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THE EFFECTIVENESS OF NUTRITION EDUCATION FOR PREGNANT WOMEN CERTIFIED AS WIC PARTICIPANTS IN AN URBAN AREA OF SOUTH CAROLINA

The University of North Carolina at Greensboro PH.D. 1983

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THE EFFECTIVENESS OF NUTRITION EDUCATION FOR PREGNANT WOMEN CERTIFIED AS WIC PARTICIPANTS IN AN URBAN AREA OF SOUTH CAROLINA

by

Harriette E. Duncan

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Approved by

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APPROVAL PAGE

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The study assessed the effectiveness of nutrition education, combined with the provision of supplemental foods for a group (N=59) of low-risk pregnant women participating in the Special Supplemental Food Program for Women, Infants and Children (WIC). In addition, the study examined the effects of previous nutrition education experiences of women who participated in the WIC program prior to the period of the study.

A separate sample, pretest-posttest design was used due to the constraints of program mandates for benefits to be extended to all who are eligible. Random assignment to pretest and posttest or posttest only groups provided control for testing effects. The mean pretest scores of Group 1 (N=30) were then compared to mean posttest scores og Group 2 (N=29). Within groups, mean test scores of participants with previous experience were compared to mean test scores of participants with no previous experience in the program.

Nutrition knowledge was tested using a 36-item pictorial test (Pack Test). Dietary intakes were observed at entry into the program and again after provision of supplemental foods. Mean nutrient scores (data from a 24-hour diet recall) of each group were compared. Analysis of diets

for specific foods provided by the program was also performed.

Mean pretest scores (Group 1) and mean posttest scores (Group 2) were compared using a *t* test. There was no statistical difference (p 0.05) between groups for nutrition knowledge or for nutrient scores. Within-group differences for previous WIC experiences were also examined for knowledge and nutrition scores, but no differences were observed between subjects who had previous WIC experience and those who had never been enrolled in the program. Utilizing the Pearson product-moment correlation, a positive correlation between knowledge and dietary behavior was demonstrated. However, the correlation coefficient was not statistically significant.

Observed changes in cognitive behavior and dietary behavior were in a positive direction, but none was found statistically significant. These results suggest that current WIC program efforts to improve nutrition knowledge and dietary behavior among low-income pregnant women may be inadequate. More effective methods must be identified.

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CHAPTER I

INTRODUCTION

Despite its wealth and its sophisticated systems of health care, the United States has been unable to assure the survival of its youngest citizens. Outcome of pregnancy involves complex multiple variables, but the role of maternal and infant nutrition cannot be underestimated. Food is essential to life and growth. With an inadequate supply of nutrients, an organism cannot grow and develop; without the essential nutrients, the organism cannot survive.

Historical Background

During the last decade, research has confirmed that nutrition and weight gain of the pregnant woman are among the most important determinants of infant mortality and morbidity. The importance of nutrition and its role in the health of mothers and infants have been addressed by the World Health Organization (WHO) Expert Committee on Maternal and Child Health (1969; 1976). This committee noted that undernourished women tend to produce babies of low birth weight even at term and that the onset of labor is frequently premature. Many mothers and children subsist on diets defective in quality, as well as in quantity, and may suffer from a variety of chronic conditions and infections.

The committee report further stated that the magnitude of the task of preventing malnutrition may not be fully recognized. The report suggests that health care providers must give greater attention to high-risk groups that contribute greatly to the occurrence of infant mortality. Efforts should be directed toward early identification of problems and toward effective intervention during pregnancy. Health care providers must be cognizant of the cultural and social factors that may interfere with the consumption of essential nutrients needed during pregnancy and should provide nutrition education to the population at risk. The committee also suggested that, when appropriate, supplemental foods and nutrients should also be a component of efforts to reduce infant morbidity and mortality.

The Congress of the United States has demonstrated its concern about the nutritional needs of vulnerable population groups through the passage of legislation for a variety of nutrition programs. However, by the early 1970's, it became apparent that food assistance programs--such as the Food Stamp Program, the Child Nutrition Act, and the Commodity Supplemental Food Program--had not significantly influenced the problem of infant mortality, perhaps because these programs were not focused on the most critical stages of human development, just before and after birth.

The Special Supplemental Feeding Program for Women, Infants, and Children (WIC) is a federally-funded program that was specifically designed to influence infant mortality and morbidity. The program, which was initiated in 1973, operates under the auspices of the United States Department of Agriculture (USDA). WIC provides nutrition counselling and nutrition education, as well as supplemental foods, to low-income pregnant and lactating women and children (up to age 5) who are at risk because of inadequate diet and/or health care (Appendix A).

The WIC program is both preventive and therapeutic in nature. The program provides nutrition education and supplemental nutritious food as an adjunct to health care during critical periods of growth and development. It provides these services to pregnant or lactating women and infants who are at nutritional risk due to inadequate diet or income. The WIC program is administered through existing health care delivery settings--such as public health departments, hospital outpatient clinics, rural health centers, and other nonprofit community health organizations--to ensure that participants have access to health care, as well as food supplements and nutrition education services.

The USDA has established a priority system to classify individuals at greatest nutritional risk. Pregnant women, breast-feeding women, and infants are ranked as highest priorities, ahead of children from one to five years of age.

Potential WIC participants are medically assessed for nutrition risk to determine their eligibility for the program. Once enrolled, participants remain on the program for six months, except that pregnant women are enrolled for the entire period of their pregnancy. During enrollment, participants are provided monthly food prescriptions (a voucher redeemable at local grocery stores) for foods specified by WIC and are scheduled for at least two nutrition education sessions.

The WIC program regulations mandate that one-sixth of the program's administrative funds be used for nutrition education. Agencies which provide WIC services are responsible for developing nutrition education plans based on the following guidelines: (1) The agency is to tailor nutrition programs to the special needs of the WIC client; (2) The agency is to assist clients with poor dietary habits to change those habits; (3) The agency should maintain flexibility to allow the program to be adapted to the particular characteristics of the client group served. These guidelines are subject to broad interpretation and allow sponsoring agencies to adopt a variety of differing approaches to the provision of nutrition education services.

The original legislation for the WIC program contained the mandate for national program evaluation, and two major evaluation studies were implemented at the beginning of the program. The University of North Carolina, School of Public Health, initiated a medical evaluation study (Edozien, Switzer,

& Bryan, 1979), and the United States Bureau of Standards began an evaluation of the program's administration (Bendick, Campbell, Bawden, & Jones, 1976). Both studies faced insurmountable difficulties as the evaluation effort was mandated to begin immediately upon implementation of the WIC program. However, time constraints related to the funding and completion of the evaluation studies resulted in insufficient training of personnel and inadequate standardization of clinical and laboratory techniques. Similarly, the States had few guidelines and little time to establish administrative structures and functions or local policy for program services. Consequently, neither of these studies was able to fulfill the intent of evaluating the WIC program on a national basis.

At the state and local level, there have been several efforts to assess the effectiveness of the WIC program. One of the better studies was performed by the Louisiana State Health Department (Langham, Dupree, Atkins, & Schilling, 1975). This study was a retrospective review of medical records to compare infants and children who had experienced WIC with a control population from a similar economic background. The researchers concluded that the WIC children achieved better heights, weights, and hemoglobin levels than the non-WIC children. In Massachusetts, Heimendinger (1981) also investigated the effects of the WIC program on the growth of children, but she examined the influence of the mother's participation in WIC during pregnancy. She found that children born to

women who had participated in WIC demonstrates improved growth up to 18 months of age.

Kennedy (1979) examined the effects of maternal WIC participation on birth weight of infants in four programs in Massachusetts. This retrospective study evaluated a total of 1298 infants born to women who had participated in the WIC program. The study results showed that WIC participants delivered larger infants than women not enrolled in the program. In a similar retrospective study of WIC participants in Massachusetts, Kotelchuck, Schwartz, Anderka and Finison (1981) used birth certificates to assess morbidity and mortality of infants born to women participating in the WIC program. Birth certificates of infants born to WIC mothers were matched by maternal race, age, parity, marital status, education, and town of birth to a control group of infants born to non-WIC mothers. The researchers reported that WIC mothers had fewer low birth weight infants and that neonatal mortality was significantly reduced for this group. Greater improvements were seen for women who had participated in the WIC program during several pregnancies.

A study (Endres, Sawicki, & Casper, 1981) of pregnant women participating in the WIC program in Illinois examined nutrient intakes prior to and after participation in the program. Through the use of a 24-hour diet recall, nutrient intake and utilization of the WIC food package were examined. The study showed that the intake of total nutrients of women who had participated in the program was not higher than

the nutrient intake prior to program enrollment. It was also shown that women enrolled in the WIC program consumed selected foods in the WIC food package more frequently than did women who had not participated in the program.

Significance

The WIC program was established on the premise that the provision of nutrition education and supplemental foods (in concert with other prenatal health care services) would lead to improved nutritional status, which in turn would lead to improved pregnancy outcome. Several studies of the WIC program have indicated that WIC participation may result in improved pregnancy outcomes. However, only one study to date has examined the program's influence on dietary behavior, and none has included evaluation of changes in nutrition knowledge that may result from the nutrition education and supplemental foods provided by the program. Because the delivery of these services is so closely integrated with other aspects of prenatal health care, the cognitive and behavioral impact of the program must be examined to determine if the WIC services can be expected to enhance pregnancy outcomes.

Thus, the purpose of this study is to isolate the WIC service component and to focus on the immediate impact of the WIC program as one factor contributing to pregnancy outcome. To directly address the effectiveness of specific WIC services (i.e., nutrition education combined with

supplemental foods), the study will examine pre- and postprogram nutrition knowledge, dietary behavior, and nutrient intake among pregnant women who have participated in the WIC program.

Definitions

The following terms are defined for this study:

Low-Risk Pregnancy. A pregnant woman, under surveillance by medical professionals, is considered at low risk if she does not exhibit symptoms that may cause complications for her health or that of the fetus.

High-Risk Pregnancy. A woman is considered at high risk during pregnancy because of age (less than 20 or greater than 34); three or more pregnancies with two years; history of poor reproductive performance; chronic systemic disease; drug addiction; or other medical disorders requiring treatment by a specialist.

Prenatal Care. Prenatal care is defined as the continuous surveillance and management of expectant women throughout their pregnancies. The process includes the identification of high-risk pregnancies; the application of accepted methods to prevent, detect, and treat pregnancy complications; and attention to nutritional, social , emotional, and physical needs and education to prepare the woman for the demands of pregnancy, childbirth, future self-care, and care of the infant.

CHAPTER II

REVIEW OF THE LITERATURE

Special attention to the diet of pregnant women has been noted since the beginnings of recorded history. Many foods have been restricted or even prohibited, while other foods have been regarded as necessary for the mother or infant. Ancient documents record messages of restrictions that are prevalent in modern times in both developed and underdeveloped countries. Today, as in ancient times, some views of maternal nutrition have no more scientific basis than they did years ago (Committee on Maternal Nutrition, 1970). Throughout modern history, there have been surges of interest in the role of nutrition and pregnancy outcome. The most recent upswing in medical and public interest has probably been due to the 1970 report, Maternal Nutrition and the Course of Pregnancy, of the Committee on Maternal Nutrition, Food and Nutrition Board, National Research Council.

The major recommendation of this report emphasized the need for nutrition education at all levels: education for prospective mothers through nutrition education programs in the schools, education for pregnant women through nutrition education programs in maternity clinics, and education for health professionals through strengthening the nutrition curriculum of medical and other professional training institutions.

This recommendation has had a far-reaching influence in both clinical and applied research addressing nutrition during pregnancy. Policy decisions affecting professional organizations, as well as federal and private health programs, are obvious results of the impact of the report in increasing the emphasis given to the role of nutrition during pregnancy. One of the largest ($900 million in 1981) federally funded health programs in the United States is the Supplemental Food Program for Women, Infants, and Children, which focuses primarily on the nutritional needs of pregnant women. The National Foundation March of Dimes campaign for the 1980's addresses the elimination of birth defects through its "Healthy Mothers, Healthy Babies" program, which also is targeted to improving the nutritional status of pregnant women (Hughes, 1982).

It can safely be said that more is known about the role of nutrition in human reproduction and in the course of pregnancy than ever before. Tremendous amounts of resources have been expended both in basic research and in the delivery of nutrition services for pregnant women. However, as is shown in this review of the literature, there is a lack of clear evidence that nutrition education for the pregnant woman leads to improved knowledge, which can in turn be linked to improved dietary behavior.

Nutrition Education

According to the American Dietetic Association (1978), nutrition education is the process by which beliefs, attitudes, environmental influences, and understanding about food lead to practices that are scientifically sound, practical, and consistent with individual needs and available food resources. This basic definition was elaborated upon by Todhunter (1969), who pointed out that nutritional needs are physiological and are influenced by age, sex, occupation, activity, and individual variability. She went on to say that effective nutrition education must focus on those individual variables. Humans cannot instinctively select foods which meet their nutritional needs, and nutrition education must focus on improving food patterns to ensure that those needs are met.

Fisk (1979) has categorized nutrition education consumers by three levels of intensity of interest and need for information. Level One represents the amount of nutrition information that an individual needs for survival and personal well-being. Level Two is identified as the amount of information a person requires to satisfy a special interest or desire. Level Three information extends to the career interest of individuals who seek knowledge to achieve professional status. Utilizing these three levels of informational needs as a frame of reference, it becomes apparent that most nutrition research is directed to the interest of the Level Three consumer.

Nutritional status and dietary intake have received increasing attention as important variables in biomedical and behavioral research. Most research in nutrition education has been derived from clinical settings in which dietary intake and other relevant conditions are carefully controlled. The focus of such research has been the accumulation of a scientific data base for the nutrition professional, or Level Three consumer. Other research has been conducted among population groups that require specialized nutrition intervention, such as dietary management of persons with renal failure or phenylketonuria. These studies, too, are representative of the informational needs of the nutrition professional, but the patients involved in such research might be classified as Level Two consumers, as they are provided the education or training needed for dietary self-management.

Research concerning the informational needs of the Level One consumer is not as well-defined. Several authors (Dwyer, 1981; Fisk, 1979, Hochbaum, 1981) pointed out that a major concern in basic nutrition education is the inability to identify the knowledge, skills, and attitudes needed to ensure that individuals make appropriate food choices. Basic, or Level One, nutrition education research has generally relied on three approaches: (1) surveys of nutrition knowledge and individual practices; (2) clinical and experimental research on physiological factors that

influence nutritional status; and (3) clinical and experimental research on psychological factors that influence nutritional status. Hochbaum (1981) pointed out that these types of descriptive and analytical studies have led to the development of a number of theories that may have significant implications for understanding nutrition-related behaviors. However, he concluded that further research is needed in the context of individuals' daily lives so that

> in all the complexity and sometimes seeming irregularity and unpredictability of their food-related practices (we may) discover common and recurrent elements which may generate new theories. (p. 565).

In spite of this relatively poor understanding of the basic informational needs of the Level One nutrition education consumer, there are numerous examples of programs purporting to provide nutrition education. In a review of nutrition education programs funded by the federal government, Michelman (1977) described a scope of nutrition education services that ranged from programs to teach patients with special needs for diet therapy, to programs designed to improve public awareness of general nutrition concepts, to programs addressing food storage, preparation, and handling. An attempt to determine the overall effectiveness of these programs was doomed from the start because of the inherent differences in the purposes of this wide variety of nutrition education efforts.

Nutrition education programs in the school setting share a greater similarity of purpose, in that they usually are designed to provide basic information for improving children's food choices and dietary habits. Levy, Iverson, Walberg (1979) have reviewed a number of academic studies that were carried out in classes or in cafeterias as part of the school food service program, or (in a few cases) in the home setting of the children. They found that very little could be said about the effectiveness of these nutrition education programs, since the majority lacked an evaluation component, did not determine the validity of measurement instruments used, and were lacking any theoretical frame of reference for their methodology.

These examples are given simply to illustrate some of the difficulties faced both in defining nutrition education and in determining the effectiveness of nutrition education efforts. Nevertheless, changing technology, increasing public interest and awareness, and improved understanding of the influence of nutrition on morbidity and mortality are forcing nutrition educators to examine the basic informational needs of the free-living population. Studies of these population groups have continued to raise questions and concerns related to validity, reliability, methodology, and data analysis (St. Jeor, 1982).

A major concern in developing nutrition education programs is to determine which of the innumerable aspects of individual

variability are the most important factors contributing to appropriate food selection and dietary behavior. While many educators wish to assume that the mere provision of information will result in desirable outcomes, it is clear that many variables can intervene in the process of translating information into appropriate actions.

Attitudes

Reference is frequently made to the influence of attitudes on nutrition behaviors (Eppright, Fox, Fryer, Lampkin & Vivian, 1970; National Research Council, 1945; Rosander & Sims, 1981; Schwartz, 1976; Sims, 1978, 1981c; Zimmerman & Munro, 1972). Reference and recognition, however, have not resulted in a mutual agreement among researchers concerned with this issue. Foley, Hertzler, and Anderson (1979) prepared a comprehensive review of the basic attitudinal concepts that have been researched in the nutrition education literature. They noted that this research could be classified by five definitional categories of attitudes: (1) attitudes as preferences, likes or dislikes, and feelings; (2) attitudes as food behaviors; (3) attitudes as flexibility versus rigidity; (4) attitudes as agreement; and (5) attitudes as complexity of meanings. The reviewers concluded that the inadequacy of these definitions of attitudinal terminology has complicated, rather than heightened, the interpretation of many food habit and nutrition education studies. While there seems to be

little doubt that attitudes are important, additional research is needed to clarify and delineate the essential components of this broad concept.

Culture and Food Beliefs

Most of the data documenting the importance of cultural influences on food behaviors have come from the field of cultural anthropology (Pelto, 1981), sociology (Hertzler & Owen, 1976), and social psychology (Evans & Hall, 1978; Glanz, 1981). These descriptive studies, which have focused on the role of culture in nutrition information and education, alert the nutrition educator or researcher to the potential influence of the food beliefs of the population being studied or served.

Several studies in nutrition education have also explored the effects of culture on food behavior. In a study conducted in upstate New York, mothers revealed that certain foods were considered important for their children because of custom or habit rather than for valid nutritional reasons (Emmonds & Hayes, 1973). Customs of procuring and consuming food are transmitted from one generation to the next, and thus, many food habits may be based largely on tradition.

Williams (1977) pointed out that cultural considerations may be particularly important in providing nutritional guidance for the pregnant woman and recommend that culturally related food patterns should be explored. She also pointed out that

many individuals within the community provide the pregnant woman with culturally based advice concerning what she eats. Similarly, Bartholomew and Poston (1970), in a study of food taboos during pregnancy, found that 50% of their study population of 200 pregnant women chose their food according to superstitious food beliefs. Pregnancy appeared to be a time to practice food taboos learned from parents and relatives, and these authors stressed that efforts must be made to consider background, beliefs, and customs when determining informational needs for nutrition education.

Changes introduced into any society should not be disruptive and should fit into the cultural framework of the people (Gifft, Washbon, & Harrison, 1972). New or different foods are not necessarily accepted because they are wise food choices or because programs offer them free. The individual must perceive the advantage being gained from the change before he or she will adopt the change. Nutrition education programs must augment and supplement local food patterns, not replace them.

Nutrition Knowledge

Several studies have evaluated the relationship between nutrition knowledge and dietary practice or quality of the diet. In a 12 state study of 2050 households, Eppright et al. (1970) found that the quality of preschool children's diets was influenced by the nutrition knowledge of the mother.

The researchers observed that there was a positive correlation between nutrition knowledge and nutrition behavior, but that, of the socioeconomic variables studied, the amount of money spent for food was the most influential factor in predicting the quality of the diet of the children.

Emmonds and Hayes (1973), in a study involving children in upstate New York, attempted to gain further insight into the nutrition knowledge of mothers and the relationship of their knowledge to their children's diets. This study showed that mothers served food from a variety of food groups, although they failed to report certain food groups as being important in their children's diet. In this case, nutrition practices seem inversely related to nutrition knowledge.

In a study of a self-selected population, Duyff, Sanjur, and Nelson (1975) tested 75 Puerto Rican girls for nutrition knowledge and evaluated the nutrient content of three-day records of foods consumed. They found that higher intake of Vitamin C and Vitamin A, as well as greater dietary diversity were significantly and positively related to better scores on the knowledge test.

These representative studies illustrate some of the inconsistencies found in examining the importance of nutrition knowledge as a determinant of dietary practice, of nutrition-related behavior. They suggest that nutrition knowledge does influence nutrition behavior, but that knowledge is not the only motivating force directing individuals in making appropriate and healthy food choices.

Demographic Influences

Health surveys and food consumption surveys generally include information on demographic population descriptors, and many nutrition education studies have examined age, income, and educational level to determine whether these variables influence nutrition knowledge or nutrition behavior. For example, surveys conducted by the U. S. Food and Drug Administration (Abelson, Schrayer, & Gunzelman, 1974) showed that younger shoppers and those with college education were more likely to have greater nutrition knowledge. However, in analyzing the results of the Nationwide Food Consumption Survey, Windham, Wyse, and Hansen (1981) found that age did not affect quality of the diet.

Two similar studies (Jelso, Burns, & Rivers, 1965; Wang; Green & Ephross, 1971) related age, educational level, and income to food faddist beliefs and practices. Subjects with the fewest years of formal education were more likely to practice food faddism, as were older subjects and those with lower incomes. Eppright et al. (1970) examined diet quality and nutrition knowledge in relation to educational level and income. They found that education seemed to be the most significant factor in determining the quality of the diet.

Another dietary survey (Mumaw, 1973), conducted in Leveland, Texas, found that families with higher incomes and higher educational levels tend to have more adequate diets.

The same was true in the 1970 North Carolina Nutrition Survey. However, family income alone does not necessarily ensure good diets (adelson, 1968). To the contrary, low family income does not necessarily indicate dietary inadequacy. Two studies (Hootman, Haschke, Roderuck, & Eppright, 1967; Kerrey, Crispin, Fox, & Kies, 1968) found that the diets of children from low-income families did not demonstrate gross inadequacies. Owen, Kram, Garry, Lowe, & Lubin (1974) in a national study of preschool children, reported that major dietary differences between income groups were related to the source of nutrients in the diet and not necessarily to the overall quality of the diet.

This overview of the possible relationships between demographic variables (such as age, income, and educational level) and nutrition knowledge and behavior again suggests that additional study may be needed to clarify some of the inconsistencies in the literature. There is, however, general agreement that educational level and income are important variables affecting both nutrition knowledge and quality of the diet.

Prior Educational Experience

Information about the effects of previous experience or prior exposure to nutrition education is lacking from most studies designed to evaluate nutrition education programs. Only one study, (Jacobson, Grevenberg, Kelly & Young, 1976)

has attempted to assess the long-term benefits of a nutrition intervention program. The study sample included 165 school age girls who had participated in a nutrition education program for pregnant adolescents in New Jersey. The researchers minimized circumstances that might be threatening to the study participants by utilizing interviewers who had worked with the original intervention program, as well as incentives ($10 per interview) for participation. The study results indicated that the participants had maintained adequate food intakes, but there were many unforeseen problems in the collection and anlysis of the follow-up data. The researchers concluded that nutrition intervention programs should contain an evaluation component from the beginning in order to provide a data base for future evaluation efforts.

Nutrition Education for Pregnant Women

Research to support the assumption that the provision of appropriate information will result in group or individual nutrition behavior change is sketchy at best (Sims, 1981b). This is particularly true for studies addressing nutrition education programs for pregnant women.

An early study by Berry and Wiehl (1952) examined whether or not low-income pregnant women would change dietary practice if provided individual dietary instruction. Prenatal patients attending maternity clinics in a public hospital in New York City were assigned on an alternate basis to either a control

group or a study group. The study group was provided with at least two nutrition education sessions, while the control group received information pertaining to diet only if individual patients requested information from their physician. Diet histories were taken before and after treatment, but the results of the dietary analysis did not show a statistical difference between groups. However, these researchers insisted that there must have been a difference due to the education provided. Their data did show that dietary change was greater for the group receiving nutrition education, but their conclusion was based primarily on the outcome of pregnancy. Women who received the structured nutrition education experienced less perinatal mortality than women without nutrition education. This finding was summarized as evidence of the need for nutrition education for pregnant women.

A study to determine the effects of nutrition information on knowledge and food behavior of pregnant women was conducted by Nobmann and Adams (1970) in two different prenatal clinics in California. Methodology for the delivery of nutrition information differed in each clinic. In Clinic A, a physician delivered the nutrition message using a lecture method of teaching, while in Clinic B, another physician utilized a less structured, more casual approach to teaching. Through subjective evaluation of food behaviors, the study indicated that clients in Clinic A had a greater change in food behavior than the clients attending Clinic B. However, this conclusion

was weakened by several problems in the design of the study. There were significant demographic differences in the clientele of the two clinics, there were clear differences in the two instructors' philosophy of patient care, and there was no attempt made to validate the research instruments used for testing nutrition knowledge.

A study carried out in an upstate New York prenatal clinic (Mason & Rivers, 1970) also utilized dietary behavior to evaluate nutrition education. A sample of 37 pregnant women were given a supply of prenatal vitamins that did not contain Vitamin C. All of the women were instructed to take the vitamins, but they were then randomly assigned to a study group to receive specific nutrition counselling or to a control group which received no further instruction. During the counselling sessions, the women were encouraged to consume foods containing Vitamin C. Blood tests were performed on all women at each clinic visit to evaluate plasma nutrient levels. There was a significant increase ($p < 0.05$) in the plasma ascorbic acid levels of the study group.

A study of 119 pregnant women attending prenatal clinics in New York City examined dietary change among pregnant women receiving nutrition education (Bowering, Morrison, Lowenberg & Tirado, 1976). All women in the study received nutrition education from either a professional nutritionist in the clinic or a nutrition aide who visited the home. The study population was allowed to select the method of their choice,

which resulted in an unequal distribution of subjects for comparative analysis. The study indicated that both groups demonstrated improved dietary behavior. The authors proposed that nutrition knowledge must have increased, although no attempt was made to assess pre- or postprogram nutrition knowledge.

Rosander and Sims (1981) conducted a study of nutrition education in a WIC clinic population. Their nutrition education classes were designed to evaluate a specific method of teaching and their study population was self-selected. However, their findings did indicate that low-income pregnant women changed dietary behavior as a result of nutrition education intervention.

An excellent study (Hunt, Jacob, Ostergaro, Masri, Clark & Coulson, 1976) of the effects of nutrition education on knowledge, diet, and biochemical indices was conducted in a California public health clinic. The total sample included 344 pregnant Mexican women with low education and income levels. Clinic patients were eligible for the study at their first clinic visit if they were no more than 21 weeks pregnant. The women were randomly assigned to treatment or control groups, with the treatment group receiving a total of five nutrition education sessions. A pre- and postprogram nutrition knowledge questionnaire and twenty-four hour diet recall were administered to all clients.

The study showed that women who attended at least three of the five educational sessions significantly ($p < 0.05$) improved their nutrition knowledge test scores. Their diet histories also reflected significant changes in food behavior as evaluated by percentage intake of Recommended Dietary Allowances. The study also analyzed several biochemical measures, although the results of these evaluations were not significant between the two groups. According to the researchers, this may have been due to the fact that all patients were provided prenatal vitamins and minerals by the clinics. The study also included birth weights of infants as an outcome measure, but no significant differences were observed between groups. The study illustrated that nutrition education for certain ethnic and low income groups can be effective in bringing about positive changes in knowledge and behavior.

Nutrition Supplements for Pregnant Women

Recognition of the fact that socioeconomic status is a major contributor to perinatal mortality has led many to conclude that if low-income pregnant women were provided the nutrients not present in their diets, then pregnancy outcomes would improve. On this premise, the provision of nutrient supplements for pregnant women has been common since the early 1900's.

It was during the first half of this century that research in the field of nutrition was advanced significantly. Of particular importance were major discoveries about the functions of vitamins in health and disease. Thus, a natural sequence of events was to focus on the role of these protective nutrients in the diets of pregnant women. Two studies published during the 1940's are considered classics as examples of the effects of supplements during pregnancy. Both studies have been and are still cited as support for model nutrition care to be provided for pregnant women.

The first of these studies was conducted by Ebbs, Tisdall, and Scott (1942). The researchers examined 380 women who had been categorized into three groups based on reported diet adequacy. Women who reported a good diet were not given vitamins and minerals, but received diet counselling. Women whose diet was judged to be poor were further categorized into two subgroups.

One subgroup (study group) was given vitamin and mineral supplements, as well as diet counselling. The other subgroup (control group) was given placebos and no diet counselling. The researchers reported that the outcome of pregnancy was best for the study group.

The second study was carried out by Balfour (1944) through a retrospective evaluation of the medical records of pregnant women who had been provided vitamin and mineral supplements through public clinics in England. Fetal mortality, maternal mortality, and toxemia were evaluated. The study

reported a significant reduction of stillbirth rates for the population receiving supplements as compared to a control population which did not receive supplements and concluded that women should receive nutrient supplements during pregnancy.

Both of these studies have been criticized for their design as well as their methods (Vermeersch, 1977). A major criticism concerns evaluation of nutritional status in the Ebbs et al. study in that it is not possible to determine nutritional status from dietary intake alone. Neither study included consideration of other factors, such as age, parity, and income, that are known to affect pregnancy outcome. Reproductive casualties are complicated and complex, but these early studies made direct correlations which have proven over time to be incorrect. Diet or nutrient effects on outcome of pregnancy cannot be studied in isolation of other variables.

Developing countries have provided a rich laboratory for research in nutrition and pregnancy, and there are excellent reviews (Hemminki & Starfield, 1978; Susser, 1981) of international studies of the use of dietary supplements to reduce pregnancy wastage and improve fetal outcome. Many studies in the United States have also provided supplemental vitamins and minerals to improve the nutritional status of pregnant women, but few have used the special formulas or liquid supplements that are frequently used in developing countries with limited food supplies.

One recent study (Rush, Stein & Susser, 1980) has brought about debate on the utilization of such prophylactic supplements for pregnant women in developed nations such as the United States. The study involved 770 women who were randomly assigned to three groups; the sample was drawn from the prenatal clinic population of a municipal hospital serving a largely indigent black community in New York City. The major criterion for inclusion in the study was a history of poor nutritional status. The sample was randomly assigned to three study groups which received the following treatments: Group 1. a high-calorie, high-protien, liquid supplement containing an array of vitamins and minerals; Group 2. a liquid supplement containing fewer calories, less protien, and reduced amounts of vitamins and minerals; Group 3. non-intervention. This third group represented the control population which was provided usual prenatal care including a supply of multivitamin/mineral tablets. All groups had identical prenatal clinical experiences, except for the differences in the types of supplements used.

The results of the study showed surprising differences in infant birth weights among the three groups. The mean birth weight of infants from Group 2 was higher than for the control group, but the mean birth weight of Group 1 infants was less than that of the control group. Thus, if infant birth weight is used as a pregnancy outcome measure, the use of special supplemental feeding may be questionable. The researchers have examined the data extensively and cannot explain the negative outcome by any variable other than the

Provision of supplements. Susser (1981) has suggested that the study should not be repeated although the issue remains unresolved.

Studies of the effectivenss of food as a direct dietary supplement have not been executed, although it seems that food as a supplement is less likely to cause the negative results associated with special supplemental formulas (Fairchild, 1983). The Nutrition Education Program at the Montreal Diet Dispensary and the WIC Program are believed to be the only documented instances of the utilization of food supplements and nutrition education. The Montreal Diet Dispensary has provided nutrition education and food supplements for indigent pregnant women since 1963 (Higgins, 1973). Higgins reported numerous case histories which support her position for intervention through the provision of supplemental foods and nutrition education. Rush (1981) has further analyzed the Montreal experience through examination of the clinic records of 3291 women served by the program. He found that women attending the nutrition education sessions and receiving supplemental foods delivered infants with a mean birth weight almost 40 grams greater than a control group which did not receive food supplements or diet counselling. This difference in birth weights was statistically significant ($p < 0.05$). Thus, the use of food supplements for women with a history of poor dietary intake can have a positive influence on the outcome of pregnancy.

The Present Study

This literature review has illustrated the wealth of information available on the role of nutrition in pregnancy, but it has also pointed out many gaps in the body of knowledge on this topic. Specifically, there is a lack of evidence supporting the overall premise that nutrition education (with or without the provision of supplemental foods) leads to changes in dietary behavior which then lead to improved pregnancy outcome.

Previous studies have focused on different aspects of this basic premise, but none has examined the combined effects of food supplements and nutrition education on the dietary behavior or food intake of pregnant women. The ability to demonstrate that intermediate cognitive and behavioral changes result from nutrition intervention would strengthen the conclusion that the desired outcome results from that service. This gap in the current research is particularly significant in regard to the conduct of the WIC program as a service designed to provide food supplements and nutrition education to improve outcome for low-income pregnant women.

The WIC program suggests both the opportunity and the necessity to carefully examine the relationship between nutrition education/food supplements and nutrition knowledge/ dietary behavior. The present study will examine the following questions:

1. Do women who participate in WIC learn basic nutrition concepts?

2. Do women who participate in WIC consume the supplemental foods provided by the program?

3. Do women who participate in WIC change their dietary behavior during pregnancy?

4. Do women who participate in WIC demonstrate a positive correlation between nutrition knowledge and diet quality?

5. Do women who have previous WIC experience demonstrate any continuing effect of program benefits?

CHAPTER III

METHODS

In South Carolina, the WIC program is administered by the South Carolina Department of Health and Environmental Control, which is the state's official public health agency. Within the agency, the WIC program is administratively located in the Division of Maternal and Child Health, with services delivered through the 46 county health departments and their satellite clinics. The Division of Maternal and Child Health ensures optimal integration of WIC services with other prenatal and pediatric services offered by the health department.

The setting of the present study is in the Charleston County Health Department, one of the first local health agencies to receive WIC funding in South Carolina. It was chosen for the site of this study because it has a large WIC population of pregnant women, because staffing has been relatively stable over the past few years, and the staff were interested and willing to assist with the study.

The Charleston County Health Department serves a total population of 284,179 residents of the county, and in Fiscal Year 1982, the health department served 1559 pregnant women through the WIC program. Most indigent women in the county traditionally obtain prenatal care from the Medical University

of South Carolina or from the federally funded Fetter Comprehensive Health Care Center.

The North Charleston Area Clinic is the health department's only self-contained maternity clinic. It not only serves pregnant women, but also provides a full complement of services for pediatric and adult health. In the fall of 1982, the clinic was providing care for only 38 low-risk pregnant women. However, due to changes in federal health care financing and subsequent reduction of indigent prenatal services in the area, by July of 1983, the clinic's case load of low-risk pregnant women had increased to 536.

Research Design

Evaluation of the effects of the WIC program would ideally be based on a prospective study with random assignment of subjects to treatment and control groups to insure internal validity. However, the WIC program has been broadly implemented for a period of nearly 10 years. The program mandates that pregnant women who meet program eligibility requirements cannot be denied program services. To seek a control population is to identify individuals who are eligible for the program, but who have chosen, for whatever reason, not to participate. If individuals choose not to participate, they are not comparable to the treatment group by the fact that they do not participate, and, thus, are not eligible to serve as a control population. The fact that

the program is in place requires that the population to be studied is self-selected. Consideration of this major constraint has led to the selection of an alternative study design that is not as tightly controlled as the experimental design, but that includes several features adaptable to a study of the WIC program.

The design used in this study is the Separate Sample, Pretest-Posttest Design described by Campbell and Stanley (1971). This quasi-experimental design can be used for prospective evaluation in a situation that does not allow for random segregation of treatment and control groups. The design does, however, allow for random assignment between two treatment groups. Each group receives the same treatment, but the random assignment determines whether or not a pretest will be administered. The paradigm for the Separate Sample, Pretest-Posttest Design is shown below.

PARADIGM FOR DESIGN

Group 1	R	O_1	X	O_2
Group 2	R		X	O_3

Analysis of this design is based upon comparison of the pretest scores of Group 1 (O_1) and the posttest scores of Group 2 (O_3). Since it is not permissible to deny WIC program services to any study subjects, Group 2 in essence serves as a control group. The assumption is made that if subjects in Group 2 had been given a pretest, then their

scores would have been similar to the pretest scores of Group 1. It is further assumed that if subjects in Group 1 had not been given a pretest, then their posttest scores would have been similar to Group 2.

Mean posttest scores for Group 1 may be expected to increase due to statistical regression and are of little value unless they are in agreement with the mean posttest scores of Group 2. If the intervention is effective, then $O_1 - O_3$ differences should confirm $O_1 - O_2$ differences. Thus, direct comparison of the mean pretest scores of Group 1 and the mean posttest scores of Group 2 will allow determination of the effectiveness of the intervention to which both groups were exposed.

The use of this design also allows investigation of the long-term benefits of WIC participation. Each group, due to random assignment has women who have no previous WIC experience as well as women who have WIC experience. Women who have had previous WIC experience, either during a previous pregnancy or by having a child participate in the program, can be examined for differences in knowledge and behavior as compared to women with no prior WIC experience.

Hypotheses

1. The nutrition knowledge of women enrolled in the WIC program for at least two months will be greater than the nutrition knowledge of women who have not participated in the WIC program.

2. Women who have had previous WIC experience will have greater pre-program nutrition knowledge than women participating in the WIC program for the first time.
3. The quality of the diets of women enrolled in the WIC program for at least two months will be higher than the quality of the diets of women who have not participated in the WIC program.
4. Women who have had previous WIC experience will have a pre-program diet of higher quality than women participating in the WIC program for the first time.
5. There will be a positive correlation between nutrition knowledge and the quality of the diets of women enrolled in the WIC program.

Control of Extraneous Variables

Random assignment to groups provides the major control of extraneous variables in this study. Through use of this process, variance among individual subjects is minimized. Also, the study sample was drawn from the homogeneous population of low-income pregnant women eligible for the WIC program. The sample contained only women who were ascertained to be at low risk, thus minimizing physical and psychological elements related to pregnancy that may interfere with the ability to learn. An additional control to maximize homogeneity was that all women attending the clinic resided in a confined geographic area. (The assumption was made that all subjects had an equal chance of exposure to external

information sources, such as radio, television, other media, or other nutrition information programs.)

Treatment (nutrition education) was provided in group sessions and by individual consultation. The sample attended group sessions with the total WIC clinic population. There was no identification of the sample to the treatment providers.

Subjects

The subjects for the study were low-risk pregnant women, who attended the North Charleston Area Clinic between May and July of 1983. All of the subjects met the criteria for WIC eligibility, as determined by nutritional status and income (Appendix A), and were enrolled in the program during their initial visit to the clinic. The final sample included 59 women; subjects were randomly assigned to Group 1 (pretest and posttest) or Group 2 (posttest only) by asking each client to flip a coin.

Instruments

The two instruments used in this study were the Pack Test (Brock, 1978, Appendix B) and the 24-hour diet recall (Frank, Berenson, Schilling & Moore, 1977, Appendix C), analyzed for nutrients by the Nutrient Dietary Data Analysis System (Endres, 1979, Appendix D).

The Pack Test is a 36-item pictorial multiple-choice

questionnaire for assessing nutrition knowledge. Test scores could range from 0-36. It is a criterion-reference measure which assesses knowledge about basic nutrition concepts. The test was not used to compare individuals' knowledge to the total group's knowledge, but the mean score of each group provides an assessment of the knowledge of that group. The test was originally developed to evaluate the effectiveness of a nutrition education program for low-income homemakers in South Carolina.

The selection of the Pack Test was based on three major considerations: (1) The research hypothesis of this study is that women in the WIC program learn basic nutrition concepts. Thus, the test to be used had to address that subject. The Pack Test had been previously evaluated for content validity by a panel of experts in the fields of nutrition and home economics (Brock, 1978). (2) The population to be studied was a low-income population expected to have a low literacy rate. The test had to be able to assess each member of the study sample without discrimination due to inability to read. The Pack Test used is a pictorial test that had been evaluated for face validity in a similar group of low-income women. (3) The previous performance of the test and its stability needed to be assured. The Pack Test's reliability coefficient using the Spearman-Brown modified formula was 0.94 for the population examined by Brock. Prior to the implementation of this study, the Pack Test was

administered to a sample of women attending a similar WIC clinic in Charleston County. In this instance, the reliability coefficient using the Juder-Richardson (KR-20) analysis for internal consistency was 0.78. A reliability measure for a criterion-reference test may be as low as 0.20 and still be reliable, but a reliability of 0.70 is considered very good (Grey, 1976).

The 24-hour recall is a standardized interview technique for determining the foods consumed by an individual during a defined 24-hour period. It incorporates the use of food models, household measuring devices, and common portion containers to assist the client in remembering portion sizes and amounts. It is generally regarded as the preferred method of obtaining data on average nutrient intakes of population groups (Block, 1982).

Young, Hagan, Tucker and Foster (1952), found that the 24-hour diet recall and 7-day record gave similar values (agreement within 10%) when used with groups of 50 or more subjects. In 1976, Madden, Goodman, and Guthrie unobtrusively observed the food consumed by 76 elderly subjects during the noon meal. They compared actual consumption with recalled intake collected 24 hours after the meal. Paired t tests showed no significant differences between mean recalled and actual consumption. A study to determine the reliability of the twenty-four hour dietary recall during pregnancy was carried out by Rush and Kristal (1982). They concluded that

repeated twenty-four hour recall is a reliable instrument "and remains the best available dietary measurement for such research". Similar findings have been reported by other researchers (Beaton, 1982, Burk & Poe, 1976; Emmonds & Hayes, 1973; Garn, Larkin, & Cole, 1976; Greger & Ethyre, 1978; Madden et al., 1976; Nutrition Reviews, 1976; Rasanen, 1979; Stunkard & Waxman, 1981).

The Nutrient Dietary Data Analysis system of Southern Illinois University was used for analysis of dietary intake data from the 24-hour recall. This nutrient analysis system utilizes the Ohio State University Nutrient Data Base for determination of the nutrient content and composition of foods. The Nutrient Dietary Data Analysis system provides gram weight of foods consumed, intake levels for 34 nutrients or dietary substances, and the percentage of the recommended dietary allowance (Appendix E) met for the 17 nutrients considered as essential in the diet (National Research Council, 1980).

Procedures for Treatment and Data Collection

WIC-eligible, low-risk pregnant women included in the study (N=59) were randomly assigned to either Group 1 (pre-test and posttest) or Group 2 (posttest only) as determined by a coin toss. At entry into the study, all clients in Group 1 were administered the Pack Test (Appendix B) and the 24-hour diet recall (Appendix C). All clients in Group 2

were administered the 24-hour diet recall, in accordance with standard clinic procedure. Basic demographic data were abstracted from the client's clinic records.

Clients in both groups were subjected to the same treatment, consisting of two nutrition education sessions as specified by the WIC program (Appendix A). Clients were given appointments for posttesting to coincide with their regularly scheduled monthly food voucher pick-up; thus, posttesting was conducted at the clinic visit that most closely followed the completion of two nutrition education sessions. Posttesting was the same for both groups; all clients were administered both the Pack Test and the 24-hour diet recall.

After administration of the Pack Test, subjects' responses were transferred to optical scanning forms for computer grading. The "University Grader" program of the University of South Carolina was used to obtain individual test scores, item analysis, and test reliability, as well as mean test scores and standard deviations for each study group.

After administration of the 24-hour diet recall, subjects' responses were transferred to an optical scanning form for nutrient analysis. The Nutrient Dietary Data Analysis system of Southern Illinois University was used to obtain the gram weights of different foods consumed, the actual intake level of the 17 essential nutrients, and the percentage of the Recommended Dietary Allowance met for each of those nutrients. A total nutrient score was obtained by averaging the overall

intake (as a percentage of the Recommended Dietary Allowance) of the seventeen nutrients for which there are established requirements or standards. An example for calculating a nutrient score is given in Appendix E.

Analysis of Data

The data were analyzed using a *t* test to determine the effects of the independent variables, nutrition education and supplemental foods, on the dependent variables of nutrition knowledge and dietary behavior. The *t* test was repeated for subgroups with and without previous WIC experience. Alpha was established at the 0.05 level.

The Pearson product moment correlation coefficient was calculated to determine if and to what degree a relationship exists between nutrition knowledge (as indicated by the Pack Test) and dietary behavior (as indicated by the 24-hour diet recall). In addition, extraneous variables, age, race, education, and previous WIC experience were examined using a regression model.

SAS computer software (SAS Institute, Inc., 1982) was used to analyze the data.

CHAPTER IV

RESULTS

This chapter reports the findings of the study and includes a description of the study sample and testing of the five hypotheses. An additional examination of the actual consumption of the supplemental foods provided to the study subjects was also conducted.

Description of the Study Sample

The study sample was drawn from the population of WIC-eligible, low-risk pregnant women who sought prenatal care at the North Area Clinic of the Charleston County Health Department. A total of 74 women were interviewed as potential study subjects; 59 of these were included in the final sample. The remaining 15 women were excluded from the study sample because they did not return for clinic appointments or because they were subsequently diagnosed as high-risk pregnancies.

A Chi-square test was performed to determine if there were any differences between survivors (those included in the sample) and nonsurvivors (those excluded from the sample). The two groups were compared for differences in age ($p=.8776$), race ($p=.0933$), parity ($p=.8912$), educational level ($p=.3792$), and previous WIC experience ($p=.2819$). No significant differences were observed.

Table 1 provides a description of the subjects included in the final study sample. The sample was nearly equally distributed by race, and most (78%) of the subjects were 18 to 34 years of age. Over half of the study subjects had not completed a high school education. Parity and previous WIC experience were similar in that approximately half of subjects were experiencing their first pregnancy, as well as their first encounter with the WIC program.

The study subjects were randomly assigned to two groups for pretesting (Group 1) or for posttesting only (Group 2). As shown in Table 2, the sample was evenly distributed between the two groups. A Chi-square test was performed to ensure that the groups were comparable with regard to race ($p=0.2403$), age ($p=0.4957$), educational level ($p=0.3947$), parity ($p=0.3327$), and previous WIC experience ($p=0.9394$). No significant difference was found between groups.

Hypothesis 1

The first hypothesis tested was that the nutrition knowledge of women enrolled in the WIC program for at least two months would be greater than the nutrition knowledge of women who had not participated in the program.

Figure 1 shows that both the preprogram knowledge scores from Group 1 ($N=30$) and the postprogram knowledge scores from Group 2 ($N=29$) were normally distributed. The mean preprogram

TABLE 1

Description of Sample Subjects
(N=59)

VARIABLE	NUMBER	PERCENTAGE
Race		
Black	30	50.8
White	29	49.2
Age (years)		
Under 18	12	20.3
18 - 34	46	78.0
Over 34	1	1.7
Education (years of school completed)		
Less than 12	31	52.5
12	23	39.0
More than 12	5	8.5
Parity		
0	27	45.8
1	15	25.4
2	9	15.2
3	6	10.2
4 or more	2	3.4
WIC Experiences		
0	32	54.2
1	7	11.9
2	8	13.5
3	6	10.2
4 or more	6	10.2

TABLE 2

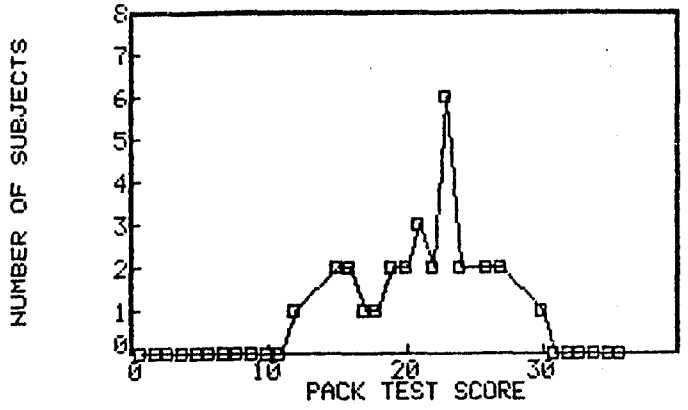
Description of Sample Subjects by Group Assignment

VARIABLE	GROUP 1 (N=30)		GROUP 2 (N=29)	
	Number	Percentage	Number	Percentage
Race				
Black	13	43.3	17	58.6
White	17	56.7	12	41.4
Age (years)				
Under 18	7	23.3	5	17.2
18 - 34	22	73.3	24	82.8
Over 34	1	3.3	0	0
Education (years of school completed)				
Less than 12	15	50.0	16	55.2
12	11	36.7	12	41.4
More than 12	4	13.3	1	3.4
Parity				
0	15	50.0	12	41.4
1	6	20.0	9	31.0
2	3	10.0	6	20.7
3	4	13.3	2	6.9
4 or more	2	6.7	0	0
WIC Experiences				
0	16	53.3	16	55.2
1	3	10.0	4	13.8
2	4	13.3	4	13.8
3	4	13.3	2	6.9
4 or more	3	10.0	3	10.3

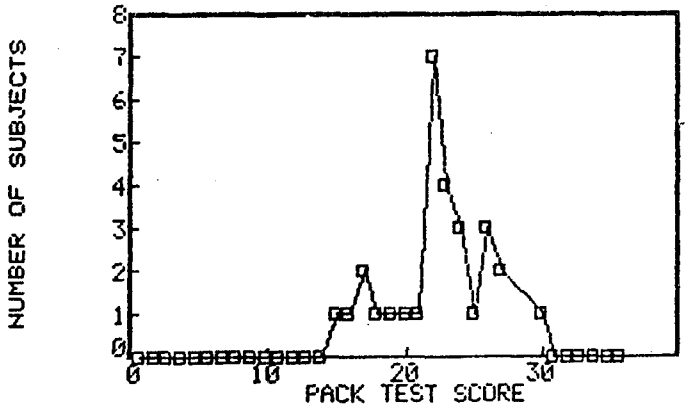
FIGURE 1

DISTRIBUTION OF PACK TEST SCORES

A. PRETEST (GROUP 1)



B. POSTTEST (GROUP 2)



Pack Test score (Group 1) was 21.33 (SE=0.75), and the mean postprogram Pack Test score (Group 2) was 22.34 (SE=0.65). The reliability coefficients (KR-20) for the Pack Test for Groups 1 and 2 were r=0.63 and r=0.48, respectively.

The two study groups were known to be of comparable variance (f=1.36, p=0.4194). A two-tailed t test was performed on the mean Pack Test scores of the two groups. The slight observed difference between the preprogram and postprogram scores of the two groups was not found to be significant (t=-1.0123, p=0.3157). The data did not support Hypothesis 1; therefore, the hypothesis was rejected.

Hypothesis 2

The second hypothesis tested was that women who had had previous WIC experience would have greater preprogram nutrition knowledge than women participating in the WIC program for the first time.

The mean preprogram Pack Test score for women with previous WIC experience (N=14) was 21.21 (SE=1.04), while the mean preprogram score for women participating in the WIC program for the first time (N=16) was 21.44 (SE=1.10). The variance of these subgroups was comparable (f=1.28, p=0.6662). A two-tailed t test was performed on the mean Pack Test scores of the two subgroups. There was no significant difference between the two groups (t=0.1458, p=0.8852), and Hypothesis 2 was also rejected.

Hypothesis 3

The third hypothesis tested was that the quality of the diets of women enrolled in the WIC program for at least two months would be higher than the quality of the diets of women who had not participated in the program.

Figure 2 shows that both the preprogram nutrient scores (from Group 1) and the postprogram nutrient scores (from Group 2) formed relatively normal distributions. The mean preprogram nutrient score was 78.88 (SE=7.39), and the mean postprogram nutrient score was 96.49 (SE=8.47).

The two study groups were found to be of comparable variance (f=1.27, p=0.5246). A two-tailed t test was performed on the mean nutrient scores of the two groups. Although the observed difference in the mean nutrient scores would seem to indicate an improvement in the quality of the diet, this difference was not found to be significant (t=-1.5690, p=0.1222). Thus, Hypothesis 3 was rejected.

Hypothesis 4

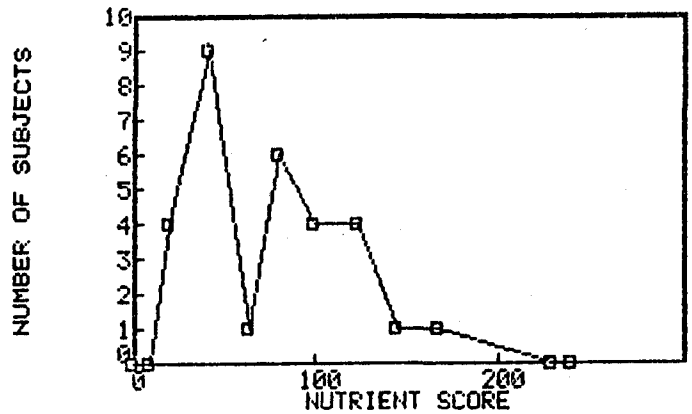
The fourth hypothesis tested was that women who had had previous WIC experience would have a preprogram diet of higher quality than women participating in the WIC program for the first time.

The mean preprogram nutrient score for women with

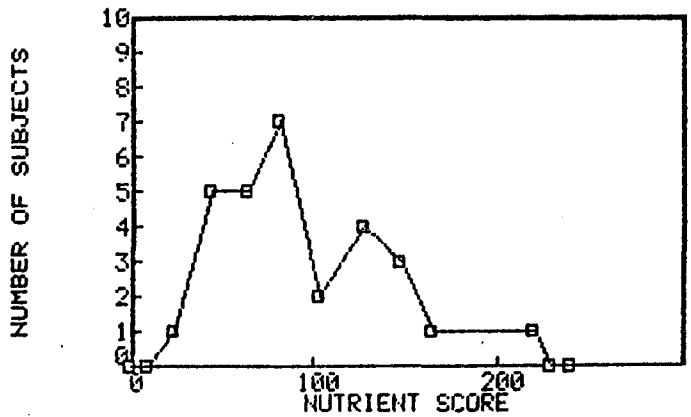
FIGURE 2

DISTRIBUTION OF NUTRIENT SCORES

A. PRETEST (GROUP 1)



B. POSTTEST (Group 2)



previous WIC experience (N=14) was 89.98 (SE=11.27), while the mean preprogram score for women participating in the WIC program for the first time (N=16) was 69.17 (SE=9.39). The variance of these subgroups was found to be comparable (f=1.26, p=0.6598). A two-tailed t test was performed on the mean nutrient scores of the two subgroups. There was no significant difference between the two groups (t=1.4297, p=0.1639). The data did not support the hypothesis; therefore, it was rejected.

Hypothesis 5

The last hypothesis to be tested was that there will be a positive correlation between nutrition knowledge and the quality of the diets of women enrolled in the WIC program.

The relationship between Pack Test scores and nutrient scores for the total study sample (i.e., pretest scores from Group 1 and posttest scores from Group 2) were compared using the Pearson product-moment correlation, which indicated a positive correlation (r=0.11) between knowledge and diet. However, this correlation coefficient was not significant (p=0.4162), and Hypothesis 5 was rejected.

Consumption of WIC food Package

To further explore the lack of significant improvements in either nutrition knowledge or diet quality among study subjects, a decision was made to examine consumption of the specific food items provided in the WIC Food Package.

The food package was provided to the client after the time of the pretest that coincided with entry into the program. Therefore, the 24-hour diet recalls at entry reflect the diet without the food package. Table 3 shows the mean gram weights of the foods from the WIC Food Package consumed by Group 1 (preprogram) and Group 2 (postprogram). Consumption of milk and milk products was significantly ($p=0.0017$) higher for women in Group 2, but no significant differences were observed for any of the other items in the WIC Food Package.

Actual food consumption was also examined with regard to previous WIC experience. Table 4 compares the consumption of foods contained in the WIC Food Package by women with previous WIC experience and by women participating in the WIC program for the first time. There were no significant differences between these two groups for any of the items in the WIC Food Package.

TABLE 3

Mean Consumption (in grams) of Food Items in the WIC Food Package Before and After Participation in WIC

FOOD ITEMS	GROUP 1	GROUP 2	t	p
Dairy Products	212.12	580.24	-3.3500	0.0017
Eggs	35.12	36.21	-0.0619	0.9508
Fruit Juice	78.70	152.25	-1.0058	0.3188
Cereal	5.33	7.02	0.3374	0.7371
Beans/Peas	0	3.78	-1.0174	0.3133
Peanut Butter	3.00	4.31	-0.4688	0.6410

TABLE 4

Mean Consumption (in grams) of Food Items in the WIC Food Package by Previous WIC Experience

A. Group 1 (Pretest)

FOOD ITEMS	NO WIC EXPERIENCE	PREVIOUS WIC EXPERIENCE	t	p
Dairy Products	263.03	153.93	1.0463	0.3044
Eggs	25.22	46.43	0.7911	0.4386
Fruit Juice	23.44	141.86	-1.3270	0.2045
Cereal	5.25	5.43	-0.0236	0.9813
Beans/Peas	0	0	0	0
Peanut Butter	1.88	4.29	-0.5153	0.6126

B. Group 2 (Posttest)

FOOD ITEMS	NO WIC EXPERIENCE	EXPERIENCE	t	p
Milk Products	504.99	674.08	-0.8714	0.3912
Eggs	42.44	28.54	0.5660	0.5760
Fruit Juice	77.44	244.37	-1.2973	0.2149
Cereal	9.16	4.38	0.7532	0.4588
Beans/Peas	5.94	0	0.8983	0.3770
Peanut Butter	3.75	5.00	-0.3608	0.7211

CHAPTER V

DISCUSSION

The purpose of this study was to assess the effectiveness of nutrition education, combined with the provision of supplemntal foods, for a group of low-risk pregnant women participating in the WIC program. The study examined nutrition knowledge and dietary behavior prior to and after participation in the program. In addition, the study examined the effects of previous experiences of women who participated in the WIC program prior to the period of the study.

The following discussion will address each of the five proposed hypotheses and the observed interrelationships of selected extraneous variables. The discussion will focus on the results as they relate to previous work by others, the possible effects of uncontrolled variables, and the theoretical and practical implications of the findings.

Hypothesis 1

Hypothesis 1 was that the nutrition knowledge of women enrolled in the WIC program for at least two months would be greater than the nutrition knowledge of women who had not participated in the program. This study did not confirm this hypothesis, although the data indicated change in a positive direction.

Nutrition education was provided to the subjects through utilization of two approaches: all WIC program participants attend two nutrition education group sessions (or classes) and also receive individual counseling as outlined in the WIC Program Guidelines. Women in the sample received nutrition education according to this procedure and were tested on their knowledge of basic nutrition concepts soon after their completion of the two group education sessions.

The one study that evaluated nutrition education through preprogram and postprogram assessment of nutrition knowledge (Hunt et al., 1976) was also directed to low-income pregnant women who were provided nutrition education through classroom presentations. However, Hunt et al. provided a total of five education sessions and found that knowledge gain was exhibited at a significant level only by women who had attended a minimum of three sessions. By contrast to the present study, this observation alone may give some insight into the criteria for influencing knowledge gain.

More is not necessarily better, but it is important to consider the variables that may influence learning under the condition of longer exposure to teaching. Additional contact with the class instructor may positively influence learning in that it affords the learner a greater opportunity for interaction with the instructor, as well as with other participants. Extended contact may also allow the learner to inspect more carefully the information provided by the

class and to identify her own learning needs better. As has been pointed out by several authors (Dwyer, 1981; Fisk, 1979; Hochbaum, 1981), nutrition educators have not in the past been able to identify the knowledge and skills needed by individuals as related to food choices.

Similarly, consideration must be given to physical settings that are conducive to learning. Public health clinics are often overcrowded and understaffed, and these conditions pose difficulties for both clients and staff. These variables are uncontrollable, and may indeed have influenced the outcome of this study. In July of 1982, the North Charleston Area Clinic had a prenatal care caseload of 30 pregnant women, but by July of 1983, the caseload had increased to over 500 pregnant women. This increase was not planned, facilities were not enlarged, and staff increase was minimal. As a result, the entire clinic facility is crowded, classroom space is limited, and staff are overextended to provide adequate patient care. The assumption is made that these uncontrolled variables are equal for all members of the study sample, but it is certainly possible that the physical setting of the study had a negative influence on both teaching and testing for nutrition knowledge.

It is appropriate to note the influence that may be exerted by the administration of the Pack Test. Observation of the mean Pack Test scores of the posttest for Group 1 showed an increase in score. This suggests that the testing

procedure may influence nutrition knowledge and that the test itself may be serving the role of "educator". The observed increase may be due to statistical regression and any conclusions based on this observation cannot be supported by the design used for this study.

Hypothesis 2

Hypothesis 2 was that women who have had previous WIC experience will have greater preprogram nutrition knowledge than women participating in the WIC program for the first time. This study did not confirm this hypothesis.

To date, no study of nutrition education for pregnant women has been successful in evaluating the long-term effects of intervention. The present study did not demonstrate a significant difference in nutrition knowledge for women with previous WIC experience, but this finding is not surprising in light of the previous discussion of Hypothesis 1. If WIC nutrition education is ineffective in increasing the nutrition knowledge of program participants, then no long-term advantage would be expected for women with previous program experience.

Another consideration is the extraneous and uncontrolled variable of the clinic setting. Many of the women in the study sample were totally unfamiliar with the North Charleston Area Clinic. Although they had previously participated in the WIC program, their participation had been in a quite

different setting at the large and modern facilities of the Medical University of South Carolina. They had received prenatal care for past pregnancies at the medical center at a time when federal funding was available for indigent medical care. The introduction of new indigent-care policies and the resultant need to seek an alternative source of care may be an additional burden for these women.

The conduct of the present study also required the introduction of the process of testing. No similar evaluation or testing had been performed in the WIC program, and women with previous experience in WIC may have responded poorly to this variation from what was expected. This may have contributed to the finding that women with previous WIC experience did not demonstrate a significant knowledge advantage over women who had no previous experience in the program.

Hypothesis 3

Hypothesis 3 was that the quality of the diets of women enrolled in the WIC program for at least two months would be higher than the quality of the diets of women who had not participated in the program. This study did not support this hypothesis, although the data indicated change in a positive direction.

Several earlier studies of the effects of nutrition education for pregnant women were also unable to demonstrate significant differences in overall dietary behavior following

the provision of nutrition education (Berry & Wiehl, 1948; Bowering et al., 1976; Mason & Rivers, 1979). Bowering et al. and Mason and Rivers demonstrated the effectiveness of nutrition education in increasing the intake of selected nutrients, but neither of these studies showed that nutrition education results in changes in the overall quality of the diet.

The present study is similar to the work of Berry and Wiehl in that positive, but statistically nonsignificant, dietary changes were observed among clients who were provided two nutrition education sessions. However, a major difference is that Berry and Wiehl provided nutrition education through individual patient counseling, rather than group classes. They also related improved outcome of pregnancy to the provision of nutrition education.

The WIC program, however, offers more than nutrition education. A specified package of supplemental foods is also provided to each program participant. Since the present study did not indicate improvements in the overall quality of diets of WIC participants, an attempt was made to examine the consumption of foods contained in the WIC Food Package. While subjects did consume greater amounts of milk and milk products after WIC enrollment, there was no significant change in the consumption of any of the other food items. This finding is consistent with the results of Endres et al. (1981), who found no significant differences in the frequency of

consumption of foods in the WIC Food Package or in diet quality before and after program participation.

In attempting to assess the overall quality of an individual's diet, several variables, including the reliability of the instrument, must be considered. The 24-hour diet recall is accepted as the best instrument for studying dietary behavior in a population, but there are recognized limiations in its use with small groups. For example, in this study, most subjects were interviewed during early pregnancy. In early pregnancy, women are frequently nauseated, have little appetite, and, consequently, may not consume a normal diet. This problem could be alleviated in a larger group study since women seek care at different stages of their pregnancies, but it may have influenced the reported diets of subjects in the present study.

A different type of interference in obtaining accurate diet information may be related to the eligibility requirements of the WIC program. Before the USDA established a priority system for WIC eligibility, clients could be enrolled in the program solely on the basis of poor dietary history. A true picture of the client's perception of the use of the dietary recall is not known, but there is the possibility that WIC clients believe that they should report poor or inadequate food consumption.

There is also the consideration that the clinic setting may not be conducive to accurate administration of the 24-hour

diet recall. The instrument is used frequently in the clinic setting, but the previously discussed problems of overcrowding and congestion may have had a detrimental effect on its usefulness.

The food intake of the subjects of this study may be influenced by a number of variables that are beyond the control of this study. For example, the subjects may well be sharing the supplemental foods with other adults and children in the household. This practice may even be encouraged by the fact that the WIC program allows redemption of food vouchers only on a monthly basis. In addition, the clients' perception of the food items contained in the WIC Food Package is not known. The foods offered may be unacceptable or unfamiliar to the background or the cultural beliefs of the study population. If these types of variables are intervening in the present study, they would be expected to have a negative influence on the dietary behavior of the subjects.

Hypothesis 4

Hypothesis 4 was that women who had had previous WIC experience would have a pre-program diet of higher quality than women participating in the WIC program for the first time. This study did not support this hypothesis, although the data indicated change in a positive direction.

Very few studies have attempted to examine the effect

of previous learning experiences, and none has been able to successfully evaluate the long-term effects of nutrition education on food behaviors. One study (Jacobson et al., 1976) examined dietary behavior of adolescents who had received nutrition education at a period six years in the past. The researchers subjectively summarized their findings by stating that the dietary patterns of their subjects seemed to indicate that there had been a lasting effect of their previous nutrition education.

The present study did not demonstrate a significant difference in dietary behavior for women with previous WIC experience, but this result is not unexpected in light of the previous discussion of Hypothesis 2. A change in old habits must occur before new habits can be adopted and sustained.

Little is known about the perceived nutrition needs of women who have participated in the WIC program during a previous pregnancy. If these women believe that food habits need to be changed only during pregnancy, then they may not continue to practice those behaviors that are considered peculiar to the pregnancy. Bartholomew and Poston (1970) found that pregnant women practice certain culturally based food habits only during pregnancy. If this finding is generalized to information provided by the WIC program, then dietary changes, if any, may be for a very limited time span.

Again, it is possible that these women have a limited

total food supply in the household, and sharing may be part of the culture. The relationship between food intake and pregnancy outcome is not immediately obvious and may not be meaningful to women who have had one or more previous pregnancies, but have never experienced a negative outcome.

Hypothesis 5

Hypothesis 5 was that there will be a positive correlation between nutrition knowledge and the quality of the diets of women enrolled in the WIC program. This study did suggest a positive correlation between these two dependent variables, although the correlation was not found to be statistically significant.

A number of studies that have examined the relationship between nutrition knowledge and dietary behavior do not agree that a positive and significant relationship exists between these variables (Emmonds & Hayes, 1973; Adelson, 1968). Intuitively, it would seem that knowledge and behavior should be strongly associated. However, neither variable has been shown to be predictive of the other, and a significant correlation cannot be interpreted to imply a causal relationship.

It also must be recognized that one limitation to demonstrating an association between nutrition knowledge and dietary behavior may be the lack of a standardized approach to the measurement of knowledge. The instrument used to test

nutrition knowledge in the present study was found to be valid and reliable, but it may not test the same topics or concepts addressed by other studies attempting to relate knowledge and behavior. This inconsistency of instrumentation may partly explain some of the ambiguity and conflicting results found in the nutrition education literature.

Independent Variables

Several independent variables were examined; these included age, race, educational achievement, parity, and previous WIC experience. (Income as a variable was equivalent for all subjects since it is a criterion for WIC program eligibility.) A correlation matrix was developed to examine possible relationships between these independent variables and the dependent variables of nutrition knowledge and dietary behavior. For the total sample, a significant correlation observed was between educational achievement and nutrition knowledge score ($p=0.01$). This correlation agrees with several studies that have addressed the relationship between educational attainment and nutrition knowledge (Duyff et al., 1975; Eppright et al., 1970; Jelso et al., 1965). The association of these two variables is interesting since relatively little effort is made by the educational system to teach nutrition except as part of a biology or other science curriculum (Fisk, 1979). Knowledge of nutrition may be

derived from many sources throughout an individual's life experience. Years of formal education in the school system may enhance overall learning skills and may be reflected in increased knowledge of basic nutrition concepts.

To examine the variance in the nutrition knowledge scores, an analysis of variance model was developed. The previously listed independent variables accounted for forty-seven percent of the variance ($p=0.009$). Educational achievement and race contributed most significantly ($p<0.05$) to the overall variance.

A second positive and significant ($p=0.03$) correlation was observed between the dependent variable nutrient score and race for the total sample.

CHAPTER VI

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Low-risk pregnant women participating in the Special Supplemental Food Program for Women, Infants and Children (WIC) in a public health prenatal clinic in Charleston, South Carolina made up the sample (N=59) for this study. The women were observed to assess the effects of nutrition education and supplemental foods on cognitive and dietary behaviors. In addition, the effects of previous WIC program experiences prior to this study were examined.

A separate sample, pretest-posttest design was used, due to the program mandate that all participants must receive the treatment that was being examined by this study, that is, the provision of nutrition education and supplemental foods. To guard against pretest effects on posttest scores, one sample group was given a pretest and a posttest and the second sample group was given a posttest only. Both sample groups were assumed to be equal as a result of random assignment. Evaluation of individual scores is not possible utilizing this design, but mean pretest and posttest scores can be examined.

At entry into the program, women were randomly assigned

to either Group 1 or Group 2. Members of Group 1 (N=30) were pretested using a 36-item pictorial test (Pack Test) for nutrition knowledge. In addition, a 24-hour diet recall was taken. Members of Group 2 (N=29) were asked to provide 24-hour diet recall.

Nutrition education was provided according to WIC program mandate (two nutrition education sessions). In the clinic site of this study, nutrition education consisted of one lecture (classroom) session and an individual conference with a health professional. In addition, at the first clinic visit the women received vouchers for supplemental foods that were redeemable at local grocery stores.

Upon completion of nutrition education (at least two months after entry into the program), members of both groups received a posttest for nutrition knowledge using the Pack Test and a 24-hour diet recall was taken. The Pack Tests were graded and a mean score for each group was obtained. The 24-hour diet recalls were analyzed for nutrient content. A nutrient score for individuals was calculated using the percentage of the Recommended Dietary Alowance for 17 nutrients. A mean nutrient score for each group was calculated.

Mean scores of the Pack Test for Group 1 (pretest) and Group 2 (posttest) and mean nutrient scores for each group were compared using a t test. There were no significant differences between the pretest and posttest knowledge scores (p=0.3157) or the nutrient scores (p=0.1222).

Similarly, the knowledge scores and the nutrient scores of the subjects with previous experience in the WIC program and without previous experience were compared within the two groups. Again, there were no significant differences between knowledge scores ($p=0.8852$) or between nutrient scores ($p=0.1639$(.

A correlation coefficient was developed using the variables nutrition knowledge scores and nutrient scores. The Pearson product moment correlation was $r=0.11$, indicating a low positive correlation that was not statistically significant ($p=0.4162$).

Observation of foods consumed was made by calculating the mean consumption of foods provided by the WIC food package. All subjects (N=59) were included in the analysis using the data collected by 24-hour diet recall at the beginning of the study and the recall at the time of the posttest. Comparison of individual food items showed a significant increase in the consumption of dairy products ($p=0.0017$) but not for any other items.

This study assessed the effectiveness of providing nutrition education and supplemental foods for pregnant women enrolled in the WIC program at the North Charleston Area Clinic in Charleston, South Carolina. The study results indicated that women in the study sample did not demonstrate significant increases in nutrition knowledge or in the nutrient value of their diets after participation in the

WIC program. No significant correlation between nutrition knowledge and dietary behavior was observed. Further examination of knowledge and behavior did not indicate any significant residual effects of the program among women with previous WIC experience.

It is universally recognized that nutrition is critical to the outcome of pregnancy, and the major purpose of the WIC program is to improve the nutritional status of low-income pregnant women, who may be most vulnerable to perinatal health problems. The major objective of the program is the provision of nutrition education, although the federal regulations provide limited guidelines for the delivery of this service.

Multiple variables that do not enhance the objectives of the program may be intervening in the delivery of WIC services. Many programs have been funded to address infant mortality in the United States. Most have not succeeded in lowering the high infant mortality. Nutrition is only one of the important variables related to pregnancy outcome.

Nutrition and its relation to pregnancy is a complex issue and nutrition education is a complex educational problem. It cannot be offered using a simplistic approach. There is disagreement among nutrition educators on the basic content of what nutrition education should be. There is also lack of agreement on the variables that influence nutrition

behaviors. It is agreed that health-related behaviors are not influenced simply by knowledge. Instead, health behaviors are learned and formed through a complex set of influences such as cultural habits and beliefs. Parents and peers serve as models and individuals' behaviors are influenced by socializing institutions such as schools and churches. Major influences are television and advertising media of all kinds. Individuals are confronted by these influences daily and behaviors are shaped due to the significance perceived by the individuals.

Pregnancy may be a time when a woman is susceptible to the influence of knowledge of the need to change nutrition behaviors. This study, however, did not support that premise. Foods in the WIC food package provide over 50% of most of the major nutrients needed to support a positive pregnancy outcome. This study did not confirm that the sample examined increased nutrient intake to that level.

The study did show that minimal changes in knowledge and behavior are being accomplished, and these findings cannot be negated for the sake of research. However, efforts to ensure greater change will be beneficial for both the WIC population and for the general population. Cost for current program efforts are high and cost effectiveness must be considered for all programs, especially government-supported programs.

RECOMMENDATIONS

1. The content of the nutrition education component of WIC program should be evaluated to assure that the messages are clear, understandable, and are not in conflict with fundamental beliefs, customs, or ethnic values. This should be done by program participants and professional staff. If changes are recommended and implemented, evaluation of the results should be carried out to identify increases in learning. The current content of the program is not changing knowledge levels of the participants.
2. Innovative methods for the delivery of nutrition education should be explored. Utilization of the pretest for the study demonstrated an effect on participants' knowledge on the posttest. Participants' interest in the instrument should not be ignored.
3. Utilization and the importance of the consumption of the WIC food package should be stressed in the nutrition education messages delivered by all professionals and staff to the WIC program participants. No one food is better than the other and all foods should be consumed to meet the nutritional requirements of the WIC participant.

4. Periodic evaluation of the effectiveness of program efforts should be implemented to assure long-term benefits of the program. Clients participating in the program over long periods of time did not exhibit any differences than those participating the first time.

BIBLIOGRAPHY

Abelson, H., Schrayer, D., & Gunzelman, S. Food and nutrition, knowledge and beliefs: Main findings. In FDA Consumer Nutrition Knowledge Study: A nationwide study of food shopper's knowledge, beliefs, attitudes and reported behavior regarding food and nutrition. Washington, D.C.: U. S. Government Printing Office, 1974.

Adelson, S.F. Changes in diets of household, 1955 to 1965. Journal of Home Economics, 1968, 60(6), 448-455.

American Dietetic Association. Position paper on the scope and thrust of nutrition education. Journal of the American Dietetic Association, 1978, 72, 303-305.

Balfour, M.J. Supplement feeding in pregnancy. Lancet, 1944, 1, 208-216.

Bartholomew, M.J., & Poston, F.E. Effect of food taboos on prenatal nutrition. Journal of Nutrition Education, 1967, 2, 15-17.

Beaton, G.H. Evaluation of nutrition interventions: Methodologic consideration. The American Journal of Clinical Nutrition, 1982, 35, 1280-1289.

Bendrick, M., Campbell, T.H., Bawden, D.L., & Jones, M. Toward efficiency and effectiveness in the WIC delivery system. Washington, D.C.: The Urban Institute, 1976.

Berry, K., & Wiehl, D.G. An experiment in diet education during pregnancy. The Milbank Memorial Fund Quarterly, 1952, 30, 119-151.

Block, G. A review of validations of dietary assessment methods. American Journal of Epidemiology, 1982, 115(4), 492-505.

Bowering, J., Morrison, M.A., Lowenberg, R.L., & Tirado, N. Role of EFNEP aides in improving diets of pregnant women. Journal of Nutrition Education, 1976, 8(3), 111-117.

Brock, J.A. An evaluation of the expanded food and nutrition education program in Sumter and Kershaw Counties, South Carolina. Unpublished Masters thesis, Winthrop College, Rock Hill, S. C., 1978.

Burk, M.C., & Pao, E.H. Methodology for large-scale surveys of household and individual diets. Home Economics Research Report (No. 40). Washington, D.C.: U.S. Department of Agriculture, 1976.

Campbell, D.T., & Stanley, J.C. Experimental and quasi-experimental designs for research. Chicago: Rand McNally, 1971.

Duyff, R.L., Sanjur, D., & Nelson, H.Y. Food behavior and related factors of Puerto Rican-American teenagers. Journal of Nutrition Education, 1975 7(3), 99-103.

Dwyer, J. Nutrition education and information. Better health for our children: A national strategy, Vol. 4. Background Papers (DHHS[PHS[Publication No. 79-55071). Washington, D.C.: U.S. Government Printing Office, 1981.

Ebbs, J.H., Tisdall, F.F., & Scott, W.A. The influence of prenatal diet on the mother and child. Milbank Memorial Fund Quarterly, 1942, 20, 35-46.

Edozien, J.C., Switzer, B.R., & Bryan, R.B. Medical evaluation of the Special Supplemental Food Program for Women, Infants and Children. American Journal of Clinical Nutrition, 1979, 32, 677-692.

Emmonds, L., & Hayes, M. Nutrition knowledge of mothers and children. Journal of Nutrition Education, 1973, 5(2) 134-139.

Endres, J.M., & Sawicki, M. Nutrient dietary data analysis guide. Carbondale: Southern Illinois University, 1979.

Endres, J.M., Sawicki, M., & Casper, J.A. Dietary assessment of pregnant women in a supplemental food program. Journal of The American Dietetic Association, 1981, 79, 121-126.

Eppright, E.S., Fox, H.M., Fryer, B.A., Lampkin, G.H., & Vivian, V.M. The North Central Regional Study of diets of preschool children: 2. Nutrition knowledge and attitudes of mothers. Journal of Home Economics, 1970, 62(5), 327-332.

Evans, R.L. & Hall, Y. Social-psychologic perspective in motivating changes in eating behavior. Journal of The American Dietetic Association, 1978, 72, 378-383.

Fairchild, G.T. Personal communication, November, 1982.

Fisk, D. A successful program for changing children's eating habits. Nutrition Today, 1979, 14(3), 6-10; 28-33.

Foley, C., Hertzler, A.A., & Anderson, H.L. Attitudes and food habits: A review. Journal of The American Dietetic Association, 1979, 75, 13-18.

Frank, G.C., Berenson, G.S., Schilling, P.S., & Moore, M.C. Adapting the 24-hour recall for epidemiologic studies of school children. Journal of The American Dietetic Association, 1977, 71, 26-31.

Garn, S., Larkin, F.A., & Cole, P.E. The real problem with 1-day diet records. The American Journal of Clinical Nutrition, 1978, 31, 1114-1116.

Gay, L.R. Educational Research: Competencies for analysis and application. Columbus, Ohio: Charles E. Merrill, 1976.

Gifft, H.H., Washbon, M.B., & Harrison, G.G. Nutrition behavior and change. Englewood Cliffs, N.J.: Prentice Hall, 1972.

Glanz, K. Social psychological perspectives and applications to nutrition education. Journal of Nutrition Education. 1981, 13(1) Supplement 1, 566-569.

Greger, J.L., & Etnyre, G.M. Validity of the 24-hour dietary recalls by adolescent females. American Journal of Public Health, 1978, 68, 70-72.

Heimendinger, J. The effect of the WIC program on the growth of children. Unpublished doctoral dissertation, Harvard University, School of Public Health, 1981.

Hemminki, E., & Starfield, B. Prevention of low birth weight and pre-term birth: Literature review and suggestions for research policy. Milbank Memorial Fund Quarterly/ Health and Society, 1978, 56(3), 339-361.

Hertzler, A.A., & Owen, C. Sociologic study of food habits -- a review. I Differentiation, Accessibility and Solidarily. Journal of The American Dietetic Association, 1976, 69, 381-384.

Higgins, H.C. Montreal diet dispensary study. In Nutritional supplementation and the outcome of pregnancy (Proceedings of a workshop, Sagamore Beach, MA, November 1971). Washington, DC: National Academy of Sciences, 1973.

Hochbaum, G.M. Strategies and their rationale for changing people's eating habits. Journal of Nutrition Education, 1981, 12(1) Supplement 1, 559-565.

Hootman, R.H., Haschke, M.C., Roderuck, C., & Eppright, E.S. Diet practices and physical development of Iowa children from low income families. Journal of Home Economics, 1967, 59(1), 41-44.

Hughes, M. Health mothers, healthy babies. The Community Nutritionist, 1982, Nov.-Dec., pp. 9-12.

Hunt, I.F., Jacob, M., Ostergard, N.J., Masri, G., Clark, V.A., & Coulson, A.H. Effect of nutrition education on the nutritional status of low-income pregnant women of Mexican descent. The American Journal of Clinical Nutrition, 1976, 29, 675-684.

Jacobson, H.N., Grevenberg, B.M., Kelly, A.F., and Young, A.J. Long-term effects of a nutrition education program for pregnant adolescents as measured by a new nutritional analysis program. New Brunswick, N.J.: New Brunswick Public School District, 1976.

Jelso, S.B., Burns, M.M., & Rivers, J.M. Nutritional beliefs and practices. American Dietetic Association Journal, 1965, 47, 263-268.

Kelsay, J.L. A compendium of nutritional status studies and dietary evaluation studies conducted in the U.S., 1957-1967. Journal of Nutrition, 1969, 99(1) (Supplement 1, Part II), 123-166.

Kennedy, E.T. Evaluation of the impact of Women, Infants and Children's Supplemental Feeding Program on prenatal patients in Massachusetts. Unpublished doctoral dissertation, Harvard University, School of Public Health, 1979.

Kerlinger, F.N. Foundations of behavioral research. New York: Holt, Rinehart and Winston, 1973.

Kerrey, E., Crispin, S., Fox, H.M., & Kies, C. Nutritional status of preschool children: I. Dietary and biochemical findings. American Journal of Clinical Nutrition, 1968, 21(1), 1274-1279.

Kotelchuck, M., Schwartz, J., Anderka, M., & Finison, K. 1980 Massachusetts special supplemental food program for women, infants and children (WIC) evaluation project. Boston, MA.: Department of Public Health, 1981.

Langham, R.A., Dupress, B.W., Atkins, E.H., & Schilling, P.E. Impact of the WIC program in Louisiana. New Orleans: Louisiana State Health Department, 1975.

Levy, S.R., Iverson, B.K., & Walbert, H.S. Nutrition education research: A review. Paper presented at the meeting of The American Public Health Association, New York, October, 1979.

Madden, J.P., Goodman, S.J., & Guthrie, H.A. Validity of the 24-hour recall. Journal of The American Dietetic Association, 1976, 68, 143-147.

Mason, M., & Rivers, J.M. Factors influencing plasma ascorbic acid levels of pregnant women: II. Predicting changes in levels following dietary instruction. Journal of The American Dietetic Association, 1970, 56, 321.

Michelman, K.C. The role of the federal government in nutrition education (The Library of Congress, Congressional Research Service). Washington, D.C.: U.S. Government Printing Office, March, 1977.

Mumaw, L.J. Dietary survey of selected low-income families in Leveland, Texas. Unpublished manuscript, 1973.

National Research Council. Manual for the study of food habits. Washington, D.C.: National Academy of Sciences. 1945.

National Research Council, Committee on Maternal Nutrition. Maternal nutrition and the course of pregnancy: Summary report. Washington, D.C.: National Academy of Sciences, 1970.

National Research Council, Food and Nutrition Board. Recommended Dietary Allowances (9th rev. ed.). Washington D.C.: National Academy of Sciences, 1980.

Nesheim, R.O. Measurement of food consumption: Past, present, future. The American Journal of Clinical Nutrition, 1982, 35, 1292-1296.

Nobmann, E.D., & Adams, S. Survey of changes in food habits during pregnancy. Public Health Reports, 1970, 85(12), 1121-1127.

North Carolina State Board of Health. North Carolina Nutrition Survey. Raleigh, North Carolina: Author, 1971.

Owen, G.M., Kram, K.M., Garry, P.S., Lowe, J.E., & Lubin, A.H. A study of nutritional status of preschool children in the United States, 1968-1970. Pediatrics, 1974, 53(4) Supplement, 597-646.

Pelto, G.H. Anthropological contributions to nutrition education research. Journal of Nutrition Education, 1981, 13(1) Supplement, 52-58.

Rasanen, L. Nutrition survey of Finnish rural children: Part 4. Methodological study comparing the 24-hour recall and the dietary history interview. American Journal of Clinical Nutrition, 1979, 32, 2560-2567.

Ray, A.A. (Ed.), SAS users guide: Statistics. Cary, NC: SAS Institute, Inc., 1982.

Rosander, K., & Sims, L.J. Measuring effects of an effective-based nutrition education intervention. Journal of Nutrition Education, 1981, 13(3), 102-105.

Rush, D. Nutrition services during pregnancy and birthweight: A retrospective matched pair analysis. Canadian Medical Association Journal, 1981, 125, 567-576.

Rush, D., & Kristal, A.R. Methodologic studies during pregnancy: The reliability of the 24 hour dietary recall. The American Journal of Clinical Nutrition, 1982, 35, 1259-1268.

Rush, D., Stein, Z., & Susser, M. A randomized controlled trial of prenatal nutritional supplementation in New York City. Pediatrics, 1980, 65, 683-843.

Schwartz, N.E. Nutrition knowledge, attitudes and practices of Canadian public health nurses. Journal of Nutrition Education, 1976, 8(1), 28-31.

Sims, L.S. Demographic and attitudinal correlates of nutrition knowledge. Journal of Nutrition Education, 1976, 8(3), 122-125.

Sims, L.S. Dietary status of lactating women: II. Relation of nutrition knowledge and attitudes to nutrient intake. Journal of The American Dietetic Association, 1981, 78, 147-154. (a)

Sims, L.S. Food-related value-orientation, attitudes, and beliefs of vegetarians and non-vegetarians. Ecology of Food and Nutrition, 1978, 7, 23-25.

Sims, L.S. Further thoughts on research perspectives in nutrition education. Journal of Nutrition Education, 1981, 73 (1), Supplement 1, S70-S75. (b)

Sims, L.S. Toward an understanding of attitude assessment research. Journal of The American Dietetic Association, 1981, 78, 460-466. (c)

St. Jeor, S. Nutrition research methodology. Paper presented at the 65th Annual Meeting of the American Dietetic Association, San Antonio, Texas, October, 1982.

Stunkard, A.J., & Waxman, M. Accuracy of self-reports of food intake. Journal of The American Dietetic Association, 1981, 79, 547-551.

Susser, M. Prenatal nutrition, birthweight, and psychological development: An overview of experiments, quasi-experiments, and natural experiments in the past decade. The American Journal of Clinical Nutrition, 1981, 34, 784-803.

Todd, K.S., Hudes, M., & Calloway, D.H. Food intake measurement: Problems and approaches. The American Journal of Clinical Nutrition, 1983, 37, 139-146.

Todhunter, E.N. Approaches to nutrition education. Journal of Nutrition Education, 1969, 1(1), 8-9.

Validity of 24-hour dietary recalls. Nutrition Reviews, 1976, 34, 310-311.

Vermeersch, J. Maternal nutrition and the outcome of pregnancy. In B. S. Worthington, J. Vermeersch & S.R. Williams, Nutrition in pregnancy and lactation. Saint Louis: C. V. Mosby, 1977.

Wang, V.L., Green, L.W., & Ephross, E.H. Not forgotten, but still poor (Monograph 2). College Park: University of Maryland, 1971.

Williams, S. R. Nutritional guidance in prenatal care. In B. S. Worthington, J. Vermeersch & S.R. Williams, Nutrition in pregnancy and lactation, Saint Louis: C.V. Mosby, 1977.

Windham, C.T., Wyse, B.W., Hurst, R.L., & Hansen, R.G. Consistency of nutrient consumption patters in the United States. Journal of The American Dietetic Association, 1981, 73, 587-595.

World Health Organization, Expert Committee on Maternal and Child Health. WHO Technical Report Series (5th Report), 1969, 428, 5-24.

World Health Organization, Expert Committee on Maternal and Child Health. WHO Technical Report Series (6th Report), 1976, 600, 7-98.

Young, C.M., Haga, G.C., Tucker, R.E., & Foster, W.D. A comparison of dietary study methods: II. Dietary history vs. seven-day record vs. 24-hour recall. Journal of The American Dietetic Association, 1952, 28, 218-221.

APPENDIX A

WIC GUIDELINES

1. Certification Requirements
2. Nutritional Risk Criteria for Pregnant Women
3. Income Criteria
4. Food Package
5. Nutrition Education

CERTIFICATION REQUIREMENTS

This describes the requirements for the certification of persons applying for WIC Program benefits, based on WIC Program regulations that pertain to certification with a description of the local agency's responsibilities.

A. GENERAL OVERVIEW

1. Certification is the use of criteria and procedures to assess and document each applicant's eligibility for the program.
2. To be certified as eligible for the WIC Program, the participant must meet all of the following requirements:
   a. Be categorically eligible.
   b. Be a member of the population served by the local project.
   c. Meet the prescribed income standards.
   d. Meet at least one of the nutritional risk criteria specified for participants.
3. Participation in any health service beyond what is necessary for certification, cannot be required for participation in the WIC Program. However, the types, purposes, benefits and location of health services will be explained to the participants and they will be encouraged to participate.

4. An applicant cannot be required to pay any fee or charge in order to be determined eligible or to participate in the program.
5. Participation in nutrition education as a prerequisite for receipt of program benefits cannot be required. However, participants will be encouraged to participate in nutrition education and the purposes and benefits shall be explained.
6. Eligible participants are certified at the time of their entrance into the program and remain eligible until the end of the month that their ineligibility begins. Specifically:
   a. Children and Priority I and IV infants are eligible for a period of six (6) months per certification.
   b. Priority II infants are eligible until six (6) months of age.
   c. Pregnant women are certified for the duration of the pregnancy and continue to be eligible until six (6) weeks postpartum, regardless of the outcome of the pregnancy.
   d. Postpartum women are certified until six (6) months after delivery.
   e. Breastfeeding women are categorically eligible as long as they are breastfeeding or until the infant is one (1) year of age. Breastfeeding women can

be certified at six weeks postpartum and then reevaluated at a six (6) month interval.

f. Eligible infants of breastfeeding mothers are certified whether or not they are currently receiving a food package. Anthropometric measurements must be no more than 30 dyas old at time of certification.

7. Participants may remain on the Program as long as they are eligible according to category, residency and income and remain at nutritional risk.

8. Documentation must be recorded for all applicants/participants to support certification decisions.

   a. Certification data is recorded on the WIC Program Data Entry Form.

   b. Supportive data for all risk factors noted must be in the patient's health record.

9. Notification of the right to a fair hearing must be provided each applicant/participant. (Each Program applicant will be informed of the right to a fair hearing at application, certification, termination or suspension.)

B. CATEGORICAL ELIGIBILITY

1. To be categorically eligible the person must be a woman who is pregnant or is within six (6) months

postpartum; or a breastfeeding woman within one year postpartum; an infant up to one year of age; or a child up to five (5) years of age.

2. WIC certification guidelines require confirmation of pregnancy. Several measures are acceptable as confirmation of pregnancy:
   a. A positive pregnancy test,
   b. A history and clinical assessment indicating presumption of pregnancy (this may include detection of fetal heart tones, active fetal movements palpated by the observer and/or a bimanual exam),
   c. An obvious advanced state of pregnancy, or
   d. A statement of estimated date of confinement (EDC) from a physician.

WIC administrative funds may be used to purchase pregnancy testing materials. The stipulation is made that if WIC funds are utilized for pregnancy testing materials, no charge will be made for this service.

C. RESIDENCE ELIGIBILITY

1. The participant must be a member of the population served by the local agency.
2. The area in which the participant receives other health care is the area in which they should be eligible for WIC.

3. Central Office will follow whatever policy exists for the local agency.

D. INCOME ELIGIBILITY

1. Income standards used for determining WIC eligibility are 185% of the Poverty Income Guidelines established by the Office of Management and Budget.
2. An income determination for eligibility must be completed on each person at the time of initial certification and at each subsequent recertification, with the exception of migrant participants. This income determination is valid for the entire certification or recertification period, regardless of changes in the participant's income after eligibility has been determined.

   Note: It is not necessary to determine income eligibility for "in-stream" migrants when they are being recertified by the Local Agency.
3. Income is defined as gross income before deductions for income taxes, social security, insurance premiums, bonds, etc.
4. For purposes of determining income eligibility for WIC, family is defined as a group of related or non-related individuals who are not residents of an institution but who are living together as one economic unit.

E. NUTRITIONAL RISK DETERMINATION

1. To be certified for the Program, individuals must be determined to be at nutritional risk.
2. A health professional will determine if the individual is at nutritional risk through a limited health/ dietary evaluation.
   a. WIC Regulations define a health professional as a physician, registered nurse, nutritionist or individual designated by local medical authority.
   b. The District Medical Director can request approval from Central Office for other service providers to perform WIC certifications.
3. Nutritional risk determination can be based on referral data submitted from other health care providers.
4. Nutritional risk criteria are established in accordance with federal regulations.
5. The essential components of a limited health/dietary evaluation are:
   a. Anthropometric Measures - height or length, weight, evaluation of growth pattern or weight gain pattern.
   b. Biochemical - Hemoglobin or hematocrit and/or erythrocyte protoporphyrin.
      1) Required initially on all applicants over six (6) months of age, and
      2) Required on all subsequent evaluations.

c. Dietary Evaluation - Twenty-four hour dietary recall with evaluation statements.

1) Required initially on all applicants over six (6) months of age, and

2) Required on all subsequent evaluations.

d. Medical History

6. When there is a possibility of regression in nutritional status without the supplemental foods and there is no waiting list of potential participants, the breast-feeding woman, infant or child may remain on the Program.

7. When participants are determined to be no longer at nutritional risk by the competent health professional they must be removed from the Program.

NUTRITIONAL RISK CRITERIA

FOR PREGNANT WOMEN

Transfer of Certification: Current and valid certification transfer with measures and/or risk factors unknown.

Age: Less than 20 or greater than or equal to 35 years at date of conception for this pregnancy.

History of High Risk Pregnancy: (in any pregnancy): Low birth weight infant (2500 grams or less); miscarriage (spontaneous abortion less than 20 weeks); therapeutic abortion after 20 weeks; fetal death (20 weeks to birth); neonatal death (birth to 28 days); premature infant (less than 37 weeks gestation); small for gestational age infant (medically diagnosed and documented); preeclampsia; multiple birth; or multi para (5 or more pregnancies).

Cigarettes: Cigarette smoking in excess of one pack per day in this pregnancy.

Preeclampsia: Medically diagnosed and documented preeclampsia or pregnancy induced hypertension in this pregnancy.

Diagnosis of More Than One Fetus in Utero: Medically diagnosed and documented in this pregnancy.

Short Interconceptual Period: Interconceptual period of less

than one year between this pregnancy and the preceding pregnancy.

Abnormal Pattern of Weight Gain: Insufficient weight gain of less than three (3) pounds per month during the second and third trimesters; or excessive weight gain of more than two (2) pounds per week or eight (8) or more pounds per month in this pregnancy.

Abnormal Pattern of Weight Loss: Any weight loss during the second and third trimesters.

Poor or Delayed Intrauterine/Fetal Growth: Medically diagnosed and documented in this pregnancy.

Alcohol: Ingestion of two (2) or more drinks at a time (1 drink equals 12 ounces beer, 6 ounces wine or 2 ounces 80 proof liquor) in this pregnancy.

Drugs: Frequent use or addiction to controlled drugs (such as heroin, marijuana, cocaine, barbiturates, amphetamines) in this pregnancy either diagnosed and documented by the certifier or referred by a drug abuse program; or routing or excessive usage of prescribed or non-prescribed medications in this pregnancy which may interfere with the ingestion, absorption and/or utilization of nutrients; or routing usage of oral contraceptive agents for more than one year with pregnancy within three months after discontinuance.

Mental Retardation: Diagnosed and documented (preferably

through an interdisciplinary evaluation, but at a minimum by a psychiatrist or licensed psychologist) score of 70 or below on a standardized individual intelligence test; attending or has attended either an Educable Mentally Handicapped or a Trainable Mentally Handicapped Class in a public school; or has been institutionalized in a state institution for the mentally retarded.

Abnormal Blood Values: Hemoglobin less than 11 grams or hematocrit less than 34% in this pregnancy.

Sickle Cell Anemia: Medically diagnosed and documented sickle cell anemia.

Anemia: Medically diagnosed and documented iron deficiency anemia or all other types of anemia in this pregnancy.

Underweight: Pre-pregnancy weight (prior to this pregnancy) that is 10% or more below standard weight for height for age.

Overweight: Pre-pregnancy weight (prior to this pregnancy) that is 35% or more above standard weight for height for age.

Dental Problems: Untreated dental caries, missing teeth and/or peridontal disease in this pregnancy which may interfere with the ability to ingest nutrients.

Chronic Infections: Medically diagnosed and documented nutritionally-related chronic infections such as tuberculosis, staphylococcal infections (if intestinal flora destroyed),

chronic bronchitis, chronic hepatitis, chronic pneumonia or chronic meningitis in this pregnancy.

Pica: Routine ingestion of non-food substances such as charcoal, freezer ice, clay, dirt or starch in this pregnancy which may interfere with the ingestion, absorption and/or utilization of nutrients.

Lead Toxicity: Medically diagnosed and documented lead toxicity in this pregnancy.

Other Nutritionally-Related Medical Conditions: Other medically diagnosed and documented nutritionally-related medical conditions in this pregnancy such as clinical signs of nutritional deficiencies or acute infectious diseases such as acute hepatitis, acute pneumonia or acute meningitis which may interfere with the ingestion, absorption and/or utilization of nutrients.

Metabolic, Digestive and Transport Disorders: Medically diagnosed and documented disorders in this pregnancy except for inborn errors of metabolism which fall into the category below.

Inborn Errors of Metabolism: Medically diagnosed and documented inborn errors of metabolism such as Branchedchain Ketoaciduria (MSUD): Galactosemia; Histidinemia; Homocystinuria (Cystathonine Synthase Defect); Phenylketonuria (PKU); or Tyrosinemia.

Diabetes: Medically diagnosed and documented diabetes in this pregnancy.

Elevated Blood Pressure: Diastolic blood pressure of at least 90mm Hg or a systolic blood pressure of at least 140 mm Hg.

Other Chronic Diseases: Medically diagnosed and documented chronic diseases in this pregnancy other than the ones listed previously such as renal disease, cardiovascular disease or liver disease.

Inadequate Dietary Pattern: Dietary pattern in this pregnancy that is determined to be inadequate in the certifier's professional judgment with the use of the reproductive female diet evaluation form.

INCOME CRITERIA*

FAMILY SIZE	YEARLY	MONTHLY	BI-WEEKLY	WEEKLY
1	$ 7,970	$ 644	$306	$153
2	10,530	878	405	203
3	13,080	1,090	503	252
4	15,630	1,303	601	301
5	18,190	1,516	700	350
6	20,740	1,728	798	399
7	23,290	1,941	896	448
8	25,840	2,153	994	497
For each additional member add	2,550	213	98	49

*Based on gross income which is defined as total income before deductions for income taxes, employee social security taxes, insurance premiums, etc.

FOOD PACKAGE

The following supplemental foods are provided on a monthly basis to pregnant women enrolled in the WIC program.

1. Milk and Milk Products: 28 quarts whole fluid milk; or equivalent in evaporated whole milk; or equivalent in form of whole milk cheese.

   Milk must contain 400 International Units (IU) of Vitamin D. If skim milk is used, it must contain 400 IU of Vitamin D and 2000 IU of Vitamin A.

   Cheese must be a whole milk product.

2. Cereals: 36 ounces of dry cereals (hot or cold type).

   Dry cereal must contain a minimum of 28 milligrams (mg) of iron per 100 grams of dry cereal. The cereal can contain no more than 21.2 grams of Sucrose, or or other simple sugar, per 100 grams dry cereal.

3. Fruit Juice: No more than 144 ounces per two week period. Fruit juices must be single strength pure juice and contain a minimum of 30 mg of Vitamin C per 100 milliliters.

4. Eggs: One dozen per 2 week period. Eggs must be large white or brown.

5. Peanut Butter or Dry Beans/Peas: One 18-ounce jar per month. The product must be pure peanut butter. One pound of dried beans or peas per month may be substituted for peanut butter.

NUTRITION EDUCATION

This provides information on how nutrition education is offered to WIC participants. Nutrition education activities are delegated to the Local Agencies. Providers of nutrition education employ a variety of approaches and messages that are tailored to the needs of the individual. The State Agency assumes the responsibility for leadership and guidance for the overall integrity of the Program.

Definition of Nutrition Education

A. Nutrition education means individual or group educational sessions and the provision of information and educational materials designed to improve health status, achieve positive change in dietary habits, and emphasize relationships between nutrition and health, all in keeping with the individual's personal, cultural, and socio-economic preferences.

B. Nutrition education activities shall emphasize the relationship of proper nutrition to good health according to individual nutritional needs and/or to the different categories of WIC participation.

C. Explanation of the WIC Program (purpose, supplemental program, use of food instrument, allowable foods,

client rights, etc.) shall be considered program education and not acceptable for nutrition education.

D. Nutrition education services are to be available to all participants.

1. Participants should be encouraged to take part in the nutrition education activities but program benefits are not to be denied if they elect not to participate.

2. All adult participants and the parents or caretakers of infant and child participants will participate in two (2) separate nutrition activities per certification period.

   a. When a contact is made with the caretaker of more than one WIC participant and the education provided is appropriate to each, a contact may be counted for each individual.

   b. If the WIC participant receives nutrition education from more than one provider in the same day or visit, each contact is considered a continuation of the basic encounter and only one contact may be counted.

APPENDIX B

PACK TEST

Nutrition Knowledge Questionnaire

APPENDIX C

TWENTY-FOUR HOUR DIET RECALL PROTOCOL

TWENTY-FOUR HOUR DIET RECALL PROTOCOL

I. INTRODUCTION

"I am Ms. _____, with the WIC Program. (Client's name), we are interested in learning what women like you who are participating in the WIC Program eat. The things we talk about today will help us plan future programs. I have a special form on which to write what you ate."

II. SAMPLE INTERVIEW

Interviewer: "Do you usually eat like you did yesterday?" ("...like you did during the last 24 hours?") If the answer is "yes," mark "yes" after "Do you want data saved?" If "no," code "no." "Try to remember all the things you ate or drank yesterday and how much you ate beginning with the time you got up yesterday morning." (If recall is taken after client has eaten noon meal, acquire the dietary intake directly preceeding the interview.) "Can you tell me all of the things you ate or drank and how much you ate or drank before you came to the clinic today? I will help you as much as I can and you help me as much as you can."

"I will appreciate your being honest with me about what you ate and drank and the amount you ate. We will use these food models to help you decide how much of the food you eat. So put on your thinking cap and let's begin."

"It is (2 p.m.). Did you have anything to eat while you waited to see me today?"

Client: "No."

Interviewer: "Did you eat or drink anything on the way to the clinic?"

Client: "Yes, a hamburger, french fries, cole slaw. (Do not interrupt the speaker to ask quantities until all food items are given for the meal or snack. It is possible for a trained interviewer to remember at least six items without making specific notes.)

Interviewer: "Did you eat or drink anything else with the hamburger, french fries, cole slaw?"

Client: "Oh yes, I drank a glass of milk."

Interviewer: "Anything else with the hamburger, french fries, cole slaw and milk?"

Client: "That was all at that time."

When the client responds, listen without marking your form.

If many items are listed at once and must be written to be remembered, then use a separate piece of paper or the boxes at the top of each food group listing. Do not write on the form in any place but the designated boxes. Remember it is time consuming to transfer food items or amounts from one form to another.

Interviewer: "About what time was that?"

Client: "12:00 noon."

Interviewer: "I have a model of a hamburger, was the hamburger smaller, larger, or about the same size as this model?"

Client: "Same size."

Interviewer: "How was that prepared or cooked?"

Client: "Fried on the grill at a restaurant."

Interviewer: (Records 3 oz. hamburger which is coded as fried.) "Did you eat the hamburger with bread or bun or roll?"

Client: "A bun."

Interviewer: "Can you describe the bun (pointing to a ruler) in size and the flour used in the bun?"

Client: "About (points to 4 inches) that size and white (rather than whole wheat) bun."

Interviewer: (Indicates 2 slices bread as substitute for bun in the box preceeding breads and cereals. Since this is a common food in the diet of most people, there is a possibility that it may be used again so no mark is placed next to the bread scanning areas.) "Was anything put on the bread or the hamburger?", pointing to food models.

Client: "Butter on the bun and catsup on the hamburger."

Interviewer: "Was that butter or margarine?"

Client: "That was really margarine, not butter."

Interviewer: "Which of these measures would be the appropriate amount of margarine?" (Client points to a teaspoon, verifying the amount.)

Interviewer: "What about the catsup?"

Client: "A little more than this (1 tablespoon) and about 1 teaspoon."

Interviewer: (Interviewer would probably record catsup directly onto the form. Note that three teaspoons equal one tablespoon and one teaspoon additional.) "Can you describe the type of cole slaw and which cup the cole slaw would fit into?"

Client: (Points to one-half cup serving) "It was creamy cole slaw."

Interviewer: (The interviewer marks one-half cup under cole slaw, mayonnaise type.) "About how many french fries (pointing to cups and bowls) would you estimate that you ate?" Note: At McDonalds the small serving equals one-half cup."

Client: "About this much in the bowl (points to one and one-half cup); they were placed in a small carton when I got them."

Interviewer: "About how much milk did you drink?"

Client: (Points to one glass or one cup.)

Interviewer: "What kind of milk was it?"

Client: "Whole milk."

Interviewer: (Puts mark in the box on the top of the Milk and Milk Products Food Group since additional milk may be drunk by the client.) "Can you remember anything else that you ate or drank at this time?"

Client: "No, I believe that's all at that time."

Interviewer: "When did you eat before that noon meal?

Client: "Coffee break, around 9:00 when I had a doughnut and coffee."

Interviewer: "How much coffee (pointing to cups) did you have?"

Client: "I had approximately two of these cups (pointing to a coffee cup, 2 coffee cups = 1-1/2 measuring cups totally.)"

Interviewer: "Did you put anything into your coffee?"

Client: "No."

Interviewer: (Interviewer marks 1-1/2 cups coffee.) "What kind of doughnut did you eat and how many?"

Client: "I only had one of those glazed/yeast doughnuts."

Interviewer: (Interviewer marks doughnut on form.) "That was around 9:00, you said; do you remember if you ate or drank anything else with the coffee and doughnut?"

Client: "No, but I drank a glass of orange juice when I first got up."

Interviewer: "About how much (points to all the glasses) would you say you drank?"

Client: "About this size." (4 oz.)

Interviewer: (Interviewer marks 1/2 cups orange juice) "Do you add anything to the orange juice? (e.g., honey or sugar)?"

Client: "No, I did not add anything else."

Interviewer: "Can you remember if you drank or ate anything else from the time you got up until this afternoon."

Client: "No, that was all I have eaten today."

Interviewer: "What time did you go to bed last night?"

Client: "10:30 p.m."

Interviewer: "Did you eat or drink anything right before you went to bed?"

Client: "Yes, I had popcorn and some Coke." (At this time, the interviewee volunteers the amount of popcorn and coke.) "The popcorn would be this bowl full to line and I drank a whole can of Coke." (Interviewer takes time to record 1-1/2 cups of popcorn and one 12 ounce can of Coke.)

Interviewer: "Did you put anything onto the popcorn?"

Client: "I didn't add butter or salt, but it was popped in oil."

Interviewer: "When did you eat before bedtime?"

Client: "I had supper." (Never use the words, "breakfast, lunch, dinner or supper" until the client has spoken the terms first.)

Interviewer: "What did you have for supper?"

Client: "I had one beef pot pie--one of those little ones--a tossed salad, another glass of milk and some jello with some kind of fruit in it for dessert."

Interviewer: "You had one beef pot pie, tossed salad, milk and fruited gelatin? Anything else?"

Client: "No, I can't think of anything else."

Interviewer: (Interviewer should be able to remember these four items without recording, however, boxes on the form allow for minimal recording.) "About how large was the beef pot pie in diameter (pointing to the ruler)?"

Client: "It was about this large (4 inches)." (Interviewer records 4" beef pot pie.)

Interviewer: "How large was the salad?"

Client: (Points to 1-1/2 cup size)

Interviewer: "What was the salad made of?"

Client: "Head lettuce and carrots and a few tomatoes."

Interviewer: (Marks tossed salad) "Did you put anything on your tossed salad?"

Client: "French dressing, about this much (1 tbsp.)."

Interviewer: (Interviewer records 1 tbsp. French dressing.) "You indicated that you had jello with fruit in it for dessert. Do you have any idea what kind of fruit was in the jello and approximately how much you ate?"

Client: "I believe I ate more than this measure (1/2 cup) but not quite a full cup - about 3/4 of a cup. I believe the jello had peaches or pears."

Interviewer: (Interviewer may code fruited gelatin.)
It is at the discretion of the interviewer if he/she prefers to code individual fruit within the gelatin.
"You indicated that you had a glass of milk Could you tell me what the size was?"

Client: (Points to one cup)

Interviewer: "What kind of milk?"

Client: "Whole milk."

At this point the interviewer would again put a second line in the box next to "Milk and Milk Products" since additional servings of milk may be drunk.

Interviewer: "About what time was that?"

Client: "About 5 p.m."

Interviewer: "Did you have anything to eat or drink between 2 p.m. yesterday and 5 p.m ?"

Client: "I had another Coke and some potato chips. I know my diet is terrible."

Interviewer: Interviewer gives no value judgment until after 24 hour recall has been taken but may say "We need to look at the total food intake not just one snack. Now could you tell me how much Coke you had to drink?"

Client: "Twelve ounce can of Coke (pointing to can)."

Interviewer: "About which container would the potato chips fit into?" (Note: One cup of potato chips is approximately 3/4 ounce or equivalent to small bag as purchased for lunch boxes).

Client: Indicates that approximately two ounces of potato chips were eaten.

Interviewer: Interviewer records the Coke and potato chips, however, it is necessary to completely erase the mark for one serving and record two servings or two 12 ounce Cokes. "Can you think of anything else you might have eaten or drunk in the last 24 hours? We find that clients often forget to mention snacks such as candy, cookies, chips, or alcoholic beverages. Do you recall having taken in any other foods or beverages within the last 24 hours?"

Client: "I had several snacks but I believe I told you about each one."

Interviewer: "We're finished with your 24-hour intake. Let's see, you ate yesterday noon; you had a snack in the morning and a glass of orange juice when you got up; again you had a snack before you went to bed and supper as well as a snack in the

mid-afternoon. That makes six times that you ate during the last 24 hours. Is that correct?"

Client: "Yes, that sounds about right."

Interviewer records six on page two for the "number of meals and snacks" and records exact quantities of milk, bread and any other food which was not directly coded onto the form.

Interviewer has completed the 24-hour recall.

The form referred to in the sample interview is NDDA Form Number 08-8020-321.

APPENDIX D

NUTRIENT DIETARY DATA ANALYSIS SYSTEM

1. Excerpt from Data Collection Form
2. Excerpt from Dietary Analysis Report

EXCERPT FROM DATA COLLECTION FORM*

MILK AND MILK PRODUCTS	AMOUNT					
Whole Milk (c)	1/4	1/2	1	2	3	4
Skim Milk (c)	1/4	1/2	1	2	3	4
2% Milk (c)	1/4	1/2	1	2	3	4
Buttermilk (c)	1/4	1/2	1	2	3	4
Chocolate Milk (c)	1/4	1/2	1	2	3	4
Evaporated Milk (c)	1/8	1/4	1/2	1	2	3
Nonfat Dry Milk (T)	1/2	1	2	3	4	5
American Process Cheese (oz)	1/2	1	2	3	4	5
Brick Cheese (oz)	1/2	1	2	3	4	5
Cottage Cheese (c)	1/8	1/4	1/2	1	2	3
Vanilla Ice Cream (c)	1/8	1/4	1/2	1	2	3
Sugar Cone (each)				1	2	3
Chocolate Pudding (c)	1/8	1/4	1/2	1	2	3
Vanilla Pudding (c)	1/8	1/4	1/2	1	2	3
Plain Yogurt (c)	1/8	1/4	1/2	1	2	3

*Other groupings of food include Meat and Meat Alternatives, Casseroles, Vegetables, Breads and Cereals, Fruits and Fruit Juices, Beverages, Desserts, Condiments, Fats and Oils, Snacks, and Baby Foods and Formulas.

EXCERPT FROM DIETARY ANALYSIS REPORT

I. NUTRIENT INTAKE

Nutrient[1]	Amount	% RDA
Energy	(3145 kcal)	(131)
Protein	(97.8 gm)	(129)
Vitamin D	(510.6 IU)	(25)
Cholesterol	(293.2 mg)	-
Sucrose	(81.3 gm)	-

[1]Other substances analyzed include Vitamin A, Vitamin E, Vitamin C, Folacin, Niacin, Riboflavin, Thiamin, Vitamin B6, Vitamin B12, Calcium, Phosphorus, Iron, Magnesium, Zinc, saturated fat, fructose, glucose, lactose, maltose, crude fiber, sodium, potassium, phenylalanine, and caffeine.

II. FOOD CONSUMPTION

Food Group[2]	Amount	Servings
Milk and Milk Products		(3)
2% Milk	(369.0 gm)	(2)
American Cheese	(168.0 gm)	(1)
Breads and Cereals		(2)
White Bread	(140.0 gm)	(2)

[2]Other food groups include Meat, Eggs, and Combination Dishes, Legumes and Nuts; Soups; Fruit, Vegetables,

Juice, and Salads; Breads and Cereals; Fats and Oils; Baby Foods and Formulas; Others.

APPENDIX E

RECOMMENDED DIETARY ALLOWANCES

FORMULA FOR CALCULATING NUTRIENT SCORE

RECOMMENDED DIETARY ALLOWANCES (RDA)

PREGNANT WOMEN

NUTRIENT	AGE 15 - 18	19 - 22	23 - 50
Calories		2400	
Protein (gms)	76	74	74
Vitamin A (IU)	800	800	800
Vitamin D (ug)	15	12.5	10
Tolacin (ug)	800	800	800
Vitamin E (mg)	8	8	8
Vitamin C (mg)	80	80	80
Thiamin (mg)	1.5	1.5	1.4
Riboflavin (mg)	1.6	1.6	1.5
Niacin (mg)	16	16	15
Vitamin B_6 (mg)	2.6	2.6	2.6
Vitamin B_{12} (ug)	4.0	4.0	4.0
Calcium (mg)	1600	1200	1200
Phosphorus (mg)	1600	1200	1200
Magnesium (mg)	450	450	450
Iron (mg)	18 (±60)	18 (±60)	18 (±60)
Zinc (mg)	20	20	20

NUTRIENT SCORE = [(% RDA Calories + % RDA Protein +
% RDA Vitamin A + RDA Vitamin D +
% RDA Vitamin E + % RDA Vitamin C +
% RDA Thiamin + % RDA Riboflavin +
% RDA Niacin + % RDA Vitamin B_6 +
% RDA Folacin + % RDA Vitamin B_{12} +
% RDA Calcium + % RDA Phosphorus +
% RDA Magnesium + % RDA Iron + % RDA Zinc)/
1700]100

EXAMPLE: Client receives 100% of RDA's for all nutrients:
100% calories + 100% protein + 100% Vitamin A +
100% Vitamin E + 100% Vitamin C + 100% Thiamin +
100% Riboflavin + 100% Niacin + 100% Vitamin B_6 +
100% Folacin + 100% Vitamin B_{12} + 100% Calcium +
100% Phosphrous + 100% Magnesium + 100% Iron +
100% Zinc

$= \frac{1700}{1700} = 1 \times 100 = \underline{100}$ (Score)