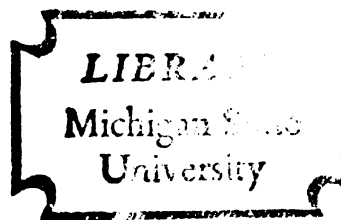


A BIOCHEMICAL, DIETARY AND
ATTITUDINAL ASSESSMENT OF
THE EFFECTS OF NUTRITION EDUCATION
ON FAMILIES ENROLLED IN THE
EXPANDED NUTRITION AND
FAMILY PROGRAM

Thesis for the Degree of M. S.
MICHIGAN STATE UNIVERSITY
DONNA VIVIAN DUFF
1974

THESIS



ABSTRACT

A BIOCHEMICAL, DIETARY AND ATTITUDINAL ASSESSMENT OF THE EFFECTS OF NUTRITION EDUCATION ON FAMILIES ENROLLED IN THE EXPANDED NUTRITION AND FAMILY PROGRAM

By

Donna Vivian Duff

This study is an attempt to evaluate the change in individuals after enrollment in the Expanded Nutrition and Family Program (ENFP). The major objective of this program is to improve the nutritional status of low income families. The most objective measures of nutritional status in this part of the study are riboflavin and thiamin excretion levels.

Families within the ENFP were interviewed from six counties in Michigan. Data from a control group of 30 non-ENFP families were collected for comparison. This group was demographically similar to the treatment group (ENFP) of 163 families.

Identical instruments were administered pre (at the time of enrollment in the program) and post (after a six to nine month interval) on both treatment and control groups. The instruments included:

gathering information about the family characteristics, the homemaker's shopping practices, nutrition information, nutrition attitudes and dietary intake. Also urine samples were collected from all available and willing-to-participate family members. Urine samples were analysed for riboflavin and thiamin levels per gram of creatinine. The individual excretion levels were categorized age-wise and classified as deficient, low, acceptable, or high by the ICNND (1963) Standards.

Final analysis indicated no significant differences between the treatment and control groups for riboflavin and thiamin excretion levels, dietary intake, nutrition attitudes and nutrition information. Improvement was found in the scores of food recall, nutrition knowledge and riboflavin nutriture of ENFP families; however, these were no higher than the increases within the control group. Thiamin excretion levels indicated this nutrient to be essentially adequate for all individuals at both pre and post phases of the study.

Homemakers were given a score on their 24-hour food recall on the basis of meeting the Basic Four adult recommendations. Scores indicated all food groups were not adequately met. The meat group was most frequently met, while the fruits and vegetable group was least frequently met.

Supermarkets were used almost exclusively for shopping. The stores were generally within five miles of the homemaker and the family car, or that of a friend or relative, was the main source of transportation. Food selection was influenced mainly by cost, family preference, needing the food item and nutritional value, in that order.

The nutritional attitudes indicated most homemakers tended to be planners. The nutritional knowledge of homemakers tended to be limited in many areas.

There was a negative correlation between homemakers' ages and nutritional attitude scores. There were positive correlations between homemakers' knowledge and food recall scores; their educational level and attitude and knowledge scores; and family income and the homemakers' nutrition knowledge. There was also a positive correlation between the number of home visits by the aide and the homemakers' 24-hour food recall score.

A BIOCHEMICAL, DIETARY AND ATTITUDINAL ASSESSMENT OF
THE EFFECTS OF NUTRITION EDUCATION ON FAMILIES
ENROLLED IN THE EXPANDED NUTRITION
AND FAMILY PROGRAM

By

Donna Vivian Duff

A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

MASTER OF SCIENCE

Department of Food Science and Human Nutrition

1974

DEDICATION

In honor of my mother,
in memory of my father, and
in appreciation of Mr. Richard Smythe,
a family friend, whose guidance and
encouragement inspired me.

ACKNOWLEDGMENTS

This longitudinal study required the efforts of not one, but many individuals. The people who cooperated in this venture are truly appreciated.

Sincere appreciation is extended to my committee members:

To Dr. Portia Morris, my major professor, for her patience, encouragement and guidance from the beginnings of research to final thesis preparation.

To Dr. Wanda Chenoweth and Dr. Gordon Thomas for their excellent suggestions and help in the revision of this thesis.

A very special thanks goes to Dr. Verda Scheifley, without whose expert advice in statistical analysis would have left me floundering amongst the figures. Also, a thanks to Dr. Jo Lynn Cunningham for her words of wisdom, as she served as a backbone in guiding our research efforts.

My traveling companions and co-workers were many during these past two years, yet all sincere and dedicated graduate assistants:

A round of applause goes to my fellow urine sample collectors: Mary Kerr and Joan Kazmarek, who waited for the last drop.

The second team of researchers held up the rear as they diligently followed in our steps with interview statements in arm. Thanks goes to Sue Schram, Beverly Eubank, Dottie Gietler, Maureen Good and others that pitched in: Mary Andrews, Ann Wilson, Cynthia Graham

and Judy Vertalka.

Sincere appreciation is expressed to these professors who gave me further insight into this research: Dr. Dale Romsos, Dr. G. Leveille, Dr. Olaf Mickelsen, and Dr. Rachel Schemmel.

Others whose input was crucial to the final execution of this study was our lab technician, who was able to analyze the tiniest of samples, Kathy Muiruri, and our quality checker, Odessa Bogen, who was able to decipher the worst of handwritings. Also my thesis writing was carefully checked by my loyal roommate, Rosilyn Andrews.

My heartfelt appreciation goes to all of the aides and home economists for their cooperation in letting us interview their families. Also to the hundreds of families who welcomed us into their homes.

Finally, a thanks to all the consenting urine donors, but this does not slight all of those wonderful people who tried, but couldn't give----

Thank you, thank you, thank you anyway.

TABLE OF CONTENTS

	Page
LIST OF FIGURES AND TABLES	vii
 Chapter	
I. INTRODUCTION	1
Objectives	3
II. REVIEW OF LITERATURE	4
Expanded Nutrition Programs	4
Dietary Status	6
Dietary Intakes	10
Riboflavin	10
Thiamin	12
Urinalysis	13
Riboflavin	13
Thiamin	13
Creatinine	14
Nutrition Information	15
III. METHODOLOGY	18
The Sample	18
The Instrument	18
Data Collection	20
Measurement of Variables	22
Hypotheses	24
Procedures for Analysis of Data	26
IV. RESULTS	27
Hypothesis I	27
Hypothesis II	42
Hypothesis III	45

Chapter	Page
V. DISCUSSION	46
Summary and Conclusions	51
Implications	52
Suggestions for Future Research	53
BIBLIOGRAPHY	54
APPENDICES	61
Appendix A. Instrument I - Phase I (pre-test)	61
Appendix B. Instrument I - Phase II (post-test)	66
Appendix C. Instrument II - Phase I and II (pre- and post-test)	72
1. Nutrition Attitudes - Part I	72
2. Nutrition Knowledge - Part IV	73
Appendix D. Other	74
1. Permission Slip	74
2. Referral Slip	75

LIST OF FIGURES AND TABLES

Figure	Page
1. Geographical location of counties researched	19
 Table	
1. Differences between treatment and control	28
2. Number of families, residence, and ethnic background of Michigan and Project families	28
3. Age of homemaker and family size and income per month	29
4. Educational levels of homemakers	30
5. Type of aid received and amount	31
6. Food preparation equipment and utilities available to homemakers	32
7. Homemakers meeting Basic Four standards	32
8. Adequacy of food group from 24-hour food recalls	33
9. Percentage of homemakers achieving various food recall scores	34
10. Thiamin excretion levels by age	35
11. Riboflavin excretion levels by age	36
12. Grocery shopping data	37
13. Money spent on groceries per month	38
14. Factors influencing food purchases	40

Table	Page
15. Nutrition statements inappropriately responded to by one-half or more of the homemakers	41
16. Correlation matrix between 14 variables	43
17. Correlation matrix of program variables	44
18. Program variables of the treatment group	45

CHAPTER I

INTRODUCTION

As an aid to visualizing the situation, suppose we compress the supposed 500 thousand years of man's development into fifty years, comparable to our own lifetimes. On this time scale it took man forty-nine years to get over being a nomad, and to settle down to organized communities. It took him even longer to get his first pair of pants and first eating utensils and many other things we consider time-worn characteristics of man. About six months ago a few men first learned to write; two weeks ago the first printing press was built. Only within the last three or four days have we really understood how to use electricity, around which so much modern civilization is built (Elvehjem, 1957).

And within the very last day have come such amazing things as radio, television, diesel locomotive, rayon, nylon, sulfur drugs, penicillin, bookkeeping, electric computers and food processing...jet planes, a dozen new antibiotics and hormones, T.V. dinners, instant coffee and the release of atomic energy all came into the picture since breakfast (Elvehjem, 1957). Over all these years man had a basic biological problem of feeding himself adequately for survival. Today, although food is more readily available, man has the problem

of selecting foods that would comprise an adequate diet.

During the first half of this decade, we are faced with the paradox of knowing how much we do not know, and of realizing what enormous jobs lie ahead of us if we are to achieve our goal of adequate nutrition for every human being (Pearson, 1972). The Expanded Nutrition Programs throughout the United States provide one attempt to cope with this problem.

The Expanded Nutrition Program, existing in all 50 states, Puerto Rico and the Virgin Islands, is concerned with that portion of the population that is nutritionally at risk as a result of poor dietary intake--the low income population. However, high income alone is no assurance of good diet (Kelsey, 1969; Heimstra, 1972). There is no single solution. Since poor nutrition has a direct influence on the physical well being of our people, as well as a potential risk for the mental well being of populations, there are great implications for nutrition education.

Increased urbanization, greater mobility and new modes of living have caused changes in the United States food habits, with some adverse effects on the dietary intake of the population. Even with increasing per-capita income, the diets are decreasing in nutritional value (Parrish, 1971). The need for nutrition education at all income levels, especially low income, is growing.

The Expanded Nutrition Program is a means of communicating and distributing nutritional information. Paraprofessionals teach homemakers on a one-to-one basis. The challenge of influencing food habits

is a difficult one; however, the cultural gaps are lessened by these homophilous change agents (Splindler, et al., 1967).

Since nutritional studies have indicated relations between poverty, diet and growth achievement, and biochemical evidence of sub-optimal nutrition (Owen, et al., 1969), the evaluation of a nutrition program should encompass some of these parameters. This study includes measurements of urinary thiamin and riboflavin excretions, as well as a dietary evaluation. Height and weight measurements of pre-school children were included and will be reported in a later study. An attitudinal evaluation and test of nutrition knowledge is also examined.

Objectives

This study has two primary objectives: First, the goal is to measure the influence of contact by the nutrition aides on diets, food habits, and the homemakers' nutrition information and attitudes. Secondly, the results of this study are intended to provide information for future development of educational materials for homemakers of the ENP and for the strengthening of the existing program.

CHAPTER II

REVIEW OF LITERATURE

Expanded Nutrition Programs

Expanded nutrition aides can be either paid workers or volunteers trained and supervised by professional home economists to establish contact with hard to reach low income families and to teach them better ways of homemaking. The aides are used to bridge the gap and to extend the efforts of the professional home economists (Spindler, et al., 1967). The aide is generally indigenous to community or neighborhood with a prime quality--the ability to identify and communicate with the needy family (Frye, 1971).

In 1970 over 7500 aides were working with over 500,000 families. Approximately 60% of the aides worked in urban areas and the average aide completed the 11th grade. Usually an aide has a caseload between 40-45 families (Fleming, 1970).

The primary objective is to help the families acquire the knowledge and skills necessary for attaining a more adequate diet. More specifically, the aim is to help increase the family knowledge of the needs and essentials of good nutrition. A focus is on improving their ability and practices in selecting and buying foods and

preparing and serving them. A supportive objective is to increase participation in food assistance programs (Frye, 1971).

Studies have reported favorable results on the progress of this program. Some of the ways that homemakers were helped by aides are in this decreasing order of value to the homemaker: meal planning, preparation of recipes, shopping for food and saving money, better housekeeping, helping to gain self-confidence, getting children into lunch programs, getting food stamps and other needs (Prichard and Hall, 1971).

In Puerto Rico other achievements encompassed an increase in awareness that the consumption of the Basic Four was a means of keeping healthy. This knowledge increased with length in the program (Frye, 1971). Also there was an increase in the number of servings of food in each Basic Four group after a 6 month interval, an increase from 51% to 69% of the homemakers were reported as having at least one serving from each of the Basic Four, and an increase from 7% to 15% were reported as having all the recommended number of servings for each group (Fleming, 1970).

In another Expanded Nutrition Program study in Louisiana it was found that after 12 months the greatest improvement in consumption was in fruits and vegetables, followed by milk, bread and cereals, then meat. As the number of group visits increased, there was a significant increase observed in the consumption of fruits and vegetables. This correlation was not observed for the number of home visits. However, there was a positive correlation between the number of home visits and

consumption in the milk and the bread and cereal groups (Verma and Jones, 1973).

Dietary Status

A significant proportion of the United States population have dietary intakes below one-half of the Recommended Daily Allowances (RDA) and biochemical tests have revealed deficiencies (Davis, et al., 1969). In another nationwide survey on food consumption, more than 50% of the subjects had less than the recommended allowances (Kelsey, 1969). Consumption studies corroborate the initial observation based on medical studies: There is a high incidence of malnutrition among the poor (Citizens Board, 1968). It is believed that the poverty child is more "at risk" nutritionally than other youngsters (Owen, et al., 1969).

Retardation in physical growth development was found to depend upon family dietary practices and on the occurrence of infectious diseases. It was not related to differences in housing facilities, personal hygiene, proportion of total income spent on food, or other indicators of social and economic status. Hunger for food overrides hunger for knowledge in the form of listlessness, fights over food, inattentiveness, acute hunger pangs, withdrawal, a sense of failure (Citizens' Board, 1968).

To further compound the problem of hunger a problem which conservatively affects 10 million Americans (Citizens' Board, 1968), many changes in the United States food habits have an adverse effect on the nutritional status of the population. These changes are urbanization, greater mobility, and new modes of living. Such a relation

poses strong possibilities of further diet deterioration. In fact, changing food habits was the reason suggested for the decrease in the number of diets identified as (good) from 60% to 50% between 1955-1965 and for the rise in poor diets from 15% to 20% during that same period (Chassey, et al., 1967; Parrish, 1971).

The highest percentage of inadequate diets are among the lowest socio-economic levels (Schuck, 1972; Hardy, et al., 1943; Hinton, et al., 1963; Hendel, et al., 1965). The Ten State Nutrition Survey also confirmed this observation. Low economic levels of both black and white people showed diets deficient in important nutrients (Morgan, 1959). All available evidence from the Citizens' Board of Inquiry (1968) indicated incidences where malnutrition correlated directly with income levels. Other investigators also found that adequacy of diets increased with income (Adelson, 1965; Hendel, et al., 1965); however, Kelsey (1969) and Metheny, et al. (1962) point out that high income alone is no assurance of good diet.

As computed by the Economic Resource Service from the United States Department of Congress, the average amount spent on food has decreased from 20% of disposable income in 1960 to less than 17% in 1970. This figure is based on data from the entire country (Bunting and Le Bovit, 1970). The Expanded Nutrition Program families investigated by Frye (1971) between September 1969-70 reported the average monthly income as \$242, with \$84 spent on food or approximately 35% of their income. One would be prone to admit that America today has malnutrition of varying degrees, only loosely associated with income

(Heimstra, 1972) so that only at the bottom of the economic scale is lack of funds a dominant factor in determining nutritional status (Henderson, 1972).

Food habits are influenced by many factors. Age, sex, ethnic and educational backgrounds are all a part of the picture. Nutrition education usually involves efforts to influence food habits, and ideas of sectors of culture which are often deeply rooted in custom, linked to emotional predispositions and resistant to change (Wellin, 1955).

Although dietary inadequacy is common to all ages (Hardy, 1943), age has a highly significant influence on food habits. Younger students were found to have better eating habits than older students in a study by AuCoin in 1972. A study on homemakers up to the age of sixty indicated that homemakers under 40 did a better job of feeding their family than did middle aged homemakers. The percentage of homemakers using milk products in the home decreased as their age increased (Young, et al., 1956). This same trend was also reported by Cornelly, et al. (1963).

The teenage years nutritionally are a vulnerable time and teenage marriages are on the increase. In a study done by De Mark (1971) on teenage marriages, calcium and riboflavin intake were markedly decreased because of low milk consumption. The milk group normally supplies three-quarters of the daily intake of calcium and one-half of the riboflavin.

A positive relation was found between the education of the homemaker and the food scores (Young, et al., 1956; AuCoin, et al., 1972). Morse, et al. (1967) found an increased level of education

meant better knowledge of nutrition. Other studies looked at the different educational levels and found a direct relationship was consistent only between the highest and lowest levels (Davis, et al., 1969). The teenage study of De Mark (1971) found no significant differences--all the families consumed low amounts of fruits and vegetables. Other investigators found positive correlation between educational level and Vitamin C intake (Hendel, et al., 1965; Morse, et al., 1967; Davis, et al., 1969; Lund and Burk, 1969).

Investigators cannot determine nutritional status from dietary intake alone (Hunscher and Mackey, 1951). The 24-hour food recall is a record of all foods consumed in one day. Some studies indicate that a one-day recall can be used to determine the characteristic of food used for groups (Morgan, 1959). Lund and Burk (1969) compare food recall to food records and suggest that the data, although not in complete agreement, varies only slightly. In this regard, as Young, et al. (1952) point out, a 24-hour recall can be substituted for the 7 day food record in estimating group intakes.

In relationship to fieldwork, no one technique gives a completely reliable pattern of the characteristic of the individual (Trulson and McCann, 1959). The main weakness of the 24-hour recall is that it measures only one day. A repeated 24-hour recall history can be a valid aid if repeated 8 or more times to reduce error (Balough, et al., 1971). In conclusion, consumed diets should not be the only factor considered in diet deficiency (Levertson, 1960) and the 24-hour recall at best is only a means of checking the usual intake for a given interval. The recall may be justified when only limited

time, money and personnel are available, but it is inadequate when correlated on a longitudinal basis (Beal, 1967).

Some studies have indicated that seasonal variances are evident in the incidence of "poor diets" or those falling short of two-thirds of the Recommended Daily Allowance (RDA). For instance, in the North Central region the spring has the highest percentage of poor diets at 21% where the other three seasons are at about 18% (Beloian, 1971). However, most studies indicate that the influence of seasons is not significant on large scale studies (Morgan, 1959; Eppright, et al., 1970). There was even no significant differences between fall and spring intake for the majority of nutrients (Lund and Burk, 1969).

Although the Citizens' Board of Inquiry into Hunger and Malnutrition in the United States (1968) felt that the participants in the Food Stamp Program did not get enough money to secure an adequate diet, they felt strongly that the real problem was getting more people to participate in the program. The important concept was showing the low income family that food stamps will help them buy more food.

Other studies indicated a definite improvement in dietary patterns followed by a marked increase in food stamps (Hardy, et al., 1943). Spindler, et al. (1967) and Heimstra (1972) both confirmed a substantial improvement of certain food and nutrients consumed by stamp recipients.

Dietary Intakes

Riboflavin

Numerous studies have indicated dietary riboflavin deficiencies

in different portions of the population. Riboflavin levels were found low among low income children in Honolulu (Brown, et al., 1970), in poverty groups, children and youth (Henderson, 1972), in Negro migrant workers in New York (Kelsey, 1969), in non-Latin white subjects (McGanity, 1969), among preschool children (Methany, et al., 1962) and in Iowa women over 30 (Swanson, 1959).

The Ten State Nutrition Survey (1972) showed riboflavin excretion level values lower for blacks than either whites or Spanish Americans. The mean values were low in the low income ratio states. The highest percentage deficient or low was the 17 year old and younger age group. Data suggests a potential problem of riboflavin nutriture.

Other studies of urinary riboflavin excretions have noted different correlations. Henderson (1972) found riboflavin deficiency decreased with age whereas Meyers, et al. (1962) had evidence of riboflavin deficiency to increase with age. Bailey (1970) correlated dietary intakes of riboflavin directly to income level.

Beal (1955) indicated that riboflavin closely paralleled the graph of milk intake. Stitt (1960) suggested that an increase in riboflavin in the last 50 years is attributed to enrichment of grain products and increased consumption of dairy products. The Ten State Nutrition Survey (1972) indicated that dairy products were the source of 61% to 70% of the riboflavin in the diets of infants and young children. Adults, pregnant women and older persons received about three-quarters of riboflavin intake from milk, meat and cereal grains.

Thiamin

Thiamin was more often found adequate as the Ten State Nutrition Survey (1972) indicated no nutritionally significant problem with this nutrient, and Brown, et al. (1970) showed excretion of thiamin to be adequate for those with dietary supplements. Some studies, however, indicate a deficiency of thiamin. In a study of preschool children, Metheny, et al. (1968) showed thiamin and calcium the least well supplied of all nutrients, whereas riboflavin was below the RDA in only a few diets. McGanity (1969) found a low percentage of thiamin twice as frequent among non-Latin white subjects as compared to Mexican and Negro Americans. In a study of 209 California families, thiamin levels fell below two-thirds of the RDA for more than 12% of the families (Shapiro, 1962). Bailey (1970) in a study of Spanish speaking Americans found dietary thiamin and riboflavin levels to be low.

The trends for thiamin as reported by Parrish (1971) showed increases of thiamin with increases in per capita income. Meyers, et al. (1968) show a tendency of thiamin deficiency to decrease with age. This is confirmed by the Ten State Nutrition Survey (1972) with the exception of the age group between 10 to 16 years where the deficiency is the greatest.

Stitt (1960) reports flour is a main source of dietary thiamin enrichment. Arroyave, et al. (1964) concludes that an increase in the intake of calories and carbohydrates increases thiamin levels.

Urinalysis

Riboflavin

A difficulty in the determination of riboflavin in serum and red blood cells had restricted its evaluation to determination of urinary excretion in terms of micrograms of riboflavin per gram of creatinine (Krehl and Hodges, 1965). Urinary excretion of riboflavin varies with the amount of vitamin consumed. The use of random non-timed specimens with the riboflavin analysis related to the creatinine excretion can be used (Lowry, 1952; Stearns, et al., 1958). Some studies have indicated an apparent relationship between riboflavin and positive or negative nitrogen balance (Pollack, et al., Windmueller, 1964).

Thiamin

At present the most useful biochemical index of thiamin intakes in human population groups is the measurement of the urinary excretion of thiamin (Pearson, 1962). The percentage of available vitamin, which is excreted in urine is a function of how great an excess is present (Melnick, et al., 1939). The excretion of thiamin is related to the amount available to the tissues and this amount may be considered as an indicator of the immediate availability of the supply of that vitamin (Benson, et al., 1942). The output of thiamin in urine was directly and linearly correlated with intake (Elson, 1942; Mickelsen, et al., 1945) except for very low levels of intake (Kelsey, 1969).

The determination of thiamin as micrograms per gram of creatinine indicates that the ratio of thiamin to creatinine is fairly

consistent and could be used as a 24-hour ratio for a rough estimate of the thiamin nutrition of the subjects (Louhi, et al., 1952). Urinary excretion best describes thiamin status of large groups (Lowry, 1952; Tanphaichier, et al., 1970).

Creatinine

It is usually considered difficult and troublesome to obtain accurately timed urinary collections, especially under the conditions of field surveys. Therefore, great convenience results from the use of non-timed urine specimens in which the riboflavin or thiamin content is related to the creatinine excretion. The creatinine being a measurement on the same specimen (Lowry, 1952). An additional advantage is that use of creatinine as a basis tends to correct for size of the individual (Plough and Cousolano, 1959). The practical validity of this is confirmed in two studies, Adamson, et al. (1945) and Aykroyd, et al. (1949), which show this method to be not only the simplest, but makes a more rational basis for calculating the 24-hour excretion.

Determining the excretion of vitamins in relation to creatinine in urine is an especially helpful tool in the nutrition surveys of large groups (Krehl, et al., 1965; Plough and Consolano, 1959). It minimizes the effect of the timing of collection periods. From a single random 24-hour sample, a rough estimate of the nutritional status of a population can be obtained (Clark, et al., 1966). With large groups the basal excretion can be indicative since individual variances tend to cancel out and the low values become meaningful (Lowry, 1952). There is better than a 1 to 100 probability that

daily creatinine will vary no more than 7.5% around the mean; therefore, creatinine excretion serves to be an excellent check on completeness of urine collection (Vestergaard, et al., 1958).

Since creatinine excretion varies with age, it is imperative to use separate interpretative guides (Kelsay, 1969; Pearson, 1962). These guides are standardized for both riboflavin and thiamin in micrograms of vitamin per gram of creatinine in the Interdepartmental Committee on Nutrition for National Defense (ICNND) tables (1963).

Nutrition Information

Kilander (1964) believes man is an easy victim of superstition and fear about anything for which he lacks facts. This applies especially to matters of health and nutrition. Since the science of nutrition is so relatively new, it is to be expected that many people do not know the facts about nutrition and, therefore, often hold misconceptions and believe in old wives' tales. People do not realize that their ideas are superstitions. He states that the American public has slowly become better informed about nutrition during the period 1936-63. He has found that no age group is sufficiently informed. Also he noted that better informed women tended to eat more wisely.

Many studies concurred that nutrition knowledge is significantly correlated with education (Eppright, et al., 1969; Blitz, 1971; Johnson, 1971). Blitz and Johnson also found nutrition education to negatively correlate with age. However, Blitz found a positive correlation with income level. Eppright showed mothers of

children whose diets were low nutritionally had a relatively low level of nutrition knowledge. (Quinn (1971) found a significant correlation between the number of school age children in the family and the level of nutrition knowledge of the mother.

There seemed to be a number of incidences of increased knowledge by increasing the use of milk products, and the Basic Four (Young, et al., 1956). However, in a study by Breeling (1971), most women surveyed thought they were doing a good job of meeting nutritional needs and that good nutrition was important, but when asked to describe a balanced meal, only 50% came close.

The mothers that Eppright, et al. (1969) found to score low in the area of nutrition knowledge also had relatively unfavorable attitudes towards meal planning, and highly permissive attitudes toward the eating behavior of their children. Another study done on 163 preschool children categorized mothers into two groups--Type I and Type II. Type I mothers were characterized by higher socio-economic status and exhibited more equalitarian attitudes toward child rearing. Type II mothers were of lower socio-economic status and exhibited greater authoritarianism. Children of Type I mothers had an increased calcium and ascorbic acid intake. Their mothers considered nutrition important, and their nutrition test scores were higher. Children of Type II mothers had an increase in the intake of calories, carbohydrates and iron and thiamin (Sims, 1971).

Studies on nutritional status of people have indicated the need for nutrition education. The way of dealing with the presentation of this information is crucial. Bailey (1970) notes that

nutrition educators working with groups of various cultural backgrounds must strive to maintain integrity and pride of the culture being assisted. Knowledge and understanding of the population's food habits and beliefs improve overall success.

Adelson (1965) feels that nutrition education needs to intensify: (1) helping the homemaker choose wisely, (2) emphasis of milk consumption, (3) helping low income use less expensive foods, (4) developing programs at different age levels, and (5) guiding teenagers in the selection of snacks. Lamkin, et al. (1970) feels most homemakers as shoppers need more knowledge on enrichment and qualities of food. Parrish (1971) indicates only a massive program of nutrition education and food fortification and enrichment for the entire population will change the direction of the United States' diets to a more adequate level.

Meyers (1970) believes that by combining education, economics and psychology together, these three will have leverage greater than the sum of the three applied separately in bringing about change in the homemaker. Lackey (1971) suggests nutrition education be made more personal and dramatic. The homemaker is an important figure in the household. She is the challenge because if change comes, it must be initiated by her personal incentive (Heimstra, 1972).

CHAPTER III

METHODOLOGY

The Sample

The original selection of 300 Expanded Nutrition Families came from a random selection of five Michigan counties, plus a small sample from the Detroit area (Wayne County). The five counties included: Lenawee, Saginaw, St. Joseph, Kent, and Jackson counties (Figure 1). The reason for the selection of a large sample was to compensate for the expected drop-out rate in the program. To control for any bias within our sample, only new and consecutively enrolled families were visited in each county.

As a means of controlling for variables other than those of the Expanded Nutrition and Family Program (ENFP), a control group was visited. The group was composed of low income families from the area of Lansing and vicinity (Figure 1). Thus, the ENFP are designated as the "treatment group" and the non-ENFP are the "control".

The Instrument

There were two instruments developed for this study. The instrument presented at the first interview asked the following types of questions: demographic data, the homemakers 24-hour food recall,



Figure 1. Geographical location of counties researched.

shopping practices, use of vitamin supplements, food preparation and storage equipment available (Appendix A).

The second instrument was presented at a second interview that followed approximately one week later. The homemaker responded to a series of statements. The statements were divided into four specific areas: Part I--Nutrition Attitudes, Part II--Child-Rearing Attitudes, Part III--General Social and Educational Attitudes, Part IV--Nutrition Information. Only Part I and Part IV will be analyzed in this study (Appendix C-1 and C-2).

The statements were adapted from various nutrition studies for this project. The Parental Attitude Research Instrument developed by Schaefer and Bell (1958) as well as other sources (Lund and Burk, 1969; Sims, 1971) were the basis of the attitudinal instrument. Test-retest reliability was .785 for the nutrition attitudes, and .803 for the nutrition knowledge statements on a sample size of 16.

Data Collection

Project directors and researchers visited with the Home Economists and aides of each county before initiating the interviews in order to secure cooperation. Small skits were performed involving researchers and aides as one means of projecting the nature of the interviews, familiarizing the aides with the project and emphasizing the cooperation needed between the researchers and aides.

The project procedures were executed in a specified manner. The aides enrolled families as usual. The first team of researchers accompanied the aide on her next visit to the family. The aide was

instructed to make only limited contact with the families after enrollment and prior to the researcher's interview. Written permission of the homemakers to participate in the project was secured by the first researchers on their first visit (Appendix D-1).

Urine samples were collected from all available family members. The specimens were tested immediately for hemoglobin, ketones, glucose, albumin, and pH by the use of Labstick reagent strips from Ames Company, a division of Miles Laboratory. The purpose of this immediate testing was specifically to offer the family a service and encourage their participation. If the test result was abnormal, there was a special form provided to the homemaker referring the test result to her physician (Appendix D-2). The urine samples were collected and poured into bottles, acidified with 1 N HCl at 5 ml HCl per 50 ml urine. They were returned to the University where they were frozen and stored until analyzed.

Heights and weights of the preschool children were taken at this time. The analysis of this data will be covered in a future study. Demographic data were collected at this time, as well as information about shopping practices (Appendix A). The last procedure of the first interview was scheduling an appointment for the second interview--usually for the following week. At the second interview, the homemaker was asked to indicate whether she strongly agreed, mildly agreed, strongly disagreed, or mildly disagreed with each statement as read (Appendix B).

Collection of data began in November of 1972 and continued until May of 1974. During this period all available families who were

visited the first time for the pre-test were revisited after a six to nine month interval. The first administration of these interviews was considered the first phase or pre-test. The second administration which occurred after a specified period was the second phase or post-test. Instrument I in Phase I and II was essentially the same with a few minor additions to Phase II to secure more data (Appendix A and B). Instrument II for both phases had only the sequence of the statements altered. The same procedures were employed for the control group.

Measurement of Variables

Data was examined on the 163 experimental and 30 control families which had complete pre- and post-data. Analysis was made on the urine samples for thiamin and riboflavin and creatinine. Creatinine was determined by the Technicon Auto-Analyser method N-11b I/II. Thiamin was initially analyzed by Leveille's (1972) three tube method; a later modification was made to a two tube method (Muiruri, et al., 1974). The second method proved to be simpler and equally accurate. Riboflavin was determined by Pelletier and Madère's automated method (1970). Both riboflavin and thiamin were calculated as micrograms of vitamin per gram of creatinine. The levels were described as high, adequate, low and deficient, using the standards of ICNND (1973), appropriate to the specific age group. The individual scores were further computed for a family average.

The demographic data included residence location, age and ethnic background of the homemaker, family size and income, financial aid received by the family. Information on grocery shopping practices,

money spent on groceries, use of vitamin supplements, and availability of equipment for food preparation and storage was included. The educational background of the homemaker was recorded by grade level.

The homemaker's 24-hour food recall was compared to the Basic Four adult standard. The method of scoring was by assigning values to each food group. Each group was given a maximum of four points, a total of 16 represented 100% of the total Basic Four requirements. In the meat and milk groups each serving was equivalent to two points each, since the recommendation for the group was two servings per day. For the bread and cereal, and fruit and vegetable groups, each serving was equivalent to one point each. The Basic Four recommendation is four servings per day from these groups. This way of assigning points enabled the researcher to better define the homemaker's food recall. A score of eight meant she met three-quarters of the requirement. No extra points were given if the number of servings exceeded the recommendations of the Basic Four.

The nutrition attitude scores were evaluated on a continuum ranging from laissez-faire to planning. Laissez-faire denotes an attitude of little or no planning, whereas an attitude of planning indicates a more structured organizational approach to nutrition. Values were assigned to each item. A value of a four reflected an attitude of planning nutrition, a value of one reflected a laissez-faire attitude. The responses for all items were averaged to compute the nutritional attitude score (Appendix C-1).

The nutrition knowledge statements were analyzed by a group of food and nutrition specialists and graduate assistants (Appendix C-2).

The most appropriate response to each statement was given a value of four; the next most appropriate, a value of three; the two least appropriate responses two and one. The homemaker's score was determined by computing a mean of her responses. The statements were also individually analyzed with regard to the statements most correctly answered and least correctly answered.

The program variables were as follows: number of months in the program, number of home and number of group visits. During the interval between the pre-phase and post-phase, the aides visited the homemakers. Home visits were those in the home with a direct contact between the aide and homemaker. Group visits involved more than one homemaker, either in a home or in a workshop within a community. The number of months in the program was determined from the date of enrollment to the first visit of the post-phase by the researcher.

Hypotheses

The study was designed to objectively measure the progress of ENFP Families over a 6 to 9 month period. There are also subjective measurements which enhance the evaluation process. The preciseness of the objective, as well as the implications of the subjective, measurements are therefore indicative of a profile of progress in the ENP. This profile of homemakers in the control and treatment group will be compared. Thus the following hypotheses are developed:

- I. H_0 There is no difference between the control and treatment groups on the following variables at either the pre- or post-phase: food recall, thiamin and

riboflavin excretion levels, nutrition attitude scores, nutrition knowledge scores, and demographic data.

H_a There is a difference between the control and treatment group on the following variables: food recall, thiamin, and riboflavin excretion levels, nutrition attitude scores, nutrition knowledge scores, and demographic data.

II. H_o There is no relationship between the family excretion levels, the homemakers food recall, nutrition knowledge, and attitude scores, age of the homemaker, education level, income per family, and income per family member.

H_a There is a positive relationship between the family excretion levels, the homemakers food recall, nutrition knowledge, and attitude scores, age of the homemaker, education level, income per family, and income per family member.

III. H_o There is no difference between the program variables and the homemaker's food recall, nutrition knowledge and attitude scores and family excretion levels pre and post in the treatment group.

H_a There is a difference between the program variables and the homemaker's food recall, nutrition knowledge and attitude scores and family excretion levels pre and post in the treatment group.

Procedures for Analysis of Data

There were 163 experimental families and 30 control families with complete pre-and post-data for use in this study. Complete data indicates no information missing on any item of any of the questionnaires either pre or post. The main reason for the sizable decrease in program families from 300 in Phase I to 163 in Phase II was the dropout rate. This dropout was mainly attributed to the mobility of the families and, to a lesser extent, lack of interest in the ENFP.

The variables used in analysis were formed by computer programs written for the project by the research unit of the College of Human Ecology. The analysis program used to test the three hypotheses of this study was Multivariate, a library program on the Control Data Corporation (CDC) 6500 model computer at Michigan State University.

The statistical process used to test Hypothesis I was multivariate analysis of covariance (Scheifley and Schmidt, 1973). Correlation analysis was used to test Hypothesis II and III.

CHAPTER IV

RESULTS

Hypothesis I

For Hypothesis I, the treatment and control groups were found to be similar for the following variables: food recall, thiamin, riboflavin, nutrition attitudes and knowledge. Thus, the null hypothesis (H_0) cannot be rejected (* $F = .98$, **d.f. = 22, 238, *** $p < .49$). Also, demographically, the treatment and control groups were very similar for the following variables: income, age and educational level of the homemaker and family size. The null hypothesis is not rejected ($F = 1.47$, d.f. = 8, 374, $p < .17$). The families who dropped out of the program between the first and second phases of the study had no significant differences in relation to the families who remained in the program ($F = 1.17$, d.f. = 14, 251, $p < .30$). (Table 1) The dropout rate was higher in the treatment group--almost one-half. The dropout rate for the control group was only 17%.

The treatment group was demographically very similar to the families in the total Michigan Expanded Nutrition and Family Program. (Table 2) Slightly over half of the homemakers were Caucasian. The

* F - Ratio for multi variate test of equality of mean vectors.
**d.f. - degrees of freedom.
*** p - probability.

balance were mostly Negro and about 12% were Spanish-American.

Table 1. Differences between treatment and control.
(Treatment N = 163, Control N = 30)

<u>Variables</u>	<u>F-ratio</u>	<u>d.f.</u>	<u>p is less than</u>
Measurement	.98	22, 338	.49
food recall			.94
thiamin			.15
riboflavin			.09
nutrition attitudes			.76
nutrition knowledge			.29
Demographic	1.47	8, 374	.17
Dollars per family member			.45
Homemaker's age			.05
Number of family members			.14
Educational level			.38
Dropout families	1.17	14, 251	.30

Table 2. Number of families, residence, and ethnic background of Michigan and project families.

	<u>Mich. ENFP</u>	<u>Treatment</u>	<u>Control</u>
No. of families	8,883	163	30
Residence	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>
Urban	76.50	84.66	83.33
Rural		14.72	13.33
Farm		.61	3.33
Ethnic Background			
Caucasian	55.50	58.28	60.00
Negro	34.5	28.83	30.00
Spanish-American	8.1	12.27	10.00
Others	1.9	.61	0.0

The mean age of the homemakers was 29 years in the treatment group. The range extended from the teen years to the mid-seventies. Seventy-five percent of the homemakers were between 20 and 36 years of age. Family size ranged from one member up to fourteen members. The average family had approximately four and one-half members. The average monthly income was approximately \$392 per family, and \$97 per family member in the treatment family post-phase. The family income showed about a 30% increase during the six to nine month interval between visits. (Table 3) The average number of school age children was 2.5.

Table 3. Age of homemaker and family size and income per month.
(Treatment N = 163, Control N = 30)

	<u>Mean</u>	<u>S.D.</u>	<u>Range</u>		
Age of Homemaker					
Treatment	29.36	9.85	16	76	
Control	33.70	8.72	19	62	
Family Size					
Treatment	4.56	2.06	1	14	
Control	5.40	2.02	2	11	
Family Income					
Treatment					
Pre	Total	\$359.64	\$147.42	\$ 20	\$ 882
	Per Member	\$ 89.92	42.62	\$ 5	\$ 250
Post	Total	\$391.78	\$166.17	\$ 38	\$1100
	Per Member	\$ 96.58	\$ 46.19	\$ 8.40	\$ 300
Control					
Pre	Total	\$450.80	\$189.44	\$194	\$ 990
	Per Member	\$ 88.31	\$ 31.99	\$ 41	\$ 190
Post	Total	\$463.80	\$234.90	\$143	\$1224
	Per Member	\$ 91.14	\$ 40.95	\$ 21	\$ 200

The education of the homemakers ranged from no formal education to beyond high school. The mean grade attained was tenth. The greatest number of homemakers (51.83%) had at least some high school education. (Table 4)

Table 4. Educational levels of homemakers.
(Control N = 30, Treatment N = 163)

<u>Grades</u>	<u>Percent Treatment</u>	<u>Percent Control</u>
No Education	1.83	0.0
2	1.22	0.0
3	1.22	3.33
4	1.22	0.0
5	3.05	3.33
6	1.22	0.0
7	1.22	10.00
8	8.54	10.00
9	9.76	3.33
10	9.76	10.00
11	19.51	13.33
12	15.24	30.00
Beyond High School	7.32	10.00
Mean	10.00	9.4
S.D.	2.67	3.57

The treatment and control group also closely paralleled the Michigan Expanded Nutrition and Family Programs in the type of aid received. The majority of the families received assistance through welfare--usually Aid to Dependent Children (ADC). The second greatest assistance program was food stamps. Over 50% of the families who received welfare were also receiving food stamps. By far most families were receiving aid from at least two sources. (Table 5)

Table 5. Type of aid received and amount.

	<u>Mich. ENFP</u>	<u>Treatment</u>		<u>Control</u>	
		Percent		Percent	
		<u>Pre</u>	<u>Post</u>	<u>Pre</u>	<u>Post</u>
Type of Aid Received					
Stamps	67.00	58.90	51.53	53.33	53.33
USDA/FHA		3.07	1.28	0.0	0.0
Welfare	55.00	54.60	55.83	70.00	63.33
Social Security		4.29	2.45	10.00	6.67
Other		3.07	1.84	10.00	0.0
Number of Aid Categories					
None		26.99	34.97	23.33	33.33
One		23.93	18.41	23.33	10.00
Two		47.24	45.40	40.00	53.33
Three		1.84	1.23	13.33	3.33
	Mean	1.23	1.13	1.43	1.26
	S.D.	.87	.92	1.00	.98

For the majority of homemakers there appeared to be adequate cooking facilities. Over 95% of the homemakers had electricity, running water, a refrigerator, an oven and stove in working condition. Over 40% had electric frying pans available to them. About 20% had a separate freezer available. (Table 6)

According to the mean averages, the homemakers adequately met only two of their food groups. They met one-half of their requirements in an average of three of their food groups. Both homemaker groups tended to increase the number of adequate servings in the several food groups and improve the adequacy of dietary intake during the course of the study. (Table 7)

Table 6. Food preparation equipment and utilities available to homemakers. (N = 163)

	<u>Treatment</u>		<u>Control</u>	
	Percent		Percent	
	<u>Pre</u>	<u>Post</u>	<u>Pre</u>	<u>Post</u>
Stove	100.00	100.00	100.00	100.00
Oven	95.71	98.77	96.67	100.00
Hot Plate	5.52	12.27	6.67	16.67
Frypan	41.72	42.33	70.00	66.67
Freezer	19.63	20.24	31.03	40.00
Refrigerator	99.93	100.00	96.67	100.00
Icebox	.61	.61	3.33	6.67
Electricity	100.00	100.00	100.00	100.00
Running Water	99.39	99.39	100.00	100.00
Indoor Bath	100.00	98.16	100.00	100.00

Table 7. Homemakers meeting Basic Four standards.
(Treatment N = 163, Control N = 30)

	<u>Treatment</u>		<u>Control</u>	
	Percent		Percent	
	<u>Pre</u>	<u>Post</u>	<u>Pre</u>	<u>Post</u>
Totally Adequate Group(s)				
none	22.70	11.04	23.33	16.67
one	38.04	28.83	23.33	23.33
two	23.93	34.40	30.00	40.00
three	11.66	16.56	23.58	16.67
four	3.68	9.20	0.0	3.33
Mean	1.36	1.84	1.53	1.67
S.D.	1.07	1.12	1.10	1.06
One-Half Adequate				
none	1.23	0.0	0.0	0.0
one	9.20	.61	6.67	3.33
two	25.15	17.18	26.67	16.67
three	36.81	40.49	36.67	30.00
four	27.61	41.72	30.00	50.00
Mean	2.8	3.23	2.90	3.27
S.D.	.99	.75	.92	.86

The food group most often met was the meat group. Despite the rising meat cost occurring in the nation during this study, this group remained the most frequently met pre and post by the homemakers. The fruit and vegetable group, on the other hand, was most frequently inadequate. For this group, the homemakers in the treatment group showed the most improvement. The milk group and the bread and cereal group seemed to be at approximately the same adequacy level--about 40% post. However, in the milk group the increase was greater from pre to post. (Table 8)

Table 8. Adequacy of food groups from 24-hour food recalls.
(Treatment N = 163, Control N = 30)

	<u>Treatment</u>		<u>Control</u>	
	Percent		Percent	
	<u>Pre</u>	<u>Post</u>	<u>Pre</u>	<u>Post</u>
Meat	68.09	79.14	60.00	63.33
Milk	24.54	42.33	36.67	40.00
Fruits and Vegetables	13.50	22.70	20.00	16.67
Bread and Cereal	29.45	39.88	36.67	46.67

The diets were also analyzed in relation to a food recall score computed for each homemaker. The method for scoring was discussed in "Methodology", Chapter III. The homemakers score ranged from 2 to 16. The average homemaker had a score of 10, indicating she was meeting the Basic Four requirements ten-sixteenths of the time. There was a definite increase in these scores pre to post for both groups. (Table 9)

Table 9. Percentage of homemakers achieving various food recall scores. (Treatment N = 163, Control N = 30)

<u>Score</u>	<u>Treatment</u>		<u>Control</u>	
	Percent		Percent	
	<u>Pre</u>	<u>Post</u>	<u>Pre</u>	<u>Post</u>
2	1.23	0.0	0.0	0.0
3	2.45	0.0	0.0	3.33
4	3.68	3.68	6.67	0.0
5	3.68	1.84	6.67	3.33
6	10.42	3.07	13.33	3.33
7	12.27	7.36	6.67	6.67
8	12.27	7.36	6.67	6.67
9	7.36	5.52	3.33	13.33
10	12.27	14.72	13.33	10.00
11	6.74	10.43	10.00	6.67
12	9.81	10.43	13.33	3.33
13	9.20	12.27	10.00	23.33
14	2.45	6.75	3.33	13.33
15	2.45	5.52	6.67	3.33
16	3.68	9.20	0.0	3.33
Mean	9.20	10.88	9.50	10.73
S.D.	3.26	3.17	3.31	3.20

Urine samples were obtained from all available, willing to participate members of the family. The majority of urine samples were from adults and preschool children because these were the family members in the home at the time of the interviews. The following tables indicate the results of the urinalysis. (Tables 10 and 11)

Thiamin excretion levels were found adequate for all age groups. The adequacy levels had a range from deficient to high (1-4). With the exception of four people in Phase I, all persons fell in the adequate and high range. The family mean was 3.97. (Table 10)

Riboflavin excretions on the other hand were not as adequate. The family mean was closer to a 3.1. Although the excretion levels were more toward adequacy than deficiency, a fair percentage of persons fell in the categories of low and deficient. Twenty-three percent in Phase I and fifteen percent in Phase II were in this category. (Table 11)

Table 10. Thiamin excretion levels by age, based on ICNND standards of adequacy. (4 = high, 3 = acceptable, 2 = low, 1 = deficient)

<u>Years of Age</u>	<u>N</u>	<u>Means and Standard Deviations</u>							
		<u>Treatment</u>				<u>Control</u>			
			<u>Pre</u>	<u>N</u>	<u>Post</u>	<u>N</u>	<u>Pre</u>	<u>N</u>	<u>Post</u>
1 - 3	43	M	3.91	21	3.95	3	4.00	3	4.00
		S.D.	.48		.22		0.00		0.00
4 - 6	53	M	3.98	71	3.94	14	4.00	10	4.00
		S.D.	.14		.23		0.00		0.00
7 - 9	14	M	4.00	15	4.00	15	4.00	19	4.00
		S.D.	0.00		0.00		0.00		0.00
10 - 12	8	M	4.00	9	3.89	12	4.00	12	4.00
		S.D.	0.00		.33		0.00		0.00
13 - 15	8	M	3.88	7	4.00	5	4.00	5	4.00
		S.D.	.35		0.00		0.00		0.00
Adults									
16 and older	154	M	3.98	157	3.97	35	4.00	35	4.00
		S.D.	.24		.18		0.00		0.00
Total	280	M	3.97	280	3.96	84	4.00	84	4.00
		S.D.	.27		.19		0.00		0.00

Table 11. Riboflavin excretion levels by age, based on ICNND standards of adequacy. (4 = high, 3 = acceptable, 2 = low, 1 = deficient)

<u>Years of Age</u>	<u>N</u>	<u>Means and Standard Deviations</u>							
		<u>Treatment</u>				<u>Control</u>			
			<u>Pre</u>	<u>N</u>	<u>Post</u>	<u>N</u>	<u>Pre</u>	<u>N</u>	<u>Post</u>
1 - 3	43	M	3.16	21	3.67	3	2.67	3	4.00
		S.D.	.95		.80		1.15		0.00
4 - 6	53	M	3.28	71	3.62	14	3.00	10	4.00
		S.D.	.93		.69		1.11		0.00
7 - 9	14	M	3.00	15	3.73	15	3.00	19	3.74
		S.D.	.88		.46		1.07		.56
10 - 12	8	M	3.63	9	3.67	12	3.08	12	3.58
		S.D.	.74		.71		1.08		.79
13 - 15	8	M	2.88	7	3.14	5	2.40	5	3.60
		S.D.	.99		.38		.89		.89
Adults									
16 and older	154	M	3.05	157	3.19	35	2.83	35	3.46
		S.D.	.90		.92		1.18		.89
Total	280	M	3.12	280	3.38	84	2.89	84	3.63
		S.D.	.91		.85		1.10		.74

Grocery shopping was predominately done by the mother with occasional help from the family. Approximately 16% of the time the father was involved. Almost 100% of the homemakers went to a supermarket for the majority of their shopping. (Table 12) Over 50% did all of their occasional shopping at supermarkets and 30% made use of small neighborhood stores.

For over 80% of the treatment families, the shopping facilities were less than five miles from their home. The main source of transportation was the family car or a ride from a neighbor, friend, or relative. (Table 12)

Table 12. Grocery shopping data. (Treatment N = 163, Control N = 30)

	<u>Treatment</u>		<u>Control</u>	
	Percent		Percent	
	<u>Pre</u>	<u>Post</u>	<u>Pre</u>	<u>Post</u>
Individual Doing the Shopping				
Mother	83.44	74.23	76.67	60.00
Father	7.36	6.13	0.0	6.67
Other Relative	.61	0.0	3.33	3.33
Both Mother and Father	7.36	11.66	16.67	20.00
Other Combination	1.23	7.98	3.33	10.00
Kind of Store				
Supermarket	98.77	96.93	100.00	100.00
Small Neighborhood Store	1.23	2.45		
Specialty Store	0.0	.61		
Distance				
Less than 1 mile	30.06	24.54	3.33	10.00
1-5 miles	52.76	59.51	56.66	53.33
6 miles or more	17.18	15.95	40.00	36.67
Transportation for Shopping				
Family Car	55.21	63.19	63.33	83.33
Neighbor, friend, relative's car	33.74	23.31	33.33	10.00
Walking	7.36	8.59	0.0	3.33
Bus	1.23	.61	3.33	0.0
Taxi	0.0	4.29	0.0	0.0
Other	0.0	0.0	0.0	3.33

Most homemakers in the treatment group had about \$120-\$130 spending power for groceries per family and about \$30 per family member per month. However, the homemakers' actual amount of money spent was somewhat less, approximately \$100-\$115 for the family and about \$24 per family member. In relationship to income, the amount of spending power was over one-third of the family income. The amount

actually spent was slightly less than one-third of the family income.
(Table 13)

Table 13. Money spent on groceries per month.
(Treatment N = 163, Control N = 30)

	Means and (Standard Deviations)			
	<u>Treatment</u>		<u>Control</u>	
	Dollars		Dollars	
	<u>Pre</u>	<u>Post</u>	<u>Pre</u>	<u>Post</u>
Spending power	122.56 (57.51)	132.77 (67.75)	148.13 (59.42)	172.67 (55.11)
Family money spent	101.08 (53.96)	144.44 (70.04)	130.77 (68.47)	131.30 (70.24)
Spending power per family member	30.14 (13.65)	31.33 (11.93)	28.35 (9.98)	33.31 (8.19)
Family money spent per family member	24.43 (11.36)	26.28 (11.93)	24.44 (9.98)	23.72 (8.19)
	Percent		Percent	
Spending power as percent of income	36.42 (16.58)	36.71 (17.16)	34.73 (12.48)	42.43 (20.39)
Family money spent as percent of income	28.72 (12.74)	30.14 (15.30)	34.73 (13.40)	42.43 (14.21)

The reason these homemakers had more shopping power than actual money spent is attributed to the fact that a majority of homemakers are on food stamps. The bonus value of the stamps allowed them extra spending power.

The homemakers were asked to give two factors that influenced their selection of food purchases. The two most frequent responses were cost and if someone in the family likes it. The other frequently named

categories were if she was out of it and needed it, and whether nutritionally it was better for the family. Nutrition was mentioned about 17% of the time, (Table 13).

In some cases homemakers only gave one response. Both decisions are compiled into the totals, since for the pre-measurements, order of importance was not asked. In some cases the homemakers gave only one response; therefore, the percentages will not total exactly 200%, (Table 13).

Twelve percent of the homemakers in the pre-phase and thirty percent of the homemakers in the post-phase had their own vegetable garden. An increase in the percentage of homemakers having a garden was only evident in the treatment group, an increase of about 18%. The control group decreased slightly, about 7% between the pre- and post-phase.

The general trend of the homemakers' nutrition attitudes was toward planning. The average attitude score was 3.18 with a s.d. of .51 on a scale of 4. The greatest majority of homemakers felt that nutrition was one of the most important concerns a mother had for her family. They were also in almost total agreement that parents should not let their children eat whatever they want, (Appendix C-1, Items 8 and 16).

The items that were in least agreement were: (1) whether a child wants a particular food, is it important to let him have it, and (2) whether a child should be made to eat everything on his plate (Appendix C-1, Items 17 and 19).

Table 14. Factors influencing food purchases.
(Treatment = 163, Control = 30)

	<u>Treatment</u>		<u>Control</u>	
	<u>Pre</u> %	<u>Post</u> %	<u>Pre</u> %	<u>Post</u> %
*Cost	50.92	47.24	43.33	53.33
*Someone Likes It	38.65	32.52	53.33	33.33
Grocery List	9.82	6.75	0.0	10.00
*Out of it - Need it	21.47	23.31	26.66	30.00
On Sale	12.27	12.27	10.00	23.33
Convenient - Easy to Fix	1.23	.61	0.0	0.0
New Product to Try	4.29	1.84	0.0	0.0
*Nutrition	17.18	17.79	13.3	16.66
In Season	6.75	.61	0.0	0.0
Specific Brand	6.75	4.29	10.00	6.66
Needed Something Special	1.84	0.0	3.33	0.0
Comparison Price Shopping	.61	3.68	3.33	3.33
Appearance of Package	3.68	4.91	0.0	0.0
Quality of Product	3.68	4.91	0.0	6.66
Plan Meals	1.23	8.59	6.66	6.66
Stretch Meals	3.07	4.29	10.00	0.0
Other	7.36	5.52	6.66	0.0
First Decision	163	163	30	26
Second Decision	137	129	26	27

* Priority items.

Homemakers were tested for their knowledge of nutrition. The average score was 2.8 pre and 2.9 post, a slight improvement. The responses were examined individually to see the percentages of homemakers

responding appropriately to the questions. The following statements were incorrectly responded to by more than 50% of the homemakers.

(Table 15. Appendix C-2)

Table 15. Nutrition statements inappropriately responded to by one-half or more of the homemakers. (N = 163)

<u>Item No.</u>	<u>Percent Missed by Homemakers</u>	<u>Statements</u>
17	85.36	Adults should avoid fat in their diets in order to prevent heart diseases and strokes.
3	74.38	Gelatin desserts are a good source of protein.
8	69.51	Apples have a lot of Vitamin C.
19	67.68	Lemonade and orange juice have about the same amount of Vitamin C.
24	67.04	Eating carrots helps a person see better.
5	66.47	Eating bacon for breakfast is a very good way to get the protein that is needed for the day.
6	62.10	School-age children need to have vitamin pills every day for good health.
22	61.00	A reducing diet should not contain bread or potatoes.
21	55.48	Most fat children and adults have a problem with their glands.
15	54.25	Eating cheese causes constipation.
9	53.65	Healthy, active children need some sweets, such as candy or cake, each day for energy.

Hypothesis II

Hypothesis II has some variables significantly related and other variables not related to one another. Some of the relationships from the hypothesis that are significantly different from zero are indicated on the following matrix. (Table 16) The letters a and b indicate the probability levels .001 and .01 respectively. The a levels are significantly different at a smaller probability level.

There are some correlations which are high for obvious reasons, so attention is not being focused on these variables. The instrument was very similar in composition for measuring both attitudes and knowledge. For this reason, there are significantly high correlations between these two groups. Also, since the instrument had high test retest reliability and was repeated, the scores pre and post for the same variables are positively correlated with each other. These items should be disregarded in making this particular analysis.

Nutrition knowledge and food recall had a positive relationship, both pre and post. The homemaker's age negatively correlated with her nutrition attitudes. However, the homemaker's educational levels positively correlated with her nutrition attitude. This was further substantiated by the negative correlation between homemaker's age and educational level. (Table 16)

The homemaker's education was also related to her knowledge of nutrition. The income per family member at the probability level of .01 and the income of the family at the .001 level indicated a correlation with the homemaker's knowledge of nutrition.

Table 16. Correlation matrix between 14 variables. (Treatment N = 163, Control N = 30)

PRE						POST								
	Fd. rcl	Thia.	Ribo.	Nut. Att.	Nut. Know.	Fd. rcl	Thia.	Ribo.	Nut. Att.	Nut. Know.	Hmkr. Age	Hmkr. Ed.	Inc. Memb.	Inc. Fam.
PRE														
Fd. Rcl.	1.000													
Thia	-.013	1.000												
Ribo	.155	.018	1.000											
Nut. Att.	.053	-.070	.082	1.000										
Nut. Know.	<u>.238^a</u>	-.058	-.058	.547	1.000									
POST														
Fd. Rcl.	.373	.026	.121	.053	.090	1.000								
Thia.	-.009	.018	.019	.115	.059	.119	1.000							
Ribo.	-.039	.074	.234	.093	.042	.056	<u>.295^a</u>	1.000						
Nut. Att.	.047	-.039	-.002	.657	.398	.110	.103	.101	1.000					
Nut. Know.	<u>.194^a</u>	-.018	.006	.546	.812	.159	-.022	.036	.487	1.000				
Hmkr. Age	-.076	.005	.076	-.246 ^a	-.150	-.096	.005	-.001	-.217 ^a	-.150	1.000			
Hmkr. Ed.	.138	.037	.062	<u>.478^a</u>	<u>.455^a</u>	.038	.002	.110	<u>.392^a</u>	<u>.446^a</u>	-.290 ^a	1.000		
Inc/Memb.	.150	-.004	.090	.044	<u>.181^b</u>	.150	.101	.027	.026	.137	-.069	.063	1.000	
Inc/Fam.	-.001	-.019	.060	.098	<u>.232^a</u>	.082	.027	.123	.076	<u>.211^a</u>	.087	-.019	.369	1.000

^asignificant $p < .001$ ($r \geq .19$).^bsignificant $p < .01$ ($r \geq .17$).

Table 17. Correlation matrix of program variables. (N = 163)

	<u>PRE</u>					<u>POST</u>				
	Fd Rcal	Thia.	Ribo.	Nut. Att.	Nut. Know.	Fd Rcal	Thia.	Ribo.	Nut. Att.	Nut. Know.
Number Months Program	-.051	.064	-.160	-.111	.014	-.052	-.015	-.074	-.168	-.024
										1.000
Number Home Visits	.143	-.003	.070	.047	-.042	<u>.181^b</u>	.028	.002	.010	.094
										.025
										1.000
Number Group Visits	.052	.066	.014	-.135	-.059	.007	.008	.018	-.123	-.031
										.016
										.093
										1.000

^a significant $p < .001$ ($r \geq .24$)

^b significant $p < .01$ ($r \geq .175$)

Riboflavin and thiamin urinary excretion levels had positive correlations with one another only at the post-evaluation period. The other variables had no significant correlations. (Table 16)

Hypothesis III

Hypothesis III was able to relate significantly to only one variable. The number of home visits was positively related to food recall scores at the probability level of .01. All other program variables had no significant relationship with the other nine variables. (Table 17) Further analysis indicated that the group that best correlated with the number of home visits was the bread and cereal group.

The aide visited the homemaker an average of ten times during the interval between Phase I and Phase II of the study. These visits included only actual contact with the homemaker. The group sessions met considerably fewer times as they encompassed many homemakers at a session. (Table 18) There was a 6 to 9 month span during which these visits were made for both control and treatment groups. However, length of time in the program did not show a correlation with the other variables.

Table 18. Program variables of the treatment group. (N = 163)

<u>Type of Visit</u>	<u>Mean</u>	<u>S.D.</u>	<u>Range</u>
Home	9.94	5.18	1-28
Group	.74	1.57	0- 7
Months in Program	8.94	1.39	6-14

CHAPTER V

DISCUSSION

The researchers conducting this study visited sample families in seven counties of Michigan. (Figure 1) These families were very similar demographically with the state statistics from the Michigan Nutrition Survey of 1971. The vast majority of subjects were urban dwellers which is the typical environment for low income families. The average size family was four and one-half, with an average of two and one-half school age children. The mothers were young, 29 years was the average age. This is the type of family the Expanded Nutrition Program on a whole is geared to assisting.

Since in only 52% of the families was the father present in the home, the role of the homemaker as a decision maker is important. About 55% of the families were on welfare. The mean income per family was \$350-\$400 of which almost one-third was spent on food. This result concurs with Frye's study (1971) of E.N.P. families. The National statistics indicates less than 17% is presently being spent on food. (Bunting, 1970). The homemakers in this study were proportionately spending twice as much money to feed their families, even with the use of food stamps.

The availability of equipment for food preparation does not seem to be a problem. Over 95% of the homemakers had all the necessary

equipment and in working condition.

The dietary intake as reported by the homemakers' 24-hour recall indicates the homemakers are very inadequate in meeting the Basic Four food groups. This analysis was done by food recall adequacy frequency counts as well as nutrition scores. The scores indicate the homemaker meeting an average of 10 out of 16 possible servings. Only two groups were adequately met and three groups one-half adequately met on the average. Although there was improvement in both treatment and control in increasing the amount of groups adequately and half-adequately met from Phase I to Phase II, they still remained unsatisfactory in relation to the Basic Four recommendations. The current trend of nutrition awareness may have an effect on the recalls of the control group, whereas the increase in the treatment groups may have been heavily influenced by the nutrition taught by the aide.

The most adequately met food group was the meat group (70% - 80%). This was an indication that the protein requirement was met. The least adequately met group was fruits and vegetables. This would be expected to indicate low intakes of Vitamin A and C, and calcium and iron. This relationship of high protein, low Vitamin A and C intakes has been reported in other nutrition studies (Hardy, 1943; Shapiro, 1960; Ten State Nutrition Survey, 1972). These two nutrients have been reported low the most often in many nutrition studies (Morgan, 1959; Leverton, 1960; Hendel, et al., 1965; Kelsey, 1969; Owen, et al., Robinson, 1970; Sanjur and Scoma, 1971). Only 12% in Phase I and 30%

in Phase II grew vegetable gardens. As pointed out in a study by Henderson (1972) greater urbanization reduces the opportunity of families to produce their own foods. With such a large percentage of our homemakers urban dwellers, the chance of growing their own vegetables is limited. It should be noted that the number of gardens doubled from pre- to post-testing in the treatment group, whereas they decreased in the control families. The promotion of home gardens is one of the promotion points of the ENFP aides.

Many of the studies have shown varying levels of thiamin and riboflavin deficiencies in different portions of the population (Morgan, 1959; Leverton, 1960; Shapiro, 1962; McGinity, 1969; Lackey, 1971). This study found inadequacies only in riboflavin excretions. However, other studies have found high thiamin, low riboflavin excretions in their populations (Brown, 1970; DeMark, 1971).

The thiamin excretion levels were found to be very adequate. This finding concurs with the findings of the Ten State Nutrition Survey (1972) indicating no nutritionally significant problem with this nutrient. This is not surprising considering the present enrichment of many foods with this vitamin.

The riboflavin excretion levels had a means of 3.1 pre and 3.4 post in the treatment groups indicating some intakes are inadequate. Numerous studies have found this nutrient less than adequate (Swanson, 1959; Methany, 1962; Kelsey, 1969; Henderson, 1972). The Ten State Nutrition Survey found riboflavin deficiencies among blacks and among youth. This suggests that this nutrient is a potential problem. The survey also points out that dairy products are a significant source of

riboflavin. This group was adequate for the homemakers only 30% to 40% of the time in our study.

The majority of homemakers, both pre and post, used supermarkets exclusively for shopping. The 30% of the homemakers who used grocery stores used them primarily for occasional shopping. Over 80% of the homemakers were less than 5 miles from their store and close to 90% had either the family car or a ride by a friend, relative, etc., as a means of transportation. (Table 13) The lack of transportation as was pointed out by Meyers (1971) or use of smaller stores for shopping, are not problems the E.N.P. homemakers face. Our findings closely parallel those of Williams (1972).

The homemaker plays the major role in making the shopping decisions; however, 16% of the time the father shared the responsibility. This was also reported by Lamkin, et al. (1970). Prices appeared to be the most predominate factor in decision making as was concurred by Williams (1972). The second most influential factor was personal likes by family members and by far was more important to the homemaker than nutrition. Breeling (1971) found this also to be true of his subjects. Once the cost barrier was passed, the next consideration seemed to be taste. Nutrition was found to be considered by only 17% of the homemakers. This percentage did not change from Phase I to Phase II.

The trend of the homemakers in regards to nutrition attitudes tended more toward planning and less towards laissez-faire. Sims (1971) points out the Type II mother of lower socio-economic status as exhibiting a greater authoritarianism. In low income families the mother is most

often the dominating figure. Our evaluation tends to indicate a trend towards the more strict adherence to planning nutrition.

The nutrition scores were not significantly changed from pre-testing to post-testing. From the types of statements with the highest scores, the homemakers seem to have a grasp of the importance of nutrition. From the types of questions with the lowest scores, there is an indication of lack of factual knowledge on various food items.

This study indicated a significant correlation between nutrition knowledge and education level. This agrees with Eppright, et al. (1969), Biltz (1971), and Johnson (1971). This correlation, however, was not found in Quinn's 1971 study. The study also indicated a negative correlation between nutrition attitudes with homemakers' age. This indicates that the younger homemaker is more of a planner. Biltz and Johnson reported a negative correlation between age and nutrition knowledge. However, our study did not show this correlation at a significant level.

A positive correlation was shown between nutrition knowledge and income level. This was also pointed out by Biltz (1971). Income did not show a relation to food recall as was found in other studies (Fryer, 1971; Heimstra, 1972). Also educational level alone did not show a correlation with food recall. Although other nutrition studies did indicate this correlation, (Hendel, et al. (1965), Morse, et al. (1967), Eppright, et al. (1970). Knowledge of nutrition and food recall did show a positive relation. This has implications that by increasing the homemakers' knowledge the food recall will improve.

For correlations exclusively related to the treatment group, the number of visits made by the aides correlated positively with food recall scores. This implies that the aides are helping to improve the adequacy of the diets. Other relationships were not correlated; for example, the number of months in the program or group visits with other variables. Nutrition knowledge was not correlated to length in the program; however, Frye (1971) pointed out an increase in knowledge of the Basic Four requirements with length in the program. This study indicated the strongest correlation between home visits and bread and cereal intakes. Verma and Jones (1973) found a positive correlation between home visits and consumption of bread and cereal and milk.

Summary and Conclusions

This study was not able to find differences between families enrolled in the Expanded Nutrition Program and those not enrolled in terms of these variables: 24-hour food recall, riboflavin and thiamin excretion levels, nutrition attitude and nutrition knowledge scores. In both groups there was an improved homemakers' dietary recall and more individuals were in the acceptable or high ranges for excretion of urinary riboflavin, indicating an improved riboflavin intake. Riboflavin nutriture was inadequate in 23% pre and 15% post in the treatment group. Dietary intakes of thiamin were found to be adequate.

Most of the homemakers were low-income, urban dwellers receiving some form of public assistance. The average size family was four and one-half with two school age children.

Homemakers spent approximately one-third of their income on groceries. They almost exclusively shopped at supermarkets less than five miles from their home. Transportation was generally by car. Cost was the most influential factor in shopping selection. Nutrition ranked fourth in importance.

Homemakers tended to have planning attitudes toward nutrition. The younger the homemaker, the more she planned. Nutrition knowledge scores indicated limited knowledge in many areas. A positive relationship was found between nutrition knowledge and both income level and food recall. Food recall was also correlated with the number of home visits made by the aide.

Implications

1. The fruit and vegetable group needs the most attention in nutrition education. Less time needs to be allocated to teaching preparation of meats and baked goods.

2. This study corroborates other studies that food habits and attitudes are very difficult to change, suggesting that more than nine months is needed to assess changes in behavior promoted by nutrition educators.

3. Findings of this study suggest that many forces such as T.V. and radio may be operating in the area of nutrition education, since the control group had similar increases in the same variables.

4. The mere contact by a researcher in this receptive control group could have influenced the response to the study.

Suggestions for Future Research

1. Because the control responded similarly to the treatment group, and showed more stability as a result of a smaller dropout rate, it might be desirable to increase the size of the sample by collecting additional data from low income families not in the ENFP.

2. Other parameters of the ENFP not evaluated in this project could be researched, such as food preparation skills and money management, since the EFNP does reach families in many ways. This was pointed out in an Expanded Food and Nutrition program study by Wang (1970) where 57% of the white and 74% of the black homemakers indicated looking forward to help from the aides in areas other than nutrition in the future.

3. 24-hour food recalls taken directly by the researchers could increase the reliability of the method.

BIBLIOGRAPHY

BIBLIOGRAPHY

- Adamson, J.D., N. Joliffe, H.D. Kruse, O.H. Lowry, P.E. Moore, B.S. Platt, W. H. Sebrell, J.S. Till, F.F. Tindall, R.M. Wilder and P.C. Zamcnik. Medical survey of nutrition in Newfoundland. Can. Med. Assn. J. 52: 227-250, 1945.
- Adelson, S.F. Changes in diets of households 1955-65. J. of H. Ec. Vol. 60: 448-455, 1965.
- Arroyave, G., M. Flores and M. Behar. The effect of a controlled increment in dietary nutrient intake on blood and urine biochemistry in children. Am. J. Clin. Nut. 15: 331-339, Dec. 1964.
- Au Coin, D., M. Haley, J. Rae, M. Cole. A Comparative study of food habits: Influence of age, sex and selected family characteristics. Can J. of Pub. Health 63 (2); 143-151, 1972.
- Aykroyd, W.P., W. Jolliff, O.H. Lowry, P.E. Moore, W.H. Sebrell, R.E. Shank, F.F. Tisdall, R.M. Wilder and P.C. Zamecnik. Medical survey of nutrition in Newfoundland, 1945. Can. Med. Assn. J. 60: 329-352, 1949.
- Bailey, Marcelle A. Nutrition education and the Spanish-speaking American. J. of Nut. Ed. 2 (2): 50-54, 1970.
- Balough, Miriam, H.A. Kahn and J.H. Medalie. Random repeat 24 hour dietary recalls. Am. J. Clin. Nut. 24: 304-310, 1971.
- Beal, V.A. Nutritional intake of children, III. Thiamine, riboflavin and niacin. J. Nut. 57 (2): 183-192, Oct. 1955.
- Beal, V.A. The Nutritional History in Longitudinal Research. J.A.D.A. 51: 426-432, 1967.
- Beloian, Arletta M., Season variances in U.S. diet. Fam. Eco. Rev. 25-29. March, 1971.
- Benson, R.A., L.B. Slobody, C.M. Witzberger, L. Lesis. Further studies on the urinary excretion of thiamin on children. J. of Pediatr. 20: 454, April, 1942.

- Blitz, Peggy A. "A Study of Nutrition Knowledge and Food Selection Practices of Some Homemakers." Master's thesis, Kent State University, 1971.
- Bivins, G.E. Convenience foods. J. of H. Ec. Vol. 61: 26-30, 1969.
- Breeling, J. Nutrition guidelines, J.A.D.A., Vol. 59: 102-105, 1971.
- Brown, M.L., D.S. Smith Mertz, H.M. Hill and S.F. Adelson. Diet and nutriture of preschool children in Honolulu. J.A. Diet. Assn. 57 (1): 22-28, July, 1970.
- Bunting, F., and C. Le Bovit. Percentage of income spent on food: Estimated from National Income and Household Survey Data. N.F.S. 137: 22-30. Aug., 1970.
- Chaney, Margaret S. and M.L. Ross, Nutrition, seventh edition. Houghton, Mifflin Co., Boston, pp. 270-275, 1966.
- Chassey, J.P., VanVeen, A.G. and F.W. Young. The application of social science research methods to the study of food habits and food consumption in an industrializing area. Am. J. of Cl. Nut., 20: 56-64, 1967.
- Citizens' Board of Inquiry, Hunger U.S.A. Beacon Press, Boston, pp. 11-86, 1968.
- Clark, R.P. de G. Cosgrove, and E.H. Morse. Vitamin and creatinine ratios. Variability in separate voidings of urine of adolescents during a 24 hour period. Am. J. Clin. Nut. 19: 335-431, 1966.
- Cornely, Paul, B. Stanley, K. Bigman, D. Watts. Nutritional beliefs among low income urban populations. J.A.D.A. 42: 131-135, 1963.
- Davis, R.A.T., S.N. Gershoff, and D.E. Gamble. Review of studies of vitamin and mineral nutrition in the U.S. (1958-1968). J. Nutri. Educ. 1 (2). Supplement 1, 1969.
- DeMark, Von. Dietary habits and food consumption patterns of teenage families. J. H. Ec. 63 (7): 540-544, Oct. 1971.
- Dewhurst, W.G. and G.H. Morgan. Importance of urine volume in assessment of thiamine deficiency. Am. J. of Cl. Nutri. 23: 379-381, 1970.
- Dickins, Dorothy and Virginia Ferguson. Knowledge of nutrition as related to the use of dairy products. J. of H. Ec. 50: 25-28, 1958.

- Elson, K.D., J.G. Reinbold, J.T.L. Nicholson, and C. Charnoch. Studies of the B. Vitamin in the human subject. V. The normal requirements of thiamine: some factors influencing its utilization and excretion. *Am. J. Med. Sci.* 203: 569-577, 1942.
- Elvehjem, C.A. From the minds of men to the lives of people. *J. of H. Ec.* 49: 503-507, 1957.
- Eppright, E.S., M.B. Patton, A.L. Marlott, and M.L. Hathway. Dietary study methods. V. Some problems in collecting dietary information about groups of children, *J.A.D.A.* 28: 43-48, Jan. 1952.
- Eppright, E.S., H.M. Fox, B.A. Fryer, G.H. Lamkin, V.M. Vivian. Eating Behavior of preschool children. *J. of Nut. Ed.* 1: 16-19. 1969.
- Eppright, E.S., H.M. Fox, B.A. Fryer, G.H. Lamkin, V.M. Vivian. The North Central Regional Study of diets of preschool children. 2. Nutrition knowledge and attitudes of mothers, *J. of H. Ec.* 62 (5): 327-332, May, 1970.
- Expanded Nutrition and Family Programs, Cooperative Extension Service bulletin. Michigan State University, February, 1974.
- Fleming, B. Extension trains aides to help mothers. *What's New in H.Ec.*, 34 (7): 15-16, 21, 1970.
- Folin, O. Laws governing the chemical composition of urine. *Am. J. Physiol.* 13: 66-115, 1905.
- Friend, B. Nutrients in the U.S. food supply. A review of trends 1909-13 to 1965. *Am. J. Clin. Nut.* 20: 907-919, 1967.
- Frye, Robert. The Expanded Food and Nutrition Program. *Family Econ. Review*, 30-33. March, 1971.
- Hardy, M.C., A. Spohn, G. Austin, S. McGiffert, E. Mohf, and A.B. Patterson. Nutrition and diet inadequacy among children from different socio-economic groups. *J. Am. Diet. Assn.* 19: 173-181, March 1943.
- Hendel, G.M., M.G. Burk, and L.A. Lund. Socio-economic factors influencing children's diets. *J. H. Ec.* 57 (3): 205-208, 1965.
- Hiemstra, Stephen J. Evaluation of the USDA food program. *J. Am. Diet Assn.* 60: 193-196, 1972.
- Henderson, L.M. Nutritional problems growing out of new patterns of food consumption. *Am. J. of Pub. Health* 62 (9): 1194-1198, 1972.

- Hinton, Maxine Armstrong, E.S. Eppright, H. Chaddendon and L. Wolins. Rating behavior and dietary intakes of girls 12-14 years old. J. Am. Diet. Assn. 43: 223-227, 1963.
- Hunscher, H.A. and I.G. Macy. Dietary study methods. I. Uses and abuses of dietary study methods. J. Am. Diet. Assn. 27: 558-563, 1951.
- Interdepartmental Committee on Nutrition for National Defense. Manual for Nutrition Surveys. Wash. D.C.: U.S. Government Printing Office, 1963.
- Jalso, Shirley B., M.M. Burns and J.M. Rivers. Nutritional beliefs and practices, J.A.D.A. 47: 263-268, 1965.
- Johnson, Sister Jean Louise. "Nutritional Knowledge of Homemakers." Master's Thesis, Penn State Univ., 1971.
- Kelsay, J.L. A compendium of nutritional status studies and dietary evaluation studies conducted in the U.S. 1959-1967. J. Nut. 99 (1), Supplement, Part II: 123-137, 1969.
- Kilander, H.F. The public's beliefs in nutritional facts and fallacies, J. of Sch. Health, 34: 218-221, 1964.
- Krehl, W.A. and R.E. Hodges. The interpretation of nutritional survey data. Am. J. Clin. Nut. 17: 191-199, 1965.
- Lackey, H.M. How can we solve malnutrition in the U.S. School Lunch J. 25 (2): 42-45, Feb. 71.
- Lamkin, G., M.L. Hielscher, H.B. Jones. Food purchasing practices of young families. J. of H. Ec. 62: 598-604, 1970.
- Le Veille, Gilbert. Modification of the thiochrome procedure for the determination of urinary thiamin. Am. J. Clin. Nut. 25: 273-274, 1972.
- Leverton, R.M. Rose's foundations for nutritional evaluation. J. Am. Diet. Assn. 37: 553-557, 1960.
- Louhi, H.A., N. Yu, B.E. Hawthorn, and C.A. Stowick. Thiamine metabolism of women on controlled diets. I. Daily urinary thiamine excretion and its relation to creatinine excretion. J. Nut. 48: 297-30. 1952.
- Lowry, O.H. Biochemical evidence of nutritional status. Physiol. Rev. 32: 431-448, 1952.

- Lund, Lois A. and M.C. Burk. A multi-disciplinary analysis of children's food consumption behavior. University of Minn., Agr. Exp. Sta. Bulletin No. 265, 1969.
- Mason, H.L. and R.D. Williams. The urinary excretion of thiamin as an index of the nutrition level. Assessment of the value of a test dose. J. of Clin. Invest. 21: 247-255, 1942.
- McGanity, W.J. Nutrition Survey in Texas. Preliminary findings. Tex. Med. 65: 40-49, March, 1969.
- Melnick, D., H. Field, Jr., W.D. Robinson. A quantitative chemical study of the urinary excretion of thiamin by normal individuals. J. of Nut. 18: 593-610, 1939.
- Metheny, N.Y., F.E. Hunt, M.B. Patton, and H. Heyo. The diets of preschool children: I. Nutritional sufficiency findings and family marketing practices, II. Factors in food acceptance. J. Am. H. Ec. 54: 297-308, April, 1962.
- Meyers, Trienah. The extra cost of being poor. J. of H. Ec. 62: 379-384, 1970.
- Mickelsen, O., H. Condiff and A. Keys. The determination of thiamine in urine by means of thiochrome technique. J. Biol. Chem. 160: 361-370, 1945.
- Morgan, A.F. Nutritional Status, U.S.A. University of Calif., Calif. Agr. Exp. Stat. Bulletin 796: 5-120, 1959.
- Morse, E.H., M.M. Clayton, and L. De G. Cosgrove. Mother's nutrition knowledge. J. H. Ec. 59 (8): 667-668, Oct. 1967.
- Muiruri, K.L., D.R. Romsos, J. Kirk. Simple automated method for the determination of urinary thiamine, in press, 1974.
- Owen, G.M., P.J. Garry, K.M. Kram, C.E. Newsoen, and J.M. Montalvo. Nutritional status of Mississippi preschool children. Am. J. Clin. Nut. 22: 1444-1459, 1969.
- Parrish, John. Implication of Changing food habits for nutritional educators. J. Nut. Ed. 2 (4): 140-146, Spring 1971.
- Pearson, William N. Biochemical appraisal of Nutritional status in man. Am. J. Clin. Nut. 11: 462-469, 1962.
- Pelletier, O. and R. Madere. Automated determinations of riboflavin (Vitamin B₂) in urine. Clinical Chemistry 18: 937-942, 1972.

- Plough, I.C. and C.F. Consolano. The use of casual urine specimens in the evaluation of the excretions rates of thiamine, riboflavin and N methylnicotinamide. J. Nut. 69: 365-369, 1959.
- Pollack, H. and J.J. Bookman. Riboflavin excretion as a function of protein metabolism in the normal, catabolic and diabetic human being. J. Clin. Med. 38: 561-573, 1951.
- Prichard, Keith and M.R. Hall. Attitudes of aides and clients in the Expanded Nutrition Program. J. of H. Ec. 63: 545-551, 1971.
- Quinn, Harolyn Werft. "A Survey of Nutritional Knowledge of some Migratory Workers in Hartville, Ohio." Master's thesis, Kent State Univ., 1971.
- Schuck, Cecilia. Food consumption of low income rural negro households in Mississippi. J. Am. Diet. Assn. 62 (3): 151-155, Feb. 1972.
- Sanjur, Diva and Anna D. Scoma. Food Habits of low-income children in Northern N.Y. J. Nut. Ed. 2 (3): 85-95, 1971.
- Schaefer, E.S. and R.Q. Bell. Development of a parental attitude research instrument. Child. Dev. 29 (3): 339-361, Sept. 1958.
- Scheifley, V.M. and W.H. Schmidt. Jeremy D. Finn's Multivariate-univariate and multivariate analyses of variance, covariance, and regression. Occasional paper No. 22, Office of Research Consultation, College of Ed., M.S.U., 1973.
- Shapiro, L.R., R.L. Huenemann, and M.S. Hampton. Dietary survey for planning a local nutrition program. Pub. Hlt. Repts. 77: 257-265, 1962.
- Sims, Laura Smail. "Nutritional Status of Preschool Children in Relation to Selected Factors Characterizing the Family Environment - an Ecological Approach." Ph.D. dissertation, Michigan State University, 1971.
- Spindler, E.B. Olsen, B.F. Oliver M. "Program Aides" for work with low-income families. J. Am. Diet. Assn. 50: 478-486, 1967.
- Stearns, G., L. Adamson, J.B. McKinney, T. Lenner, and P.C. Jeans. Excretion of thiamine and riboflavin by children. Am. J. Dis. Child. 95: 185-201, 1958.
- Stitt, Kathleen, Nutritional value of diets today and fifty years ago. J. of Am. Diet. Assn. 36: 433-444, 1960.

Swanson, P.E., Willis E. Jebe, J.M. Smith, M.A. Ohlson, A. Biester, L.M. Burrill. Food intakes of 2,189 women in five North Central States. Iowa Arg. & H.E. Exp. Sta. Res. Bulletin 468: 477-499, 1959.

Tanphaichitr, V., S.L. Vimokesant, S. Dhanamitta, A. Valyasevi. Clinical and biochemical studies of adult beri-beri. Am. J. Clin. Nut. 23: 1017-1026. July-Dec., 1970.

Technicon Auto-Analyzer Methodology. Creatine. Method file N-11b I/II. Tarrytown, N.Y.: Technicon Corp., n.d.

Ten-State Nutrition Survey. See U.S. Dept. of H.E.W.

Trulson, M.F., M.B. McCann. Comparison of survey methods. J. Am. Diets, 35: 672-676, 1959.

U.S. Department of Health, Education, and Welfare. Ten-State Nutrition Survey: 1968-70. DHEW Pub. No. (HSM) 72-8132, vol. IV: 217-219, Atlanta: U.S. Dept. of H.E.W., 1972.

Verma, Satish, J.H. Jones, Jr. Educational participation and dietary changes of the EFNEP Homemakers in Louisiana. H. Ec. Res. J. Vol. 2, No. 2: 94-104, Dec., 1973.

Vestergaard, P. and R. Leverett. Constancy of urinary creatinine excretion. J. Lab. and Clin. Med. 51: 211-218, 1958.

Wang, Virginia Li and Paul H. Ephross. Poor But Not Forgotten. Monol. College Park, Md.: Cooperative Extension Service, Univ. of Md., 1970.

Wellin, Edward. Cultural Factors in nutrition. Nut. Rev. 13: 129-131, 1955.

Williams, Shirley Walker. "Food Buying Practices of Selected Low- and Middle-Income Families in Americus, Georgia," Master's thesis, U. of Ala., 1972.

Windmueller, H.G., A.A. Anderson, and O. Mickelsen. Elevated riboflavin levels in urine of fasting subjects. Am. J. Clin. Nut. 15: 73-76, 1964.

Young, C.M., G.C. Hagan, R.E. Tucker, W.D. Foster. A comparison of dietary study methods II Dietary history vs. one day record vs 24-hour recall. J.A.D.A. 28: 218-221, 1952.

APPENDICES

APPENDIX A

Instrument I - Phase I (pre-test)

BIOLOGICAL DATA

APPENDIX A

County Code _____ Instrument I - Phase I (pre-test)

Family ID Number _____

Part I. General Family Information

Date aides first visit _____

Check for residence location: _____ no information

_____ urban

_____ rural non-farm

_____ farm

_____ other

Check for aid received by family: _____ no information

Yes No

_____ USDA Food Stamps

_____ USDA/FHIA Assistance

_____ Welfare

_____ Social Security

_____ Other (specify) _____

Total family income for last month (dollars) _____

Does family have a garden? ___ Yes ___ No

Part II. Homemaker Information

Homemaker's age _____

Check for education of homemaker: _____ no information

_____ 8th grade or less

_____ 9-12 grade

_____ beyond high school

_____ other (specify)

County Code _____

Family ID Number _____

Part II. (continued)

Check for background of homemaker. _____ no information
_____ Caucasian
_____ Negro
_____ Spanish American
_____ Oriental
_____ American Indian
_____ other (specify) _____

Check for homemaker. _____ no information
_____ non-pregnant
_____ pregnant
_____ lactating

Homemaker's 24-hour Food Recall (record actual number of servings)

_____ No information
_____ Meat group
_____ Milk group
_____ Fruit-vegetable group
_____ Bread-cereal group

Check for equipment available. _____ no information

<u>Yes</u>	<u>No</u>
------------	-----------

_____	_____ Stove/range
_____	_____ Oven
_____	_____ Hot plate
_____	_____ Electric frying pan
_____	_____ Freezer
_____	_____ Refrigerator
_____	_____ Ice box
_____	_____ Electricity
_____	_____ Running water
_____	_____ Other (specify) _____

BIOLOGICAL DATA

APPENDIX A

County Code _____

Family ID Number _____ Instrument I - Phase I (pre-test)

Part III. Family Interview

Date _____

Time of day _____

Number of prior aide visits to family _____

Has anyone in your family been taking vitamin pills in the last week or so?

_____ no information

_____ no

_____ yes

If so, who has been taking the vitamin pills? _____ no information

<u>Yes</u>	<u>No</u>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Pre-school children (ages 0-5)

School-age children (ages 6-12)

Teen (s) (ages 13-18)

Adult (s) (19 and over)

Who does the grocery shopping for your family most of the time?

_____ no information

_____ mother

_____ father

_____ children

_____ other relative

_____ non-relative

Where do you (or other person) usually shop for your groceries?

_____ no information

_____ supermarket

_____ small neighborhood store

_____ specialty food store

_____ other (specify) _____

County Code _____

Family ID Number _____

Part III. (continued)

How far away from your home is this store?

- _____ no information
- _____ less than 1 mile
- _____ 1-5 miles
- _____ 6 miles or more

How do you usually get to the store?

- _____ no information
- _____ family car
- _____ neighbor, friend, relative drives their car
- _____ walk
- _____ bus
- _____ taxi
- _____ bicycle
- _____ other (specify) _____

Is there any other store where you occasionally buy groceries?

- _____ no information
- _____ supermarket
- _____ small neighborhood store
- _____ specialty food store
- _____ other (specify) _____

When you go grocery shopping, there are many, many different kinds of food you could buy. What kinds of things help you decide what to buy? (Record 2 responses)

- _____ no information
- _____ cost-whether I can afford it
- _____ I or someone in my family likes it
- _____ it is on my grocery list
- _____ I am out of it or need it for something special
- _____ it is on sale
- _____ it is easy to prepare-convenient
- _____ it is a new product someone wanted to try
- _____ it is good for us-nutrition
- _____ it is in season
- _____ it is a specific brand
- _____ other (specify) _____

[illegible][illegible]

APPENDIX B

Instrument I - Phase II (post-test)

BIOLOGICAL DATA

APPENDIX B

County _____ Instrument I - Phase II (post-test)

Family ID Number _____

Part I. General Family Information

group visits _____

Total number of aide visits with homemaker or family member _____

Check for residence location: _____ NI

_____ urban

_____ rural non-farm

_____ farm

Check for aid received by family: _____ NI

Yes No

_____ _____ USDA Food Stamps

_____ _____ USDA/FHA Assistance

_____ _____ Welfare

_____ _____ Social Security

_____ _____ Other (specify) _____

Homemaker's 6-month 24-hour Food Recall (record actual number of servings)

_____ NI

_____ Meat group

_____ Milk group

_____ Fruit-vegetable group

_____ Bread-cereal group

Net family income for last month (dollars) _____

Amount spent for food/food stamps last month _____

If receiving food stamps, value of bonus stamps received _____

County _____

Family ID Number _____

Information for Phase I

If homemaker was pregnant at entry into the program, what trimester of pregnancy was she in at that time?

_____ *NA* _____ NI

Circle trimester: 1 2 3

Amount spent for food/food stamps at program entry _____

If receiving food stamps, value of bonus stamps received at program entry _____

[illegible]

County _____

Family ID Number _____

Part III. Family Interview

Date _____

What grade did you complete in school? _____

If high school incomplete did you take G.E.D. test?

_____ NI _____ NA _____ Yes _____ No

Did you have a course in nutrition in high school or elsewhere, other than in the Expanded Nutrition Program?

_____ NI _____ Yes _____ No

Check for homemaker: _____ NI

_____ non-pregnant

_____ pregnant (circle trimester: 1 2 3)

_____ lactating

Do you have a garden or did you have one this past summer?

_____ NI _____ Yes _____ No

Check for equipment available: _____ NI

Yes No

_____ Stove/range

_____ Oven

_____ Hot plate

_____ Electric frying pan

_____ Refrigerator (one-door)

_____ Refrigerator/freezer combination (two-door)

_____ Separate freezer

_____ Ice box

_____ Electricity

_____ Running water

_____ Indoor bathroom

County Code _____

Family ID Number _____

Part III. (continued)

Who does the grocery shopping for your family most of the time?

_____ NI	_____ children
_____ mother	_____ mother & children
_____ father	_____ other relative
_____ mother & father	_____ non-relative
_____ other combination	

Where do you (or other person) usually shop for groceries?

_____ NI

_____ supermarket

_____ small neighborhood store

_____ specialty food store

_____ Other (specify) _____

How far away from your home is this store?

_____ NI

_____ less than 1 mile

_____ 1-5 miles

_____ 6 miles or more

How do you usually get to the store?

_____ NI

_____ family car

_____ neighbor, friend, relative drives their car

_____ walk

_____ bus

_____ taxi

_____ bicycle

_____ other (specify) _____

County _____

Family ID Number _____

Part III. (continued)

Is there any other store where you occasionally buy groceries?

____ NI

____ no

____ supermarket

____ small neighborhood store

____ specialty food store

____ other (specify) _____

When you go grocery shopping, there are many, many different kinds of food you could buy. What kinds of things help you decide what to buy? Record 2 responses.

____ NI

____ cost--whether I can afford it

____ I or someone in my family likes it

____ it is on my grocery list

____ I am out of it/need it

____ I need it for something special

____ it is on sale

____ it is easy to prepare/quick/convenient

____ I compare costs per unit/comparison price shop

____ it is a new product someone wanted to try

____ it is good for us--nutrition

____ it is in season

____ it is a specific brand

____ the way it looks--appearance of packaging

____ the way it looks--quality of product

____ I plan my meals & shop accordingly

____ what will stretch for a long time

____ other (specify) _____

APPENDIX C

Instrument II - Phase I and II (pre & post-test)

1. Nutrition Attitudes - Part I
2. Nutrition Knowledge - Part IV

APPENDIX C - 1
Nutrition Attitudes - Part I

- (1) SA MA MD SD Children will eat the right things if they can pick what they want to eat.
- (2) SA MA MD SD If a child drinks enough milk, his mother doesn't need to worry about nutrition.
- (3) SA MA MD SD The foods that children eat will have a big effect on their health in the future.
- (4) SA MA MD SD As long as children eat a lot, they will get all the vitamins and other nutrients they need.
- (5) SA MA MD SD It's all right for people to snack between meals.
- (6) SA MA MD SD A good mother should make her child eat what she thinks is best for him.
- (7) SA MA MD SD If children are not sick, it means they are eating the right foods.
- (8) SA MA MD SD Parents should let their children eat whatever they want.
- (9) SA MA MD SD Dessert always just adds extra calories but no other nutrients to a family's diet.
- (10) SA MA MD SD Children's foods have so many vitamins added to them that parents don't need to worry about their children's nutrition.
- (11) SA MA MD SD It is all right for children to choose their own food as long as they do not always pick the same thing.
- (12) SA MA MD SD Young children don't grow correctly if they eat the wrong foods.
- (13) SA MA MD SD Children should be able to choose what they want to eat for meals even if it means a little more work for the mother.
- (14) SA MA MD SD If children have plenty of liquids, their mothers don't need to worry about what they eat.
- (15) SA MA MD SD If a child doesn't like to eat breakfast, it is better to let him go without it than to start the day off with an argument.
- (16) SA MA MD SD Nutrition is one of the most important concerns a mother has for her family.
- (17) SA MA MD SD If a child wants a particular food to eat, it is important to let him have it.
- (18) SA MA MD SD As long as the doctor doesn't say anything to a mother about nutrition, she doesn't have to worry about it.

- (13) SA MA MD SD A child should always be made to eat everything on his plate.
- (20) SA MA MD SD Eating fruits and vegetables is important for children but doesn't make much difference for adults.

APPENDIX C - 2

Nutrition Knowledge - Part IV

- (1) SA MA MD SD Meat, milk, and eggs all have lots of nutrients which are needed for the growth of small children.
- (2) SA MA MD SD When children have enough food to satisfy their appetites, they are getting enough nutrients.
- (3) SA MA MD SD Gelatin desserts are a good source of protein.
- (4) SA MA MD SD It is better not to have orange juice and milk in the same meal because the orange juice causes the milk to curdle in the stomach.
- (5) SA MA MD SD Eating bacon for breakfast is a very good way to get the protein that is needed for the day.
- (6) SA MA MD SD School-age children need to have vitamin pills every day for good health.
- (7) SA MA MD SD A good easy way to lose weight is to skip breakfast.
- (8) SA MA MD SD Apples have a lot of Vitamin C.
- (9) SA MA MD SD Healthy, active young children need some sweets, such as candy or cake, each day for energy.
- (10) SA MA MD SD It is best to avoid eating milk and fish together.
- (11) SA MA MD SD Adding soda while cooking vegetables and dried beans makes them easier to digest.
- (12) SA MA MD SD Dried beans contain many of the same nutrients as meat.
- (13) SA MA MD SD Year-old babies should eat different kinds of foods, since drinking only milk may not be enough for growth.
- (14) SA MA MD SD White bread and cereals that are enriched are better for both children and adults than those that are not.
- (15) SA MA MD SD Eating cheese causes constipation.
- (16) SA MA MD SD It is important to eat many kinds of foods from day to day.
- (17) SA MA MD SD Adults should avoid fat in their diets in order to prevent heart diseases and strokes.
- (18) SA MA MD SD Milk is needed mainly by infants and growing children.
- (19) SA MA MD SD Lemonade and orange juice have about the same amounts of Vitamin C.

- (20) SA MA MD SD Peanut butter is a nutritious food for both children and adults.
- (21) SA MA MD SD Most fat children and adults have a problem with their glands.
- (22) SA MA MD SD A reducing diet should not contain bread or potatoes.
- (23) SA MA MD SD Skim milk has about the same amount of minerals and protien as whole milk.
- (24) SA MA MD SD Eating carrots helps a person see better.
- (25) SA MA MD SD If a person drinks enough orange juice, he won't get a cold.

APPENDIX D

Other

1. Permission Slip
2. Referral Slip

APPENDIX D - 1
Permission Slip

Permission--Proof of Home Call

The Expanded Nutrition Evaluation Project has been explained to me.

I am willing to participate and have members of my family participate in the project.

I understand that I will be interviewed at agreed upon times, that my young children (if I have any) may be weighed and measured, and we will be asked to supply urine samples.

Homemaker

Aide

Date

APPENDIX D - 2
Referral Slip

Date: _____ Time: _____

To Whom It May Concern:

In doing a routine unanalysis for a research project of the Expanded Nutrition Program, subject _____ showed a positive test for _____. The test was made using Labstix produced by the Ames Company, a division of the Miles Laboratories.

Signed: _____
Research Assistant



**Typed and Printed in the U.S.A.
Professional Thesis Preparation
Cliff and Paula Haughey
144 Maplewood Drive
East Lansing, Michigan 48823
Telephone (517) 337-1527**