NUTRITIONAL ASSESSMENT OF PREGNANT ADOLESCENTS IN A WIC PROGRAM

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Bachelor of Science

Oklahoma State University

Stillwater, Oklahoma

1976

Submitted to the Faculty of the Graduate College
of the Oklahoma State University
in partial fulfillment of the requirements
for the Degree of
MASTER OF SCIENCE
December, 1977

NUTRITIONAL ASSESSMENT OF PREGNANT

ADOLESCENTS IN A WIC PROGRAM

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ACKNOWLEDGMENTS

My primary thanks must go to Ms. Elizabeth Hensler, Director of Nutrition of the Oklahoma Public Health Department, and Ms. Naomi Ard, dietitian at Mary Mahoney Memorial Health Center, for their help and guidance in this study. It was through their cooperation and that of the clinic clientele that this research was possible.

I would also like to extend my appreciation to Dr. Esther Winterfeldt for her time spent in helping me design, carry out, and evaluate this project. Her constant encouragement was indispensable for the success of the research.

My greatest thanks is to my husband, Bill, who has encouraged me through the many ups and downs which are natural in any extensive study. His love provided me strength to maintain me for the one and one-half years of the master's program.

Special appreciation is due to my parents, Mr. and Mrs. Blake Vinsant, who provided the opportunity for study at Oklahoma State University.

It is to my husband and to my parents that this research thesis is dedicated.

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CHAPTER I

INTRODUCTION

Significance of the Study

Teenage pregnancy is a rising concern in the United States. Although the birth-rate for the over-all population has declined, the number of births by girls younger than 16 years of age has increased by 80 per cent. The rate of pregnancies for adolescents from ages 16 to 17 has also risen by 25 per cent from the years of 1960 to 1976 (1). The increased number of pregnancies among the teenage population has led to a rising concern for these girls for the many social, psychological and physical stresses influencing pregnancy, one of these being nutrition.

During pregnancy, the placenta filters from the woman's blood many nutrients and substances which then nurture the fetus. Thus, pregnant women can often determine the degree of health of their unborn through the diet they consume. Vitamins, minerals, carbohydrates, fats, and proteins are provided the fetus in this manner. A balance of these nutrients throughout pregnancy results in a healthy baby. It then becomes increasingly important for a pregnant woman to have high quality nutritious foods during the pregnancy period. Women who fail to enrich their diets during pregnancy to the recommended levels set by the National Research Council are possibly subjecting their unborn child to the dangers of low birth weight (2) (3).

In Oklahoma in 1973, there are reported 88.7 per one thousand cases of low birth weight in infants born to teenage mothers. The mortality rate for this age group for the state is 27 deaths per one thousand live births (4).

Teenage pregnancy provides not only a risk for the fetus but to the mother specifically because of her immaturity and age. Pregnant teenagers are termed by many to be one of the medically known high-risk groups. If a girl is pregnant before her 18th birthday, she is more likely than an older mother to suffer from pre-eclampsia, anemia, and either excessive or inadequate weight gain (1). In each of these cases, the diet becomes important.

Purpose of the Study

The purpose of this study was to investigate the diets and clinical data of a group of pregnant girls under 20 years of age participating in the federally funded Special Supplemental Food Program for Women, Infants, and Children. Through this research, individual dietary assessments were made along with a general assessment for the group as a whole. Variables affecting the food intake of the participants were studied for correlations with dietary adequacy.

Objectives of the Study

The objectives for this study were the following:

1. To determine the dietary intake of pregnant adolescents within the WIC program through the evaluation of a 24-hour dietary recall on the basis of the 1974 RDA.

2. To determine the relationship between the adequacy of the teenager's diet and certain clinical data: age, hemoglobin level, weight gain, and the number of prior pregnancies.
3. To determine the relationship between the adequacy of the teenager's diet and eating patterns such as: meal patterns, snacking patterns, food purchasing and preparation, food dislikes and allergies, use of vitamin-mineral supplements, length of time on the WIC program, diet change made because of pregnancy, and past or present special dietary regime.

Hypotheses

1. The pregnant adolescents within this study will not meet the Recommended Dietary Allowance for their age group and stage of pregnancy based upon the 24-hour dietary recall.

2. There will be no relationship between the adequacy of the teenager's diet and the clinical data of each participant.

3. There will be no relationship between the adequacy of the teenager's diet and the eating patterns of each participant.

CHAPTER II

REVIEW OF LITERATURE

Factors Influencing Pregnancy

Multiple factors converge in the experience of human pregnancy making the study of a single one, independent of the others impractical and, at best, inconclusive. Nutrition and the outcome of pregnancy is one such factor. Many researchers have worked to find a common link between these variables while unintentional events of history may prove to be the most convincing.

Wartime starvation in Holland in the mid-1940's cut the daily intake of pregnant women to a fractional 1,000 calories and from 30 to 40 grams of protein. As a result of the deprivation, women who delivered in this period had infants of less weight and height than before. The 1941-1943 siege of Leningrad was so severe that women were unable to conceive. The only children born in this period were those of mothers able to get additional food during the entire period (5). Conversely, pregnant women of Great Britian were given special priority under the food rationing policy of wartime. This resulted in a large fall in the rate of stillbirths from 38 to 28 deaths per 1,000 live births (6). Even in these studies, the psychological state of the mother, the availability of health services, or any environmental hazards could all be underlying circumstances affecting the pregnancy of these women.

In Figure 1 is a theoretical model developed by J. R. Udry showing the effect of social structure on women's psychological state and on the outcome of pregnancy (6).

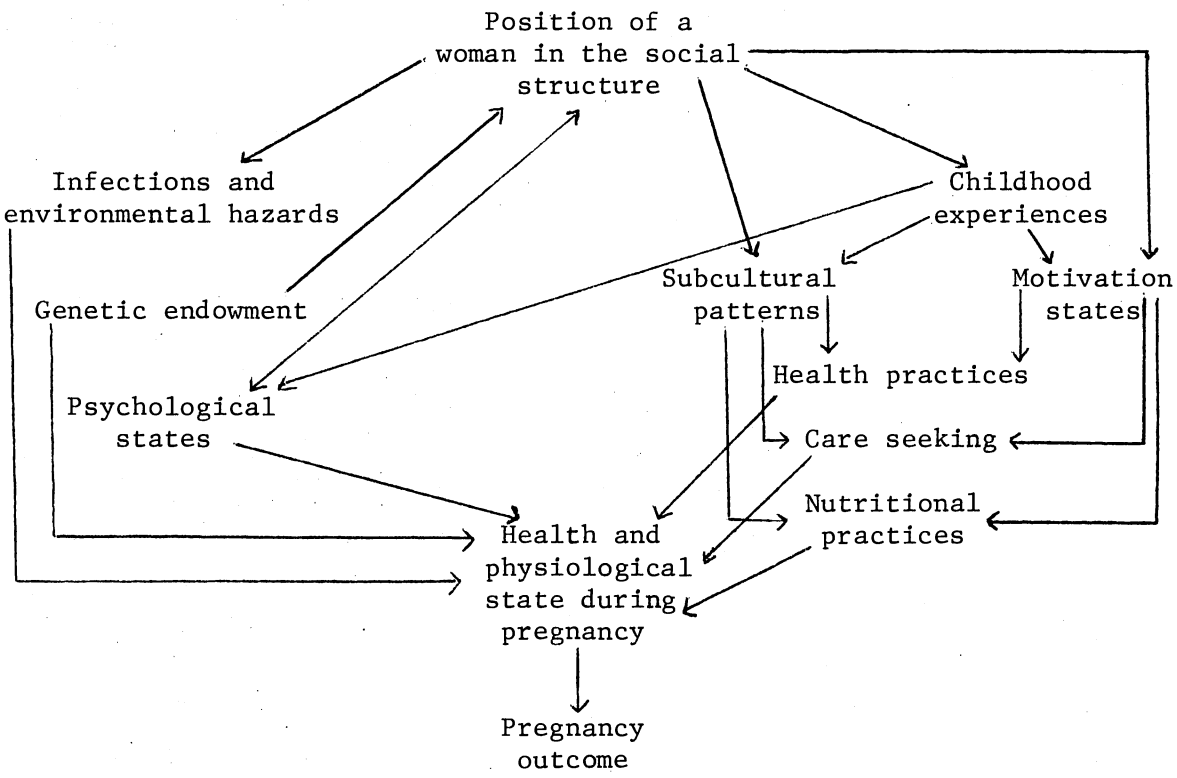

Figure 1. The Effect of Social Structure on Women's Physiological State and on the Outcome of Pregnancy

Studies of pregnant adolescents also show social factors affecting their environment and consequently the outcome of their pregnancy. Common patterns include broken homes, absence of a father figure, and often conditions of over-crowding (7) (8). These girls tend to come from high-fertility rate neighborhoods containing low-income tenants and adults

with fewer than the average years of education (9).

The extent of the problem of adolescent pregnancies can be judged from the trend in the numbers of live births, birth weights, and mortality rates for the age group. During 1973, girls under 15 years of age in the United States increased the population by 12,735 live births and girls 15 to 19 years of age gave birth to 596,795 infants. Of these two groups, 32 per cent of the former gave birth to infants less than 2,500 grams and of the latter only 9.2 per cent fell below 2,500 grams at birth in the same year (10). Mortality figures from 1965 statistics show deaths to infants of mothers under 15 years of age to be 41.2 neonatal deaths, 17.6 postnatal deaths, and 57.8 infant deaths. In the same year, deaths of infants of mothers 15 to 19 years of age came with the frequency of 22.7 deaths in the neonatal period, 10.1 postnatally, and 32.8 during infancy (6).

Table I shows the birth rate of infants born to teenage mothers in the state of Oklahoma and in two of the state's major cities during 1973.

Nutrition and the Adolescent

A problem facing the medical team working with pregnant teenagers is their reluctance to seek prenatal care. Some of the reasons cited for this negligence is a desire to conceal the pregnancy especially from welfare and school personnel, failure to recognize the pregnancy, and a fear of the physical examination (11). Nutritionists working with this group of girls have found that social and psychological problems influence the food intake and nutritional status of the pregnant adolescent.

Such turmoil affects the diet of the pregnant teenager to a greater extent than the non-pregnant teenager (12).

TABLE I

LIVE BIRTHS BY AGE OF MOTHER AND RACE, 1973

Area	Race	Total	Below 15 Years	15 to 19 Years
Oklahoma	All	40,788	162	9,920
Oklahoma City	All	11,585	48	2,651
	White	9,405	18	1,957
	Black	1,601	28	572
Tulsa	All	7,498	30	1,697
	White	6,149	12	1,253
	Black	921	16	318

In 1972, less than 40 per cent of the teenage mothers in Oklahoma have received adequate prenatal care beginning in the first trimester of pregnancy. Fewer of the younger teenagers have adequate care than those aged 18 or 19 (4). Demographic studies in Oklahoma show that in 1974, there have been a total of 4,805 births to out-of-wedlock teenage mothers and 10,065 births to married teens (13). Approximately 15 per cent of these adolescents or 2,230 per year have little or no prenatal care while 45 per cent or 6,691 lack the total care that they need. This may reveal that the importance of dietary regulations is not demonstrated to these young mothers-to-be when they need it the most.

Pre-pregnancy nutrition is important to all pregnant women and

especially to a pregnant adolescent. A well-nourished woman with ample nutrient supplies before pregnancy may be able to adequately furnish nutrients to the fetus from these stores without increasing nutrient intake during the nine months of gestation. The less nutritionally sound the mother's diet is before pregnancy, the more important her diet becomes during pregnancy (2). The pregnant adolescent must then look towards earlier teen years for pre-pregnancy nutrition. The 1968-70 Ten State Nutrition Survey has identified adolescents from 10 to 16 years of age as the group having the highest prevalence of unsatisfactory nutritional status (14). Teenage girls often skip meals, short-changing themselves of calcium, iron, and vitamins A and C in an effort to stay slim (15) (16). Unless the adolescent diet can improve to substantiate the bodily stress of the growing fetus, the teen becomes a biological risk.

A recent study of pregnant adolescents in Louisiana has shown nutritional inadequacies in 45 of 51 participants (17). They fell below two-thirds of the Recommended Dietary Allowances for protein, vitamin A, pyridoxine, vitamin B_{12}, niacin, thiamine, riboflavin, ascorbic acid, iron, and calcium. Several studies from 1969 to 1976 have reported calcium, iron, and vitamin A as the deficient nutrients found lacking in the diets of pregnant adolescents. Deficiencies of these nutrients have greater effects on the fetus than on the mother herself (18) (19) (20) (21).

Maternal and Fetal Growth

During nine months of pregnancy, a woman's body makes many adjustments for the fetus growing within her. Some of these changes are made

by natural body alterations but many must come out of the response of the mother through her diet. In order to understand those happenings, it becomes necessary to investigate the progress of the fetus during the incubation period, the requirements of growth and the restrictions placed on the mother for her own body functions and those of the fetus.

The nine months of fetal growth can be divided into three growth periods, the implantation, differentiation of major organs and tissues, and the intensive growth period. During the first period lasting from conception through the first two weeks, the fertilized ovum forms two layers that later become the placenta. The second stage lasting from the second to the eighth week is the time the ectoderm changes into the gastrointestinal lining, the liver, pancreas, and the thyroid; and the mesoderm becomes the skeleton, connective tissue, vascular and urogenital systems, dermis, and most skeletal and smooth muscles. From the eighth week until term, the fetus develops more specialization of tissue and grows in size.

Maternal growth, in the form of weight gain, proceeds simultaneously with the growth of the fetus. Weight gained during this period goes for various functions and is not all transmitted to the fetus. A normal gain during pregnancy for a woman over 20 years of age is generally two to four pounds during the first trimester and one pound every week thereafter to term. A greater gain would be seen in adolescents who are continuing their own body growth. Table II shows the components making up average weight gain in the pregnant woman (7).

Nutrient Needs During Pregnancy

Tissue enlargement of the mother's body, and tissue growth of the

fetus, requires increased energy intake. This energy in the form of calories necessitates the increase of carbohydrates, fats, and protein in the mother's diet above the normal intake levels. When dietary increases are not made, the body needs come from maternal nutrient stores.

TABLE II

COMPONENTS OF THE AVERAGE WEIGHT GAINED IN NORMAL PREGNANCY

	Component	Weight Gained in Grams by Weeks			
		10 Weeks	20 Weeks	30 Weeks	40 Weeks
A.	Total gain of body weight	650	4000	8500	12500
	Fetus	5	300	1500	3300
	Placenta	20	170	430	650
	Liquor amnii	30	250	600	800
	Increase of:				
	Uterus	135	585	810	900
	Mammary gland	34	180	360	405
	Maternal blood	100	600	1300	1250
B.	Total (rounded)	320	2100	5000	7300
C.	Weight not accounted for (A - B)	330	1900	3500	7200

Protein is a major nutrient necessary for growth. The gravid organism must supply protein for the fetus, the placenta, the uterus, and the mammary glands. It is calculated that 17 to 18 grams of

nitrogen is used for the placenta, 1 gram for the amniotic fluids and membranes, 17 grams of nitrogen for the growth of the mammary glands, and 39 grams for the enlargement of the uterus. This makes the total nitrogen requirement during pregnancy about 140 grams of nitrogen or 870 grams of protein (22). The recommended protein intake is from 1.5 to 2 grams of protein per kilogram of body weight. The body itself makes provisionary allotments for the increased need of protein by storing nitrogen in excess of the calculated requirements. During parturition, postpartum bleeding, placental extrusion, uterine and pelvic organ changes, and in breast milk nitrogen storage, the nitrogen balance becomes negative. These nitrogen stores of pregnancy are a natural mechanism of defense. Pre-pregnancy nutrition affects protein retention during pregnancy. A study of women having unsatisfactory nutritional status six years before conception show they could retain only 86 grams of protein during pregnancy whereas women having adequate pre-pregnancy nutrition for the same period could retain up to 196 grams of protein (22). Positive correlations have also been found to exist between the protein content of the mother's diet and the weight, length, and bone development of the infant at birth (22). Besides the greater need for protein, the pregnant mother has an obligation to the fetus to increase her intake of many minerals and vitamins.

Calcium and phosphorus are two very important minerals to the growing fetus. Calcium is the essential element in the growth and maintenance of the bones and teeth, and phosphorus is necessary for adequate absorption of calcium. Depletion of calcium in the mother during pregnancy is suggested by occasional cases of osteomalacia (7). Pregnant women having diets poor in calcium bear infants with low calcium and

phosphorus stores. Poor calcification of the teeth can also be expected in a calcium deprived fetus (22). The calcium content of the pregnant woman's diet also affects her breast milk. Those ingesting low calcium diets produce low calcium milk. For a child to have healthy bones and teeth, the mother's responsibility begins with proper feeding of herself before the child is born.

Sodium intake during pregnancy has been debated over time. In the past, it has been associated with the toxemia that sometimes develops during pregnancy. More recent studies have been reported with contrary results. These reports say that during pregnancy the body has a need for increased levels of sodium. The body is able to cope with these needs through natural body adjustments. However, intentional dietary restrictions of sodium at a time when the need for sodium is greater, exceeds the capabilities of adjustment normally made by the body. Therefore, moderate sodium intakes during pregnancy are recommended (22).

Iron is an essential trace mineral needed in increased quantity by both mother and child during the period of pregnancy. An "iron cost" estimation has been organized by the National Research Council to suggest the needed amounts required by the pregnant women (7). Table III shows this information. Iron supplementation is generally recommended for all pregnant women. Supplements of 30 to 60 mg of iron a day will help rebuild maternal iron stores, furnish iron for the new blood volume development, and fortify her for the blood losses during delivery. The mother supplies the fetus with a three to four month supply of iron in the liver to provide for the first months of iron-poor food which will be his livelihood. Oral iron treatment during the last trimester

of pregnancy seems to produce a greater iron circulation in the newborn (24). Iron transport in the first two-thirds of pregnancy is about 0.4 mg a day and rises to 4.7 mg per day in the last three months (25). Without sufficient maternal transfer of iron stores to the fetus, the newborn could become anemic within a short period after birth.

TABLE III

IRON BALANCE DURING PREGNANCY

Components	mg of Iron
Extra iron in:	
Product of conception	370
Maternal blood	290
Total	660
Less iron "saved" by cessation of menstruation	120
Total	540

Many attributes of the already-named nutrients can be seen as also important in the requirements of vitamin A. The vitmain A increase of 1,000 I.U. for the last half of pregnancy is used as an essential factor in cell development, maintenance of the integrity of epithelial tissue, tooth formation, normal bone growth, and vision. The placenta has been known to be weak in transmitting vitamin A across to the fetus but in mothers consuming diets high in vitamin A greater liver stores of the

vitamin have been found. It is theorized that vitamin A may pass into the placenta without increasing the levels in the cord blood or that the fetal liver may withdraw vitamin A from the blood so efficiently and so rapidly that the placenta does not reflect as increased concentration in the blood of the newborn (22).

Without a sufficient prenatal intake of vitamin D, an infant could develop rickets at birth. Supplementation of mothers in their last two months of pregnancy cannot eliminate the possibility of reickets occurring in the child but the severity of the rachitic process is influenced by prenatal feeding. The value of vitamin D in the calcification of bones and teeth in fetal life is well documented. A good prenatal storage of vitamin D will offset a deficient diet postnatally (22). Such stores are imperative for the breast-fed newborn since this milk contains very little vitamin D. In an intake of 1,000 ml of breast milk, an infant could receive only 80 I.U. of vitamin D per day, the requirement being 400 I.U. per day.

Ascorbic acid is another vitamin that shows the interrelationship of the nutrients. It is helpful for increased absorption of iron to form hemoglobin as well as in the formation of intercellular cement in the developing connective tissue and vascular systems of the fetus. Excretion tests show that greater needs for pregnant women in the second half of pregnancy must be met to equal excretion levels of non-pregnant women (22). The ascorbic acid content of human milk ranges from 1 to 11 mg per 100 ml; the highest figure being in a mother given massive doses of vitamin C both orally and intravenously (22). Increasing supplements of vitamin C and vitamin D are generally given newborns in their mixed formulas within two to three weeks from birth.

The B-vitamins which are of importance as coenzymes in many metabolic functions become even more important during pregnancy when the number of such functions increases. High doses of thiamine have been the cure of polyneuritis that often accompanies pregnancy (22). Riboflavin is a coenzyme in protein metabolism. With an increase of protein intake during pregnancy, the intake of riboflavin should be increased comparatively. The B-vitamins are readily available in a well balanced diet but in cases of malnourishment, supplements may be recommended.

Malnutrition, imposed upon animals during gestation, interferes with the rate of cell division in the brain tissue and the duration of the malnutrition will be more than additive (26). Some data suggest that prenatal malnutrition in the human may make the brain more vulnerable to postnatal malnutrition resulting in a marked reduction in cell number (26). Malnutrition can produce irreversible damage to the brain. Children who have been treated for severe marasmus in infancy reflect clinical normalcy of body development but deficient cranial growth as well as a decreased intelligence quotient (27). The more common form of malnutrition in the United States is a reduction in calorie and protein intake leading to moderate growth retardation rather than severe stunting (28). This malnutrition is related to insufficient income to purchase food. Malnutrition, inactivity, depressed social and environmental stimuli, and disinterest form a vicious cycle which retards behavioral development (29) (30).

Factors Influencing the Outcome of Pregnancy

Studies often link various anthropometric and environmental characteristics with the outcome of pregnancy. Clifford (33) has published

such a list of demographic factors in high-risk pregnancies from his findings.

TABLE IV

DEMOGRAPHIC FACTORS IN HIGH-RISK PREGNANCIES

Factor	Estimated Incidence (Per 1000 Births)
Gravida < 16 years of age	10
Unmarried mother	15
Height < 157.5 cm (62 inches)	190
Nonpregnant weight < 45.4 kg (100 lb.)	50
Non-white	100
Gestational age > 43 weeks	50
Gestational age > 42 weeks	110

Kaltreider (34), using only height and weight to determine their influence on the problems of pregnancy, has found that when both characteristics are considered for the patients they have no effect on the incidence of pre-eclampsia. However, over-weight pregnant women tend to have more hypertensive diseases and slightly more perinatal loss. Underweight patients suffer more from anemia and tend to have more premature infants than a heavier counterpart.

Smoking also increases risk during pregnancy. Those of lower socioeconomic levels appear to be more affected by cigarette smoking

through the chance of perinatal mortality than a mother of a higher socioeconomic level. Likewise, blacks have greater risks from smoking during pregnancy than whites even when the smoking levels are equal. A mother smoking less than a pack of cigarettes a day increases the risk of perinatal loss by 20 per cent, whereas a mother smoking a pack a day or more increases the perinatal mortality risk rate by 43 per cent (35).

Educational achievement affects the outcome of pregnancy by influencing dietary management. The number of years of formal education completed by the pregnant adolescent is positively related to the amount of nutrients ingested. Those pregnant adolescents planning to continue their education after delivery also tend to have better diets (17). When the pregnant teenager lives at home, the educational level of the person responsible for buying and preparing the meals regulates the nutritional status of all children under 17 years of age. When education levels go up, diet inadequacies tend to go down (14).

Special Supplemental Food Program for Women, Infants, and Children

Scientific studies linking malnutrition with mental and physical growth were presented in hearings in the 92nd Congress in 1972. These findings provided substantial concern among the representatives to instigate a two-year pilot supplemental food program. It allows food benefits for pregnant and lactating women, infants, and children under the age of five determined by competent professionals to be at nutritional risk from inadequate nutrition and inadequate income (36). The

Special Supplemental Food Program for Women, Infants, and Children (abbreviated WIC) became an amendment to the 1966 Child Nutrition Act falling under the direction of the Secretary of Agriculture, administered by the Food and Nutrition Services (36).

Under the WIC program, the Food and Nutrition Services provides cash grants to health departments or comparable state agencies, Indian tribes, bands, or groups recognized by the Department of Interior and Indian Health Service to allow these participating agencies to make specified foods available to pregnant and lactating women, infants, and children determined to be at nutritional risk. The Food and Nutrition Service also requires each WIC program to supply medical data and other information collected under the program that would aid in a program evaluation of the food intervention (28). For local agencies to participate in the WIC program each must meet all of the following criteria: (1) ability to provide ongoing health services and the competent professional authority, facilities, and equipment necessary to perform the measurements of eligibility and for the collection of medical data required by the Food and Nutrition Service; (2) provide health care free or for less than the full charge customarily made for such services; (3) implement a delivery system agreeable to the state agency, the Food and Nutrition Service and to the recipients; (4) provide health services to substantial numbers of women, infants, and children at nutritional risk; (5) be tax exempt by the Internal Revenue if a private agency; (6) agree to provide supplemental food to all categories of eligible participants unless the agency does not normally treat all three; (7) service only those residents presiding within their own geographic area as defined by the state agency and as approved

by the Food and Nutrition Service; and, (8) insure that WIC participants are not also receiving aid from more than one food distribution program (28).

Persons applying to WIC for assistance must also meet basic requirements before gaining acceptance into the program. Each recipient is a member of the target area served by the local agency, each is determined eligible to services free of charge or for less than the full charge, each is certified by a competent professional to be at nutritional risk through a medical examination, diet history and hemoglobin/hematocrit tests. Recertification is required each six months and from professional discretion, participants may be kept on the WIC program or removed from the program. Guidelines which aid the professional in making these decisions concerning pregnant, postpartum and lactating women are as follows:

1. Primary Criteria
   - A. Age--below 20 years of age and over 35
   - B. Frequent conception--less than 24 months between dates of conception
   - C. High parity--3 or more deliveries of a viable infant
   - D. Nutritional anemia--hemoglobin less than 12 g/100 ml or hematocrit less than 37%
   - E. Pattern of growth
     1) Low-prepregnancy weight (10% or more underweight)
     2) Insufficient weight gain during pregnancy (24 lb.)
     3) Overweight or obesity before, during, and after pregnancy (over 15% overweight)
2. Secondary Criteria (Two or more recommended for eligibility)
   - A. Inadequate diet--less than RDA for calories, protein, vitamins, and minerals
     1) Inadequate dietary pattern
        a) Less than 3 cups of milk or milk alternate per 24 hours
        b) Less than 6 ounces of meat, fish, or poultry or meat exchanges per 24 hours
   - B. History or presence of dietary faddism when affecting the nutrition of the mother or fetus

D. High risk pregnancy
   1) Complication of pregnancy
   2) History of previous pregnancy complications
   3) Presence of metabolic or chronic disease
   4) History of stillborn, premature infant, low-birth weight infant, neonatal death, infants with congenital abnormality, or overwieght infant (37, p. 27).

Most WIC programs distribute the food products by way of a voucher system. Items available to the participant are listed on a signed certificate and are redeemable at participating markets for the food. Problems can arise out of this system from abuse of the vouchers by both merchants and program recipients. Transportation may also be a problem for some participants since all items on the weekly voucher must be purchased at one time. Food products available in the WIC package are defined by law although local agencies can make substitutions to the original package based upon individual needs and provided these substitutions are also permissible by law (37). In a month's time a pregnant or lactating woman would receive seven gallons of vitamin A and D fortified whole, low-fat, or skim milk (or an option of four pounds of cheese and four gallons of milk), two gallons of reconstituted fruit or vegetable juice, 36 ounces of cereal (Buc Wheats, Malt-o-Meal, Cream of Wheat, Total, or Product 19), and two dozen large eggs. The nutrients supplied through the foods in the WIC packet are protein, iron, calcium, and vitamin C.

After two and one-half years (from 1973 to 1976) of supplemental food intervention through the WIC program, an assessment has been made to fulfill the congressional mandate for evaluation of the Special Supplemental Food Program for Women, Infants, and Children. The Department of Nutrition, School of Public Health of the University of North

Carolina contracted to perform this medical evaluation of the program. Participating states include Alabama, Arizona, Connecticut, Indiana, Minnesota, Mississippi, Missouri, New Jersey, New York, Ohio, South Carolina, Texas, Vermont, and Wisconsin representing 19 projects in 14 states. Composite findings of the medical evaluation show these results (38).

1. An increase in height, weight, and head circumference among participating infants;
2. A reduction in anemia for mother and infants;
3. An increase in mean corpuscular hemoglobin concentration for infants and children;
4. An increase in the consumption of protein, calcium, phosphorus, iron, vitamin A, thiamine, riboflavin, niacin, ascorbic acid and folacin by participating mothers;
5. A relative increase in weight gain during pregnancy by participating mothers; and
6. A particularly marked increase in birth weights of minority infants.

Dietary Assessment Methods

Methods in use for dietary assessment are the food diary, diet histories, seven-day dietary recall, and the 24-hour dietary recall. The food diary is individually conducted whereby the participant keeps a record of all food eaten in the specified period. This form can only be used with literate persons and those interested enough to accurately record. Food items may be falsified in the diary to please the surveyor

(39). Diet histories require an interviewer who probes the eating patterns of the participant for information. This method of acquiring dietary incites may be hampered by poor memory. This form also requires trained personnel for the necessary interview probing. It is impossible to predict from a diet history information that estimates dietary recall on a seven-day basis (40).

The seven-day dietary recalls determines consumption on a weekly basis. From an individual standpoint, the seven-day recall can illustrate dietary trends which may not be evident in either the diet history or the 24-hour diet recall.

The most commonly used method of dietary assessment from a practical point is the 24-hour dietary recall. The accuracy obtained from a large number of 24-hour recalls exceeds that of a small number of seven-day recalls. When the mean of 50 or more subjects with a 10 per cent error can be tolerated, the 24-hour recall is a reliable substitute for a seven-day recall (41) (42) (43). In taking 24-hour recalls some variations of nutrient content is seen between the nutrient content of the diet of rural and urban areas (42). No significant difference has been found between nutrient intake and the day of the week that the 24-hour dietary recall is taken, except among college students (41). The 24-hour dietary recall has other advantages over the other methods of data collection. It requires less expertise for the same quality of response from the subject.

The Interview Technique

The interview as used in dietary assessment fits into the definition of the typical. It is a "two person conversation conducted by one of

the participants in accordance with a definite program" (45, p. 165). The interview technique as a research style does not yield 100 per cent reliable data, yet the situation involved and technique available establishes its usefulness (46). Some of the basic conditions for effective interviewing include the following: attentive listening, the establishment of rapport, freedom from interruption, confidentiality, geographical privacy, and emotional objectivity by the interviewer (47). When all of these rights of the interviewee are granted, the chances for error diminish.

In all forms of communication, tactics used by one or both persons can facilitate or inhibit the flow of information. In an interview situation, internal rewards can be given to the interviewee which will accommodate the flow of valid communication (48). With this capacity, the interviewer can partially control the information gained from the subjects. An interviewer is much more than a recorder. He must have the ability to pursue his questioning in a tactful manner to the point where no ambiguities exist.

CHAPTER III

METHODS AND PROCEDURES

This study is designed to assess the nutritional quality of the diets and certain demographic and clinical data of a group of pregnant adolescents. Those participating are in a Special Supplemental Food Program for Women, Infants, and Children in an area of Oklahoma City. This information is combined with living, health, and eating patterns of this same group, along with selected clinical data obtained from medical records.

The subjects participating in this research are pregnant adolescents under 20 years of age obtaining medical services through the Mary Mahoney Memorial Health Clinic and living in this target area (See map in Appendix A). All 39 pregnant teenagers participating in the Mary Mahoney WIC program during the month of August, 1977, were considered for inclusion in the study. However, five delivered babies prior to the interview, one moved outside of the target area, and six did not attend the clinic simultaneously with the interviewer. Therefore, a total of 27 subjects were included in the study.

In order to obtain the dietary intake information, an interview instrument was developed (Appendix B). It included personal data, clinical data, subjective information, general eating trends, and a sample of a typical day's intake. Multiple choice type questions were used to determine living, health, and eating patterns. Completion

questions were used to gather information concerning a categorized seven-day recall of usual food eating patterns. A 24-hour dietary recall was also taken. Information from medical records was gathered at a date after the interview. Pretesting of the instrument was done prior to the interviewing dates with pregnant participants in the Mary Mahoney clinic who were ineligible for the study on the basis of thier age. The pre-test was conducted as an interview with two subjects. Extra answer categories to the multiple choice questions were added as a result of the pretesting.

Under the direction of the clinic's dietitian, an orientation day was spent in the clinic for familiarization with personnel, clientele, and the services provided through the facility. It was on this day that the pretesting was done to insure question clarity and time requirements for the interview.

The days chosen for interviewing were Mondays, the day that the prenatal clinic is held. The clients often come in for a monthly doctor's appointment and pick up the WIC vouchers for obtaining the food supplies at the same time. There is no set appointment time for the voucher pick-up except for the week in which the prior month's vouchers expire. As the nurses visit with girls who are potential subjects for this study, they send them to be interviewed. Further, when eligible girls visited the dietitian for WIC vouchers, these girls were also sent to be interviewed. The number of interviews accomplished in any one day varied from one to eight. Interviews were gathered on four Mondays during August at which time 21 subjects were seen. Six more interviews were obtained during the first week of September.

At the time of the interview, the participants were told the nature of the study. The majority of the subjects were willing to answer all questions without hesitation. No participant refused to answer any question but some demonstrated greater elaboration than others. The entire interview required between 20 to 30 minutes to administer including all multiple choice type questions and a 24-hour dietary recall. Picture food models were used to aid in portion determination in the dietary recall.

For many participants, hemoglobin tests were taken on the day of the interview through the cooperation with the prenatal clinic and the dietitian. All participants had the test done within a week of the interview.

Access to the medical records of the participants interviewed was also allowed. Information concerning age, race, hemoglobin, weight gain, the number of prior pregnancies, the progression of the pregnancy, the length of time participating in WIC, and the per cent of payment made to the clinic was collected for each participant.

The dietary intake data was first analyzed by a computer program for the nutrient content of the 24-hour dietary recall. Eight essential nutrients plus calories were correlated with information gathered from the patient charts. The 24-hour dietary recall totals for calories, protein, calcium, iron, vitamin A, thiamine, riboflavin, niacin, and ascorbic acid were also categorized into three groups--high, medium, and low. These three categories coincide with the values which are greater than 100 per cent RDA, from 2/3 to 100 per cent RDA, and less than 2/3 RDA. A Chi-square association was made between the categories of living, health, and eating patterns, and the responses from the 24-hour dietary

recall. This is the method used to compare nominal data which cannot be given a numerical value for assessment. Information gathered from the clinical data was also correlated with the nutrient content from the 24-hour dietary recall.

CHAPTER IV

RESULTS AND DISCUSSION

This study is to determine the nutritional status of a group of pregnant teenagers. Interview-collected data concerning living, health, and eating patterns along with a 24-hour dietary recall and selected clinical data is here analyzed and significant associations made.

Identifying Information

The girls interviewed differed widely in regard to age, years of formal education, employment status, and progress of pregnancy. Table V shows the variability among the girls' age and race.

TABLE V

PROFILE OF SUBJECTS

Race	Age in Years						Total
	14	15	16	17	18	19	
Black	1	0	4	0	3	6	14
White	1	1	4	2	3	2	13

From chart information, the years of formal education accomplished is available for 22 of the 27 participants. These ranged from the seventh grade to the first year in college. The mean level of education fell in the ninth grade. Table VI shows the education and age of the subjects.

TABLE VI

EDUCATIONAL ACHIEVEMENT AND AGE--22 OF 27 PARTICIPANTS

Grade in School	Age in Years						Totals
	14	15	16	17	18	19	
Seventh	1	0	0	0	0	0	1
Eighth	0	1	1	1	0	0	3
Ninth	1	0	4	1	0	1	7
Tenth	0	0	0	0	0	0	0
Eleventh	0	0	1	0	1	1	3
Twelfth	0	0	0	0	5	2	7
One year of college	0	0	0	0	0	1	1

Six of the 27 participants are employed outside of the home. Of this group, four work full-time, one works an hour five days a week, and the other works in sporadic baby-sitting jobs.

At the time of the interview, the stage of pregnancy ranged from 8 weeks to 36 weeks. Divided into monthly segments, this distribution is shown in Table VII. For most girls this is their first pregnancy.

For nine subjects this is the second pregnancy and for one the third. The distribution spread suggests what has been found in past research, that teenagers tend to wait in seeking medical help. The greatest influx of recipients come in for help in the seventeenth week of pregnancy and after.

TABLE VII

STAGE IN PREGNANCY

	5-8 Weeks	9-12 Weeks	13-16 Weeks	17-20 Weeks	21-24 Weeks	25-28 Weeks	29-32 Weeks	33-36 Weeks
Number of Subjects	1	2	2	6	5	4	4	3

In most cases, girls attending the clinic for the first time due to pregnancy are also placed in the WIC program at that time. Table VIII shows the progress of each participant's pregnancy at the time interviewed, the week that each participant began receiving the WIC program food package, and the number of weeks that each has been on the program prior to the interview. The mean for the week of pregnancy that the participants began receiving WIC is 14.8 weeks and the average number of weeks having received WIC food supplements is nine weeks.

Daily Food Guide

The diets of each girl is compared with the Basic Four Daily Food

TABLE VIII

PREGNANCY STATUS AND WIC RECEIVABLES

Age	Current Status of Pregnancy in Weeks	Week of Pregnancy Began Receiving WIC	Number of Weeks on the WIC Program
14	27	9	18
	32	18	14
15	17	17	0
16	13	13	0
	28	19	9
	10	10	0
	18	17	1
	30	26	4
	18	18	0
	24	18	6
	15	6	9
17	20	9	11
	17	9	8
18	29	16	13
	27	11	16
	22	18	4
	23	15	8
	36	13	23
	34	18	16
19	24	12	12
	28	12	16
	16	16	0
	24	24	0
	36	16	20
	29	21	8
	12	12	0
	19	5	14

guide for adequacy. The diets are rated "good" if a subject eats food from all four food groups and meets the required amount of three groups. The diets are rated "fair" if a subject eats food from all four groups and meets the required amounts of two groups; and the diet is rated "poor" if either all four groups are not represented in the diet or if the four food groups are represented but required amounts are not met. Results from this form of analysis show that only seven per cent of the girls have "good" diets, 33 per cent have "fair" diets, and 59 per cent have "poor" diets as shown in Table IX. The Basic Four determination of dietary adequacy is not as precise a method as nutrient evaluation. It accounts for those foods rich in a specific nutrient yet not for those nutrients found in small quantities in many foods. For example, a poor rating in the Basic Four may not always mean low percentages of the RDA, and vice versa.

TABLE IX

BASIC FOUR FOOD GROUP RATINGS

Age	N	Frequency	Ratings		
			Good	Fair	Poor
14	2	2	0	2	0
15	1	1	0	1	0
16	8	8	0	2	6
17	2	2	0	0	2
18	6	6	1	3	2
19	8	8	1	1	6

At the time of the interview, 23 of the total number of subjects were not experiencing morning sickness. The remaining four responded to a question about the nausea as being either mild, medium, or severe. However, when asked about their general health, 14 described themselves as feeling either excellent or good and 13 described themselves as feeling fair or poor. When the variable of expressed health condition of the respondent is compared with adequacy of the diet it is impossible to discern which brought on the other; if poor health promoted poor eating habits or if poor eating habits brought on poor health. Table X shows that the two girls who have good diets report feeling excellent or good. At the same time, 12 others report feeling good and excellent yet have fair or poor diets. It is also interesting to note that the 13 respondents who report feeling fair or poor also have diets that are fair or poor.

TABLE X

HEALTH STATUS AND BASIC FOUR FOOD RATINGS

Health Status	N	Basic Four Ratings		
		Good	Fair	Poor
Excellent	7	1	1	5
Good	7	1	1	5
Fair	12	0	7	5
Poor	1	0	0	1
Total	27	2	9	16

The combined guardianships under which these girls live makes the food buying and food preparation responsibilities fall on the guardian, on the girls, or jointly on both. Nine girls have the full responsibility over the food buying for their household. Eleven have sole responsibility over the food preparation. For six participants, food buying is a joint effort with another household member, and for six others food preparation is a joint effort. This leaves 44 per cent who have no responsibility for food buying and 37 per cent have no responsibility for the food preparation. When the effect of guardianship, the food buyer, and the food preparer are considered with dietary adequacy based upon the Basic Four Food groups, there is only a slight variation between those who live with their mother, with both parents, with their husband or with someone else. The same is true with responsibility of the buying and preparation.

Nutrient Intake

The 24-hour dietary recalls were analyzed for calories and the nutrients (protein, calcium, iron, vitamin A, thiamine, riboflavin, niacin, and ascorbic acid). Individual totals of nutrient intake are given in Table XI. This table shows that 48 per cent of the participants fall below the RDA for calories, 25 per cent are below the RDA for protein, 63 per cent are below the RDA for calcium, and 100 per cent are below the RDA for iron, 59 per cent are below the RDA for vitamin A, 70 per cent are below the RDA for thiamine, 44 per cent are below the RDA for riboflavin, 48 per cent are below the RDA for niacin, and finally 40 per cent are below the RDA for vitamin C. The participants

TABLE XI

TOTAL NUTRIENT INTAKE FOR EACH SUBJECT BY AGE

Age and Number of Subjects	Calories	Protein (grams)	Calcium (grams)	Iron (mg)	Vitamin A (IU)	Thiamine (mg)	Riboflavin (mg)	Niacin (mg)	Vitamin C (mg)
14 (2)	2275	96	1.296	12.3	7460	.89	2.32	16.4	59
	3309	115	.261	11.8	968	1.58	4.09	14.1	250
15 (1)	1857	89	.261	14.0	7190	1.01	1.46	26.4	94
16 (8)	1433	54	.257	7.3	1965	.65	.87	13.5	147
	2691	91	.527	15.1	2330	1.74	1.71	23.4	166
	2450	80	1.730	7.0	2825	1.52	2.72	10.0	22
	2769	103	.988	16.4	8365	1.61	2.01	19.7	86
	1030	46	.646	5.7	1875	.40	1.13	7.0	29
	2170	68	.595	9.7	7653	1.21	1.36	11.1	53
	1719	76	.885	8.5	1835	.81	1.54	10.6	14
	718	35	.629	4.0	1070	.82	1.06	4.6	11
17 (2)	1730	68	1.311	6.2	2570	.87	2.15	5.2	8
	1753	59	.186	11.4	6310	1.07	.81	17.7	69
18 (6)	3316	144	1.571	21.6	5515	2.58	2.80	27.4	747
	3727	191	2.336	22.1	7527	2.21	4.37	30.7	279
	2003	86	1.138	13.0	3485	1.37	2.18	11.8	41
	1484	76	.400	8.5	1560	.69	1.27	18.3	65
	2641	108	1.364	16.6	5235	1.41	2.32	22.4	89
	3176	76	1.648	13.5	9123	1.26	2.94	12.1	172

TABLE XI (Continued)

Age and Number of Subjects	Calories	Protein (grams)	Calcium (grams)	Iron (mg)	Vitamin A (IU)	Thiamine (mg)	Riboflavin (mg)	Niacin (mg)	Vitamin C (mg)
19 (8)	3313	132	.225	10.0	4580	1.64	3.70	28.2	288
	2480	55	.669	9.9	629	.71	1.15	8.0	17
	2918	122	.987	18.7	1925	1.09	2.16	19.4	67
	3888	173	3.387	19.0	15378	2.33	5.76	20.5	201
	715	25	.071	6.4	4045	.33	.41	7.1	52
	4435	163	1.391	20.8	3933	1.40	2.12	40.1	69
	1984	72	.619	11.5	1578	.54	1.26	18.5	7
	3128	75	.329	13.9	3995	.86	1.02	19.5	150

take vitamin tablets and iron supplements which help to offset their dietary deficiencies.

Nutrient assessment of each subject based upon the Recommended Daily Allowances for pregnant teenagers (Appendix C) allows the scores to be categorized into unit scores of 100 per cent RDA and above, 2/3 RDA to 100 per cent, and scores falling below 2/3 RDA. Table XII shows the ranking of each subject by nutrient and by age.

In the objectives, it is considered that a relationship may exist between the per cent of payment made to the clinic (based upon the income of the participant) and nutrient intake. Only seven of the girls in the study paid more than zero per cent and these payments were 15, 20, 30, 45, 55, and 75 per cent of the normal cost of the medical services. The only dietary difference was in the protein adequacy of these diets. It is possible that the extra income available to these girls is used to purchase protein.

The protein intakes of each individual extended from one-third the daily requirement to two and one-half times the needed amount. Six recipients fell below the RDA for protein. In the statistical analysis of the variables it becomes significant to note that as total calories rise in the diet, protein also increases at a correlation of .86, α .0001. This demonstrates the high priority placed upon protein by these girls. Of the protein sources chosen on the day of the interview, half of the group selected low cost meats or meat combinations such as hamburger, weiners, stew; while the other half chose high cost meats such as ham, pork chops, and steak.

Sixty-three per cent of the girls in the study have a one day calcium intake below the RDA for their age group. This is an unusual

TABLE XII

INTAKE OF NUTRIENTS BY ADOLESCENTS IN PER CENT OF RDA

Age and Number of Subjects	% RDA	Calories	Protein (g)	Calcium (g)	Iron (mg)	Vitamin A (IU)	Thiamine (mg)	Riboflavin (mg)	Niacin (mg)	Vitamin C (mg)
14 (2)	Less 2/3	0	0	0	2	0	1	0	0	0
	2/3-100%	1	0	0	0	0	0	0	2	1
	100% +	1	2	2	0	2	1	2	0	1
15 (1)	Less 2/3	0	0	1	1	0	0	0	0	0
	2/3-100%	1	1	0	0	0	1	1	0	0
	100% +	0	0	0	0	1	0	0	1	1
16 (8)	Less 2/3	3	3	4	8	5	4	2	3	4
	2/3-100%	2	3	2	0	0	1	3	3	1
	100% +	3	2	2	0	3	3	3	2	3
17 (2)	Less 2/3	0	0	1	2	1	1	1	1	1
	2/3-100%	2	2	0	0	0	1	0	0	0
	100% +	0	0	1	0	1	0	1	1	1
18 (6)	Less 2/3	1	0	1	6	1	1	1	0	0
	2/3-100%	1	2	0	0	1	2	1	2	1
	100% +	4	4	5	0	4	3	4	4	5
19 (8)	Less 2/3	1	1	4	8	3	4	2	2	2
	2/3-100%	1	3	1	4	4	2	2	0	0
	100% +	6	4	3	0	1	2	4	6	6

finding since a major ingredient of the WIC supplements is milk. However, past research has shown that the teenage population have low intakes of calcium.

High vitamin A levels are seen in the diets of a few participants, but 59 per cent remain below the RDA for this nutrient. The high levels come from a high consumption rate of fresh fruits, especially peaches and watermelon. During other months of less accessibility to fresh fruits, the number falling below 5000 I.U. of vitamin A may become even greater.

Seventy per cent of the WIC recipients in this study fall below the recommended daily allowance for thiamine. Pork is a good source of thiamine, so those girls including ham, pork chops and pork sausages in their diets tend to have diets adequately rich in thiamine.

Riboflavin is available in many foods in small amounts, yet is primarily found in milk and milk products. A person with an inadequate intake of milk may be low in calcium yet meet the RDA standards for riboflavin. This is evident in this study. Sixty-three per cent of the subjects fell below the RDA's for calcium yet only 44 per cent are below the RDA's for riboflavin.

Niacin values varied with the intake of calories and protein. At a .0001 significance, as calories and protein go up in the diet, levels of niacin also rise ($r = .71$ and $r = .79$, respectively).

Vitamin C found in the diets of the participating girls reflects the amount of fruit juice and fresh fruits and vegetables consumed. Those whose diets are below the RDA for vitamin C had few fruits and vegetables in their diets. From this day's 24-hour dietary recall, 40 per cent of the WIC recipients interviewed fell below the RDA for

vitamin C. From the WIC package, the girls are allowed two gallons of vitamin C rich fruit or vegetable juice. This would provide one cup of juice each day for a month which would also be twice the RDA for vitamin C.

As the actual weight gain is compared with the suggested weight gain, the individual differences are generally evident in the 24-hour dietary intake of calories. Those whose daily calorie intake exceeded the RDA tend to have a weight gain also exceeding the recommended limits. The reverse is also true with regard to insufficient calorie intake. This may indicate the reliability of the 24-hour dietary recall method of assessment for this study.

One section of the interview concerns weekly dietary trends. When compared with an actual 24-hour dietary recall it proves to be somewhat different. The weekly assessment reports an exaggerated use of cokes and other snack items which do not show up in the recall. The routine sandwich lunch and large dinner referred to in many weekly assessments are also not seen in the Sunday 24-hour recalls. This change may be accountable to late sleeping, or one large family meal on Sunday. This may also result in the use of higher cost meats.

Weight Gain

The weight gain of each participant is shown in Table XIII along with the suggested weight gain for the status of pregnancy. For those participating in WIC for 10 or more weeks, the actual weight gain is closely related to suggested values. When these values are correlated through statistical analysis, weight gain, and the number of weeks in the WIC program are significant to the .001 level with an r value of .58.

TABLE XIII

WEIGHT GAIN AND DIETARY ADEQUACY

Age and Number of Subjects	Pregnancy Status in Weeks	Suggested Weight Gain in Kg.	Actual Weight Gain in Kg.	Number of Weeks on WIC	Dietary Adequacy Basic 4
14 (2)	27	8.1	7	18	Poor
	32	10.35	20	14	Fair
15 (1)	17	3.6	-.2	0	Fair
16 (8)	13	1.85	1.8	13	Poor
	10	1.35	0.0	0	Fair
	18	4.05	3.3	1	Fair
	30	9.45	1.5	4	Poor
	18	4.05	3.4	0	Poor
	24	6.75	2.2	6	Poor
	15	2.70	-4.7	9	Poor
	28	8.55	9.0	9	Fair
17 (2)	20	4.95	3.5	11	Fair
	17	3.6	2.5	8	Fair
18 (6)	29	9.0	3.0	13	Good
	27	8.1	2.3	16	Poor
	22	5.85	0.0	4	Poor
	23	6.3	4.0	8	Fair
	36	12.15	10.5	23	Poor
	34	11.25	12.5	16	Poor
19 (8)	24	6.75	13.3	12	Good
	19	4.5	.5	14	Fair
	28	8.55	6.4	16	Poor
	16	3.15	14.7	0	Poor
	24	6.75	2.7	0	Poor
	36	12.15	12.6	20	Poor
	29	9.0	6.0	8	Poor
	12	1.35	-.7	0	Poor

Iron Intake and Hemoglobin

Dietary intake of iron is low for every subject. This low value is off-set by daily iron supplements taken by each girl but one. Each supplement contains 325 mg. of iron in a ferrous sulfate form. The girls receiving the pills take as many as one to four supplements per day. With normal hemoglobin levels ranging from 12 to 16 gm, 81 per cent of the participants fall below the normal hemoglobin range. The distribution of hemoglobin levels by age, the number of weeks pregnant, and the number of weeks on the WIC program is seen in Table XIV.

Mean Nutrient Intake for Nine Variables Studied

Presented in Table XV are the mean percentages of the Recommended Dietary Allowances consumed according to nine studied variables.

Age differences are observed among the girls in the study with regard to their nutrient intake. Those girls 18 to 19 years of age have the highest dietary intake of calories, protein, calcium, iron, thiamine, niacin, and ascorbic acid than the other participants. The youngest group, those 14 to 15 years of age, fell only slightly below the oldest girls in their means of the forenamed nutrients, and surpassed them in vitamin A and riboflavin intake. Participants 16 to 17 years of age were lowest in every nutrient. They fell below 2/3 RDA in calcium and iron. These nutrient differences among the ages may stem from living and social conditions. The older girls may be more established in their own households than the other girls, and the youngest girls may still be influenced by their own maternal homes. Peer pressure may also be

TABLE XIV

DISTRIBUTION OF HEMOGLOBIN BY AGE, NUMBER OF WEEKS PREGNANT, NUMBER OF WEEKS ON WIC

Hemoglobin Levels and Age in Years	N	Pregnancy Status in Weeks	Weeks on WIC	Number of Iron Supplements
9.0-9.9				
Age				
16	1	28	9	2
18	1	27	16	3
19	1	19	18	4
10.0-10.9				
Age				
14	1	27	19	2
16	2	10	0	1
		18	4	3
18	1	22	8	3
19	3	24	0	2
		36	20	1
		24	12	3
11.0-11.9				
Age				
14	1	32	13	3
15	1	17	0	2
16	3	13	0	2
		18	0	2
		15	8	2
17	1	20	11	2
18	3	29	16	3
		23	8	3
		36	23	3
19	3	28	12	2
		16	16	2
		12	0	2
12.0-12.9				
Age				
16	2	30	4	0
		24	7	2
18	1	34	20	2
19	1	29	8	3
13.0 +				
Age				
17	1	17	4	2

TABLE XV

MEAN PERCENTAGES OF RECOMMENDED DIETARY ALLOWANCES CONSUMED ACCORDING TO THE NINE VARIABLES STUDIED

Variables	n	Calories %	Protein %	Calcium %	Iron %	Vitamin A %	Thiamine %	Riboflavin %	Niacin %	Vitamin C %
Age										
14-15	3	103	128	47	35	104	77	154	118	223
16-17	10	76	87	64	25	73	71	90	76	100
18-19	14	116	137	95	40	97	86	140	131	266
Education										
7-8	4	87	101	80	30	82	71	120	111	233
9-10	7	94	111	84	30	93	72	100	95	60
11+	11	115	133	105	41	102	94	141	120	291
% Payment										
0%	19	103	108	65	33	100	79	123	104	235
15% +	8	106	137	105	36	64	80	135	105	116
Health										
Good	14	107	128	114	37	100	86	145	107	223
Fair	13	93	105	41	30	77	73	99	111	173
Hemoglobin										
9.0-9.9	3	112	132	52	35	69	105	148	131	275
10.0-10.9	7	107	123	104	35	117	80	137	109	140
11.0-11.9	12	99	117	71	36	86	82	111	116	260
12.0 +	5	88	98	90	29	69	58	116	80	96

TABLE XV (Continued)

Variables	n	Calories %	Protein %	Calcium %	Iron %	Vitamin A %	Thiamine %	Riboflavin %	Niacin %	Vitamin C %
Weight Gain (kg)										
Loss-0	5	80	93	69	25	64	72	100	88	77
1-5	12	92	114	74	31	94	75	101	104	156
6-10	3	76	91	45	31	50	59	76	104	130
11 +	7	141	146	110	43	112	100	167	126	381
Weeks Pregnant										
10-15	4	73	71	68	19	32	61	85	56	81
16-20	7	107	124	59	35	116	83	114	132	158
21-25	5	97	129	110	35	102	77	142	112	125
26-30	7	91	119	83	37	81	76	120	112	165
31 +	4	143	130	79	42	98	104	159	114	548
Prior Pregnancies										
0	17	101	120	97	35	105	90	131	105	210
1 +	10	85	111	47	32	62	78	110	116	181
Weeks on WIC										
0	6	82	97	57	27	84	70	102	99	107
1-5	3	76	97	81	26	85	68	117	66	68
6-10	6	84	107	65	33	46	72	98	113	113
11-15	6	105	128	75	32	129	86	137	101	255
16 +	6	137	156	116	48	119	106	151	147	405

more intense for girls 16 and 17 years of age than for the other two groups.

Educational achievement levels also show an influence on the diets of the participants. For many nutrients, especially calories, protein, calcium, vitamin A, and thiamine, as the educational level rose the intake levels rose. This may indicate a greater emphasis placed upon nutrition in the higher grades than in the lower grades.

The economic levels of the participants indicated through the per cent payment made to the clinic shows little difference in nutrients between those obtaining free services and those paying a portion for medical services. The recipients of free services had higher intakes of vitamin A and vitamin C. The girls paying for the services had nutritional intakes exceeding the others in protein and calcium.

Girls who reported feeling good and excellent with regard to their health had intakes of calories and all eight nutrients above those reporting having fair and poor health. This is consistent with the expected outcome of good eating habits.

The relationship of hemoglobin levels in the blood and mean nutrient intakes showed some unsuspected results. The intake of calories, protein, thiamine, riboflavin, and niacin was highest among girls with the lowest hemoglobin level and decreased in this same manner through the lowest intake in girls having highest hemoglobin levels. Those with hemoglobins of 12 mg/100 ml had the lowest nutrient intakes of calcium, protein, iron, vitamin A, thiamine, niacin, and vitamin C. Here the impact of 325 mg iron supplements can be seen in that the higher hemoglobin levels are no doubt due to iron supplements.

The relationship between weight gain and nutrient intake was generally as expected, that is, as nutrient intake rose, weight gain rose.

Mean nutrient intake showed no consistent trend when compared with the stage of pregnancy. High and low nutrient intakes shifted among the weeks of pregnancy.

Sixty-two perccent of the participants are experiencing their first pregnancy. The mean percentages of the RDA met by these girls are 100 per cent of all nutrients and calories excepting iron and thiamine. The girls in their second or third pregnancy are below 100 per cent RDA for all nutrients excepting protein, riboflavin, niacin, and ascorbic acid.

The comparison of the number of weeks of participation in WIC and the mean nutrient intake shows the progress made by the recipients in relation to benefits of the program. Variation in the first five weeks on the program is slight and even shows nutrient deficiencies in some cases. By the sixth through the tenth week, significant increases are seen in the diets of girls participating in the program in regard to ascorbic acid and niacin. Other nutrient improvements are observed in participants in the program for 11 to 15 weeks in regard to vitamin C, riboflavin, vitamin A, protein, and calories. Those still on the program for 16 weeks or more show nutrient scores above 100 per cent RDA in seven of the eight essential nutrients and calories. This is an improvement in five nutrients and calories, apparently due to participation in the program.

Statistical Analysis

The data which were collected from the interview questionnaire and from the analysis of the nutrients in the 24-hour dietary recall were

computerized and analyzed statistically. The variables involved were age, hemoglobin level, weight gain, number of weeks participating in the WIC program, week of pregnancy, per cent payment at the clinic, and from the 24-hour dietary recall: calories, protein, calcium, iron, vitamin A, thiamine, riboflavin, niacin, and ascorbic acid. Three of the 15 variables from the printout show no significant relationship with any of the remaining variables, these three being age, hemoglobin level, and per cent payment at the clinic. The remaining 12 variables do show interrelationships of .05 significance or better. Table XVI contains the correlation coefficients and the level of significance for the nutrients consumed by all subjects.

The remaining information which was gathered from the interview was categorized for Chi-square associations. The variables in consideration here are race, over-all health of the respondent, hours of sleep, guardian, food buyer, food preparer, number of meals eaten at home, number of meals eaten away from home, number of snacks, types of snacks, and the number of iron supplements. These are each compared with the high (greater than 100 per cent RDA), medium (67 to 100 per cent RDA), and low (less than 67 per cent RDA), categories of the eight essential nutrients and calories. Table XVII shows the Chi-square information for those variables showing significance to the study. The number of snacks eaten in a day shows significant associations with total calorie intake and ascorbic acid content of the diet. The number of iron supplements taken shows significant associations with protein intake, calcium, thiamine, riboflavin, niacin, and ascorbic acid intakes. The remaining variables show no significance and are, therefore, not included in the table.

TABLE XVI

CORRELATIONS BETWEEN 12 VARIABLES AND CALORIES AND NUTRIENTS CONSUMED

Variables	Weight Gain	Weeks on WIC	Weeks Pregnant	Calories	Protein	Calcium	Iron	Vit. A	Thiamine	Riboflavin	Niacin	Vit. C
Weight Gain	1.00	.58	.47	.62	.42	.51	.49	.65	.39	.43	.33	.40
	0.00*	.001	.01	.0008	.02	.005	.009	.0004	.03	.02	.07	.03
Weeks on WIC	.58	1.00	.60	.42	.41	.27	.46	.28	.41	.33	.33	.58
	.001	0.00	.001	.02	.02	.15	.01	.14	.02	.08	.07	.001
Weeks Pregnant	.47	.60	1.00	.14	.13	.18	.30	.29	.18	.20	.05	.46
	.01	.001	0.00	.52	.50	.65	.12	.12	.64	.30	.79	.01
Calories	.62	.42	.14	1.00	.86	.61	.81	.48	.75	.71	.71	.49
	.0008	.02	.52	0.00	.0001	.0009	.0001	.01	.0001	.0001	.0001	.009
Protein	.42	.41	.13	.86	1.00	.67	.84	.45	.82	.80	.79	.54
	.02	.02	.50	.0001	0.00	.0002	.0001	.01	.0001	.0001	.0001	.003
Calcium	.51	.27	.18	.61	.67	1.00	.49	.65	.67	.87	.16	.31
	.005	.15	.65	.0009	.0002	0.00	.008	.0004	.0003	.0001	.57	.10
Iron	.49	.46	.30	.81	.84	.49	1.00	.35	.73	.52	.82	.53
	.009	.01	.12	.0001	.0001	.008	0.00	.06	.0001	.005	.0001	.004
Vitamin A	.65	.28	.29	.48	.45	.65	.35	1.00	.51	.68	.13	.33
	.0004	.14	.12	.01	.01	.0001	.06	0.00	.006	.0002	.50	.08
Thiamine	.39	.41	.18	.75	.82	.67	.73	.51	1.00	.78	.54	.71
	.03	.02	.64	.0001	.0001	.0003	.0001	.006	0.00	.0001	.003	.0001

TABLE XVI (Continued)

Variables	Weight Gain	Weeks on WIC	Weeks Pregnant	Calories	Protein	Calcium	Iron	Vit. A	Thiamine	Riboflavin	Niacin	Vit. C
Riboflavin	.43	.33	.20	.71	.80	.87	.52	.68	.28	1.00	.35	.46
	.02	.08	.30	.0001	.0001	.0001	.005	.0002	.0001	0.00	.06	.01
Niacin	.30	.33	.05	.71	.79	.16	.82	.13	.54	.35	1.00	.46
	.11	.07	.79	.0001	.0001	.57	.0001	.50	.003	.06	0.00	.02
Vitamin C	.40	.58	.46	.49	.54	.31	.53	.33	.71	.46	.43	1.00
	.03	.001	.01	.009	.003	.10	.004	.08	.0001	.01	.02	0.00

*The second number given in this table is the probability value associated with a two-tailed test. The specified correlation coefficient is actually zero.

TABLE XVII

CHI-SQUARE ASSOCIATIONS OF SIGNIFICANCE

		Variables					
		Number of Snacks		Number of Supplements			
Nutrients	% RDA	1 or Less	2 or More	1 or Less	2 or More	Chi Square	p-value
Calories	Less 2/3	5	0				
	2/3-100%	4	4			7.544	.002
	100% +	4	10				
Vitamin C	Less 2/3	4	3				
	2/3-100%	4	0			6.364	.040
	100% +	5	10				
Protein	Less 2/3			3	0		
	2/3-100%			10	1	11.226	.003
	100% +			4	9		
Calcium	Less 2/3			10	1		
	2/3-100%			1	2	6.388	.039
	100% +			6	7		
Thiamine	Less 2/3			10	1		
	2/3-100%			5	2	10.304	.006
	100% +			2	7		
Riboflavin	Less 2/3			5	0		
	2/3-100%			6	1	7.886	.019
	100% +			6	9		
Niacin	Less 2/3			6	0		
	2/3-100%			5	2	6.171	.044
	100% +			6	8		
Vitamin C	Less 2/3			7	0		
	2/3-100%			3	1	6.898	.031
	100% +			7	9		

CHAPTER V

SUMMARY AND CONCLUSION

During August, 1977, 27 pregnant adolescents attending the Mary Mahoney Health Clinic and participating in the Special Supplemental Food Program for Women, Infants, and Children were interviewed. Information concerning their living, health, and eating patterns, along with a 24-hour dietary recall and other clinical data was collected. Selection of subjects was made depending on their availability at the clinic at the time of the interviewing.

The diets of the participants were analyzed for adequacy based upon the Basic Four daily food guide. It was found that seven per cent, or two participants, had "good" diets; 33 per cent, or nine participants, had "fair" diets; and 59 per cent, or 16 participants had "poor" diets. When these same diets are analyzed by nutrients the variation is great. The most adequate nutrient in in the diet is protein where 85 per cent of the subjects had intakes above 67 per cent RDA. Iron intake from food was the nutrient of poorest consumption with 100 per cent of the participants falling below 67 per cent. Those nutrients in descending order of deficiency are thiamine, calcium, vitamin A, calories, niacin, riboflavin, and ascorbic acid.

Eight variables were considered as contributors to total nutrient intake. The variables of age, educational achievement level, health, total weight gain during pregnancy and the number of weeks participating

in the WIC program all positively correlate with the intake of all eight nutrients and calories. There tended to be an inverse association between hemoglobin levels and nutrient intake in that the hemoglobin levels tended to rise as the nutrient intake declined. The progress of pregnancy as a variable showed no consistent correlation with the intake of any nutrient.

When the number of weeks of participation in the WIC program is compared with the weight gain during pregnancy, a positive relationship is seen. After approximately 10 weeks on the program, the actual weight gain comes closer to suggested gains than was previously seen. Statistical analysis of the number of weeks subjects participated in WIC show a significant correlation with total dietary protein, iron, thiamine, ascorbic acid, and calories.

Other variables show further correlations. Weight gain tends to increase as dietary intake of calories, protein, calcium, vitamin A, thiamine, riboflavin, and ascorbic acid increase. The stage of pregnancy shows a significant correlation only with ascorbic acid. The nutrients, when compared among themselves do show associations, too.

Significant associations were found to exist between the total number of snacks consumed and the intake of calories and vitamin C. Chi-square tests also show a significant association between the number of oral iron supplements taken and protein intake, calcium, thiamine, riboflavin, niacin, and ascorbic acid.

Recommendations for Further Study

This study was conducted on a very small scale in one WIC distribution clinic. Further studies are needed to compare programs within

Oklahoma, and with greater numbers of subjects.

A longitudinal study following the hemoglobin levels and the rate of iron absorption could merit study. Studies of blood levels of vitamins and minerals from prenatal supplements is another area for clinical investigation.

A study which would follow WIC adolescents through the pregnancy and delivery of their children would yield information regarding continual nutritional status of the girls and of the infants.

Studies of the improvement of the diet of family members of WIC participants would be means of determining how much of the WIC package is actually used by the recipient. A study of nutrition knowledge among other members of the family would also give information of the influences on the pregnant teenagers.

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APPENDIXES

APPENDIX A

MARY MAHONEY MEMORIAL HEALTH CENTER SERVICE AREAS

1. Wright Area
2. Luther Area
3. Spencer Area
4. Green Pastures Area
5. Arcadia Area
6. Dunjee Area
7. Jones Area
8. New Chance Area
9. Liberty Hicks Area
10. Nicoma Park Area
11. Choctaw Area
12. Star Area
13. Parts of Midwest City
14. Parts of Del City
15. Parts of OKC
16. Harrah

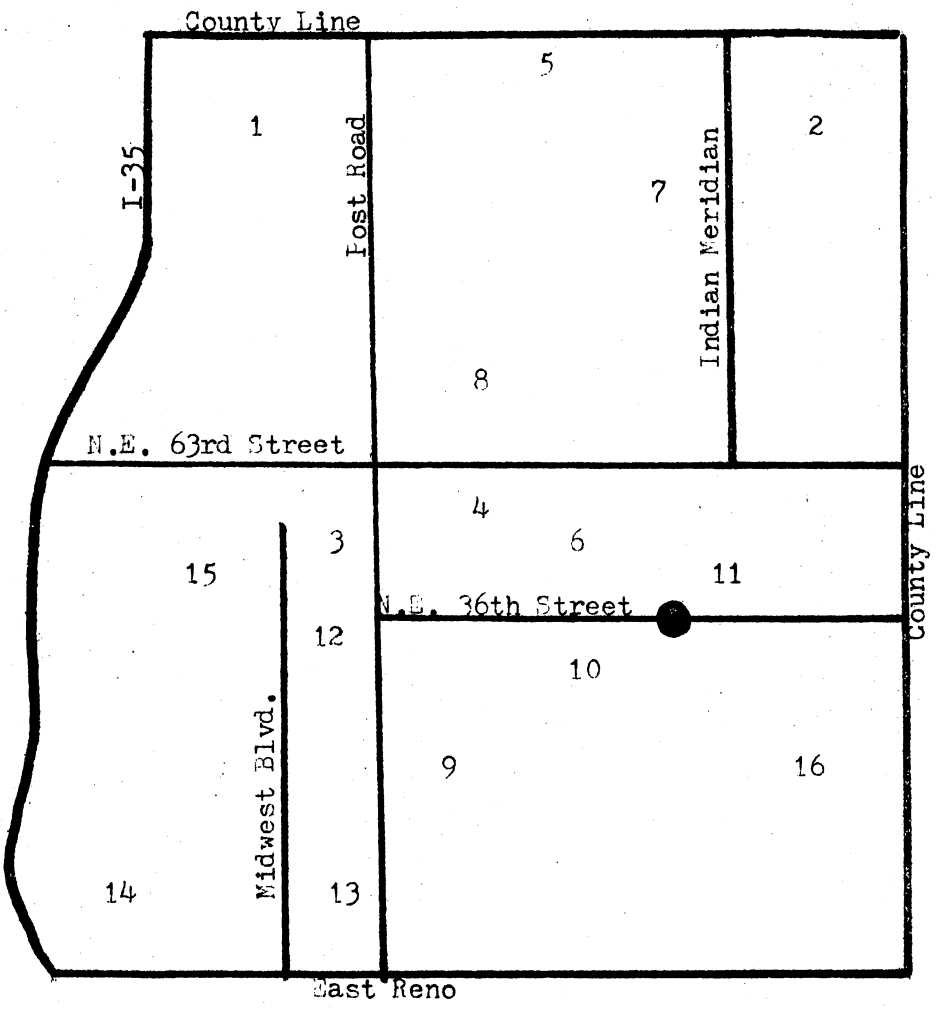

Figure 2. Mary Mahoney Memorial Health Center Service Areas

APPENDIX B

INTERVIEW QUESTIONNAIRE

The Interview Questionnaire

1. CHART INFORMATION

Name:_____

Age:_____

Race:

____ 1) Black
____ 2) White
____ 3) Indian
____ 4) Mexican-American

Hemoglobin: _____

Hematocrit: _____

Weight at start of pregnancy: _____

Weight to date: _____

Date began receiving WIC: _____

Number of pregnancies: _____

Month of pregnancy: _____

Per cent payment at clinic: _____

2. LIVING AND HEALTH PATTERNS

Are you employed? ____Yes ____No What are your usual work hours?
____ 1) 8 am to 5 pm
____ 2) Mornings only
____ 3) Afternoons only
____ 4) Evenings only
____ 5) Graveyard shift
____ 6) Variable times

Have you had much morning sickness? ____Yes ____No
____ 1) Mild
____ 2) Medium
____ 3) Severe

How do you generally feel?
____ 1) Excellent
____ 2) Good
____ 3) Fair
____ 4) Poor

How many hours do you sleep each night?
_____ 1) 0-3
_____ 2) 4-6
_____ 3) 7-9
_____ 4) 10-12

How many hours do you sleep during the day?
_____ 1) 0
_____ 2) 1-2
_____ 3) 2-3

Who is your guardian?
_____ 1) Mother
_____ 2) Father
_____ 3) Husband
_____ 4) Grandparent
_____ 5) Sibling
_____ 6) Both parents
_____ 7) Other

3. EATING PATTERNS

Who does the food buying at home?
_____ 1) Mother
_____ 2) Father
_____ 3) Husband
_____ 4) I, myself
_____ 5) Sibling
_____ 6) Grandparent
_____ 7) Other

Who prepares the food at home?
_____ 1) Mother
_____ 2) Father
_____ 3) I, myself
_____ 4) Husband
_____ 5) Sibling
_____ 6) Grandparent
_____ 7) Other

How many meals do you eat at home each day?
_____ 1) 0
_____ 2) 1
_____ 3) 2
_____ 4) 3

How many meals do you eat away from home each day?
_____ 1) 0
_____ 2) 1
_____ 3) 2
_____ 4) 3

Where are these away-from-home meals eaten?
_____ 1) School lunch
_____ 2) Carry lunch
_____ 3) Cafeteria
_____ 4) Restaurant
_____ 5) Fast food
_____ 6) Other

How often do you snack a day?
_____ 1) 0
_____ 2) 1
_____ 3) 2
_____ 4) 3
_____ 5) 4
_____ 6) 5

What are your usual snack foods?
_____ 1) Coke
_____ 2) Chips
_____ 3) Cookies
_____ 4) Candy
_____ 5) Fruit
_____ 6) Milk
_____ 7) Cheese
_____ 8) Other

Do you take vitamin-mineral pills? ___Yes ___No How often?
_____ 1) 1 a day
_____ 2) 2 a day
_____ 3) 1 a week
_____ 4) 2 a week
_____ 5) 3 a week
_____ 6) Other

Who prescribed the vitamin-mineral pills?
_____ 1) Self-prescribed
_____ 2) Doctor-prescribed

Do you take iron supplements? ___Yes ___No How often?
_____ 1) 1 a day
_____ 2) 2 a day
_____ 3) 1 a week
_____ 4) 2 a week
_____ 5) 3 a week
_____ 6) Other

Who prescribed the iron pills?
_____ 1) Self-prescribed
_____ 2) Doctor-prescribed

What foods do you greatly dislike?
____ 1) No food
____ 2) Meat
____ 3) Dairy products
____ 4) Fruits
____ 5) Vegetables
____ 6) Breads
____ 7) Cereals
____ 8) Other

Do you have food allergies? ___Yes ___No What foods?
____ 1) Dairy products
____ 2) Meat products
____ 3) Fruits
____ 4) Vegetables
____ 5) Bread or cereal
____ 6) Other

Are you on any special diet? ___Yes ___No What?
____ 1) Low calorie
____ 2) Low sodium
____ 3) Diabetic
____ 4) Low fat
____ 5) Other

Have you every been on a special diet? ___Yes ___No What?
____ 1) Low calorie
____ 2) Low sodium
____ 3) Diabetic
____ 4) Low fat
____ 5) Other

Do you eat differently now than before pregnancy? ___Yes ___No
How?
____ 1) More in quantity
____ 2) Less in quantity
____ 3) More often
____ 4) Less often
____ 5) Different foods
____ 6) Other

Do you eat non-food (pica) items? ___Yes ___No What?
____ 1) Laundry starch
____ 2) Clay or dirt
____ 3) Ice
____ 4) Other

4. DIETARY RECALL

How many times per week do you eat:

Meats, fish, poultry, eggs, dried beans _____

Milk, cheese, ice cream, yogurt _____

Fruits and vegetables _____

Bread, cereal, macaroni, rice _____

Others _____

Cokes	Candy	Cookies
Kool-Aid	Chips	Popsicles

24-HOUR DIETARY RECALL

Was your food intake yesterday what you usually eat? ___Yes ___No

	FOOD	PREPARATION	SERVING
Awaken to 10 am			
10 am to 2 pm			
2 pm to 6 pm			
6 pm to bedtime			

APPENDIX C

RECOMMENDED DIETARY ALLOWANCES

TABLE XVIII

RECOMMENDED ALLOWANCES FOR THE LAST HALF OF PREGNANCY

Age	Calories	Protein (gm)	Calcium (gm)	Iron (mg)	Vit. A (IU)	Thiamine (mg)	Riboflavin (mg)	Niacin (mg)	Ascorbic Acid (mg)
12-14	2700	74	1.2	36	5000	1.5	1.6	18	60
14-18	2400	78	1.2	36	5000	1.4	1.7	16	60
18-25	2400	76	1.2	36	5000	1.4	1.7	16	60

VITA

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organizations

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