

010-104V-262  
ISSN = 47157

# *Maternal and Infant Nutrition Reviews*

931/010



***LIBERIA***

*an International Nutrition Communication Service publication*

**MATERNAL AND INFANT NUTRITION REVIEWS**

**LIBERIA**

*A Guide to the Literature*

Compiled by

Ron Israel - Senior Editor  
Joanne Nestor - Editor and Reviewer  
Ellen Blumenstiel and Steve Wirtz - Reviewers

Reader for Liberia: Linda Lou Kelley, World Bank Consultant

12/81

An International Nutrition Communication Service (INCS) publication

INCS Advisory Board: Derrick B. Jelliffe, E. F. Patrice Jelliffe, Richard K. Manoff,  
Lyra Srinivasan, Marian L. Tompson, Joe D. Wray, Marian F. Zeitlin

INCS Steering Committee: Thomas Cooke, Phyllis Dobyms, Charles N. Myers

*This project has been conducted under Contract A.I.D./DSAN-C-0209, Office of Nutrition,  
Development Support Bureau, Agency for International Development, Washington, DC.*

CONTENTS

Introduction . . . . . i

MINR Classification . . . . .iii

Map . . . . . iv

Table I: Locations Studied . . . . . v

Review Highlights . . . . . vi

Review . . . . . 1

Bibliography . . . . . 22

## INTRODUCTION

This monograph reviews the available literature on maternal and infant nutritional status, beliefs, and practices in Liberia. It also lists current government, USAID, international agency, and Private Voluntary Organization nutrition-related programs and policies.

This is not an all-inclusive listing but it should provide enough information to enable the health/nutrition planner (our primary target audience) to ascertain quickly what is known (and what needs to be studied) about this subject. The information is chronicled according to a Maternal and Infant Nutrition Review (MINR) system outlined on page iii.

Table I on page v shows the extent to which various regions and specific locations have been surveyed. Page vi presents the highlights of our findings. Pages 1 to 21 contain the data categorized according to the MINR classification system with boldface titles within each category to describe specific listings.

Pages 22 to 25 contain an annotated bibliography with each entry described in terms of type of study (original data or literature review), methodology, sample characteristics, and location.

Ron Israel  
INCS Project Manager

# MATERNAL AND INFANT NUTRITION REVIEWS

## CLASSIFICATION SYSTEM

1. Target Group Nutrition and Health Status
  - 1.1 General
  - 1.2 Women, Pregnant
  - 1.3 Women, Lactating
  - 1.4 Infants, 0-6 Months
  - 1.5 Infants, 6-24 Months
  
2. Dietary Beliefs
  - 2.1 General
  - 2.2 About Pregnancy
  - 2.3 About Lactation
  - 2.4 About Breast Milk Substitutes
  - 2.5 About Weaning
  - 2.6 About Illness and Cure
  
3. Dietary Practices
  - 3.1 General
  - 3.2 Women
    - 3.2.1 During Pregnancy
    - 3.2.2 During Lactation
  - 3.3 Infants, 0-24 Months
    - 3.3.1 Breastfeeding
    - 3.3.2 Weaning Foods
    - 3.3.3 After Weaning
  - 3.4 Health and Medicine
  
4. Nutrition Status Correlations
  
5. Nutrition and Health Programs
  - 5.1 Health Centers
  - 5.2 Food Supplement Programs
  - 5.3 Nutrition Education Programs
  - 5.4 Other
  
6. Nutrition and Health Policies and Legislation
  - 6.1 Government (Host and Donor Countries)
  - 6.2 Non-government (Including International Agencies)
  - 6.3 Commentaries

LIBERIA

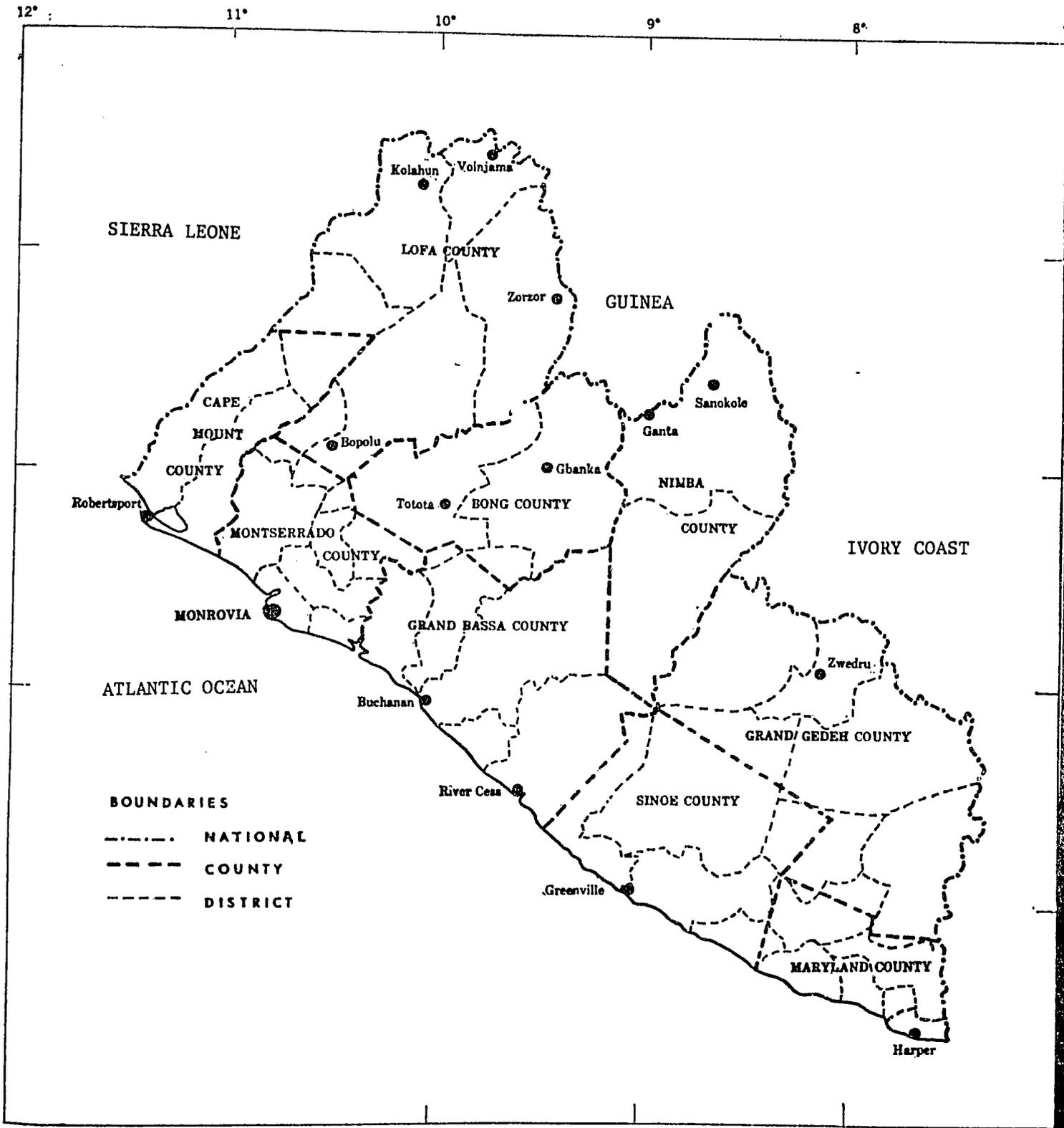


TABLE I  
Locations Studied

	Etzel, 1976	National Nutrition Survey, 1976	Subsample Report of the National Nutrition Survey, 1976	Warrack-Goldman, 1979
National		X	X	
Rural Village of Zorzor	X			
Coastal Rural Areas				X
City of Monrovia				X
Firestone Plantation				X

## HIGHLIGHTS

**Target Group Health Nutrition Status:** Infant mortality rate of 137/1000 live births, 19% of infants suffer moderate to severe malnutrition; 1 out of 5 stunted; prevalence of chronic PCM higher in males than females; malaria and gastrointestinal disease are leading causes of childhood death; prevalence of chronic PCM higher in the agricultural areas; highest prevalence of unsatisfactory levels on all anthropometric measures occurred among children from six to twenty-three months old; 60% of all children were anemic by WHO standards; high incidence of childhood morbidity, particularly respiratory infections, gastrointestinal disturbances, and malaria.

**Dietary Beliefs:** Many parts of the country have food taboos for pregnant women, e.g., leftover rice, alcohol, game meats.

**Dietary Practices:** 10% of Liberians have nutritionally adequate diet; 40% are at minimum nutrition levels; and 50% are slightly below adequate; fat supplies 31% of calories in both seasons, primarily as red palm oil and rice; men generally do not eat first; on a mean basis young children received more than their share of available nutrients within the family; rice and cassava are two leading staples; nationally adequate consumption of protein due to availability of fish; vitamin A consumed in amounts well above RDA; seasonality does not appear to be an important factor affecting intake in preschool children; breastfeeding almost universally practiced; high incidence of urban bottle feeding; children not weaned until after 18 months were significantly more likely to be malnourished than those weaned earlier; common first foods included rice water and cassava; rice water often associated with acute PCM; weaning age children often are not served protein foods; beniseed and kessiseed are significant in the weaning diet; mean age of weaning is 11.7 months; by age of one year children start to eat from family pot.

**Nutrition Status Correlates:** Malnutrition and small household size; PEM and no large cooking pots, non-permanent housing, one-room housing, river water, unemployed father, absent father, absent mother, no knowledge of English; bottle feeding and SES index; nutrition and socioeconomic status.

**Nutrition and Health Programs:** Mission and private concessions provide one-half of the medical care in Liberia; only 1 out of 5 rural towns has functioning health clinic; CARE operates an elementary school lunch program.

**Nutrition/Health Policies and Legislation:** 1976-80 Socioeconomic Development Plan; 1980 draft National Nutrition Plan.

## 1. TARGET GROUP NUTRITION AND HEALTH STATUS

### 1.1 TARGET GROUP NUTRITION AND HEALTH STATUS, GENERAL

#### NATIONAL

**HEALTH PROBLEMS:** Major health problems in Liberia include: infections and communicable diseases, parasitic infections and malnutrition. Malaria, intestinal helminthiasis and the diarrheas-dysenteries are the prevailing public health problems. (Warrack-Goldman, 1979)

**ENDEMIC DISEASES:** Tuberculosis, schistosomiasis, leprosy, cholera, typhoid, venereal diseases, rabies, and yellow fever are endemic in Liberia. (Warrack-Goldman, 1979)

**HEIGHT OF WOMEN:** Mandingos, Loma and Mano tribes showed lowest prevalence of short mothers (3.3%, 4.2%, and 5.7% respectively). (National Nutrition Survey, 1976)

### 1.2 TARGET GROUP NUTRITION AND HEALTH STATUS, WOMEN, PREGNANT

### 1.3 TARGET GROUP NUTRITION AND HEALTH STATUS, WOMEN, LACTATING

### 1.4 TARGET GROUP NUTRITION AND HEALTH STATUS, INFANTS, 0-6 MONTHS

#### NATIONAL

**MORTALITY RATES:** Mortality rate of infants is 137 per thousand live births. (National Nutrition Survey, 1976)

**CAUSES OF DEATH:** Phebe Hospital records for 1966-67 show that of the patients aged 2-12 months who died, 33% of the deaths were from diarrheal diseases; 19% were caused by pneumonia, 14% were cerebrospinal meningitis and 20% hepatitis. 47% of deaths among newborns were from tetanus. (Warrack-Goldman, 1979)

**MALNUTRITION:** Nineteen percent of the children were suffering from moderate to severe malnutrition and 1 out of 5 children were stunted. (Warrack-Goldman, 1979)

**CHRONIC PEM:** Prevalence of chronic PEM was significantly higher in males than females ( $p < 0.05$ ). 3.9% of males under 6 months were below 80% of median standard weight for height, but only 1.2% of females were. (National Nutrition Survey, 1976)

#### RURAL

**INFANT MORTALITY IN FAMILIES:** 56.4% of families living on the Firestone Plantation Company and 50% of rural families had had at least one liveborn child under one year of age die. (Warrack-Goldman, 1979)

**INFANT MORTALITY IN FAMILIES:** More than 3 liveborn children had died in 16% of Firestone Plantation Company families and 17% of rural families. (Warrack-Goldman, 1979)

NEONATAL MORTALITY RATES: Infants dying before one month of age included 18.5% of all rural infants and 17.1% of Firestone Plantation infants. (Warrack-Goldman, 1979)

#### URBAN

INFANT MORTALITY IN FAMILIES: 49% of Monrovia families had had at least one liveborn child under one year of age die. (Warrack-Goldman, 1979)

INFANT MORTALITY IN FAMILIES: More than 3 liveborn children had died in 2.5% of Monrovia families. (Warrack-Goldman, 1979)

NEONATAL MORTALITY RATES: 13.8% of Monrovia infants died before one month of age. (Warrack-Goldman, 1979)

#### 1.5 TARGET GROUP NUTRITION AND HEALTH STATUS, INFANTS, 6-24 MONTHS

##### NATIONAL

MORTALITY RATES: The mortality rate of children 1 to 4 years old was 16 per 1000. (National Nutrition Survey, 1976)

CHILD MORTALITY: One out of five children born to the sample households had died. (Warrack-Goldman, 1979)

PEM AND INFANT MORTALITY: Households in which there was an infant with PEM had a much higher overall infant mortality rate (214/1000) than households with no infants who had PCM (130/1000). (Sub Sample Report, 1976)

CAUSES OF DEATH: Leading causes of death among children are malaria, gastrointestinal and respiratory diseases, and measles. As a result of prevailing high mortality rates, life expectancy at birth in 1970 was 45-50 years. (Warrack-Goldman, 1979)

CAUSES OF DEATH: Major causes of death of young children are malaria and gastrointestinal disease. Other significant causes of death and morbidity in infants and young children include prematurity, measles, respiratory infections, and tetanus. (National Nutrition Survey, 1976)

NORMAL NUTRITIONAL STATUS: About 80% of children from the national sample had normal nutritional status (neither stunted nor wasted). Over 90% of children from Monrovia and a special advantaged group had normal nutritional status. (National Nutrition Survey, 1976)

ANTHROPOMETRY: All indicators of nutritional status (weight, height, arm circumference) dropped rapidly in the first 12 months of life. Adequacy of weight for age and weight for height did not begin to rise until after 24 months. (Warrack-Goldman, 1979)

MORTALITY AND WEIGHT: High mortality rates were significantly and negatively correlated with increasing weight for age and weight for height. (Warrack-Goldman, 1979)

**WEIGHT AND SEASON:** Weight for age and weight for height of 168 children under four years old were significantly better in October 1976 than in April 1977. (Warrack-Goldman, 1979)

**MALNUTRITION:** 2.6% of the children in the sample suffered acute malnutrition (below 80% of reference median weight for height); 15.6% were moderately malnourished (80-90% of reference median weight for height); 23% suffered chronic malnutrition (below 90% of standard height for age); and 5.8% were severely to moderately wasted (below 82.5% reference median for mid-arm circumference). (Warrack-Goldman, 1979)

**ACUTE MALNUTRITION:** Among a national sample of children (excluding Monrovia and Buchanan), 5.6% were below 85% of the standard weight for their height. (National Nutrition Survey, 1976)

**ACUTE MALNUTRITION:** 1.6% of the children studied had a weight for height below 80% of standard. (National Nutrition Survey, 1976)

**ACUTE MALNUTRITION:** The lowest mean weight for height occurs among children 12-23 months old in both the wet and dry seasons. (Warrack-Goldman, 1979)

**ACUTE MALNUTRITION:** 2.4% of children 12-23 months of age were below 80% of NAS Reference medians for weight for height; 9.8% were below 85%. (National Nutrition Survey, 1976)

**ACUTE PEM AND SEASON:** Small percentages of children fell in the acute PEM category (weight for height below 80% standard). The author feels this may be due to relative food sufficiency and the fact that the "hungry season" had not yet begun. (National Nutrition Survey, 1976)

**CHRONIC PEM:** At 6-11 months prevalence of chronic PEM (height for age below 90% of reference median) is 15.6% in agricultural areas. This is almost 3 times the rate in non-agricultural areas, 4.7%. At 12 to 24 months prevalence of chronic PEM in agricultural areas is 24.4%, twice that of non-agricultural areas (13.9%). (National Nutrition Survey, 1976)

**CHRONIC PEM:** The prevalence of chronic PEM was higher in the agricultural areas (20.2%) than in the more densely populated localities in rural Liberia (12.4%) in Monrovia (8%) and LAMCO (9%); the overall rate was 18%. (National Nutrition Survey, 1976)

**CHRONIC PEM:** Among a national sample of children (excluding Monrovia and Buchanan), 18% were below 90% of the standard heights for their ages. (National Nutrition Survey, 1976)

**CHRONIC PEM:** 13.9% of surveyed children from 12 to 23 months fell below 90% of reference median for height for age. (National Nutrition Survey, 1976)

**STUNTING:** Almost one in five children, excluding those in Monrovia and Buchanan, were stunted below their full growth potential. (National Nutrition Survey, 1976)

**STUNTING:** Stunting began around six months of age, increased in severity to a plateau in the second year, and continued at least until five years of age. (National Nutrition Survey, 1976)

**WEIGHT FOR AGE:** Among a national sample of children, (excluding Monrovia and Buchanan), 24% were below 80% of the standard weight for their ages, reflecting long-term undernutrition which affected both their weight and height. (National Nutrition Survey, 1976)

**KWASHIORKOR:** No children studied showed clinical signs of kwashiorkor. (Warrack-Goldman, 1979)

**KWASHIORKOR:** Only four children in the total sample had clinical evidence of kwashiorkor, as shown by bilateral pitting edema of the lower legs. (National Nutrition Survey, 1976)

**KWASHIORKOR:** Prevalence of kwashiorkor was highest in the northwest and high in the northeast. (Nah, 1971)

**ANTHROPOMETRY:** The highest prevalences of unsatisfactory levels for all anthropometric measures occurred among children from six to twenty-three months old. (National Nutrition Survey, 1976)

**ANEMIA:** 60% of all children were anemic by WHO standards (below 10gm/100cc). This high rate may be partly attributable to the high prevalence of malaria. (National Nutrition Survey, 1976)

**ANEMIA:** Prevalence of anemia (hemoglobin less than 10 gm/100 cc) is 72.3% in children from 6 to 11 months, and 48.9% in children 12-32 months. Prevalence of severe anemia demanding urgent clinical attention (hemoglobin below 6 gm/100 cc) is 1.1% for children 6-32 months. (National Nutrition Survey, 1976)

**ANEMIA:** 38.3% of sample children had hemoglobins less than 10g/100ml; 62% had hemoglobins less than 11gm/100ml, and were therefore anemic. (Warrack-Goldman, 1979)

**ANEMIA:** Mean hemoglobin was lower in children from the Firestone Plantation Company (10.1gm/100ml) than rural children (10.3) or Monrovia children (11.3). (Warrack-Goldman, 1979)

**ANEMIA:** One half of the children in the Firestone Plantation Company, 40% of other rural children, and 15% of Monrovia children had hemoglobins of less than 10g/100ml. (Warrack-Goldman, 1979)

**ANEMIA AND PEM:** Median hemoglobin was 8.9 gm% in children with acute PEM, 9.1 gm% in children with chronic PEM, 9.7 gm% in children with borderline levels, and 9.8 gm% in controls. (Sub Sample Report, 1976)

**ANEMIA AND SEASON:** Hematocrit values of children were significantly higher in the dry season than in the rainy season, although hemoglobin values were not. (Warrack-Goldman, 1979)

**ILLNESSES:** 50% of children had been ill in the previous three months with respiratory infections; 41% had been ill with gastrointestinal disturbances; and 30% had had malaria symptoms. (Warrack-Goldman, 1979)

**NUTRITIONAL STATUS AND DISEASE:** Among children with acute PEM, 15% had a fever, 26% had diarrhea, and 28% were dehydrated. Among children with chronic PEM, 27% had a fever, 36% had diarrhea, and 10% were dehydrated. Among controls, 2% had a fever, 14% had diarrhea, and none were dehydrated. (Sub Sample Report, 1976)

**PARASITES:** Almost 2/3 of sample children were infected with intestinal parasites, 1/4 with more than one species. (Warrack-Goldman, 1979)

**PARASITES:** A high rate of intestinal parasitosis was found in all the regions studied. Children in the Firestone Concession had the highest rate of multiple parasitic infections. (Warrack-Goldman, 1979)

**SCHISTOSOMIASIS:** 14% of the urine samples taken in the rainy season and 13% in the dry season were positive for albumin, indicative of the presence of ova of *Schistosoma Hematobium*. (Warrack-Goldman, 1979)

**RICKETS:** Rickets was rare although calcium intake was quite low. Average daily intake for a child was 0.25 gm, but fish bones were often used to make soups and this practice may have not been taken into account. (Nah, 1971)

## **RURAL**

**ACUTE MALNUTRITION:** 3.1% of rural children and 2.6% of the children studied at Firestone Plantation suffered from acute malnutrition (below 80% of the standard weight for height). (Warrack-Goldman, 1979)

**CHRONIC MALNUTRITION:** The greatest differences in rates of chronic PEM between agricultural and semi-remote areas occur among children 12-35 months old. In semi-remote regions from 25.6 to 30.6% of children were below 90% standard for height for age; in agricultural areas incidence ranged from 21 to 22.9%. (National Nutrition Survey, 1976)

**CHRONIC MALNUTRITION:** About 26% of children in rural areas were suffering chronic malnutrition (below 90% of standard for height for age). (Warrack-Goldman, 1979)

**CHRONIC PEM:** The prevalence of chronic PEM was higher in the agricultural areas (20.2%) than in the more densely populated localities in rural Liberia (12.4%) and Lamco (9%). (National Nutrition Survey, 1976)

**WEIGHT FOR AGE:** 63% of all children studied were suffering some degree of malnutrition: one percent of sample children in the coastal diet and nutrition survey were severely malnourished (Gomez classification third degree; below 60% of standard weight for age); 14% were moderately malnourished (60-75%); and 49% suffered mild malnutrition (75-90%). (Warrack-Goldman, 1979)

**KWASHIORKOR:** None of the sample children in the coastal diet and nutrition survey showed clinical signs of kwashiorkor such as bilateral pitting edema and characteristic skin lesions. (Warrack-Goldman, 1979)

**ANEMIA:** One half of the children in the Firestone Plantation Company and 40% of other rural children had hemoglobins of less than 10 gm/100 ml. (Warrack-Goldman, 1979)

**ANEMIA:** Mean hemoglobin was 10.1 gm/100 ml among children from the Firestone Plantation Company and 10.3 among rural children. (Warrack-Goldman, 1979)

## **URBAN**

**ACUTE MALNUTRITION:** 2.0% of the children studied in Monrovia suffered from acute malnutrition (below 80% of the standard weight for their height). (Warrack-Goldman, 1979)

**CHRONIC MALNUTRITION:** 17% of the children in Monrovia suffered from chronic malnutrition (below 90% of the standard height for their ages). (Warrack-Goldman, 1979)

**CHRONIC PEM:** Prevalence of chronic PEM was 8% in Monrovia. (National Nutrition Survey, 1976)

**ANEMIA:** Mean hemoglobin was 11.3 gm/ 100 ml among Monrovia children. (Warrack-Goldman, 1979)

**ANEMIA:** 15% of Monrovia children had hemoglobins of less than 10 gm/100 ml. (Warrack-Goldman, 1979)

**PARASITES:** 65% of Monrovia children were infected with ascaris and 15% with hookworm. (Warrack-Goldman, 1979)

## **2. DIETARY BELIEFS**

### **2.1 DIETARY BELIEFS, GENERAL**

### **2.2 DIETARY BELIEFS ABOUT PREGNANCY**

## **RURAL**

**RICE TABOOS:** It is taboo for pregnant women to eat still rice (rice left over from the previous day), as it will cause her to be sleepy during delivery or to want to urinate or defecate when the baby is about to be born. She is also prohibited from eating the crisp rice crust as it will cause thrush in the baby. (Etzel, 1976)

**TABOOS:** It is taboo during the early part of her pregnancy for a woman to take laxatives, or to consume alcoholic drinks lest she have an abortion. She is not to drink water from the previous day but to collect fresh water each morning. The author feels that these are western teachings integrated into traditional concepts of pregnancy taboos. (Etzel, 1976)

**FOODS AVOIDED:** Grebo women believe that eating red plantain, papaya, sugar cane, pineapple or banana would cause problems for the pregnant woman. These are also thought to cause "open mole" (sunken fontanel due to severe dehydration). Bitter root is thought to make the placenta difficult to remove. Raw cassava is thought to cause the baby to vomit excessively, and pumpkin is believed to make the baby's mouth pink. (Etzel, 1976)

**AVOID SWEETS:** A pregnant women should avoid eating too many sweets or the baby will be born with sores in its mouth. (Etzel, 1976)

**PORCUPINE FORBIDDEN:** Bassa women are forbidden to eat the meat of the porcupine when pregnant so their children will not be born with the mouth of a porcupine. (Etzel, 1976)

**MEAT AVOIDED:** Grebo women believe that eating hippopotamus meat when pregnant will cause their breast milk to dry up. Anteaters are taboo as the baby will be unable to see at night or be delivered on its side. Eating snails will cause the baby to drool excessively. Meat of water deer will make woman sleepy and tired during delivery. Watercow will cause women's breast milk to dry up. Eating red winged blackbirds causes the baby to have asthma. Antelope meat will result in the child having dysentery or diarrhea. Eating crocodile will lead to a baby with big eyes. These forbidden foods are not those which would normally make up a significant portion of the diet. (Etzel, 1976)

**MEAT TABOOS:** Kpelle women believed that if pregnant women eat the meat of anteaters it will cause their children to be weak, slow in sitting up, and unable to walk. Catfish should be avoided because it will make the baby sick. (Etzel, 1976)

**MEAT AVOIDED:** Sarpo women may not eat snails lest an excessive amount of spit run from the baby's mouth. Meat of a water deer will cause diarrhea. Meat of elephants will cause the infant to go backward and forward when it is time for delivery. (Etzel, 1976)

**PINEAPPLE TABOOS:** Grebo women believe that if they ate pineapple they would abort the child or the newborn's skin would resemble the outside of the pineapple, i.e. he would be covered with sores and blemishes. If they ate pineapple and drank cane juice they were certain to die. The combination of sugar cane and pineapple would cause the baby's skin to peel. (Etzel, 1976)

**PLANTAIN TABOO:** Kpelle women believe that a pregnant woman should not eat plantain lest her child be afflicted with "open mole," the sunken fontanel which appears on a severely dehydrated child. (Etzel, 1976)

**PALM TABOO:** The Kpelle believed that eating palm kernels or palm apples will result in a child who has sores all over his body. (Etzel, 1976)

**YAMS AVOIDED:** Sarpo women do not eat yams as it is feared that this will cause the baby to grow extra fingers. (Etzel, 1976)

**NUTRITION EDUCATION AND FOOD BELIEFS:** Loma women had learned at the Curran hospital the importance of proper nutrition; that pregnant women should eat foods rich in essential vitamins, that the fetus depended on the mother and if she went hungry the child would be seriously affected; and that pregnant women should avoid foods high in salt to avoid water retention. (Etzel, 1976)

### 2.3 DIETARY BELIEFS ABOUT LACTATION

### 2.4 DIETARY BELIEFS ABOUT BREAST MILK SUBSTITUTES

### 2.5 DIETARY BELIEFS ABOUT WEANING

#### NATIONAL

**EGGS:** There is taboo against giving eggs to female children. (Nah, 1971)

### 2.6 DIETARY BELIEFS ABOUT ILLNESS AND CURE

## 3. DIETARY PRACTICES

### 3.1 DIETARY PRACTICES, GENERAL

#### NATIONAL

**ADEQUACY OF DIET:** 10% of Liberians have nutritionally adequate diets; 40% are at minimum nutrition levels; and 50% are slightly below adequate levels. (Nah, 1971)

**DIET QUALITY:** Average consumption of vitamins A and C was well above recommended levels. During the rainy season, average consumption of protein, niacin, and calcium was adequate. Average consumption of calories, iron, thiamine, and riboflavin was below recommended levels. (Warrack-Goldman, 1979)

**VITAMIN A:** Vitamin A was consumed in amounts well above the RDA. This finding was expected because all the sample families regularly consumed rich sources of vitamin A, including red palm oil, dark green leaves, and yellow fruits such as papaya. (Warrack-Goldman, 1979)

**VITAMIN A:** Food sources of vitamin A include red palm oil, margarine, peppers, dark green leafy vegetables, and papaya. Although these foods were used in small quantities, clinical manifestations of vitamin A deficiency were rare. (Nah, 1971)

**VITAMIN C:** Vitamin C was consumed in ample amounts by both preschool children and households. Green leaves and fresh fruits, vegetables and cassava, good sources of vitamin C, were consumed daily. (Warrack-Goldman, 1979)

**THIAMINE (VITAMIN B<sub>1</sub>):** Thiamine intakes were above FAO/WHO recommended daily allowances (RDA's) for children but below the RDA for the population as a whole. Milling levels of rice, which affect thiamine

content, vary considerably across the country according to whether milling is done by hand or by other power. Fish is often eaten in dried form, which reduces thiamine content. (Warrack-Goldman, 1979)

**RIBOFLAVIN (VITAMIN B<sub>2</sub>):** Riboflavin intakes are inadequate. Dairy products, which are good sources, are imported and consumed in small amounts. Riboflavin in foods, especially green leaves, is often lost in cooking. (Warrack-Goldman, 1979)

**B VITAMINS LOST IN COOKING:** B vitamins (thiamine and riboflavin) are lost because of the common cooking practices of boiling dark green leaves for long periods and because baking soda or baking powder are often added to the cooking water, increasing the alkalinity and destroying a large proportion of the vitamins. Folate (another B vitamin) may also be lost. (Warrack-Goldman, 1979)

**CALCIUM:** Dietary calcium levels may be higher in the rainy season because more green leaves and cassava are consumed then. Dried fish and meats were major sources of calcium. There are no published medical reports of dietary rickets in Liberia. (Warrack-Goldman, 1979)

**NO SEASONALITY OF INTAKE:** Consumption of edible green leaves, beverages, fish, seafood and imported foods (excluding rice) did not change between seasons. (Warrack-Goldman, 1979)

**SEASONAL FOOD CONSUMPTION:** Among preschool children, per capita consumption of nutrients was not higher during the farming and post harvest seasons than during the rest of the year, although household consumption was higher. Energy expenditures were not measured. (Warrack-Goldman, 1979)

**SEASONAL INTAKE:** Starchy staples as a group, fruits and vegetables, and legumes provided a larger portion of total calories in the dry season. (Warrack-Goldman, 1979)

**COASTAL DIET:** Rice, palm oil, edible leaves, and fish were the most important foods in coastal diets. (Warrack-Goldman, 1979)

**COASTAL DIET QUALITY:** Coastal diets were, on the average, adequate in protein and inadequate in calories, iron, B vitamins, and calcium. (Warrack-Goldman, 1979)

**MEAL PATTERNS:** Usually 2 meals were eaten daily, midday and evening. In rural areas there may be only one hot meal in the evening, but many people consumed snacks before this main meal. (Nah, 1971)

**FOOD PREPARATION:** In 88% of households, the wife was in charge of food preparation. (Warrack-Goldman, 1979)

**COOKING:** 35% of households cooked once a day, 55% twice daily, and 8% three times a day. (Warrack-Goldman, 1979)

**FAMILY FOOD DISTRIBUTION:** Men generally do not eat first in Liberia except among some Moslem families. Children eat from communal bowls in some families. (Warrack-Goldman, 1979)

**FAMILY FOOD DISTRIBUTION:** On a mean basis, young children received more than their share of available nutrients within the family. (Warrack-Goldman, 1979)

**FAMILY FOOD DISTRIBUTION:** Children ate significantly more in the dry season while the household ate significantly less. (Warrack-Goldman, 1979)

**FOOD CROPS:** Food crops include: rice, the staple food; cassava, the second staple carbohydrate; corn; sweet potato; cocoyam; peanuts; bush and pole beans; beniseed (sesame) and kessiseed; and pigeon peas. Some fruits, cattle, and poultry are grown. Fish is the cheapest and most available animal protein. (Nah, 1971)

**RICE STORAGE:** Unthreshed rice is stored in bunches above the kitchen where the smoke from the fire discourages insects and rodents. As the rice is needed, it is beaten in a mortar and fanned until it is polished and free of chaff. Decentralized small scale rice mills are becoming more common. (Warrack-Goldman, 1979)

**FOOD PRESERVATION:** Fish and meat are preserved in the home by drying and placing in a covered pot or by hanging over the fire. (Warrack-Goldman, 1979)

**FOODS:** Green leaves are pounded, chopped or cut, then fried in palm oil with "bush meat" (wild game), insects, innards or fish to make "chop." Common dishes include "fish and greens" and "palava sauce" which is made from a leaf of the spinach family. (Warrack-Goldman, 1979)

**FISH:** Dry fish is available throughout the year. (Warrack-Goldman, 1979)

**FISH PROTEIN:** The nationally adequate consumption of protein is partially a result of the abundance of inexpensive, easily obtainable fish on the Liberian coast. (Warrack-Goldman, 1979)

**NUTS, BEANS, AND SEEDS:** Groundnuts are eaten in considerable quantities by children for snacks and in soups, especially among the Mandingo tribe. High levels of humidity are conducive to the growth on the nuts of Aspergillus flavus which produces aflatoxin which can cause cancer of the liver. Beans and legumes are not eaten regularly. Benniseed (sesame seed) and kessiseed are used in small quantities as flavoring for soups. (Warrack-Goldman, 1979)

**GRAINS AND BREAD:** Cornmeal and wheat are imported. Cornmeal is consumed by historic settler and Congo families in Monrovia and along the coast, but is not widely used in the interior. Only wheat bread is baked in the country. The main types are "round bread," "Mandinto bread" shaped like a french loaf, and Lebanese bread which is flat and unleavened. Three European style bakeries in Monrovia make sliced bread. Traditional villagers eat bread rarely. Monrovia families frequently eat it for breakfast. Coastal Liberian children are given local biscuits from the Pioneer Biscuit factory. (Warrack-Goldman, 1979)

**VEGETABLES:** A variety of vegetables is used including hot peppers, bitter balls, eggplant, plato greens, okra, tomatoes and leaves of cassava, sweet potato, and cocoyam. Collard greens are grown and used most frequently by coastal Liberians where historic American food preferences linger. Wild greens like "mustard", "water" or "chicken" greens are gathered by rural women and by tappers' wives from swampy areas of Firestone Plantations. (Warrack-Goldman, 1979)

**VEGETABLES:** Sweet potatoes, cocoyams, field corn, and yams are grown, but play a relatively minor dietary role. (Warrack-Goldman, 1979)

**FRUITS:** Plantains, bananas, and citrus fruits are grown throughout the country and are eaten regularly. (Warrack-Goldman, 1979)

**OIL:** Red palm oil from the pericarp of the palm nut is a major ingredient in the Liberian "soups." These sauces are eaten with rice or cassava preparations such as "fofoo," "dumboy," "dipa," and "dayba." Palm-butter is a national stew made from palm nuts and chicken, meat, fish, seafood, or combinations of these. Liberian "gravies" are made with imported clear oil and have imported tomato paste as the predominant flavoring. Since gravies are not made with palm oil, traditional rural people do not eat them frequently. (Warrack-Goldman, 1979)

**FAT:** Fat supplies 31% of calories in both seasons, primarily as red palm oil and rice. (Warrack-Goldman, 1979)

**WATER:** Over 90% of families do not boil water for drinking. (Sub Sample Report, 1976)

**ALCOHOL:** "Cane juice" (the local rum) and palm wine are consumed widely in the urban and rural areas. (Warrack-Goldman, 1979)

## **RURAL**

**CALORIE INTAKE:** Rural households consumed 78% of the recommended levels of calories, and Firestone Plantation Company households consumed 77%. (Warrack-Goldman, 1979)

**PROTEIN FOODS:** The rural population ate dried ocean and fresh water fish, wild game and birds, and goat. (Warrack-Goldman, 1979)

**VEGETABLES:** Wild greens are gathered by rural women and by tappers' wives from swampy areas of Firestone Plantation. (Warrack-Goldman, 1979)

**PALM OIL:** Nearly all rural households can harvest palm nuts which grow wild. Red palm oil is made from palm nuts. (Warrack-Goldman, 1979)

## **URBAN**

**CALORIE INTAKE:** Monrovia households consumed 87% of the recommended levels of calories. (Warrack-Goldman, 1979)

**PROTEIN FOODS:** The urban population eats imported meat and local fish. (Warrack-Goldman, 1979)

### **3.2 DIETARY PRACTICES, WOMEN**

### **3.3 DIETARY PRACTICES, INFANTS, 0-24 MONTHS**

#### **3.3.1 DIETARY PRACTICES, BREASTFEEDING**

#### **NATIONAL**

**PREVALENCE:** Breastfeeding is still almost universally practiced in Liberia. 94% of sample children were breastfed for a period of at least one month. (Warrack-Goldman, 1979)

**PREVALENCE:** Up to six months of age 93.8% of all children were breastfed; from 6-11 months of age, 84.4%; and from 12-24 months, 49.2%. (National Nutrition Survey, 1976)

**PREVALENCE:** 100% of children at the Firestone Plantation Company, 94% of rural children, and 88% of children in Monrovia had been breastfed. (Warrack-Goldman, 1979)

**BREASTFEEDING AND PEM:** Among children with chronic PEM (height for age less than 92.5% of standard), 54% were partially breastfed and 19% were fully breastfed. Among control children, 26% were partially breastfed, and 57% were fully breastfed. (Sub Sample Report, 1976)

**ANEMIA AND PROLONGED BREASTFEEDING:** Among children 6-11 months old 16.4% were receiving no food apart from milk, which contains very little iron. Unless iron-containing foods such as cereals or leafy vegetables are given, the young child has no chance of restoring depleted iron stores after infection, infestation or diarrhea. (National Nutrition Survey, 1976)

**AGE AT WEANING:** Mean age of weaning for all children already weaned was 11.7 months. (Warrack-Goldman, 1979)

**AGE OF WEANING ON COAST:** Coastal Liberian children were most often weaned from the breast between 8 and 18 months. (Warrack-Goldman, 1979)

#### **RURAL**

**AGE AT WEANING:** Mean age of weaning for all children already weaned was 16.5 months on the Firestone Plantation and 11.1 months in rural areas. (Warrack-Goldman, 1979)

#### **URBAN**

**AGE AT WEANING:** Mean age of weaning for all children already weaned was 8.5 months in Monrovia. (Warrack-Goldman, 1979)

### 3.3.2 DIETARY PRACTICES, WEANING FOODS

#### NATIONAL

**SPECIAL FOODS AND MALNUTRITION:** Among infants age 5 to 11 months, use of supplemental feedings was more common among children with normal nutrition status (41%) than among infants with chronic PEM (21%) or with acute PEM (33%). (Sub Sample Report, 1976)

**FOOD OTHER THAN MILK:** Between the ages of 6-11 months, among children receiving food other than milk (83.6%), 40.9% had food specially prepared for them, 39.5% shared family food, 16.4% had no food, and 3.2% received only rice water. At 12-24 months 8.6% had specially prepared food, 86.6% had family food, 3.5% had no food, and 1.3% had only rice water. (National Nutrition Survey, 1976)

**MILK:** 31.7% of all children 12-23 months received no milk; 16.4% received milk with no additional food. (National Nutrition Survey, 1976)

**PEM AND MILK:** Breast or other milk was given to 74% of children age 5-18 months with acute PEM; to 76% of children with chronic PEM; and to 89% of children with normal nutrition status. (Sub Sample Report, 1976)

**SUPPLEMENTAL FOOD AND NUTRITION STATUS:** No important or consistent differences in nutrition status were found among children grouped according to type of food received: food only; milk only; food and milk; or rice water and milk. (National Nutrition Survey, 1976)

**INTRODUCTION OF FOODS:** Mean age for introducing non-milk foods was 6 months. (Warrack-Goldman, 1979)

**STATUS AND AGE AT SUPPLEMENTATION:** The age at which supplementary non-milk foods were introduced was not correlated with the anthropometric status of the children. (Warrack-Goldman, 1979)

**MALNUTRITION AND LATE WEANING:** Children who were not weaned until after 18 months were significantly more likely to be malnourished than those weaned earlier. (Warrack-Goldman, 1979)

**FIRST FOODS:** First foods were most commonly rice water, rice paps or soft rice. Fruits most commonly given were mashed bananas or juice of citrus fruits or papaya. Wheat and cornmeal were given in some localities. (Warrack-Goldman, 1979)

**PEM AND RICE WATER:** Children with acute PEM received rice water more frequently than children in other nutritional categories. (Sub Sample Report, 1976)

**PEM AND PROTEIN FOODS:** 45% of children with chronic PEM had some high-protein foods in their diets; but 65% of control children were reported to have eaten a high protein food. (Sub Sample Report, 1976)

**TUBERS, VEGETABLES, AND PEM:** Among children with acute PEM (weight for height below 80% of standard), 12% had eaten a tuber such as cassava

during the previous 24 hours and 27% had eaten leafy vegetables. Among children with normal nutrition status, 93% had received a tuber and 54% had eaten leafy vegetables. (Sub Sample Report, 1976)

**LACK OF HIGH PROTEIN FOODS:** From 92 to 100% of families had had a high protein food in the last 3 days but only 45 to 65% of young children in these families had eaten a high protein food. Reasons for this given by mothers included ill health, vomiting of food, insufficient teeth to chew, and taboos. (Sub Sample Report, 1976)

**EGGS:** 4% of Firestone Plantation families gave chicken eggs to children as the first food given after the introduction of cereals. (Warrack-Goldman, 1979)

**SEEDS:** Beniseed (sesame seed) and kessiseed are significant in the local diet especially for weaning children. In this damp climate they often become moldy and unfit for human consumption. (Nah, 1971)

**PALM OIL:** Palm oil is added gradually to the soft rice in infant feeding. (Warrack-Goldman, 1979)

## **RURAL**

**BOTTLE FEEDING:** 28% of rural children were mainly bottle fed. (Warrack-Goldman, 1979)

**BOTTLE FEEDING:** 43% of rural children never used a bottle during their first year; 84% of children on the Firestone Plantation never used a bottle. (Warrack-Goldman, 1979)

**BOTTLE FEEDING:** No children on the Firestone Concession were exclusively bottle fed. (Warrack-Goldman, 1979)

**INTRODUCTION OF BOTTLE:** The median age for introduction of the bottle was 3 1/2 months in rural areas and 6 1/2 months in the Firestone Plantation Concession area. (Warrack-Goldman, 1979)

**INTRODUCTION OF FOODS:** Mean age for introduction of non-milk foods was eight months on Firestone Plantation and five months in rural areas. (Warrack-Goldman, 1979)

**FIRST FOODS:** Cassava was used quite frequently as a first food in rural areas; occasionally plantain was used. (Warrack-Goldman, 1979)

## **URBAN**

**INTRODUCTION OF BOTTLE:** The median age for introduction of the bottle was 3 months in Monrovia. (Warrack-Goldman, 1979)

**BOTTLE FEEDING:** 16% of Monrovia children never used a bottle during their first year. (Warrack-Goldman, 1979)

**BOTTLE FEEDING:** 48% of Monrovia children were mainly bottle fed; 12% were exclusively bottle fed. (Warrack-Goldman, 1979)

**INTRODUCTION OF FOODS:** Mean age for introduction of non-milk foods was seven months in Monrovia. (Warrack-Goldman, 1979)

**FIRST FOODS:** Cerelac and Rice Cereal were often given to Monrovia babies as a first food. (Warrack-Goldman, 1979)

### 3.3.3 DIETARY PRACTICES, AFTER WEANING

#### NATIONAL

**FAMILY DIET:** By about one year of age, children start to eat household rice with some sauce. Very few families said they refrained from giving their children sauces flavored with hot peppers. (Warrack-Goldman, 1979)

**FAMILY DIET:** Among children 12-18 months old, 8% received special foods, and the rest ate family foods. (Sub Sample Report, 1976)

**ADEQUACY OF DIET:** Preschool children received 84% of the recommended amount of calories, 126% of protein, 103% of iron, 54% of riboflavin, 81% of calcium, and 122% of folacin. (Warrack-Goldman, 1979)

**ADEQUACY OF DIET:** Children's diets supplied ample quantities of vitamins A and C. Protein, thiamine, folacin and iron intakes were above FAO/WHO recommended levels. Average calorie, riboflavin, niacin, and calcium intakes were below recommended levels. (Warrack-Goldman, 1979)

**IRON INTAKE BY AREA:** Children's iron intakes in the Firestone concession area were lower than in the traditional rural areas or in urban Monrovia; foods which are good sources of iron were not as easily obtained by rubber tappers' households. (Warrack-Goldman, 1979)

**CALORIES AND NUMBER OF MEALS:** Children eating three meals per day got 90.7% of RDA for calories; if they ate two meals they got 79.8% of RDA for calories and if one meal they got 86.9% of RDA. (Warrack-Goldman, 1979)

**NUMBER OF MEALS:** The majority of children received two meals per day. (Warrack-Goldman, 1979)

**CALORIES:** In the rainy season, coastal Liberian children who were 2 years old ate diets which were less adequate in calories than children 1 or 3 years old (excluding children who were breastfeeding). (Warrack-Goldman, 1979)

**CALORIES:** Calorie intake for children was lowest from March to April. (Warrack-Goldman, 1979)

**CALORIES AND TIME OF MAIN MEAL:** 49.4% of children got their main meal in the evening. Children eating their main meal in the evening ate only 80% of RDA for calories. Children eating their main meal at midday got 92.5% of the RDA for calories. (Warrack-Goldman, 1979)

**CHILD FEEDS HIMSELF:** Among children 12-24 months old 71.5% had no person feeding them, excluding breastfeeding. (National Nutrition Survey, 1976)

**CHILDREN NOT FED BY MOTHER:** 36% of children were not fed by their mothers. Of this group, 8% were fed by persons living in the same household. Nutrition education programs which intend to reach the person feeding and caring for the child would therefore have to be designed to reach persons other than the mother. (Warrack-Goldman, 1979)

**IRON:** Although iron appears to be consumed in adequate amounts by coastal children (111% of RDA in rainy season and 104% in dry season), bioavailability of a typical meal is low. No significant correlation between children's hematological indices and family's use of an iron cooking pot were found. (Warrack-Goldman, 1979)

**ORGAN MEATS:** Organ meats are not eaten regularly by children and are rarely reported on food records of weighed dietary intakes. (Warrack-Goldman, 1979)

### 3.4 DIETARY PRACTICES, HEALTH AND MEDICINE

**FOOD AND ILLNESS:** Children are often not fed when they have diarrhea or fever. (National Nutrition Survey, 1976)

## 4. NUTRITION STATUS CORRELATIONS

### NATIONAL

**MALNUTRITION AND HOUSEHOLD SIZE:** The smaller the household size the greater the prevalence of nutritional deficiency in children. (National Nutrition Survey, 1976)

**PEM AND MEAL FREQUENCY:** Children's height for age was significantly better if their family cooked three times per day rather than twice a day. (Warrack-Goldman, 1979)

**PEM AND COOKING POTS:** 22.7% of children with acute PEM (weight for height less than 80% of standard) and 12.4% of children with normal nutrition status came from households with no large cooking pots. (Sub Sample Report, 1976)

**PEM AND HOUSING:** 68.2% of children with acute PEM (weight for height less than 80% of standard) and 53.9% of children with normal nutrition status lived in non-permanent structures, a significant difference ( $p < 0.05$ ). (Sub Sample Report, 1976)

**PEM AND HOUSING:** 34.1% of children with acute PEM (weight for height less than 80% of standard) and 20.2% of children with normal nutrition status lived in houses with one room (a significant difference at the  $p < 0.05$  level). (Sub Sample Report, 1976)

**PEM AND WATER SOURCE:** 78.9% of children with chronic PCM (height for age less than 87.5% of standard) and 60.3% of control children used rivers or streams as water sources rather than using wells or piped water (significant at  $p < 0.05$ ). (Sub Sample Report, 1976)

**STUNTING AND WATER SOURCE:** Children from households with indoor taps or their own well were less stunted than children living in households that drew their drinking water from rivers, streams, communal wells, or rain barrels. The majority of rural households used water from rivers or streams for drinking and cooking. In Firestone, families fetched water from division wells or outdoor taps. (Warrack-Goldman, 1979)

**INFECTIONS AND TOILETS:** Children from households having indoor toilets had multiple infections with intestinal parasites significantly less often than children living in households with outdoor toilets or no toilets. (Warrack-Goldman, 1979)

**HEIGHT AND TOILETS:** Children living in houses with indoor toilets reached 97% of expected height for age; children without achieved 93% of expected height for age. (Warrack-Goldman, 1979)

**PEM AND ANIMALS:** Acute PEM is associated with lack of animals in families living in rural areas ( $p < 0.01$ ). (Sub Sample Report, 1976)

**PEM AND EMPLOYMENT OF FATHER:** 21% of children from farm households suffered chronic PEM (less than 90% of standard height for age), 16.4% if father was government worker, and 4.9% if father was self-employed. (National Nutrition Survey, 1976)

**PEM AND ABSENT FATHERS:** 4.3% of children whose fathers had died and 26.2% of children whose fathers were absent had a height for age less than 90% of standard. 17.3% of children whose fathers were present fell in this category. (National Nutrition Survey, 1976)

**PEM AND ABSENT MOTHERS:** 40% of children whose mothers had died and 30.8% of children whose mothers were absent were below 90% standard height for age. Only 18.1% of children whose mothers were present fell in this category. (National Nutrition Survey, 1976)

**PEM AND KNOWLEDGE OF ENGLISH:** Incidence of chronic PEM (height for age below 90% of standard) was 11.3% among children whose mothers spoke and read English; 16.2% among children whose mothers spoke English; and 20.5% among children whose mothers knew no English. (National Nutrition Survey, 1976)

**PEM AND ETHNIC GROUPS:** Kpelle and Mandingo tribes had the fewest children with chronic PEM (below 90% standard height/age), 13.3% and 8.4% respectively. The Drahn had 23.5%, Kru 24.4%, Kissi 22.9%, and Dan 22.9%. (National Nutrition Survey, 1976)

**PEM AND PLACE OF BIRTH:** Fewer children born in a hospital or clinic had chronic PEM or arm wasting than those born at home. This might be accounted for by urban-rural differences in undernutrition. (National Nutrition Survey, 1976)

**PEM AND BIRTH ORDER:** Children with a birth order of 9 or more had the lowest rates of PEM and arm wasting (12.9%); the highest rate was found among children of birth order 1-3 (19.1%). (National Nutrition Survey, 1976)

**ANEMIA CORRELATES:** Using multiple regression analysis, dietary iron intakes, hookworm infections and socioeconomic status were significant determinants of anemia. (Warrack-Goldman, 1979)

**CHILD NUTRITION STATUS AND MATERNAL AGE:** There was little difference in child nutritional status according to maternal age. (National Nutrition Survey, 1976)

**WEANING AGE AND POLYGAMY:** In the past sexual intercourse was forbidden until the child was able to walk in the belief that having intercourse spoiled breast milk. Now that polygamy is disappearing mothers resume sexual relations before the child can walk. It is still believed that the breast milk is spoiled. Therefore, the child is weaned very early and is at greater risk of malnutrition. (Kelley, 1981)

**INFANT FEEDING AND SOCIOECONOMIC STATUS:** Use of bottle was strongly correlated with the SES index ( $r=.49$ ) and total per capita expenditures. Earlier weaning ages were also significantly correlated with higher socioeconomic status ( $r=-.43$ ). (Warrack-Goldman, 1979)

**INFANT FEEDING AND SOCIOECONOMIC STATUS:** Wealthier urban families were most likely to use infant formulas from birth or to wean their children early. (Warrack-Goldman, 1979)

**SOCIOECONOMIC STATUS CORRELATES:** Socioeconomic status of the household was strongly correlated with other indicators associated with nutritional status such as mortality rates, infant feeding, food purchasing and preparation, and whether the household members were traditional farmers. (Warrack-Goldman, 1979)

**LITERACY AND NUTRITION STATUS OF MOTHERS:** With decreasing literacy levels, prevalence of poor nutrition status increased among all maternal groups, as evidenced by arm circumference and skinfold measures. (National Nutrition Survey, 1976)

**NUTRITION AND INCOME:** Household income was significantly related to dietary intakes and nutritional status. (Warrack-Goldman, 1979)

**NUTRITION AND SOCIOECONOMIC STATUS:** Nutritional status and diets were significantly better with higher income and socioeconomic status. (Warrack-Goldman, 1979)

**NUTRITION AND SOCIOECONOMIC STATUS:** In an analysis of variance, higher socioeconomic status index scores and per capita incomes were significantly associated with better growth and diets. (Warrack-Goldman, 1979)

**NUTRITION AND SOCIOECONOMIC STATUS:** Children whose parents were better educated, lived in more durable houses with an indoor toilet, used piped water for drinking and had access to hospitals were better nourished. (Warrack-Goldman, 1979)

**NUTRITION AND SOCIOECONOMIC STATUS:** Poorer nutritional status was significantly associated with low income and poorer socioeconomic status, polluted drinking water sources, and births in the bush or house. (Warrack-Goldman, 1979)

**NUTRITION AND RICE PRODUCTION:** No correlation was found between rice production and nutritional status. (National Nutrition Survey, 1976)

**ANEMIA CORRELATES:** In multiple regression analysis, malarial and hookworm infections, dietary iron intakes, and income levels were significant determinants of anemia in children. (Warrack-Goldman, 1979)

## **5. NUTRITION AND HEALTH PROGRAMS**

### **5.1 NUTRITION AND HEALTH PROGRAMS, HEALTH CENTERS**

#### **NATIONAL**

**MEDICAL SERVICES:** Prior to 1971 missions and private concessions provided most medical services. They now supply about one-half of the medical care in Liberia and a large percentage of the medical training. In 1972 The John F. Kennedy Medical Center became the focus for medical training and the support center for rural health. (Warrack-Goldman, 1979)

**HEALTH CLINICS:** Only 1 of the five rural towns surveyed had a functioning health clinic. (Warrack-Goldman, 1979)

**HEALTH DELIVERY OUTREACH:** The present health delivery system reaches only 20 to 60% of the population, depending on the survey used. Most of the persons reached live within 10 miles of a major urban center. (Warrack-Goldman, 1979)

**MEDICAL SUPPLIES:** MAP International donates drugs and medical supplies, recruits and supplies medical personnel, and runs a continuing education course for nurses working abroad. (TAICH, 1976)

**HEALTH SERVICES AT FIRESTONE:** Firestone Medical Center has a hospital and operates two health centers. Firestone Plantation Company runs the oldest nursing school in Liberia, a training program for lab technicians, and a refresher course for dressers to improve diagnosis and treatment. (Warrack-Goldman, 1979)

**MISSIONARY HEALTH SERVICES:** African Mission Fathers operate two clinics providing prenatal, postnatal, and pediatric services. (TAICH, 1976)

**MISSIONARY HEALTH SERVICES:** United Methodist Church supports a hospital, school of nursing, and network of clinics in rural areas nearby. (TAICH, 1976)

**MISSIONARY HEALTH SERVICES:** Open Bible Standard Missions, Inc. operates a clinic and an outreach program of medical assistance to small villages and to those living in surrounding rural areas. (TAICH, 1976)

**MISSIONARY HEALTH SERVICES:** The Lutheran Church in America operates a hospital, programs in nursing and midwifery, well baby clinics, and comprehensive public health services. (TAICH, 1976)

**MISSIONARY HEALTH SERVICES:** In addition to the above services, five orders and denominations operate hospitals, clinics, and other treatment centers. (TAICH, 1976)

## **5.2 NUTRITION AND HEALTH PROGRAMS, FOOD SUPPLEMENT PROGRAMS**

**MISSION SERVICES:** The African Mission Fathers distribute foods shipped by Catholic Relief Services. (TAICH, 1976)

**SCHOOL FEEDING:** CARE operates an elementary school lunch program. UN/FAO World Food Programme feeds high school and college students. (Nah, 1971)

## **5.3 NUTRITION AND HEALTH PROGRAMS, NUTRITION EDUCATION PROGRAMS**

### **NATIONAL**

**ADVERTISING OF INFANT FORMULAS:** Infant formulas are advertised on the radio, but the size of the audience and the impact of the advertising are not known. (Warrack-Goldman, 1979)

## **5.4 NUTRITION AND HEALTH PROGRAMS, OTHER**

**UNICEF:** UNICEF trains women in practical home economics and nutrition so they in turn can train village women in child care, sanitation, and infant feeding. (Nah, 1971)

**PL480:** U.S.A.I.D. contributes PL480 feed for livestock and poultry. (Nah, 1971)

## **6. NUTRITION AND HEALTH POLICIES AND LEGISLATION**

### **6.1 GOVERNMENT (HOST AND DONOR COUNTRIES)**

#### **NATIONAL**

**PREVENTIVE HEALTH PLANNING:** In the 1976-80 Socioeconomic Development Plan the Ministry of Health and Social Welfare placed a strong emphasis on preventive services and on redressing the rural-urban imbalance in health care delivery. An increased proportion of the development budget was allocated to preventive health activities such as storage and distribution of medical supplies and vaccine, training of paramedical personnel, and health planning. Health sector planning is currently hampered by lack of baseline data and of skilled manpower. (Warrack-Goldman, 1979)

**GOVERNMENT SPENDING ON HEALTH:** In 1974 health expenditures accounted for 9% of total government expenditures. Only 6% was spent on preventive services. Health expenditure was \$5.83 per capita per annum. (Warrack-Goldman, 1979)

**NATIONAL NUTRITION PLAN:** The Government of Liberia held a workshop to draft a five year national nutrition plan in October 1980. (Zeitlin and Israel, 1980)

**NUTRITION PLAN RECOMMENDATIONS:** Recommendations of the draft of the National Nutrition Plan included: creation of a national nutrition board; improvement of maternal and child nutrition services, including greater surveillance, deworming, improved support of lactation, and nutrition education; agricultural and environmental sanitation improvements; and nutrition education through the mass media. (Zeitlin and Israel, 1980)

## **6.2 NON-GOVERNMENT (INCLUDING INTERNATIONAL AGENCIES)**

## **6.3 NUTRITION AND HEALTH POLICIES AND LEGISLATION, COMMENTARIES**

### **NATIONAL**

**RECOMMENDATIONS:** The author recommends the following to improve nutrition: increase food production; decrease post-harvest losses; improve income; control imports, especially bottle feeding; fortification of maggi cubes (used for seasoning) with iron; immunization; control of parasites; oral rehydration for diarrhea; and nutrition education for earlier introduction of solid foods while breastfeeding continues. (Warrack-Goldman, 1979)

## BIBLIOGRAPHY

Etzel, R.

- 1976 "Liberian Obstetrics: The birth and development of midwifery, Part I." Journal of Nurse-Midwifery, 21(4): 24-37.

Original data.

Method: Visits with traditional village midwives and discussions with women students at the Zorzor rural teacher training institute. Observational, unstructured interviews.

Sample: Traditional midwives and women students, number not specified. Nonrandom sampling.

Geographic location: Rural village of Zorzor.

This paper reviews the development of man from the ape in reference to changes in pelvis and brain size, and development of midwifery. Then it discusses various pregnancy taboos as reported by women studying at the Rural Teacher Training Institute. Also reports birth practices from visits with women and midwives in several villages.

Israel, R.

- 1980 Consultant Report for Liberia (August 30 - September 3, 1980) (Recommendations for consideration at the Liberian National Nutrition Planning workshop, October 20-24, 1980). Submitted by the Education Development Center, Newton, Massachusetts to United States Agency for International Development, Washington, D.C., 1980.

This document reports on a visit to Liberia to assist in the organization of a National Nutrition Planning Workshop. The report contains a series of recommendations and background materials about the goals and format of the workshop.

Kelley, L.

- 1981 Personal Communication.

National Nutrition Survey

- 1976 National Nutrition Survey, Office of Nutrition, A.I.D., Washington, D.C.

Original data.

Method: Height, weight, arm circumference and triceps fat fold measures were collected. Capillary blood was collected by fingerprick on approximately every fifth child in the survey. A cross sectional survey conducted during the period of food sufficiency.

Sample: In rural areas a cross-sectional random selection of 2971 children 0-5 years. In Monrovia a nonrandom sample of 223 children 0-2 years from poor areas of the city plus 285 children from advantaged homes. A total of 3479 children.

Geographic location: National.

A national nutrition survey was carried out to determine the prevalence of protein calorie malnutrition and anemia among young children. 18% of children were found to have chronic PCM. Prevalence was higher in the agricultural areas than in the more densely populated localities of rural areas or Monrovia. Stunting begins around six months of age and increases to a plateau in the second year and continues at least until five years of age. Acute PCM did not appear to be a problem at the time of the survey, but, the survey was conducted during the season of relative food sufficiency and rates may be less than during the hungry season from June to September.

Nah, N.N.

1971 "Report on Nutrition in Liberia," country report in The 1971 Dag Hammerskjold Seminar on Nutrition as a Priority in African Development, Uppsala, Sweden.

Review of climate, economic and population factors affecting nutrition. Describes nutritional status survey and nutrition education programs.

#### Sub Sample Report of the Liberia National Nutrition Survey

1976 Sub Sample Report of the Liberia National Nutrition Survey.  
Prepared by: UCLA Nutrition Assessment Unit; Ministry of Health and Social Welfare, Republic of Liberia; and U.S.A.I.D.

Original data.

Method: A socioeconomic questionnaire was administered to mothers of children suffering acute or chronic malnutrition. Mothers of control, well nourished children were also interviewed. Questions concerned type of house, possessions, agriculture, child feeding practices, and health indicators.

Sample: A subsample of about 225 children was selected from a large random sample examined in a nutritional status survey. A group of children with chronic or acute malnutrition and a group of controls were selected.

Geographic location: National.

A socioeconomic survey was carried out gathering information on malnourished children and controls. Malnourished children were more likely to come from families which did not get their water from a tap or well. Very few families boiled drinking water. Although most families of the acutely malnourished, chronically malnourished or well nourished children had received some form of high protein food in the past three days (100%, 92% and 98% respectively) the children belonging to these families had received far less (55%, 45% and 65%). Both chronic and acute PCM were associated with indicators of poor health status.

TAICH

- 1976 TAICH Country Report. Development Assistance Programs of U.S. Nonprofit Organizations in Liberia. New York: American Council of Voluntary Agencies for Foreign Service, Inc., Technical Assistance Information Clearing House.

This report describes the assistance programs for Liberia of 33 U.S. organizations, including voluntary agencies, missions and other nonprofit organizations which provide material aid and assistance to programs in medicine, public health, education, and food production.

Warrack-Goldman, H.

- 1979 "The nutrition of children in a coastal African (Liberian) food Economy." Ph.D. thesis, Cornell University, Division of Nutritional Sciences.

Original data.

Method: Anthropometric measures from 419 children, some followed up six months later. Family diet examined by weighing food, children's food weighed separately. Interviews for socioeconomic data. Semi-longitudinal study conducted over 12 months to cover seasonal variation.

Sample: 260 households randomly selected from the ongoing national Household Expenditure Survey. Of 419 children selected for initial anthropometry, 168 were remeasured 6 months later. 236 children gave blood, urine, or stool specimens. Of 419 children, 168 were measured twice, 32 children measured 3 times.

Geographic location: Coastal rural areas, city of Monrovia, rubber concession of Firestone Plantation Company.

A study of nutritional status and related factors in three regions. Etiological factors related to anemia and PEM were investigated. Food availability and diet, disease, cultural, environmental, socioeconomic and seasonal factors were studied.

Zeitlin, M. and R. Israel

- 1980 Consultant Report for Liberia, Oct. 20-24, 1980, Vol. I. Newton, MA: Education Development Center, Inc.

This document describes the planning process which culminated in a draft Five Year National Nutrition Plan. Highlights of the national nutrition plan and suggestions for follow-up are also included.

**REFERENCES OF INTEREST: NOT REVIEWED**

Jackson, R.T.

- 1981 Anemia of Pregnancy in Liberia: A Therapeutic Trial. Ph.D. Thesis, Cornell University, Division of Nutritional Sciences, Ithaca, NY.