetable-Fruit-Meat-Dairy = 1-1-1-1-1); and

(2) limiting fat intake to ≤ 30% daily energy intake. We concluded that low energy intake itself was a risk factor for low dietary quality. This finding is consistent with the finding of Murphy et al.(1992). They reported that energy intake is the best single predictor of the nutritional adequacy of the US adult diet.

In our study, the frequency of skipping meals by subjects was similar for breakfast, lunch, and dinner (26%, 32%, and 24%, respectively). We found that high frequency of skipping meals/snacks was a risk factor for low dietary quality. Morgan et al. (1986) demonstrated that omission of breakfast had a significantly negative impact on the diet quality, particularly among adult females. Stanton and Keast (1989) reported that serum cholesterol levels were high among breakfast skippers. By studying meal skipping pattern and nutrient intake in a southern rural elderly population, Lee et al. (1996) found that meal skippers were more likely to be smokers, younger elders, female, less educated, lower socioeconomic status, eat alone, and had high BMI. Authors also reported that though meal skippers snacked more frequently, their nutrient intakes were significantly lower than those of three-meal eaters.

The majority of subjects in our study had low quality diets at the time of entry (59%). Sixteen percent of diets included at least one serving from each of five major food groups. Thirty percent of diets had less than 30% energy intake from fat. Only 5% of the subjects consumed foods from five food groups (at least one serving of each food group) and limited fat to less than 30% of caloric intake. Murphy et al.(1992) reported similar findings from 5884 adults (19 years of age and older) who participated in the 1987-88 Nationwide Food Consumption Survey. They reported that only 22% of the adults consumed diets containing more than two thirds of the RDA for 15 nutrients (i.e., protein, vitamin A, vitamin E, vitamin C, thiamin, riboflavin, niacin, vitamin B6, folate, vitamin B12, calcium, phosphorus, magnesium, iron, and zinc) and only 14% of the adults consumed diets containing $\leq$ 30% fat for energy intake. Only 2% of the adults chose diets that were both high in nutrients and low in fat.

The Dietary Guidelines for Americans have focused on reducing the level of fat in the diet while maintaining nutritional adequacy (USDA, 1995). Kant (1996) reviewed the published indices of overall diet quality. The majority of

the indices which were reviewed addressed nutrient adequacy only. Few indices have addressed both low fat and meeting energy and nutrient needs simultaneously.

In our study, we used two criteria to classify the quality of diets. Our criterion one (i.e., including at least one serving from each of five major food groups) was designed to address variety and nutrient adequacy based on the intake of five food groups. This criterion has been proved to be a valid quantitative tool for screening for nutritional inadequate diets (reference: MAR-6 <75) with high sensitivity (89%) for college population (Schutte et al., 1996). Criterion one also had a high sensitivity (94%) in screening for nutritional inadequacy (reference: MAR-5 < 75) of Michigan EFNEP population in our study. Criterion two (i.e., limiting percent energy intake from fat to less than 30%) was established to address the guideline of moderation in fat intake. Compared to the subjects who met both criteria at the time of entry, subjects who met neither criteria were approximately 8 times more likely to have MAR-5 score less than 75.

At the time of entry, more than half of our subjects consumed less than 75% RDA for calcium, iron, vitamin A, and

vitamin B6 (63%, 65%, 60% and 54%, respectively). This finding is consistent with findings from national surveys. CSFII 1994 data show that average intakes of women 20 years of age and older are below 100% RDA for six nutrients: iron, zinc, vitamin B6, calcium, magnesium, and vitamin E (USDA, 1996). In our study, based on 24-hour food recalls, calcium intake appeared to be particularly low in the young female subgroup (13-24 yr, n= 1013) with an average intake of 650 mg (54% RDA). Iron appeared to be a problematic nutrient for pregnant or pregnant/nursing women (all age, n=820) with an average intake of 13 mg (43% RDA). Keep in mind that nutrients derived from supplements were not quantified and therefore were not included in the daily totals. In our study, eighteen percent of the total subjects took nutrient supplements. Especially, forty seven percent of pregnant/nursing subjects took nutrient supplements.

The Food Guide Pyramid is a general guide for eating a variety of foods to get the nutrients that humans need. The Food Guide Pyramid recommends that a diet includes 6-11 servings of the grain group, 3-5 servings of the vegetable group, 2-4 servings of the fruit group, 2-3 servings of the dairy group, and 2-3 servings of the meat group. On average,

Michigan EFNEP participants (female, 13-85 years old,

n=3866) ate 4.8, 2.5, 1.0, 2.1, and 1.4 servings of grains,

vegetables, fruits, meat, and dairy, respectively. Food

groups which were skipped most frequently by the subjects

were the fruit group (53%), followed by the dairy group

(24%) and vegetable group (20%). During the same survey

period as ours, CSFII 1994 data show that female adults (age

20 or older) ate an average of about 5.3, 3.0, 1.5, 4.0, and

1.1 servings of grains, vegetables, fruits, meat, and dairy,

respectively (Cleveland et al., Pyramid servings data,

1997). Average consumption of the five food groups (in

servings) in national representative female adults

population was higher than that in our low income Michigan

EFNEP population. The Food Guide Pyramid encourages

consumers to use fats, oils, and sweets sparingly. The

Dietary Guidelines of Americans state that consumers should

limit their fat intake to 30% daily energy intake. Subjects

in our study had 36% daily energy intake from fat. This

value was higher than the national average of 33% daily

energy from fat for women (Cleveland et al.,Highlights from

CSFII 1994, 1997).

In the Michigan EFNEP population, many of the major

food contributors for calcium, iron, vitamin A, vitamin C and vitamin B6 were not necessarily the rich sources of the nutrients. For example, potato chips were among the top five contributors for vitamin C, vitamin B6 and fiber. White bread was the most significant contributor for iron, and fifth important contributor for calcium. We do not know if this is due to the subjects' lack of knowledge of nutrient rich food sources, or due to the fact that limited financial resources constrain food choices. Lutz et al. (1995) reported that low-income households consumed 21% less fresh fruits, 13% less fresh vegetables, and 10% less dairy products than the national average. On the other hand, low income households used about 9% more fresh potatoes, 11% more canned fruits and vegetables than did the national average. The findings reflected the relatively lower price of potatoes and canned items. In our study, white potato products such as french fries, mashed potato, and baked potato accounted for 25.2% of total serving numbers of vegetable group. White potato products were the major sources for subjects' intake of vitamin C, vitamin B6, and fiber. Because of the common cooking method of potato products (i.e., fry), a significant amount of fat was

absorbed by the french-fried potatoes during preparation. Inevitably, white potato products became the major contributors for the "other" food group (i.e., added fat and sugar). Potatoes were very important economical foods that accounted for nutrient intake in this population. Creative cooking methods of preparing potatoes without adding too much fat (e.g., stir fry, casserole, and soup) should be incorporated into the menu planning section of the EFNEP curriculum.

The average fiber density in the diets of all subjects (6 g/1000 Kcal) was only half of the recommended level (12.5 g/1000 Kcal). Eating five fruits and vegetables per day is the nutritional advice to increase fiber intake. Reicks et al. (1994) concluded that cost, storage space and seasonal availabilities were the barriers to consumption of fresh fruits and vegetables for low-income families. While fruits and ready-to-eat cereals were major contributors to fiber intake among basic income women (>185% Federal Poverty Income Guideline), white potatoes and soups/dried beans were among the major contributors for low income women (≤ 185% PI; Thompson et al., 1992). EFNEP clienteles can be encouraged to achieve a substantial fiber intake with foods

which are economical to them, such as spaghetti and taco.

Nutrition promotion facilitates the appropriate eating behaviors by translating science-based dietary guidance into consumer-oriented messages (Sutton et al., 1996). EFNEP has taken the food group approach since the program began. The sound rationale behind this approach is that people eat foods not nutrients. In our study, graduates who did not include at least one serving from each of the five food group at the time of entry increased their consumption of the five food groups significantly by the end of the program. Other researchers have provided support for the importance of nutrition education efforts to take the food group approach. Guthrie and Fulton (1995) found that knowledge of the recommended number of servings for the five food groups was significantly associated with consumption of four food groups (vegetable, fruit, meat, dairy) after controlling for the effects of a number of other factors that may influence food consumption behavior. They concluded that knowledge of recommended servings by itself was able to encourage consumers to achieve the recommended consumption amount of major food groups.

Conclusion

1. The majority of Michigan EFNEP participants had
    relatively low dietary quality at the time of
    enrollment in the program. Fifty nine percent of the
    participants had diets which were classified as low
    quality diets by not meeting the two dietary quality
    criteria set in our study. Only 5% of subjects met
    both criteria by obtaining nutrients from five food
    groups (at least one serving of each food group) and
    limiting fat intake to less than 30% of daily energy
    intake. Fat intake averaged 36% of the daily energy
    intake. Fiber density averaged 6 g/1000 Kcal. More than
    half of the subjects failed to meet 75% RDA for
    calcium, iron, vitamin A, and vitamin B6, respectively.

2. White bread, whole milk, white potato products, juice,
    potato chips and soft drinks were frequently consumed,
    economically acceptable foods that accounted for intake
    of most of the nutrients and the "other" food group
    (i.e., added fat and sugar) by the low-income Michigan
    EFNEP participants.

3. Two undesirable food behaviors that were significantly
    associated with low dietary quality of Michigan EFNEP

participants were: high intake of add fat and sugar,
and low frequency of meals/snacks consumption. Other
characteristics such as energy intake, race, and
maternal status were also associated with dietary
quality.

4. Initial dietary quality can predict dietary changes of
    Michigan EFNEP participants. Participants with
    relatively low dietary quality at the time of entry
    made more dietary changes at the time of exit than
    those whose initial dietary quality was high.

In summary, the overall dietary quality of Michigan
EFNEP participants was relatively low at the time when they
entered the program. Michigan EFNEP was effective in
improving diets and nutritional well-being of participants,
especially those with relatively low dietary quality at the
entry. This research provided a better understanding of
EFNEP participants' diets, identified new areas of
improvement, and posed managerial challenges for EFNEP
program leaders. It is hoped that this research will
encourage serious discussion and action and stimulate other
researchers to pursue further research in this area. In-
depth EFNEP evaluation such as the present study is a means

of improving effectiveness and efficiency of programs.

Assumptions

In conducting the present study, the following assumptions were made:

1) The 24-hour food recall is a valid and reliable instrument for estimating dietary intake for a large group population.

2) The subjects recorded honestly and accurately all food and beverage items consumed for each 24-hour recall.

3) EFNEP staff have entered the food items into the EFNEP Evaluation/Reporting System (ERS) correctly with appropriate substitutions for food items which were not in the food database of ERS.

4) The individual teaching performance was the same among paraprofessionals.

5) Improvement in food consumption behavior was assumed due to the EFNEP intervention.

Limitations

This study has a few limitations which should be addressed.

1) 24-hour food recall does not give data representative

of an individual's usual intake. It relies on memory, depends on honesty and accuracy of self-reported food consumption, and can be affected by the learning effects when it is used more than once.

2) There may be other variables that might have affected the outcome of this study, such as education level, physical activity level. Our research questions were set up based on the available variables.

Strengths

The strengths of this study that should be recognized are the following:

1) The validity of the study is increased by the large sample size of low income women representing Michigan statewide EFNEP participants (n = 3866) and the wide range of the subjects' age distribution (13 years old to 85 years old). Our cross-sectional simple size (n=3866) is larger than CSFII 1994 low income population which was over-sampled nationally (n=732). Our longitudinal data also contains a large number of Michigan low income individuals (n=2454).

2) The dietary data for subjects were collected between

August 31, 1994 and September 1, 1995. Thus seasonal
bias is not a concern.

3)   ERS addresses intake values of nutrients, foods, and
    food groups with a reasonably large and accurate
    database.

Implications for future management

1)   Michigan EFNEP can further enhance its effectiveness in
improving dietary intake of its participants by targeting
participants who have low dietary quality diets at the time
of entry. The EFNEP Evaluation/Reporting System (ERS) has a
function to generate individual diagnostic reports as a
feedback to participant. Participants' first 24-hour recalls
collected at the time of entry can be quickly screened by
checking whether the diets include at least one serving from
each of the five food groups, and by checking whether the
fat intake is below 30% daily energy intake. These two tools
have been developed and validated in this study.
Participants who had low dietary quality diets could be
given a priority for enrollment in the currently offered
program. Instruction topics for this group may focus on
basic nutrition knowledge.

On the other hand, participants classified in the high initial dietary quality subgroup may receive educational activities with different emphasis, for example, resource management. Instead of costly and time-consuming home visits, newsletters can be a highly efficient and effective tool for participants in high initial dietary quality subgroup in refreshing their nutrition knowledge.

2)   The effectiveness of Michigan EFNEP can be further enhanced by incorporating newly identified educational needs into the current curriculum. The current emphases on eating a variety of foods from five major food groups while reducing fat intake, may be incorporated with specific advice. Examples may include listing the good food sources for key nutrients and how to prepare these foods in the meals. During cooking sessions of the EFNEP home visits, low fat recipes could be taught. Curriculum should also address the need of changing undesirable food behaviors, such as the low frequency of meal/snack consumption and the high intake of added fat and sugar.

3)   The effectiveness of Michigan EFNEP can further be enhanced through communicating the research findings of this study with paraprofessionals to help them better understand

their audiences and educational strategies.

Paraprofessionals, when carefully trained and appropriately

supervised, would

effectively improve the diets of low-income audience.
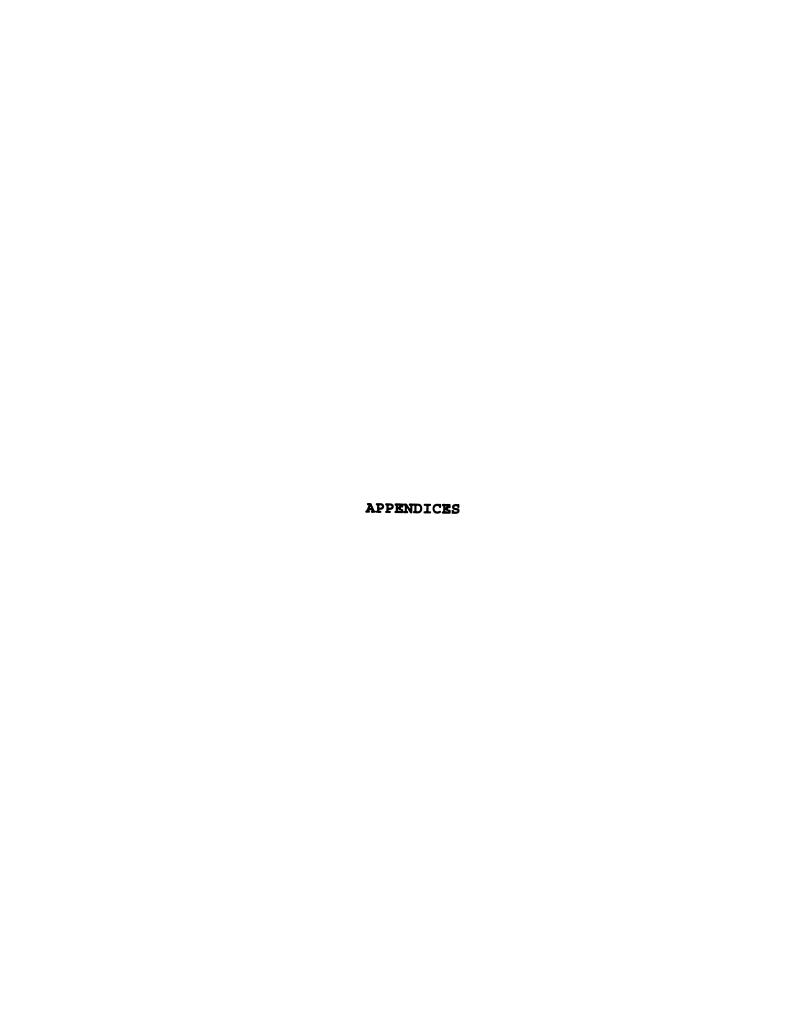
4)   "Lose interest" was the number one reason for

participants dropping out of the EFNEP in Michigan. In Kent

county, 100 out 103 dropouts indicated "lose interest" as

their reason for dropping out. How to retain the

participants in the program needs each county's attention.

Paraprofessionals performance should be evaluated

periodically.

5)   A special staff is needed for building up each year's

statewide database for in-depth program evaluation. Computer

technical support should be available to county staff.

6)   Sources of nutrients consumed by Michigan EFNEP

participants which were generated from this study can be

used as reference to develop food frequency questionnaire

related to certain health concern for Michigan low-income

population for other researchers.

Recommendations for future study

1)   In our study, participants with relatively low dietary

quality at the time of entry made more dietary changes at the time of exit than those whose dietary quality was high at the time of entry. This result poses a challenge for EFNEP program leaders who may have to decide who should be offered EFNEP services and how different emphases of educational activity should be given for participants with different entry dietary adequacy levels. The economic, political, and ethical implications of the issue on whether to screen the diets of participants at the time of entry should be addressed in future studying.

2)   In our study, pregnant/nursing participants were less likely to have low dietary quality at the time of entry than those who were non-pregnant/non-nursing. Food stamps and WIC were the two programs in which most of our subjects participated (58% and 58%, respectively). Additional research should be conducted to see how other public assistant programs such as food stamps and WIC impact EFNEP participants' diets.

APPENDICES

APPENDIX A

SUMMARY OF ADULT PARTICIPANT PROFILES

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SUMMARY OF ADULT PARTICIPANT PROFILES

State: MI109   11/08/1994
       Michigan

Reporting Period: 09/01/1993 - 08/31/1994

1) Total number of program familes: 5310

2) Number of new families enrolled this reporting period: 4618 (87 %)

3) Number of persons in program families: 18988

4) Distribution of household children:

Number of Children	Number of Families	Percent
0	498	9 %
1	1819	34 %
2	1497	28 %
3	890	17 %
4	352	7 %
5	167	3 %
6+	87	2 %
Total	5310	100 %

5) Distribution of ages of children:

Age Range	Number of Children	Percent
Under 1	1242	12 %
1 - 5	4805	46 %
6 - 8	1577	15 %
9 - 12	1421	14 %
13 - 15	750	7 %
16 - 19	551	5 %
Total	10346	100 %

6) Family enrollment in other programs:

Program	Number of Families	Percent
WIC/CSFP	2811	53 %
Food Stamps	3222	61 %
FDPIR	31	1 %
TEFAP (Commodities)	755	14 %
Head Start	836	16 %
Child Nutrition	1188	22 %
AFDC	2222	42 %
Other Public Assistance	504	9 %
Enrolled in EFNEP Only	814	15 %

APPENDIX A

SUMMARY OF ADULT PARTICIPANT PROFILES

State: MI109   11/08/1994
     Michigan

Reporting Period: 09/01/1993 - 08/31/1994

7) Gender and racial/ethnic characteristics:

	Female		Male		Total	
	Number	PCT	Number	PCT	Number	PCT
White Total	2769	52%	90	2%	2859	54%
Black Total	1744	33%	135	3%	1879	35%
American Indian/Alaskan Total	67	1%	9	0%	76	1%
Hispanic Total	337	6%	9	0%	346	7%
Asian or Pacific Islander Total	144	3%	6	0%	150	3%
Total all race codes	5061	95%	249	5%	5310	100%

8) Place of residence:

	Families	Percent
Farm	71	1 %
Towns under 10,000 and rural non-farm	737	14 %
Towns & cities 10,000 to 50,000 & their suburbs	1397	26 %
Suburbs of cities over 50,000	924	17 %
Central cities over 50,000	2181	41 %
Total	5310	100 %

9) Gender and age distribution of homemakers:

Age	Female Number	Percent	Male Number	Percent	Total Number	Percent
10-	6	0 %	0	0 %	6	0 %
11	0	0 %	0	0 %	0	0 %
12	0	0 %	0	0 %	0	0 %
13	6	0 %	1	0 %	7	0 %
14	17	0 %	0	0 %	17	0 %
15	57	1 %	1	0 %	58	1 %
16	136	3 %	4	0 %	140	3 %
17	190	4 %	12	0 %	202	4 %
18	184	3 %	22	0 %	206	4 %
19	170	3 %	7	0 %	177	3 %
20	190	4 %	5	0 %	195	4 %
21+	4105	77 %	197	4 %	4302	81 %
Total	5061	95 %	249	5 %	5310	100 %

APPENDIX A

SUMMARY OF ADULT PARTICIPANT PROFILES

State: MI109   11/08/1994
      Michigan

Reporting Period: 09/01/1993 - 08/31/1994

10) Pregnant and Nursing:

	Number	Percent
Pregnant	848	16 %
Nursing	241	5 %
Pregnant & Nursing	39	1 %
Age < 20 and Pregnant and/or Nursing	392	7 %

11) Type of instruction:

	Number	Percent
Group	2813	53 %
Individual	2327	44 %
Both indiv. & group	168	3 %
Other	2	0 %
Total homemakers taught	5310	100 %

12) Status of homemakers:

	Number	Percent
Completed program	3685	69 %
Terminated program	589	11 %
Continuing in program	1036	20 %
Total	5310	100 %

13) Months in program:

Months in Program	Number	Percent
0 - 3	3705	70 %
4 - 6	1099	21 %
7 - 9	330	6 %
10 - 12	132	2 %
13 - 15	31	1 %
16 & up	13	0 %
Total	5310	100 %

APPENDIX A

SUMMARY OF ADULT PARTICIPANT PROFILES

State: MI109   11/08/1994
       Michigan

Reporting Period: 09/01/1993 - 08/31/1994

14) Distribution of family size:

Family Size	Number of Families	Percent
1	242	5 %
2	1151	22 %
3	1444	27 %
4	1231	23 %
5	701	13 %
6	331	6 %
7	118	2 %
8+	92	2 %
Total	5310	100 %

15) Household income:

Percentage of Poverty Level	Number of Families	Percent
<= 50%	2054	39 %
51 - 75%	1073	20 %
76 - 100%	511	10 %
101 - 125%	280	5 %
126 - 150%	111	2 %
151 - 185%	76	1 %
>= 186%	67	1 %
Not specified	1138	21 %
Total	5310	100 %

16) Reasons why homemaker did not complete program:

Exit Reason	Number	Percent
Returned to school	29	5 %
Took a job	75	13 %
Family concerns	46	8 %
Staff vacancy	8	1 %
Moved	137	23 %
No longer interested	242	41 %
Other	52	9 %
Total	589	100 %

APPENDIX A

SUMMARY OF ADULT PARTICIPANT PROFILES

State: MI109   11/08/1994
    Michigan

Reporting Period: 09/01/1993 - 08/31/1994

17) Family enrollment in other programs due to
    EFNEP assistance/recommendation:

Program	Number of Families	Percent
WIC/CSFP	84	2 %
Food Stamps	44	1 %
FDPIR	1	0 %
TEFAP (Commodities)	167	3 %
Head Start	23	0 %
Child Nutrition	15	0 %
AFDC	33	1 %
Other Public Assistance	75	1 %

18) Distribution of lessons taught - Completed Program:

Number of Lessons	Number of Hmkrs	Percent
0 - 6	968	26 %
7 - 13	1826	50 %
14 - 20	878	24 %
21+	13	0 %
Total	3685	100 %

Mean = 9.7   Standard Deviation = 4.86

19) Distribution of lessons taught - Terminated Program:

Number of Lessons	Number of Hmkrs	Percent
0 - 6	556	94 %
7 - 13	25	4 %
14 - 20	7	1 %
21+	1	0 %
Total	589	100 %

Mean = 2.4   Standard Deviation = 2.84

APPENDIX A

SUMMARY OF ADULT PARTICIPANT PROFILES

State: MI109   11/08/1994
       Michigan

Reporting Period: 09/01/1993 - 08/31/1994

20) Length of Enrollment and Number of Lessons - Completed Program:

Months of enrollment

NUMBER OF LESSONS / CUMULATIVES	0 - 3	4 - 6	7 - 9	10-12	13-15	16+	Total
Entry	157	32	15	16	4	0	224
	4%	1%	*	*	*	0%	6%
1-6	594	115	28	7	0	0	744
	16%	3%	1%	*	0%	0%	20%
7-12	1075	412	92	13	3	1	1596
	29%	11%	2%	*	*	*	43%
13-18	768	166	30	6	1	1	972
	21%	5%	1%	*	*	*	26%
19+	125	12	12	0	0	0	149
	3%	*	*	0%	0%	0%	4%
Total	2719	737	177	42	8	2	3685
	74%	20%	5%	1%	*	*	100%

* Less than 0.5%

21) Length of Enrollment and Number of Lessons - Terminated Program:

Months of enrollment

NUMBER OF LESSONS / CUMULATIVES	0 - 3	4 - 6	7 - 9	10-12	13-15	16+	Total
Entry	62	40	14	9	4	0	129
	11%	7%	2%	2%	1%	0%	22%
1-6	267	117	38	3	2	0	427
	45%	20%	6%	1%	*	0%	72%
7-12	8	11	3	2	0	1	25
	1%	2%	1%	*	0%	*	4%
13-18	1	5	0	1	0	0	7
	*	1%	0%	*	0%	0%	1%
19+	0	0	0	0	1	0	1
	0%	0%	0%	0%	*	0%	*
Total	338	173	55	15	7	1	589
	57%	29%	9%	3%	1%	*	100%

* Less than 0.5%

APPENDIX A

SUMMARY OF ADULT PARTICIPANT PROFILES

State: MI109   11/08/1994
      Michigan

Reporting Period: 09/01/1993 - 08/31/1994

22) Length of Enrollment and Number of Lessons - Continuing in Program:

Months of enrollment

		0 - 3	4 - 6	7 - 9	10-12	13-15	16+	Total
	Entry	527	147	94	67	11	10	856
		51%	14%	9%	6%	1%	1%	83%
	1-6	102	14	4	3	1	0	124
		10%	1%	*	*	*	0%	12%
	7-12	19	2	0	3	2	0	51
		2%	3%	0%	*	*	0%	5%
	13-18	0	1	0	1	2	0	4
		0%	*	0%	*	*	0%	*
	19+	0	0	0	1	0	0	1
		0%	0%	0%	*	0%	0%	*
	Total	648	189	98	75	16	10	1036
		63%	18%	9%	7%	2%	1%	100%

(Left vertical labels: NUMBER CUMULATIVE OF / LATIVE OF LESSONS)

* Less than 0.5%

[15 units]

APPENDIX B

DIET SUMMARY REPORT

APPENDIX B

DIET SUMMARY REPORT

State: MI109   11/08/1994
     Michigan

Reporting Period: 09/01/1993 - 08/31/1994

I. SUMMARY OF DIETARY IMPROVEMENT   3688 graduates

A. Mean and percent of graduates
   eating a specific number of servings   Graduates at:
   of each food group   Entry   Exit

		Entry		Exit	
1. Breads & Cereals:	Mean +/- StD	4.8	3.7	5.7	3.1
0 servings		6.2%		1.8%	
1-3 servings		32.5%		21.2%	
4-5 servings		28.3%		27.4%	
6-11 servings		29.9%		45.6%	
12+ servings		.3.2%		4.0%	
2. Fruits:	Mean +/- StD	1.1	4.3	1.5	2.0
0 servings		58.9%		35.0%	
1 serving		18.8%		25.3%	
2+ servings		22.3%		39.8%	
3. Vegetables:	Mean +/- StD	2.5	4.7	3.3	3.0
0 servings		26.5%		11.6%	
1 serving		16.9%		11.7%	
2 servings		20.7%		19.8%	
3+ servings		35.9%		57.0%	
4. Calcium/Dairy:	Mean +/- StD	1.4	2.2	2.1	2.6
0 servings		41.8%		23.1%	
1 serving		24.8%		25.2%	
2 servings		16.9%		25.3%	
3+ servings		16.5%		26.4%	
5. Meats & Alternates:	Mean +/- StD	1.7	2.3	2.1	2.0
0 servings		22.4%		12.0%	
1 serving		32.8%		30.3%	
2+ servings		44.9%		57.7%	

APPENDIX B

DIET SUMMARY REPORT

State: MI109   11/08/1994
      Michigan

Reporting Period: 09/01/1993 - 08/31/1994

I. SUMMARY OF DIETARY IMPROVEMENT   3688 graduates

| | Graduates at: | |
	Entry	Exit
6. Percent with positive change in any food group at exit (BC,F,V,Ca,Mt):		92.6%
7. Percent with 3-1-1-1-1 food pattern:	16.0%	40.4%
8. Percent with 6-2-3-2-2 food pattern:	1.5%	5.7%
9. Other Servings: Mean +/- StD	17.0 17.1	20.0 19.4
0-4 servings	18.4%	10.6%
5-9 servings	18.0%	17.3%
10-14 servings	17.5%	18.4%
15-19 servings	14.2%	15.1%
20+ servings	31.9%	38.6%

Notes:
    a. Food pattern order:
       Breads/Cereals-Fruits-Vegetables-Calcium/Dairy-Meat
    b. Each 'other serving' is approximately equal to 35 calories,
       or 1 tsp. fat, or 2 tsp. sugar

APPENDIX B

DIET SUMMARY REPORT

State: MI109   11/08/1994
       Michigan

Reporting Period: 09/01/1993 - 08/31/1994

I. SUMMARY OF DIETARY IMPROVEMENT   3688 graduates

B. Percentage of graduates reporting eating a specific number of meals/snacks	Graduates at: Entry	Exit
% eating one meal/snack	7.7%	1.6%
% eating two meal/snacks	19.8%	10.1%
% eating 3 or more meal/snack⁻	72.5%	88.3%

C. Number and percent of graduates who reported supplemental use:	Graduates at: Entry	Exit
Number	512	394
Percent	13.9%	10.7%

D. Money spent on food per capita per month:	Graduates at: Entry		Exit	
Number of homemakers reporting:	2501		2262	
Mean +/- StD of money spent on food per capita per month ($)	65.9	34.7	64.7	38.1
Mean family size +/- StD	3.7	1.6	3.6	1.6
$50-	36.9%		40.7%	
$51-99	50.3%		47.9%	
$100-124	8.3%		7.1%	
$125-149	1.6%		1.9%	
$150-174	1.1%		0.9%	
$175+	1.8%		1.6%	

[15 units]

APPENDIX B

DIET SUMMARY REPORT

State: MI109   11/08/1994
      Michigan

Reporting Period: 09/01/1993 - 08/31/1994

II. SUMMARY OF CALORIE/NUTRIENT IMPROVEMENT   3518 graduates

A. Mean caloric intake and percentage of calories	Graduates at: Entry		Exit	

1. Mean +/- StD grams consumed:

Carbohydrates (grams)	219.4	157.3	270.3	144.7
Fats (grams)	72.4	59.4	88.6	68.1
Protein (grams)	70.5	53.0	92.2	50.6
Alcohol (grams)	0.4	8.9	0.3	3.3
Dietary Fiber (grams)	11.7	13.1	15.7	11.0

2. Mean +/- StD caloric intake: (Calories)   1790.9 1179.5   2219.4 1162

3. Ranges of caloric intake:

	Entry	Exit
1199- calories	30.5%	13.9%
1200-2199 calories	45.1%	49.5%
2200+ calories	24.4%	39.2%

4. Percentage of calories:

a. From carbohydrates: Mean +/- StD   48.6   12.4   49.6   6.8

	Entry	Exit
<25%	2.2%	1.3%
25-49	52.6%	55.6%
50-60%	29.9%	33.3%
>60%	15.3%	12.6%

b. From fat: Mean +/- StD   35.0   10.1   35.6   7.0

	Entry	Exit
<20%	6.5%	4.6%
20-29%	20.6%	24.3%
30-34%	18.2%	20.2%
35-39%	20.8%	22.3%
>39%	33.9%	31.3%

c. From protein: Mean +/- StD   16.1   5.9   17.3   4.3

	Entry	Exit
<5%	1.0%	0.2%
5-9%	8.1%	3.1%
10-14%	33.2%	31.4%
15-19%	35.0%	42.8%
>19%	22.7%	25.2%

APPENDIX B

DIET SUMMARY REPORT

State: MI109   11/08/1994
    Michigan

Reporting Period: 09/01/1993 - 08/31/1994

II. SUMMARY OF CALORIE/NUTRIENT IMPROVEMENT   3518 graduates

	Graduates at:	
	Entry	Exit

5. Ranges of dietary fiber intake:

	Entry		Exit	
Mean +/- StD	11.7	13.1	15.7	11.0
4- grams	20.6%		7.4%	
5-15 grams	57.5%		56.1%	
16-24 grams	14.2%		25.8%	
25+ grams	7.7%		13.3%	

B. Mean nutrient intake and percent of RDAs

	Graduates at:	
	Entry	Exit

1. Protein: Mean NAR

	Entry	Exit
Mean NAR	0.90	0.99
<51% RDA	7.8%	2.0%
51-69% RDA	7.0%	2.4%
70-99% RDA	14.8%	8.2%
>99% RDA	70.4%	90.1%

2. Iron: Mean NAR

	Entry	Exit
Mean NAR	0.66	0.81
<51% RDA	32.4%	14.8%
51-69% RDA	19.6%	18.6%
70-99% RDA	24.0%	31.5%
>99% RDA	24.0%	37.8%

3. Calcium: Mean NAR

	Entry	Exit
Mean NAR	0.54	0.71
<51% RDA	50.7%	29.3%
51-69% RDA	16.3%	18.7%
70-99% RDA	16.5%	25.7%
>99% RDA	16.5%	29.1%

4. Vitamin A: Mean NAR

	Entry	Exit
Mean NAR	0.62	0.81
<51% RDA	40.6%	20.2%
51-69% RDA	12.8%	12.8%
70-99% RDA	14.0%	17.4%
>99% RDA	32.5%	52.4%

APPENDIX B

DIET SUMMARY REPORT

State: MI109   11/08/1994
       Michigan

Reporting Period: 09/01/1993 - 08/31/1994

II. SUMMARY OF CALORIE/NUTRIENT IMPROVEMENT   3518 graduates

	Graduates at:	
	Entry	Exit
5. Vitamin C: Mean NAR	0.72	0.87
<51% RDA	29.9%	14.8%
51-69% RDA	10.0%	7.0%
70-99% RDA	12.1%	11.2%
>99% RDA	48.0%	69.6%
6. Vitamin B6: Mean NAR	0.70	0.86
<51% RDA	29.4%	11.4%
51-69% RDA	15.7%	13.3%
70-99% RDA	22.0%	23.9%
>99% RDA	32.9%	54.1%
7. 6MAR: Mean MAR	0.69	0.84
<0.51 MAR	21.8%	6.6%
0.51-0.69 MAR	23.3%	14.9%
0.70-0.99 MAR	49.1%	67.1%
>0.99 MAR	5.8%	14.1%

[15 units]

Notes:
    NAR = Nutrient Adequacy Ratio = Nutrient intake/RDA (limited at 1.0)
    6MAR = Sum of NAR values for protein, iron, calcium,
        vitamins A, C, and B6 /6 = Average NAR

APPENDIX B

DIET SUMMARY REPORT

State: MI109   11/08/1994
     Michigan

Reporting Period: 09/01/1993 - 08/31/1994

III. DISTRIBUTION OF CALORIE AND NUTRIENT INTAKE   3518 graduates
                                                          493 exits

A. Calorie and nutrient intake among
   homemakers   Graduates at:
   [Completed EFNEP]   Entry   Exit
===

1. Homemakers with 0% - 40% calorie intake

   Number and percent of homemakers   554   15.7%   167   4.7%

   Calories: mean % RDA +/-StD   27.6   9.5   30.2   8.7
   Protein: mean % RDA +/-StD   57.1   31.3   66.9   34.8
   Iron: mean % RDA -/-StD   32.5   25.9   39.4   36.0
   Calcium: mean % RDA +/-StD   20.1   15.9   26.3   18.5
   Vitamin A: mean % RDA +/-StD   43.5   63.7   56.4   66.8
   Vitamin C: mean % RDA +/-StD   63.3   73.5   94.0 109.1
   Vitamin B6: mean % RDA +/-StD   37.0   31.3   46.1   34.8

2. Homemakers with 41% - 80% calorie intake

   Number and percent of homemakers   1519   43.2%   1357   38.6%

   Calories: mean % RDA +/-StD   60.5   11.3   63.1   10.7
   Protein: mean % RDA +/-StD   120.7   42.2   132.6   41.3
   Iron: mean % RDA +/-StD   66.3   41.4   74.6   44.1
   Calcium: mean % RDA +/-StD   46.7   27.6   55.5   26.2
   Vitamin A: mean % RDA +/-StD   84.3 120.8   125.1 183.0
   Vitamin C: mean % RDA +/-StD   120.5 138.4   147.4 116.9
   Vitamin B6: mean % RDA +/-StD   72.6   43.5   86.9   44.8

3. Homemakers with 81% - 120% calorie intake

   Number and percent of homemakers   943   26.8%   1231   35.0%

   Calories: mean % RDA +/-StD   97.1   11.1   97.7   11.5
   Protein: mean % RDA +/-StD   182.2   58.0   201.0   57.5
   Iron: mean % RDA +/-StD   96.3   49.4   104.5   55.1
   Calcium: mean % RDA +/-StD   77.7   40.1   83.6   36.5
   Vitamin A: mean % RDA +/-StD   128.8 167.1   168.2 232.7
   Vitamin C: mean % RDA +/-StD   172.3 154.8   206.7 157.6
   Vitamin B6: mean % RDA +/-StD   105.7   51.7   120.1   52.2

APPENDIX B

DIET SUMMARY REPORT

State: MI109   11/08/1994
       Michigan

Reporting Period: 09/01/1993 - 08/31/1994

III. DISTRIBUTION OF CALORIE AND NUTRIENT INTAKE   3518 graduates
                                                           493 exits

		Graduates at:	
		Entry	Exit

4. Homemakers with over 120% calorie intake

Number and percent of homemakers		502	14.3%	858	24.4%
Calories:	mean % RDA +/-StD	174.6	75.9	167.7	67.0
Protein:	mean % RDA +/-StD	303.2	206.8	310.6	153.4
Iron:	mean % RDA +/-StD	157.0	144.7	150.1	115.9
Calcium:	mean % RDA +/-StD	139.3	109.4	155.0	105.3
Vitamin A:	mean % RDA +/-StD	213.3	343.2	240.3	417.6
Vitamin C:	mean % RDA +/-StD	329.6	450.4	297.2	234.4
Vitamin B6:	mean % RDA +/-StD	194.0	202.6	176.5	105.8

B. Calorie and nutrient intake among
   homemakers   At
   [Exited, objectives not met]   Entry

1. Homemakers with 0% - 40% calorie intake

Number and percent of homemakers		86	17.4%
Calories:	mean % RDA +/-StD	25.9	9.9
Protein:	mean % RDA +/-StD	55.0	29.9
Iron;	mean % RDA +/-StD	30.8	27.6
Calcium:	mean % RDA +/-StD	23.9	17.0
Vitamin A:	mean % RDA +/-StD	42.6	73.0
Vitamin C:	mean % RDA +/-StD	52.8	62.2
Vitamin B6:	mean % RDA +/-StD	33.1	23.4

2. Homemakers with 41% - 80% calorie intake

Number and percent of homemakers		216	43.8%
Calories:	mean % RDA +/-StD	60.9	11.1
Protein:	mean % RDA +/-StD	123.2	40.7
Iron:	mean % RDA +/-StD	62.6	27.9
Calcium:	mean % RDA +/-StD	47.8	25.6
Vitamin A:	mean % RDA +/-StD	85.4	125.5
Vitamin C:	mean % RDA +/-StD	122.0	123.3
Vitamin B6:	mean % RDA +/-StD	71.8	34.8

APPENDIX B

DIET SUMMARY REPORT

State: MI109   11/08/1994
      Michigan

Reporting Period: 09/01/1993 - 08/31/1994

III. DISTRIBUTION OF CALORIE AND NUTRIENT INTAKE   3518 graduates
                                                         493 exits

                                                   At:
                                                   Entry
===

3. Homemakers with 81% - 120% calorie intake

   Number and percent of homemakers   127   25.8%

   Calories: mean % RDA +/-StD   95.8 10.7
   Protein: mean % RDA +/-StD   186.7 62.0
   Iron: mean % RDA +/-StD   96.2 52.3
   Calcium: mean % RDA +/-StD   80.6 42.9
   Vitamin A: mean % RDA +/-StD   131.2 141.2
   Vitamin C: mean % RDA +/-StD   189.3 164.6
   Vitamin B6: mean % RDA +/-StD   117.1 67.2

4. Homemakers with over 120% calorie intake

   Number and percent of homemakers   64   13.0%

   Calories: mean % RDA +/-StD   159.3 41.9
   Protein: mean % RDA +/-StD   289.3 107.6
   Iron: mean % RDA +/-StD   140.5 84.5
   Calcium: mean % RDA +/-StD   115.4 81.2
   Vitamin A: mean % RDA +/-StD   212.8 357.5
   Vitamin C: mean % RDA +/-StD   206.3 165.6
   Vitamin B6: mean % RDA +/-StD   177.6 104.6

APPENDIX B

DIET SUMMARY REPORT

State: MI109   11/08/1994
      Michigan

Reporting Period: 09/01/1993 - 08/31/1994

III. DISTRIBUTION OF CALORIE AND NUTRIENT INTAKE   3518 graduates
                                                          493 exits

C. Number of homemakers with calorie &
   nutrient values over 200% RDA   Graduates at:
   [Completed EFNEP]   Entry   Exit
==

    Number of Homemakers   3518   3518

    Homemakers with over 200% RDA of
         Calories   100   143
         Protein   768   1397
         Iron   149   240
         Calcium   98   183
         Vitamin A   403   773
         Vitamin C   844   1452
         Vitamin B6   218   340

D. Number of homemakers with calorie &
   nutrient values over 200% RDA   At
   [Exited, objectives not met]   Entry
==

    Number of Homemakers   493

    Homemakers with over 200% RDA of
         Calories   9
         Protein   102
         Iron   11
         Calcium   6
         Vitamin A   52
         Vitamin C   108
         Vitamin B6   31

[15 units]

APPENDIX C

DISTRIBUTION OF MICHIGAN EFNEP COUNTIES 1994-95

APPENDIX C

DISTRIBUTION OF MICHIGAN EFNEP COUNTIES 1994-95

16 EFNEP counties
Berrien
Dickinson
Genesee
Ingham
Kent
Kalamazoo
Lenawee
Macomb
Muskegon
Oakland
Sanilac
Saginaw
St. Clair
Wayne
Washtenaw

APPENDIX D

LIST OF EFNEP CURRICULUM CONTENT

APPENDIX D

LIST OF EFNEP CURRICULUM CONTENT

EATING RIGHT IS BASIC
third edition

_____ 0. Introduction

_____ (1.) Starting with the Basics

_____ (2.) Food Guide Pyramid

_____ (3.) Understanding Food Labels

_____ (4.) Planning Makes a Difference

_____ (5.) Making the Most of Your Food Dollars

_____ (6.) Keeping Food Safe

_____ 7. Bread, Cereal, Rice & Pasta

_____ 8. Vegetable Group

_____ 9. Fruit Group

_____ 10. Milk, Yogurt & Cheese Group

_____ 11. Meat, Poultry, Fish, Dry Beans,
          Eggs & Nuts Group

_____ 12. Breakfast, Choosing Healthy Snacks

_____ 13. Eating Right for Two

_____ 14. Feeding Your New Baby

_____ 15. Feeding Infants & Children

_____ (16.) Eating Right & Light

"O" denotes part of the core curriculum

Cooperative Extension Service

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MSU is an affirmative-action, equal-opportunity institution.

APPENDIX E

UCRIHS APPROVAL

APPENDIX E   UCRIHS APPROVAL

MICHIGAN STATE
U N I V E R S I T Y

June 13, 1996

TO: Lifan Koerner

RE: IRB#:   96-371
       TITLE: STATEWIDE IN-DEPTH DIETARY EVALUATION OF
                         MICHIGAN EXPANDED FOOD AND NUTRITION EDUCATION
                         PROGRAM PARTICIPANTS
       REVISION REQUESTED: N/A
       CATEGORY: 2-H
       APPROVAL DATE: 06/12/96

The University Committee on Research Involving Human Subjects'(UCRIHS)
review of this project is complete. I am pleased to advise that the
rights and welfare of the human subjects appear to be adequately
protected and methods to obtain informed consent are appropriate.
Therefore, the UCRIHS approved this project and any revisions listed
above.

RENEWAL: UCRIHS approval is valid for one calendar year, beginning with
            the approval date shown above. Investigators planning to
            continue a project beyond one year must use the green renewal
            form (enclosed with the original approval letter or when a
            project is renewed) to seek updated certification. There is a
            maximum of four such expedited renewals possible. Investigators
            wishing to continue a project beyond that time need to submit it
            again for complete review.

REVISIONS: UCRIHS must review any changes in procedures involving human
            subjects, prior to initiation of the change. If this is done at
            the time of renewal, please use the green renewal form. To
            revise an approved protocol at any other time during the year,
            send your written request to the UCRIHS Chair, requesting revised
            approval and referencing the project's IRB # and title. Include
            in your request a description of the change and any revised
            instruments, consent forms or advertisements that are applicable.

PROBLEMS/
CHANGES: Should either of the following arise during the course of the
            work, investigators must notify UCRIHS promptly: (1) problems
            (unexpected side effects, complaints, etc.) involving human
            subjects or (2) changes in the research environment or new
            information indicating greater risk to the human subjects than
            existed when the protocol was previously reviewed and approved.

If we can be of any future help, please do not hesitate to contact us
at (517)355-2180 or FAX (517)432-1171.

OFFICE OF
RESEARCH
AND
GRADUATE
STUDIES

University Committee on
Research Involving
Human Subjects
(UCRIHS)

Michigan State University
232 Administration Building
East Lansing, Michigan
48824-1046

517/355-2180
FAX: 517/432-1171

Sincerely,

David E. Wright, Ph.D.
UCRIHS Chair

DEW:bed

cc: Won O. Song

APPENDIX F

ADULT FAMILY RECORD

Adult Family Record
Michigan Expanded Food and Nutrition Education Program

1. Instructor's Name:	2. ID:

3. Homemaker's Name _____
        (First)   (MI)   (Last)

4. ID

Address _____

       City   Zip

Phone ( )

5. Enrolled in EFNEP before?
☐ Yes ☐ No

6. If yes, did you receive a certificate of completion?
☐ Yes ☐ No

7. Age _____

8. Sex F M

9. Pregnant?
   Yes   No

10. Breastfeeding?
   Yes   No

11. Race: Check the category you identify with.

_____ (1-00) White (non-Hispanic)

_____ (2-00) Black (non-Hispanic)

_____ (3-00) Am Indian/Alaskan Native

_____ (4-00) Hispanic

_____ (5-00) Asian or Pacific Islander

12. Place of Residence: (circle one)

1 Farm

2 Towns under 10,000 & rural non-farm

3 Towns & Cities 10,000-50,000

4 Suburbs of Cities over 50,000

5 Central Cities over 50,000

13. Total household income last month: $ _____

14. Household members: List first names of children (through age 19) and their ages.

	Age		Age
1)		6)	
2)		7)	
3)		8)	
4)		9)	
5)		10)	

15. Number of other adults in household
(not counting homemaker): _____

16. Type of instruction:

1) Group

2) Individual

3) Both

4) Other _____

17. Entry Date: _____ / _____ / _____

18. Assistance programs that the Family Participates in at ENTRY: (circle)

WIC/CSFP	Y	N
Food Stamps	Y	N
FDPIR (Food Distribution Prog. on Indian Res.)	Y	N
Commodities	Y	N
Head Start	Y	N
Child Nutrition	Y	N
AFDC	Y	N
Other _____ (Specify)	Y	N

Comments:

APPENDIX G

24-HOUR FOOD RECALL

APPENDIX G   24-Hour Food Recall
Michigan Expanded Food and Nutrition Education Program

1. Homemaker's Name:	2. Family ID#
3. Date of Recall:	4. N.L. ID#

5. Pregnant ?	6. Breastfeeding?	7. Nutritional Supplements ?
☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes (please list)
8. Money spent on food last month: $		☐ No

9. Which Food Recall? ☐ ENTRY ☐ EXIT ☐ Other: Number ____

MEAL TYPE	SERVING ABBREVIATIONS
1= Morning 4= Afternoon 2= MidMorning 5= Evening 3= Noon 6= Late Evening	TBSP = tablespoon c = cup tsp = teaspoon lb = pound oz = ounce sl = slice

10. What did homemaker eat and drink in the last 24 hours?
(To be filled out by Paraprofessional or Homemaker)

11. To Be Coded By Clerical or Paraprofessional Staff.

MEAL TYPE	FOOD ITEMS AND DESCRIPTION (List all foods and beverages. List separately main ingredients in mixed dishes.)	AMOUNT EATEN	FOOD ID NUMBER	AMOUNT CODE
			01	1 o 1
			01	1 o 1
			01	1 o 1
			01	1 o 1
			01	1 c 1
			01	1 o 1
			01	1 o 1
			01	1 o 1
			01	1 o 1
			01	1 o 1
			01	1 o 1

Answer 12-14 for exiting homemakers.

12. Total number of lessons:

Food & Nutrition: _____ individual
_____ group

Parenting: _____
Other: _____

13. Exit reason (circle one)

1 Educational objectives met
2 Returned to school
3 Took job
4 Family concerns
5 Staff vacancy
6 Moved
7 Lost interest
8 Other

14. Did your family receive assistance as the result of a referral or suggestion from EFNEP personnel?

☐ Yes ☐ No

If yes, check all that apply:

_____ WIC/CSFP
_____ Food Stamps
_____ FDPIR (Food Distribution Prog. on Indian Res.)
_____ Commodities
_____ Head Start
_____ Child Nutrition
_____ AFDC
_____ Other _____
     (Specify)

12/94

APPENDIX H

**PRINT OUTS OF THREE ERS RAW DATA FILES
(ADULT.DBF, RECALL.DBF, AND MEALS.DBF)**

APPENDIX H   PRINT OUTS OF THREE ERS RAW DATA FILES

a:\adult.sav

	unit_id	id	staff_id	sex	pregnant	nursing	age	race_cod
1	MI043	6	P00001	F	F	F	33	1-00
2	MI043	19	P00001	F	F	F	22	1-00
3	MI043	20	P00001	F	F	F	22	1-00
4	MI043	21	P00001	F	F	F	19	1-00
5	MI043	22	P00001	F	F	T	19	1-00
6	MI043	23	P00001	F	F	F	23	1-00
7	MI043	24	P00001	F	F	F	23	1-00
8	MI043	25	P00001	F	F	F	24	1-00
9	MI043	26	P00001	F	F	F	31	1-00
10	MI043	27	P00001	F	F	F	17	4-00
11	MI043	28	P00001	F	F	F	23	1-00
12	MI043	29	P00001	F	F	F	22	1-00
13	MI043	30	P00001	F	F	F	42	1-00
14	MI043	31	P00001	F	F	F	29	1-00
15	MI043	34	P00001	F	T	F	26	4-00
16	MI043	35	P00001	F	F	F	27	1-00
17	MI043	36	P00001	F	F	F	34	1-00
18	MI043	37	P00001	F	F	F	31	1-00
19	MI043	38	P00001	F	F	F	38	3-00
20	MI043	39	P00001	F	F	F	38	1-00
21	MI043	40	P00001	F	T	F	19	1-00
22	MI043	41	P00001	F	F	F	23	1-00
23	MI043	42	P00001	F	T	F	23	3-00
24	MI043	43	P00001	F	T	F	36	5-00
25	MI043	44	P00001	F	F	T	31	1-00

APPENDIX H   PRINT OUTS OF THREE ERS RAW DATA FILES
a:\adult.sav

	income	town_siz	n_age_00	n_age_01	n_age_02	n_age_03	n_age_04
1	444	2	1	0	1	0	0
2	200	2	0	1	0	0	0
3	1350	2	0	0	0	1	0
4	720	2	1	0	0	0	0
5	500	2	1	0	0	0	0
6	1200	2	0	0	1	1	0
7	2500	2	0	0	0	1	0
8	185	2	1	0	1	0	0
9	1075	2	0	0	2	0	1
10	300	2	1	0	0	0	0
11	444	2	0	1	0	1	0
12	800	1	0	1	0	0	0
13	789	2	0	0	0	0	0
14	500	2	0	0	2	0	0
15	0	2	0	0	0	0	0
16	2300	1	0	0	0	1	0
17	2200	2	0	0	0	0	0
18	650	2	0	0	0	0	0
19	407	2	0	0	0	0	0
20	1730	2	0	0	0	1	0
21	0	2	0	1	0	0	0
22	1674	2	1	0	1	0	0
23	1400	2	0	1	0	1	0
24	1356	2	0	0	0	0	0
25	1600	2	1	0	0	0	0

APPENDIX H **PRINT OUTS OF THREE ERS RAW DATA FILES**
a:\adult.sav

	n_age_05	n_age_06	n_age_07	n_age_08	n_age_09	n_age_10	n_age_11
1	0	1	0	0	0	0	0
2	0	0	0	0	0	0	0
3	1	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
7	1	0	1	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0
13	0	0	0	1	0	0	0
14	0	0	1	0	1	0	0
15	0	0	0	0	0	0	0
16	0	0	1	0	1	0	0
17	0	0	0	1	0	1	0
18	1	1	0	0	0	0	1
19	0	0	0	0	1	1	0
20	0	0	0	0	0	1	0
21	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0
25	1	1	0	0	0	0	0

APPENDIX H   PRINT OUTS OF THREE ERS RAW DATA FILES

a:\adult.sav

	n_age_12	n_age_13	n_age_14	n_age_15	n_age_16	n_age_17	n_age_18
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0
17	0	1	0	0	0	0	0
18	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0
20	0	0	0	1	0	1	0
21	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0
24	0	0	0	1	0	0	0
25	0	0	0	0	0	0	0

APPENDIX H   **PRINT OUTS OF THREE ERS RAW DATA FILES**
a:\adult.sav

	n_age_19	other_fa	famly_to	entry_da	e_wic_cs	e_fd_sta	e_fdpir
1	0	1	5	01-JUN-93	T	T	F
2	0	0	2	21-JUL-94	T	F	F
3	0	1	4	21-JUL-94	T	F	F
4	0	0	2	26-JUL-94	T	T	F
5	0	1	3	04-AUG-94	T	F	F
6	0	0	3	24-MAY-94	T	T	F
7	0	1	5	20-JUL-94	T	F	F
8	0	0	3	29-JUL-94	T	F	F
9	0	0	4	25-OCT-94	T	F	F
10	0	0	2	16-DEC-94	T	T	F
11	0	1	4	13-OCT-94	T	T	F
12	0	1	3	06-JAN-95	T	F	F
13	0	0	2	01-DEC-94	F	T	F
14	0	1	6	30-NOV-94	F	T	F
15	0	0	1	14-MAR-95	T	T	F
16	0	1	5	26-JUN-95	F	F	F
17	0	0	4	26-JUN-95	F	F	F
18	0	0	4	26-JUN-95	F	F	F
19	0	1	4	26-JUN-95	F	T	F
20	0	0	5	01-MAY-95	T	F	F
21	0	0	2	22-MAY-95	T	F	F
22	0	1	4	24-MAY-95	T	F	F
23	0	1	4	24-MAY-95	T	F	F
24	0	1	3	31-MAY-95	T	F	F
25	0	1	5	19-JUN-95	T	F	F

APPENDIX H   PRINT OUTS OF THREE ERS RAW DATA FILES

a:\adult.sav

	e_tefap	e_hd_sta	e_lunche	e_afdc	e_other	lesson_t	lesson_c
1	T	T	T	T	F	2	13
2	F	F	F	F	F	1	4
3	F	F	F	F	F	2	21
4	T	F	F	T	T	2	19
5	F	F	F	F	F	1	15
6	F	F	F	T	F	2	14
7	F	T	F	F	F	2	14
8	F	F	F	F	F	2	11
9	F	T	F	F	F	2	3
10	T	F	F	T	F	2	9
11	T	F	F	T	F	2	12
12	F	F	F	F	F	2	8
13	T	F	T	F	T	2	12
14	F	F	F	F	F	2	7
15	F	F	F	T	F	2	4
16	F	T	F	F	T	1	9
17	F	F	F	F	F	3	9
18	F	T	F	F	F	3	9
19	F	F	T	T	F	3	9
20	F	F	T	T	T	2	7
21	F	F	F	F	T	1	4
22	F	F	F	F	F	3	7
23	F	F	F	F	F	3	7
24	F	F	F	F	T	1	8
25	F	F	F	F	F	2	5

APPENDIX H   PRINT OUTS OF THREE ERS RAW DATA FILES

a:\adult.sav

	exit_cod	exit_dat	efnep_he	x_wic_cs	x_fd_sta	x_fdpir	x_tefap
1	1	15-JUN-95	T	T	T	F	T
2	3	12-SEP-94	T	T	F	F	T
3	1	26-MAY-95	T	T	T	F	F
4	1	24-APR-95	F	F	F	F	F
5	1	02-FEB-95	T	T	F	F	F
6	1	30-MAY-95	T	T	T	F	F
7	1	05-APR-95	F	F	F	F	F
8	1	29-MAY-95	T	T	T	F	F
9	7	15-MAR-95	F	F	F	F	F
10	1	02-JUN-95	T	T	T	F	F
11	1	03-MAY-95	T	T	T	T	F
12	1	06-MAR-95	F	F	F	F	F
13	1	23-JUN-95	F	F	F	F	F
14	1	13-JUN-95	T	T	T	T	F
15	1	06-JUL-95	T	T	T	F	F
16	1	26-JUN-95	F	F	F	F	F
17	1	14-JUL-95	T	F	T	F	F
18	1	10-JUL-95	F	F	F	F	F
19	1	18-JUL-95	F	F	F	F	F
20	1	19-JUL-95	F	F	F	F	F
21	7	21-JUN-95	F	F	F	F	F
22		.	F	F	F	F	F
23		.	F	F	F	F	F
24	1	19-JUL-95	F	F	F	F	F
25		.	F	F	F	F	F

APPENDIX H   PRINT OUTS OF THREE ERS RAW DATA FILES
a:\adult.sav

	x_hd_sta	x_lunche	x_afdc	x_other	recall_n	recall_l	recall_e
1	T	T	T	T	2	15-JUN-95	01-JUN-93
2	F	F	F	F	1	21-JUL-94	21-JUL-94
3	T	T	F	F	2	26-MAY-95	21-JUL-94
4	F	F	F	F	2	24-APR-95	26-JUL-94
5	F	F	F	F	2	02-FEB-95	23-AUG-94
6	F	F	T	T	2	30-MAY-95	24-MAY-94
7	F	F	F	F	2	05-APR-95	20-JUL-94
8	F	F	F	F	2	29-MAY-95	29-JUL-94
9	F	F	F	F	1	25-OCT-94	25-OCT-94
10	F	F	T	F	2	02-JUN-95	16-DEC-94
11	T	T	T	F	2	03-MAY-95	13-OCT-94
12	F	F	F	F	2	06-MAR-95	06-JAN-95
13	F	F	F	F	2	23-JUN-95	01-DEC-94
14	T	T	T	F	2	13-JUN-95	30-NOV-94
15	F	F	T	F	2	06-JUL-95	14-MAR-95
16	F	F	F	F	2	18-JUL-95	26-JUN-95
17	F	F	F	F	2	14-JUL-95	26-JUN-95
18	F	F	F	F	2	10-JUL-95	26-JUN-95
19	F	F	F	F	2	18-JUL-95	26-JUN-95
20	F	F	F	F	2	19-JUL-95	01-MAY-95
21	F	F	F	F	1	22-MAY-95	22-MAY-95
22	F	F	F	F	1	24-MAY-95	24-MAY-95
23	F	F	F	F	1	24-MAY-95	24-MAY-95
24	F	F	F	F	2	19-JUL-95	31-MAY-95
25	F	F	F	F	1	19-JUN-95	19-JUN-95

APPENDIX H   PRINT OUTS OF THREE ERS RAW DATA FILES
a:\adult.sav

	recall_x	cklist_n	cklist_l	cklist_e	cklist_x	lastmod
1	15-JUN-95	2	15-JUN-95	01-JUN-93	15-JUN-95	07-SEP-95
2	.	1	21-JUL-94	21-JUL-94	.	15-AUG-95
3	26-MAY-95	2	26-MAY-95	21-JUL-94	26-MAY-95	07-SEP-95
4	24-APR-95	2	24-APR-95	26-JUL-94	24-APR-95	15-AUG-95
5	02-FEB-95	2	02-FEB-95	04-AUG-94	02-FEB-95	15-AUG-95
6	30-MAY-95	2	30-MAY-95	24-MAY-94	30-MAY-95	15-AUG-95
7	05-APR-95	2	05-APR-95	20-JUL-94	05-APR-95	15-AUG-95
8	29-MAY-95	2	25-MAY-95	29-JUL-94	25-MAY-95	15-AUG-95
9	.	1	25-OCT-94	25-OCT-94	.	15-AUG-95
10	02-JUN-95	2	02-JUN-95	16-DEC-94	02-JUN-95	15-AUG-95
11	03-MAY-95	2	03-MAY-95	13-OCT-94	03-MAY-95	15-AUG-95
12	06-MAR-95	2	06-MAR-95	06-JAN-95	06-MAR-95	15-AUG-95
13	23-JUN-95	2	23-JUN-95	01-DEC-94	23-JUN-95	15-AUG-95
14	13-JUN-95	2	13-JUN-95	30-NOV-94	13-JUN-95	07-SEP-95
15	06-JUL-95	2	06-JUL-95	14-MAR-95	06-JUL-95	07-SEP-95
16	18-JUL-95	2	18-JUL-95	26-JUN-95	18-JUL-95	18-AUG-95
17	14-JUL-95	2	14-JUL-95	26-JUN-95	14-JUL-95	28-AUG-95
18	10-JUL-95	2	10-JUL-95	26-JUN-95	10-JUL-95	28-AUG-95
19	18-JUL-95	2	18-JUL-95	26-JUN-95	18-JUL-95	28-AUG-95
20	19-JUL-95	2	18-JUL-95	01-MAY-95	18-JUL-95	28-AUG-95
21	.	2	21-JUN-95	22-MAY-95	21-JUN-95	28-AUG-95
22	.	1	24-MAY-95	24-MAY-95	.	07-SEP-95
23	.	1	24-MAY-95	24-MAY-95	.	07-SEP-95
24	19-JUL-95	2	19-JUL-95	31-MAY-95	19-JUL-95	28-AUG-95
25	.	1	19-JUN-95	19-JUN-95	.	28-AUG-95

APPENDIX H   PRINT OUTS OF THREE ERS RAW DATA FILES
a:\recall.sav

	id	rdate	nutmth	ispreg	isnurse	isnutsup	foodcost
1	6	01-JUN-93	1	F	F	F	200
2	6	15-JUN-95	1	F	F	F	.
3	19	21-JUL-94	1	F	F	F	0
4	20	21-JUL-94	1	F	F	F	200
5	20	26-MAY-95	1	F	F	F	.
6	21	26-JUL-94	1	F	F	F	150
7	21	24-APR-95	1	F	F	F	150
8	22	23-AUG-94	1	T	F	T	50
9	22	02-FEB-95	1	F	T	F	100
10	23	24-MAY-94	1	F	F	F	150
11	23	30-MAY-95	1	F	F	F	150
12	24	20-JUL-94	1	F	F	F	200
13	24	05-APR-95	1	F	F	F	180
14	25	29-JUL-94	1	F	F	F	55
15	25	29-MAY-95	1	F	F	F	.
16	26	25-OCT-94	1	F	F	F	150
17	27	16-DEC-94	1	F	F	F	110
18	27	02-JUN-95	1	F	F	F	100
19	28	13-OCT-94	1	F	F	F	160
20	28	03-MAY-95	1	F	F	F	165
21	29	06-JAN-95	1	F	F	F	246
22	29	06-MAR-95	1	F	F	F	200
23	30	01-DEC-94	1	F	F	F	100
24	30	23-JUN-95	1	F	F	F	.
25	31	30-NOV-94	1	F	F	F	150

APPENDIX H   **PRINT OUTS OF THREE ERS RAW DATA FILES**
a:\recall.sav

	isexit	nmeals	smeat	sdairy	sveg	sbread	sfruit	sother
1	F	3	2.00	2.90	1.00	6.00	1.36	11.00
2	T	6	3.22	3.21	6.25	7.19	3.02	13.28
3	F	3	2.30	3.09	2.25	6.50	.04	26.88
4	F	4	.99	1.04	6.00	5.50	.00	15.30
5	T	3	2.50	3.08	3.00	6.40	1.02	19.25
6	F	3	1.60	6.64	5.00	7.50	3.00	26.88
7	T	4	2.31	1.96	3.50	4.00	.75	18.20
8	F	6	1.66	3.64	1.00	11.60	2.00	17.80
9	T	6	4.04	2.88	6.00	5.00	2.52	14.15
10	F	6	2.75	3.50	5.00	6.50	2.00	26.28
11	T	4	6.50	2.08	5.50	5.80	1.36	26.70
12	F	6	9.10	1.86	1.50	6.70	3.04	29.71
13	T	6	2.00	4.32	3.12	8.50	4.02	20.40
14	F	6	2.00	2.75	2.00	8.50	2.00	21.55
15	T	3	1.33	2.60	1.00	7.00	1.00	11.94
16	F	5	1.75	4.25	4.00	6.40	1.02	23.25
17	F	5	.00	.75	5.00	3.00	2.38	14.66
18	T	3	2.20	5.46	2.00	6.00	2.04	21.13
19	F	3	1.33	1.54	.75	3.60	.00	30.45
20	T	3	4.56	3.62	5.00	7.00	1.02	20.60
21	F	6	1.19	5.70	2.50	7.90	1.00	37.45
22	T	4	1.99	3.94	1.00	4.50	.00	25.61
23	F	5	2.21	1.60	4.00	2.50	2.00	16.33
24	T	4	4.75	2.36	3.50	6.00	2.04	20.00
25	F	3	3.50	2.08	2.00	4.90	.00	24.40

APPENDIX H   PRINT OUTS OF THREE ERS RAW DATA FILES

a:\recall.sav
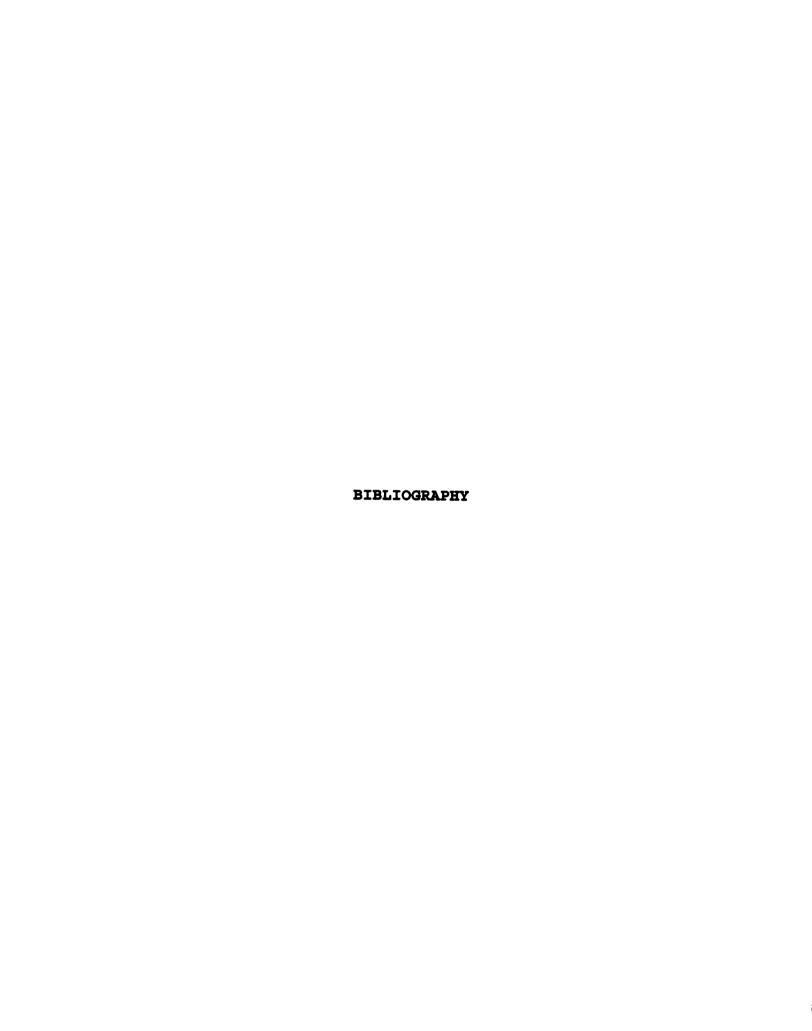
	ncal	gprotein	gfat	gcarbo	mgiron	mgca	reva
1	1578	68.6	50.7	217.6	14.9	1179	879
2	2044	121.9	70.6	260.4	20.3	1353	5413
3	2325	119.5	117.2	196.3	10.8	1330	836
4	1748	49.5	69.7	240.9	10.2	616	370
5	2124	83.4	79.1	304.9	24.0	1157	454
6	2671	107.1	106.5	327.2	12.4	2192	1129
7	1744	85.1	71.9	191.9	7.7	825	4096
8	2462	92.2	75.4	361.7	34.1	1285	659
9	2419	136.8	105.1	237.0	18.3	1348	2883
10	2337	92.9	75.5	339.3	20.7	1412	2397
11	2884	170.4	111.7	304.8	16.1	1012	2714
12	2940	181.5	122.1	276.8	16.9	1050	852
13	2381	104.6	79.5	323.0	35.1	1606	1542
14	2306	81.1	92.1	300.1	14.7	1052	730
15	1460	61.8	44.7	203.7	18.6	1079	3093
16	2158	67.8	84.0	295.6	13.7	1336	2396
17	1140	25.4	29.4	199.1	8.4	324	434
18	2425	93.1	111.3	272.1	10.6	1603	753
19	1822	51.5	64.4	269.2	10.4	609	699
20	2510	118.5	100.9	284.9	16.2	1334	1936
21	2702	95.9	116.6	314.2	11.6	1768	911
22	1943	80.0	104.3	170.8	7.4	1306	785
23	1957	89.7	76.1	242.1	12.6	941	696
24	2207	135.9	77.1	238.0	13.6	1076	764
25	2127	76.0	95.9	239.5	9.8	837	1223

APPENDIX H   PRINT OUTS OF THREE ERS RAW DATA FILES

a:\recall.sav

	mgvc	mgvb6	gfiber	galcohol	frozen	lastmod
1	71	1.67	11.1	.0	F	19940419
2	165	3.17	46.3	.0	F	19950907
3	16	1.53	7.4	.0	F	19940727
4	56	1.22	9.5	.0	F	19940727
5	189	3.25	27.6	.0	F	19950907
6	88	1.73	16.4	.0	F	19940912
7	32	2.28	9.4	.0	F	19950426
8	98	3.23	17.5	.0	F	19950406
9	113	2.04	19.8	.0	F	19950216
10	114	2.96	21.9	.0	F	19940912
11	70	3.40	23.5	.0	F	19950815
12	55	3.01	11.2	.0	F	19940912
13	161	2.04	26.9	.0	F	19950426
14	43	2.18	18.4	.0	F	19940912
15	60	2.76	12.8	.0	F	19950815
16	166	1.51	9.6	.0	F	19950216
17	104	.82	3.8	.0	F	19950216
18	167	1.21	9.4	.0	F	19950815
19	24	1.32	3.6	.0	F	19950216
20	30	1.82	9.8	.0	F	19950815
21	22	1.30	20.4	12.0	F	19950303
22	8	.95	8.6	.0	F	19950317
23	77	2.97	27.2	.0	F	19950303
24	64	2.74	16.9	.0	F	19950815
25	21	1.15	3.0	.0	F	19950303

APPENDIX H   PRINT OUTS OF THREE ERS RAW DATA FILES

a:\meals.sav

	id	rdate	mealtype	foodid	nserves
1	6	01-JUN-93	1	263	1.00
2	6	01-JUN-93	1	674	8.00
3	6	01-JUN-93	1	781	1.00
4	6	01-JUN-93	5	143	2.00
5	6	01-JUN-93	5	781	1.00
6	6	01-JUN-93	5	1205	2.00
7	6	01-JUN-93	6	995	1.00
8	6	15-JUN-95	1	133	2.00
9	6	15-JUN-95	1	259	1.00
10	6	15-JUN-95	1	678	6.00
11	6	15-JUN-95	1	776	4.00
12	6	15-JUN-95	2	3	1.00
13	6	15-JUN-95	3	154	2.00
14	6	15-JUN-95	3	255	1.00
15	6	15-JUN-95	3	318	1.50
16	6	15-JUN-95	3	631	3.00
17	6	15-JUN-95	3	727	.25
18	6	15-JUN-95	4	246	2.00
19	6	15-JUN-95	5	419	.50
20	6	15-JUN-95	5	481	1.00
21	6	15-JUN-95	5	765	12.00
22	6	15-JUN-95	5	952	6.00
23	6	15-JUN-95	5	986	.50
24	6	15-JUN-95	5	1349	1.00
25	6	15-JUN-95	6	940	3.00

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