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MATERNAL AND INFANT NUTRITION REVIEWS

MALI

A Guide to the Literature

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CONTENTS

Introduction. i

MINR Classification System. iii

Map iv

Table I: Locations Studied v

Review Highlights vii

Review 1

Bibliography 23

INTRODUCTION

MATERNAL AND INFANT NUTRITION REVIEWS: A RESOURCE FOR NUTRITION PLANNERS AND EDUCATORS

The MATERNAL AND INFANT NUTRITION REVIEWS (MINRs) profile existing data on nutritional status and nutrition-related beliefs and practices of mothers and children in developing countries. MINRs also contain information on current nutrition policies and programs of governments, the United States Agency for International Development, and other bilateral, international agencies and Private Voluntary Organizations (PVOs). There are thirty-six MINRs in all, profiling forty-five different countries. (See table on next page.)

Maternal and Infant Nutrition Reviews summarize important information obtained from available literature, government documents, consultant reports, and personal correspondence. The data are presented in bulleted form under six major headings: nutrition and health status, dietary beliefs, dietary practices, nutrition status correlations, nutrition and health policies and programs, and commentaries. A bibliography at the back of each monograph describes the listed documents in terms of type of study, methodology, sample characteristics and location, and a summary.

Nutrition planners and policy makers can use MINRs to help identify a given country's data base. For example, the information contained in each review enables the reader to identify key planning factors such as problem areas of malnutrition, prevailing beliefs about breast feeding, the extent of bottle feeding, types of weaning foods, the government's inter-agency five-year nutrition plan, the amount of donated food being distributed at MCH centers, and major PVOs involved in administering food and nutrition programs.

MINRs can be used as background documents for consultants going into the field and for program developers in-country. They can provide a frame of reference for an in-country workshop aimed at developing a national nutrition strategy. Technical assistance in organizing a workshop of this kind is available through the International Nutrition Communication Service. MINRs can also be used as a resource document in the development of journal articles and textbooks.

MINR data are stored on a computerized word processing system that allows for updates and individualized literature searches on specific topics. Patterns in a particular country or group of countries can be analyzed in accordance with user needs. A nutrition information retrieval service is available free to those working in developing countries and for a small fee to all others. Orders, inquiries, and comments should be addressed to:

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INTRODUCTION (Continued)

MINR Country Reports:

<u>AFRICA</u>	<u>NEAR EAST</u>	<u>ASIA</u>	<u>LATIN AMERICAN AND CARIBBEAN</u>
Cameroon	Egypt	Bangladesh	Bolivia
Congo	Jordan	Burma	Costa Rica
Gambia and Senegal	Morocco	India	Dominica
Ghana	Tunisia	Indonesia	Ecuador
Kenya	Yemen	Nepal	Guatemala
Lesotho		Pakistan	Haiti
Liberia		Philippines	Honduras
Mali		South Pacific*	Jamaica
Sudan		Sri Lanka	Panama
Tanzania		Thailand	Peru
Zaire			

*South Pacific Region includes the nations of Cook Islands, Fiji, Kiribati, Papua New Guinea, Solomon Islands, Tonga, Tuvalu, Vanatu, and Western Samoa

MATERNAL AND INFANT NUTRITION REVIEWS

CLASSIFICATION SYSTEM

1. Nutrition and Health Status
 - 1.1 General
 - 1.2 Maternal
 - 1.3 Infants 0-6 Months
 - 1.4 Infants 6-24 Months
2. Dietary Beliefs
 - 2.1 General
 - 2.2 About Pregnancy
 - 2.3 About Lactation
 - 2.4 About Breast Milk Substitutes (including bottle feeding)
 - 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
 - 3.3.3 After Weaning
 - 3.4 Health and Medicine
4. Nutrition Status Correlations
5. Nutrition and Health Policies and Programs
 - 5.1 Policies
 - 5.2 Programs
6. Commentaries

Bibliography

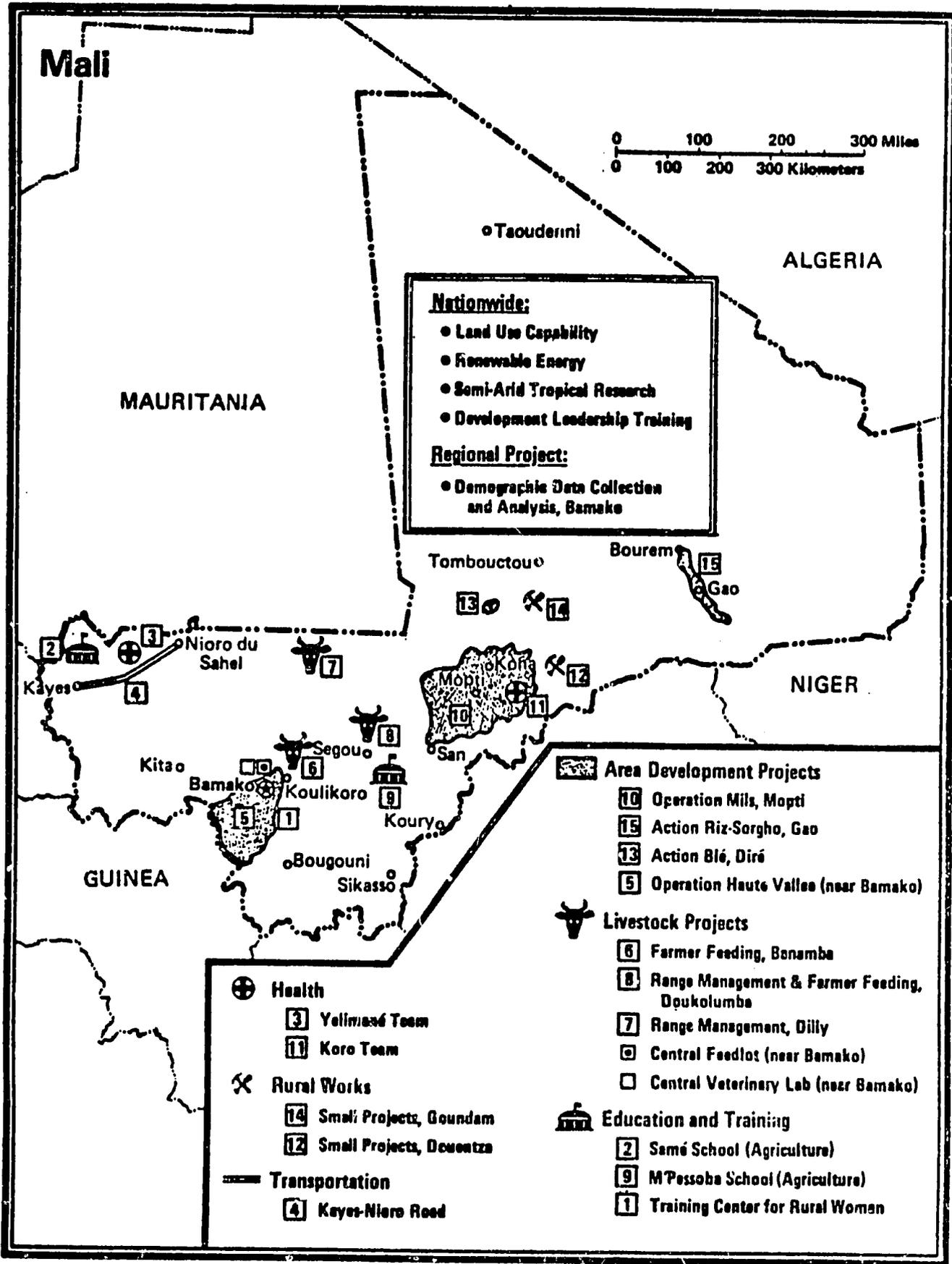


Table I

Locations Studied

NATIONAL SAMPLE	Abel 1981	Belloncle et al. 1980	Brinkerhoff 1980	Brown 1981	CDC 1975	Cisse 1981	Gray and Sankare 1981	Letarte 1981	Mondot-Bernard 1980a	Mondot-Bernard 1980b	Mondot-Bernard 1981	Semega and Toureau 1980	U.S.D.H.E.W. 1973a
REGION													
DISTRICT OR TOWN													
Kayes												X	
Yelimane			X	X		X	X						
Gao												X	
unspecified villages													X
Mopti												X	
Koro Cercle	X		X	X		X	X	X					
Nara													X
unspecified villages													
Nioro													X
unspecified villages													
"Sahelian regions"					X								
Region not specified													
Bamako									X				
Banankoro									X	X			
Diabadji									X	X			
Famsara									X				
Gakoura									X	X			
Kokonto									X	X			
Kolokani									X	X			
Sidougou	X								X	X			
Tien el Barka									X	X			
Tin Azur									X	X			

HIGHLIGHTS

1. **NUTRITION AND HEALTH STATUS:** PEM is most prevalent during the dry season from March to June. Vitamin A deficiency is found in the Sahara regions (Mopti, Gao and Tombouctou); and goiter is significant in Bougoni, Tomini, Koutiala, Bandiagara and Koro. Women's triceps skinfold measurements are often no more than 60% of standard. Urban women expend an average of 2225 calories daily. Malaria incidence is over 90% in all rural areas for all age groups studied. WHO estimates that 12.7% of all infants born in Mali weigh less than 2500 grams at birth. The most recent infant mortality rate estimate (1976) is 168 deaths per 1000 live births; the most common recorded causes of death in children under 1 year are malaria, measles and diarrhea. In 1979 the mortality rate among children age 1 to 4 years was 32 deaths per 1000 children in this age group. The most common nutritional problems among children 1 to 5 are PEM and vitamin A deficiency. Severe malnutrition affects primarily infants of weaning age, 12 to 23 months.

2. **DIETARY BELIEFS:** At least 40% of the production of eggs is not consumed because of traditional beliefs that eggs are harmful. In rural areas colostrum often is believed to be harmful, so for the first days infants are given drinks of lukewarm water with sugar. Meat is prescribed for children who have measles. When there is hemorrhaging during delivery, most TBAs use traditional remedies, including giving the mother a drink made of the millet plant.

3. **DIETARY PRACTICES:** The main staple foods are cereals such as millet and sorghum. Sweet potatoes, yams, cassava and beans provide variety, especially during the winter months. Meat is rarely consumed in the rural areas, except on holidays and during ritual ceremonies. Foods from hunting are sometimes added, but this activity is officially forbidden in order to help replenish game reserves. Although dry or green leaves are used in cooking, the sauces are cooked for 2 to 3 hours, and all the pro-vitamin A is destroyed. During the rainy season in July and August, the granaries are almost empty, and in addition to working intensively in the fields, people gather wild leaves and fruits. The supply of available calories in 1977 was 2,177 calories per person per day, 90% of the amount estimated by FAO to be necessary to meet requirements. Average iron intake varies from 19 to 35mg per day, suggesting that anemias are due to maldistribution of dietary iron among the population, or to other causes such as vitamin deficiencies and infestations. Little is known about the dietary practices of women during pregnancy and lactation. Weaning from the breast is usually late--up to age 24 to 30 months. The mother will continue to breast feed until she becomes pregnant again. At weaning time infants often are entrusted to a grandmother, and make an abrupt transition from the milk diet to the adult diet. The only supplement to mother's milk often given to children 12 to 23 months is a gruel made of millet, rice or maize flour and water with occasional small amounts of milk. Among the Dogon, a traditional practice is to give broiled, salted chicken to those with diarrhea, even children.

5. **NUTRITION AND HEALTH POLICIES AND PROGRAMS:** Agricultural development strategy aims to cover the essential requirements of the population by using the country's natural, technical, and human resources. In 1977, government expenditures per person were: health, U.S. \$1 (1975 dollars); education, \$5; and defense, \$4. USAID funding supports projects in agricultural development,

HIGHLIGHTS (Continued)

food productivity and marketing, training extension agents, fish production, and basic health services. The principal goals of USAID-assisted projects are to promote self-sufficiency in food production and improve the quality of rural life. The Projet de Sante Rurale was intended to design, implement, and evaluate a low-cost rural health system at sites in Regions I and V; activities have included training health personnel and village workers in primary health care and health promotion, and the establishment of a logistical support system for the sale and distribution of basic medicines. In the Second Region, at Ouelessebouyou, USAID is sponsoring a project to develop the capacity of the National Union of Malian Women in a variety of activities, including development and implementation of a detailed curriculum of family health, nutrition, and agricultural production.

1. NUTRITION AND HEALTH STATUS

1.1 NUTRITION AND HEALTH STATUS, GENERAL

NATIONAL

NUTRITIONAL DEFICIENCIES: PEM, a major problem, is most prevalent during the dry season, March to June. Marasmus and kwashiorkor are most prevalent in urban and suburban areas. Vitamin A deficiency is found in the Sahara regions (Mopti, Gao, and Tembouchou). Deficiencies are suspected in calcium intake, riboflavin (vitamin B₂), and vitamin C. Anemia is a widespread problem. Goiter is significant in Bougouni, Tominian, Koutiala, Bandiagara, and Koro. (Licross, 1979)

CAUSES OF ANEMIA: Malaria is a major factor contributing to anemia incidence; in the rainy season when acute malaria attacks are frequent, incidence of related anemias also increases. Iron and vitamin deficiencies are frequently the causes of anemia. There are clear deficiencies of vitamin C, which is necessary for iron assimilation, and vitamin A, which may also be needed; such deficiencies are less common in town. (Mondot-Bernard et al., 1980b)

WOMEN'S SEASONAL WEIGHT GAIN: Between the rainy season and the following dry season, women gained an average of 2 kg. (Mondot-Bernard, 1981)

WOMEN'S SKINFOLD: Women's triceps skinfold measurements were often no more than 60 percent of the standard. Body fat accounted for 16 to 24 percent of weight; thin European women average 24 to 25% fat. (Mondot-Bernard, 1981)

COMMON DISEASES: Diseases reported in significant numbers of cases include enteric disease and bacillary dysentery, poliomyelitis, typhoid, diphtheria, endemic syphilis (in Gao), cerebro-spinal meningitis (maximum incidence February to April), trachoma, brucellosis (in grazing areas), schistosomiasis (mainly vesical), onchocerciasis (in Southwest; control measures established), and trypanosomiasis (foci near Bamako and the Southeast). Cholera was reported in 1974. Malaria is widespread and the entire population is at risk, including urban areas. (Licross, 1979)

RURAL

ANEMIA: The overall prevalence of anemia was 24.4%, and the rate for women over 15 years old was 25.8%, in four villages during the dry season. The lower frequency of anemia during the dry season may be linked with a drop in the number of acute malaria cases. (Mondot-Bernard et al., 1980b)

ANEMIA: In the village of Gakoura, 34.7% of women over 15 years had hemoglobin levels below 12 gm./ 100 ml., the WHO definition of anemia. In Diabadji, the rate was 35%; at Banankoro, 42.8%; and at Sidougou, 37.5%. (Mondot-Bernard et al., 1980b)

1.1 NUTRITION AND HEALTH STATUS, GENERAL (Cont.)

SICKLE CELL TRAIT: In four villages studied, from 1.8 to 31.4% of the population were carriers of the sickle cell trait (average: 16.7%). No homozygous cases were found. (Mondot-Bernard et al., 1980b)

PARASITES: During the dry season, the most common parasitic diseases of the digestive system were amebiasis, trichomoniasis, and bilharziasis. Rates of infection ranged from 7.1% to 82.9% in the nine villages studied; 37.2% of the entire sample had parasites. (Mondot-Bernard et al., 1980b)

WOMEN'S ENERGY EXPENDITURES: Mean daily expenditures for women were 3000 kilocalories during the rainy season and 2725 kilocalories during the dry season, when there is little agricultural activity in non-irrigated areas. (Mondot-Bernard, 1981)

MALARIA: Malaria incidence was over 90% in all areas and for all age groups studied. (Mondot-Bernard et al., 1980b)

FERTILITY CHANGES: The average number of live births per women age 45-49 increased from 5.35 in 1960-61 to 7.78 in 1978, but the most common age of procreation has advanced, from 20-24 years to 25-29 years. (Mondot-Bernard et al., 1980b)

DISEASES: Villagers cited malaria, diarrhea, and measles as their three most serious disease problems. (Center for Disease Control, 1975)

URBAN

WOMEN'S ENERGY EXPENDITURE: Urban women expended an average of 2225 calories daily. (Mondot-Bernard, 1981)

1.2 NUTRITION AND HEALTH STATUS, WOMEN, PREGNANT

1.3 NUTRITION AND HEALTH STATUS, WOMEN, LACTATING

1.4 NUTRITION AND HEALTH STATUS, INFANTS, 0-6 MONTHS

NATIONAL

INFANT MORTALITY RATE: In 1976, the infant mortality rate was 168 deaths per 1000 live births. (Sivard, 1979)

INFANT MORTALITY: Infant mortality has increased since the 1960-61 population survey. (Mondot-Bernard et al., 1980b)

LOW BIRTH WEIGHT: WHO estimates that 12.7% of all infants born in Mali weigh less than 2500 grams at birth. (WHO, 1980)

CAUSES OF DEATH: The most common recorded causes of death in children under 1 year are malaria, measles, and diarrhea. Tetanus of the newborn is frequent and lethal. (Licross, 1979)

RURAL

INFANT MORTALITY RATE: The infant mortality rate was 159 deaths per 1000 live births for boys, and 145 per 1000 girls. (Mondot-Bernard et al., 1980b)

URBAN

BIRTH WEIGHT: A study published in 1977 found that the average birth weight of infants studied in Bamako was 3049 grams, and that 12.7% of infants weighed less than 2000 grams at birth. (WHO, 1980)

1.5 NUTRITION AND HEALTH STATUS, INFANTS, 6-24 MONTHS

NATIONAL

CHILD MORTALITY RATE: In 1979, the mortality rate among children age 1 to 4 years was 31 deaths per 1000; in 1960, the rate was 41 per 1000. (World Bank, 1981)

CHILD MORTALITY RATE: The mortality rate in 1977 among children age 1 to 4 years was 32 deaths per 1000 children in this age group. (World Bank, 1980)

MALNUTRITION: Severe malnutrition affects primarily infants of weaning age, 12 to 23 months. (Mondot-Bernard et al., 1980b)

PROTEIN DEFICIENCY: 50% of infants from 1 to 5 years old showed some symptoms of protein deficiency, from simple loss of weight with digestive disorders to moderate or serious kwashiorkor. (West African Conference, 1968)

KWASHIORKOR AND SEASON: Rates of kwashiorkor are highest in August and September. (West African Conference, 1968)

VITAMIN A DEFICIENCY: A 1975 study showed that, after PEM, vitamin A deficiency was the most common nutrition problem among children age 0 to 5 years. Among children examined in 6 regions, the rates of conjunctival xerosis ranged from 7.1% to 17.9%, and rates of children having xerophthalma or keratomalacia ranged from 0 to 6.4%. (Semega and Toureau, 1980)

XEROPHTHALMIA AND KERATOMALACIA: A survey of hospital records showed that in the first region (Kayes) the rate of keratomalacia was 20 cases per 10,000 children consulted; in the fifth region (Mopti), there were 2 cases of xerophthalmia per 10,000 children consulted; and in the seventh region (Gao), there were 4 cases of keratomalacia per 10,000 children consulted in 1979, and 2 cases per 10,000 in 1980. (Semega and Toureau, 1980)

NIGHT BLINDNESS: Night blindness, due to a deficiency of vitamin A, is endemic throughout Regions I, V, and VII, but is noticeably more frequent

1.5 NUTRITION AND HEALTH STATUS, INFANTS, 6-24 MONTHS (Cont.)

during the dry season, from April through July. The pathology is well-known among the people and has names in the different dialects spoken in the area. (Semega and Toureau, 1980)

ILLNESS AND VITAMIN A: In the regions studied, there is a high prevalence of infectious diseases such as gastroenteritis, measles, and whooping cough, which increase the body's need for vitamin A, impede the conversion of the beta-carotenes into retinol, and end up decreasing the biological utilization of this nutrient. (Semega and Toureau, 1980)

RURAL

MORTALITY: 6% of all 12-month-old boys died before reaching the age of 24 months, as did 7% of girls. (Mondot-Bernard et al., 1980b)

ACUTE UNDERNUTRITION: Between 8,000 and 15,000 children age 6 months to 6 years were estimated to be undernourished after the first harvest after the drought. (Center for Disease Control, 1975)

MALNUTRITION RATES: Among six children studied, age 6-11 months, 2 were below 80% of standard weight for height, 2 were below 90% of standard height for age, and one was below both standards. (Mondot-Bernard et al., 1980b)

WEIGHT FOR HEIGHT AND HEIGHT FOR AGE: Among children age 12-23 months, 17.5% were below both 80% of the reference standard weight for height, and 90% of the reference standard height for age. (Mondot-Bernard et al., 1980b)

WEIGHT FOR HEIGHT AND HEIGHT FOR AGE: Among children 12 to 23 months old, only 8% were 100% or more of the reference median weight for height, and 8.5% were 100% or more of the reference median height for age. (Mondot-Bernard et al., 1980b)

WEIGHT FOR HEIGHT: The percentage of children age 6-71 months whose weight for height is less than 80% of the reference median has varied: May-June, 1974: 10.7%; Feb.-March, 1975: 4.4%; May-June, 1975: 6.2%; and July-August, 1976: 7%. These variations may be due to seasonal effects on disease and food supply; on sample population variations; or on long-term nutritional factors. (Mondot-Bernard et al., 1980b)

WEIGHT FOR HEIGHT: Among children age 6 months to 6 years, the percent of children below the acute undernutrition threshold (AUT) (80% of median weight for height) was greatest for the shortest (and presumably youngest) children. Among children under 75 centimeters, 33.3% were below AUT in 1974, 5.9% in February-March 1975, and 13.7% in May-June 1975. (Center for Disease Control, 1975)

WEIGHT FOR HEIGHT: In mid-1975, 78% of children between 6 months and 6 years weighed less than the reference median weight for their height, and 6.2% of the children weighed less than 80% of the reference median. (Center for Disease Control, 1975)

WEIGHT FOR HEIGHT: The percentage of children age 6 months to 6 years suffering from acute undernutrition (i.e., weight for height less than 80% of median) dropped from 10.7% in 1974 to 4.4% in March and April, 1975 (after the harvest), but rose to 6.2% two months later. (Center for Disease Control, 1975)

WEIGHT FOR HEIGHT: Among "sedentary" settlement children assessed in 1973, the proportion below "threshold" (80% of standard median weight for height) was: 49% in Gao in July, 30% in Gao in September, 3% in Nioro in August, and 4% in Nara in August. (U.S.D.H.E.W., 1973a)

WEIGHT FOR HEIGHT - NOMADS: Among nomad children, 80% of those assessed at Timbuctu in August 1973 were below "threshold" (80% of standard median weight for height). Among nomad children in Gao, 70% of those studied in July 1973 and 35% in September 1973 were below the "threshold." (U.S.D.H.E.W., 1973a)

WEIGHT FOR HEIGHT - DROUGHT VICTIMS: In one nomad camp of 10,000 persons in Timbuctu, 74.6% of the children surveyed were below 80% of the standard median weight for height. (U.S.D.H.E.W., 1973b)

WEIGHT FOR HEIGHT - DROUGHT VICTIMS: In August, 1973, 4.6% of children were below 80% of median (standard) weight for height. The rates of malnutrition were probably higher in areas inaccessible to the study team and therefore also inaccessible to food relief. (U.S.D.H.E.W., 1973c)

HEIGHT FOR AGE: Among children age 12 to 23 months, 56.5% were chronically malnourished: height for age less than 90% of reference standard, but weight for height 80% or more of reference standard. (Mondot-Bernard et al., 1980b)

NUTRITIONAL SYMPTOMS: Among children surveyed, twelve had follicular hyperkeratosis (a sign of vitamin A deficiency), three had ascites (fluid in the abdominal cavity), and two had first-degree edema (a sign of protein deficiency). (Center for Disease Control, 1975)

KWASHIORKOR: Most serious cases of kwashiorkor are found in small suburban villages among families with numerous social problems, many of them attributable to poverty and ignorance. (West African Conference, 1968)

EDEMA AMONG DROUGHT VICTIMS: In one nomad camp of 10,000 persons in Timbuctu, 39% of the children had edema, indicative of a protein deficiency. (U.S.D.H.E.W., 1973b)

EDEMA AMONG DROUGHT VICTIMS: Among children examined in nomad refugee camps, 40% in Timbuctu had edema, as did 43% in Gao. Less than 2% of children in sedentary populations had edema. (U.S.D.H.E.W., 1973a)

1.5 NUTRITION AND HEALTH STATUS, INFANTS, 6-24 MONTHS (Cont.)

MEASLES: Measles incidence, restricted primarily to the eastern part of the country, was 172/1000 children age 0-5. (Center for Disease Control, 1975)

URBAN

MALNUTRITION AND HOSPITALIZATION: Among 13,079 infants hospitalized in Bamako between 1964-1967, 415 (3.2%) had kwashiorkor and 1,050 (8.0%) were malnourished. (West African Conference, 1968)

GROWTH RATES: The growth curves of 100 infants studied in Bamako showed that growth rates followed normal levels until the sixth month and then began to decline. By one year, symptoms of malnutrition began to appear, and peaked at weaning. (West African Conference, 1968)

2. DIETARY BELIEFS, GENERAL

2.1 DIETARY BELIEFS, GENERAL

NATIONAL

EGGS: At least 40% of the production of eggs is not consumed because of traditional beliefs that eggs are harmful. (West African Conference, 1968)

RURAL

"GOOD" FOODS: When villagers were questioned about which foods are "good," they mentioned meat, eggs, milk, and honey. (Letarte, 1981)

2.2 DIETARY BELIEFS ABOUT PREGNANCY

RURAL

MOTHERS' DIET: Breast feeding mothers are advised by TBAs to eat foods such as meat, fish, and beans. (Abel, 1981)

2.3 DIETARY BELIEFS ABOUT LACTATION

RURAL

COLOSTRUM: Colostrum is believed harmful, so for the first days infants are given drinks of lukewarm water with sugar. (Abel, 1981)

2.4 DIETARY BELIEFS ABOUT BREAST MILK SUBSTITUTES (INCLUDING BOTTLE FEEDING)

2.5 DIETARY BELIEFS ABOUT WEANING

2.6 DIETARY BELIEFS ABOUT ILLNESS AND CURE

RURAL

MEAT AND MEASLES: Meat is prescribed for children who have measles. (Abel, 1981)

HEMORRHAGING DURING DELIVERY: When there is hemorrhaging during delivery, most TBAs use traditional remedies, including giving the mother a drink made of the millet plant. (Abel, 1981)

3. DIETARY PRACTICES

3.1 DIETARY PRACTICES, GENERAL

NATIONAL

BASIC DIET: The main staple foods are cereals such as millet, sorghum, and sometimes rice. Sweet potatoes, yams, cassava and beans provide variety. Sauces are made of oilseeds, karite butter, dried fish, vegetable leaves, and other greens. Meat and fish (usually Niger delata) are consumed when available and as a ceremonial dish. The pastoral population in the North (Peuls, Naures, and Touareg) base their diet on milk products, meat, dates, and tea. (Licross, 1979)

STAPLE CROPS: Millet and sorghum, the staple cereals, account for more than 45% of the cultivated area; cereals as a whole accounted for 75% of the cultivated area in 1975. (Mondot-Bernard, 1980a)

SEASONAL FOOD RESOURCES: Seasonal food resources include: during the winter, corn; after the winter season, tubers (manioc, potatoes, yams), truck products, fruits and fish; during all seasons, millet, rice, and meat are available. (West African Conference, 1968)

SEASONAL INTAKE: During the rainy season, July and August, the granaries are almost empty, and in addition to working intensively in the fields, people gather wild leaves and fruits. Calorie intake is at its lowest but food intake is rich in vitamins A and C. During the dry season, from January to April, there is little or no work in the fields. (Mondot-Bernard, 1980a)

FOODS CONSUMED: Actual consumption of foods in 1979, in kilograms per person per year, was: millet and sorghum, 143.1; vegetables, 18.8; meat, 18.8; maize, 17.4; cassava, 15.3; rice, 14.9; sweet potatoes, 12.1; peanuts, 10.2; fish, 10.3; fruit, 5.7; sugar, 5.0; beans and peas, 4.6; and wheat, 3.6. (U.S.A.I.D., 1976)

ANIMAL FOODS: Meat is rarely consumed except in the urban areas, and on holidays and during ritual ceremonies in the rural areas. The abundant quantity of fish in the Central Delta of the Niger River comes to the peripheral areas in dry or smoked form. Foods from hunting are sometimes added, but this activity is officially forbidden in order to help replenish game reserves. Meat and fish are used in the preparation of sauces which are based on green leaves and vegetables. (Semega and Toureau, 1980)

FISH: Fishing is traditionally an important craft activity. Smoked and salted fish are eaten locally as well as fresh fish, and are exported, particularly to the Ivory Coast. (Mondot-Bernard, 1980a)

VITAMIN A SOURCES: Although dry or green leaves are used in cooking, the sauces are cooked for 2 to 3 hours, and all the pro-vitamin A is destroyed. Meat, as a source of retinol, is consumed only in small quantities, usually by the men. Fruits rich in vitamin A, such as mangoes, are not grown in the zones surveyed, and are extremely

3.1 DIETARY PRACTICES, GENERAL (Cont.)

expensive. Other wild fruits, accessible to children, are instead rich in vitamin C. (Semega and Toureau, 1980)

DATOU: Datou juice is obtained by crushing the fermented seed of the hibiscus kenaf and then macerating the powder in water. (Mondot-Bernard, 1980a)

MEAL SIZE AND FREQUENCY: All groups surveyed consumed three meals per day, except the Touaregs, who had only two. The three meals varied in relative size: breakfast might be equal to or smaller than the other two meals, or the noon meal might provide fully half the day's intake. (Mondot-Bernard, 1980a)

STATE OF AGRICULTURE: Most of the population are subsistence farmers or herdsman. Agriculture contributed 43% of the gross domestic product in 1972 and provided employment for more than 90% of the working population. During the drought of the early 1970s, this sector suffered the loss of 30% of its cattle, a 30% decline in fresh fish production, and significant declines in food crop output (about 35% for cereals). This reduced output forced the nation to import cereals to meet domestic consumption needs. Cereal imports totaled 288,000 tons in 1973 and 432,000 tons in 1974. (U.S.A.I.D., 1976)

AGRICULTURE: In 1979, 88% of the labor force was engaged in agriculture, as 94% had been in 1960. (World Bank, 1981)

FOOD PRODUCTION: Food production in 1973 was only 72% of the amount produced in 1963; since the population had grown 25% in the interim, this meant a per capita production in 1973 of only 57% that of 1963. (U.S.A.I.D., 1976)

FOOD PRODUCTION: During 1961-70, per capita food production decreased 0.3%; in 1970-75 it decreased 2.7%. (FAO, 1977)

FOOD PRODUCTION: Over 1970-77, total agricultural production increased an average of 2.0 to 2.7% per year. (FAO, 1979)

AGRICULTURAL EXPORTS: In 1972, agricultural products accounted for at least 76% of the nation's exports, valued at U.S. \$44 million. Cotton seeds and fiber accounted for 33% of all exports; groundnuts, decorticated, shelled, and as oil, 19%; and livestock, 24%. (Ball, 1978)

LIVESTOCK: At about the beginning of the 1970s, the demand from the coastal states for cattle from Mali and other inland areas began to exceed the supply, causing animal prices to rise. (Ball, 1978)

FOOD DEFICIT DURING DROUGHT: In April 1973, the FAO estimated the food deficit for the next six months to be 260,000 metric tons; the French Foreign Ministry estimated 230,000 metric tons. (DuBois, 1974)

CALORIE SUPPLY: The supply of available calories in 1977 was 2,117 calories per person per day, 90% of the amount estimated by FAO to be necessary to meet requirements. (World Bank, 1981)

PROTEIN AND CALORIE SUPPLIES: In 1976, per capita supplies were 56 grams protein and 2,114 calories. (Sivard, 1979)

PROTEIN AND CALORIE SUPPLIES: In 1972-74, per capita supplies averaged 1759 calories (75% of requirement) and 52.7 grams protein. 49% of the population (2,656,000) had calorie intakes below the critical limit. (FAO, 1977)

CALORIE INTAKES BY REGION AND SEASON: During the rainy season, daily calorie intakes averaged 2200 in Zone I, and 1550 in Zone II. During the post-harvest season, daily calorie intakes averaged 2000 in Zone I, 1725 in Zone II, 2150 in Zone III, and 1950 in urban areas. (Mondot-Bernard, 1980a)

RURAL

ETHNIC GROUPS: The ethnic groups of Mali include the Mande, who make up 43% of the population; the Fulani, 20%; the Senufu, 15%; the Sarahole, 8%; the Tuareg, 6%; the Songhai, 6%; and others, 2%. (U.S.A.I.D., 1976)

MAJOR CROPS - EAST: In the east-central part of the country, around Mopti (part of Zone III of the national survey), cereal crops include millet, sorghum, rice, and wheat; market-garden crops are also grown. (Mondot-Bernard, 1980a)

MAJOR CROPS - SAHEL: In the northern Sahelian Zone (part of Zone III of the national survey), some cereal crops are grown, including wheat, rice, millet, and sorghum. (Mondot-Bernard, 1980a)

TUAREG FOODS - SAHEL: The Tuaregs of the Sahelian area (Zone III of the national survey), live by raising goats, cattle and camels, which they may trade for grain. Their diet is primarily millet, sorghum, and milk. Food is cooked once a day, generally in the evening. (Mondot-Bernard, 1980a)

MAJOR CROPS - WEST: In the western end of the country (Zone I of the national survey), cereals and groundnuts are grown, with millet, sorghum, groundnuts, and cowpeas predominating in the northern part of the zone. In the southern part of the zone, around Bamako, cereal growing is more diversified, with millet, sorghum, acha, maize, some rice, and more groundnuts than in the north. (Mondot-Bernard, 1980a)

MAJOR CROPS - SOUTH: In the southern end of Mali (Zone II of the national survey), the main crops are cotton and cereals including sorghum, maize, rice, and hibiscus kenaf. (Mondot-Bernard, 1980a)

SEASONALITY OF INTAKE: Among the pastoral Kel Adrar Tuareg of the north, there are three seasons: cold and dry; hot and dry; and hot and rainy.

3.1 DIETARY PRACTICES, GENERAL (Cont.)

During the hot rainy season there is plenty of milk from camels, cattle, and sheep, and women gain weight. During the other seasons, goat milk is used; poor people with limited numbers and species of livestock are particularly vulnerable to shortages in case of rain failure. During the hot dry season, milk supplies are at their lowest and the energy required for watering animals is at its peak, producing a seasonal energy crisis which is relieved when the rains come. (Chambers et al., 1979)

KITCHENS: Kitchen equipment in Banankoro village, Boufouni region (Zone II) includes enamelled basins and bowls, iron cooking pots, "canaris" (earthenware jars) to hold water drawn from wells, and calabashes, which are gourds especially grown for use as utensils. Cooking is done over an open fire. (Mondot-Bernard, 1980a)

IRON INTAKE: Average iron intake varies from 19 to 35 mg per day, suggesting that anemias are due to maldistribution of dietary iron among the population, or to other causes, such as vitamin deficiencies and infections. (Mondot-Bernard et al., 1980b)

CALORIE CONSUMPTION: Daily calorie intake per capita was highest (2300 calories) in the villages where cereal consumption was highest. These same villages were the only ones where farmers practiced plough cultivation. (Mondot-Bernard, 1980a)

CALORIES FROM CEREALS: The percentage of calories obtained from cereals was 70% in Zone I, 86% in Zone II, and 83% in Zone III. Seasonal studies in Zones I and II showed differences of less than 7%, except one village in Zone II in which cereals comprised 81% of the intake during the rainy season and 94% during the post-harvest season. (Mondot-Bernard, 1980a)

URBAN

BASIC DIET: The basic diet in urban areas contains most of the foods used in rural areas, with the addition of imported foods such as bread, milk, and canned products. (Licross, 1979)

CALORIES FROM CEREALS: Cereals made up 70% of the calories consumed in the urban compounds sampled. (Mondot-Bernard, 1980a)

3.2 DIETARY PRACTICES, WOMEN

3.2.1 DIETARY PRACTICES, WOMEN, DURING PREGNANCY

3.2.2 DIETARY PRACTICES, WOMEN, DURING LACTATION

3.3 DIETARY PRACTICES, INFANTS 0-24 MONTHS

3.3.1 DIETARY PRACTICES, INFANTS 0-24 MONTHS, BREAST FEEDING

RURAL

DURATION: Weaning from the breast is usually late--up to age 24 to 30 months. The mother will continue to breast feed until she becomes pregnant again. (Abel, 1981)

3.3.2 DIETARY PRACTICES, INFANTS 0-24 MONTHS, WEANING FOODS

NATIONAL

WEANING PROCEDURES: At weaning time, infants are entrusted to a grandmother and make an abrupt transition from the milk diet to the adult diet. (West African Conference, 1968)

RURAL

WEANING FOOD: The only supplement to mother's milk given to children 12 to 23 months old is often a gruel made of millet, rice or maize flour and water, with occasional small amounts of milk. (Mondot-Bernard, 1980b)

MEAT: Meat is usually introduced to babies at about 12 months of age. (Abel, 1981)

3.3.3 DIETARY PRACTICES, INFANTS 0-24 MONTHS, AFTER WEANING

3.4 DIETARY PRACTICES, HEALTH AND MEDICINE

RURAL

TRADITIONAL DIARRHEA TREATMENT: Among the Dogon, a traditional practice is to give broiled, salted chicken to those with diarrhea--even children. (Letarte, 1981)

4. NUTRITION STATUS CORRELATIONS

NATIONAL

CALORIE INTAKE AND INCOME: No significant differences in the level of energy intake among rich, middle-income and poor compounds was found using analysis of variance. It is possible that the criteria used to establish income were inadequate; they included the level of family taxation, determined in part by village councils. (Mondot-Bernard, 1980a)

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5. NUTRITION AND HEALTH POLICIES AND PROGRAMS

5.1 NUTRITION AND HEALTH POLICIES

NATIONAL

AGRICULTURAL DEVELOPMENT POLICY: The agricultural development strategy chosen by the Malian authorities is based on an option giving priority to the promotion of rural areas, and an option for self-sufficient development with the aim of covering the essential requirements of the population by using the country's natural, technical and human resources. (Mondot-Bernard, 1980a)

GOVERNMENT EXPENDITURES: In 1977, government expenditures per capita were: health, U.S. \$1 (1975 dollars); education, \$5; and defense, \$4. (World Bank, 1981)

HEALTH EXPENDITURES: In 1976, public health expenditures were U.S. \$9 million; i.e., U.S. \$1.50 per capita. (Sivard, 1979)

5.2 NUTRITION AND HEALTH PROGRAMS

NATIONAL

CARE: CARE projects include rural water development, to construct wells, install foot pumps, form village sanitation committees, and train villagers in well and pump maintenance and repair. The Rural Community Development project included a variety of small local projects, including training 3 agents from the Ministry of Health and the Department of Social Affairs. (CARE, 1980)

HEALTH WORKER TRAINING MANUAL: The National School of Medicine, in cooperation with the Directorate for Functional Literacy, developed training manuals for local health workers, using the Bambara language, which is spoken by half the country. The materials not only used the local language, but also surveyed local villages to determine local health concerns and local terminology for health topics. (Belloncle et al., 1980)

FOOD AID DURING DROUGHT: During 1973, food aid was provided by the European Economic Community, the USA, China, France, the World Food Programme, USSR, West Germany, and Canada. (DuBois, 1974)

FOOD AID DURING DROUGHT: In one nomad camp of 10,000 persons in Timbuctu, each person received 1500 grams of millet weekly, which would meet half the calorie needs and 2/3 of the protein needs of a healthy person. One-half litre of non-fat dry milk, supplemented with CSM (corn-soy mix) was distributed daily to each child. (U.S.D.H.E.W., 1973b)

DROUGHT AID: Nigeria provided financial and logistical aid for drought relief beginning in May 1983; Libya provided aid in June, and Morocco in August. (DuBois, 1974)

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5.2 NUTRITION AND HEALTH PROGRAMS (Cont.)

PL-480 RECIPIENTS: In fiscal year 1977, 2300 persons received PL-480 food through a food-for-work program run by the World Food Program. (USDA, 1978)

PHYSICIANS: In 1976, there were fewer than 150 physicians, a ratio of at least 40,000 persons per physician. (Sivard, 1979)

OPHTHALMOLOGY INSTITUTE: The Institut d'Ophthalmologie Tropicale pour l'Afrique (IOTA, or Institute of Tropical Ophthalmology for Africa) is located in Mali, but its materials distributed to personnel in the field do not cover vitamin A deficiency. (Semega and Toureau, 1980)

RURAL

USAID ACTIVITIES: The current USAID development program has emerged from the period of drought relief (1973-1975) and a period of planning and project design in collaboration with the Government of Mali. The principal goals are to support Mali's efforts to achieve self-sufficiency in food production and improve the quality of rural life. USAID assists rural development operations and smaller-scale actions to raise yields of millet, sorghum, rice and wheat as well as to introduce improved extension systems, functional literacy, improved water control, farm-to-market roads and marketing and credit systems. (USAID, 1981)

USAID - ACTION RIZ-SORGHO: Since 1976, USAID has been assisting agricultural development in the Seventh Region, a chronic deficit area. Activities, which will benefit 10,000 farming families, include construction of dikes and water gates along the Niger River; establishment of a Research Station to determine seed, fertilizer, and agricultural technology suited to the area; and training extension workers and farmers. Financing to date has been \$ 3.9 million. (USAID, 1981)

USAID - OPERATION MILS MOPTI: Since 1976, USAID has been assisting agricultural projects in the Fifth Region, including research facilities at Seno, training programs for extension agents, constructing storage facilities at the village, forming village associations, and providing technical assistance in production of millet, sorghum, and vegetables. Other aspects include road building, blacksmith training, agricultural credit, and literacy training, irrigation, and well-digging. Financing to date has been \$9.5 million. (USAID, 1981)

USAID - OPERATION HAUTE VALLÉE: Since 1979, USAID has sponsored a project in the Second Region to increase productivity, production, and marketing of food crops throughout the Haute Vallee. Activities include rehabilitation of the Bancoumana rice polder, construction of market access roads and trails, establishment of a farmer credit program and animal traction centers, expansion of functional literacy and health services, integration of livestock and crop production, training of project personnel, and development of appropriate agricultural technology. Financing to date has been \$11.2 million. (USAID, 1981)

USAID - SAN PILOT FISH PRODUCTION: Since 1979, USAID has been sponsoring a project in the Fourth Region to promote fish production and to help villagers increase cash income. A pilot fish station will benefit 4,000 people, providing breeding and production facilities for Tilapia and Clarias species; it will also serve as a training station for extension staff and will sell fingerlings to rice farmers to help them supplement their diets and income. Financing to date has been \$294,000. (USAID, 1981)

USAID - RURAL HEALTH SERVICES DEVELOPMENT: Since 1977, USAID has been sponsoring projects at Koro (Fifth Region) and Yelimane (First Region) to design, implement, and evaluate a low-cost rural health system that can serve as the basis of an affordable national system. Activities have included training personnel and village health workers in primary health care and health promotion, and the establishment of a logistical support system for the sale and distribution of basic medicines. (USAID, 1981)

USAID - ACTION BLE: Since 1978, USAID has been sponsoring a project to help compensate for the chronic food deficit of the northern regions and provide part of the wheat requirement of the southern regions, through increased production of cereals. Activities, which will benefit 2,400 farm families near Diré, include provision of a credit fund for seeds, fertilizer, and irrigation pumps; construction of warehouses, staff housing, and a repair shop; and training in extension, management, and marketing. The production goal is 2.5 tons per hectare for wheat and 1.5 tons per hectare for sorghum. Financing to date has been \$2.3 million. (USAID, 1981)

USAID - TRAINING FOR WOMEN: USAID is sponsoring a project at Ouéléssébougou, in the Second Region, to develop the capacity of the National Union of Malian Women (NUMU) to provide practical multidisciplinary training in development promotion to rural women. Activities, which will benefit 520 women and their villages, include construction of a training center; development and implementation of a detailed curriculum of family health, nutrition, home economics, agricultural production, functional literacy, civics and small business management; installation of a trained staff; selection and training of village women; and follow-up activities to support women in their villages. Financing is \$500,000. (USAID, 1981)

OTHER USAID ACTIVITIES: USAID is also sponsoring a central veterinary laboratory near Bamako to produce animal vaccines; cattle production and marketing projects (in the Second, Third and Fourth Regions); tsetse fly control; an inventory of land and water resources; agricultural officers' training (First and Fourth Regions); crop research; reforestation; water improvement; teacher training; and transportation. (USAID, 1981)

PROJET DE SANTE RURALE (PSR; RURAL HEALTH PROJECT): The PSR, funded by U.S.A.I.D. and implemented by the Harvard Institute for International Development and the Government of Mali, will develop demonstration rural health systems in two cercles (districts) to test the feasibility of developing certain strengths and capacities in the health delivery

5.2 NUTRITION AND HEALTH PROGRAMS (Cont.)

system, particularly the feasibility of training local personnel to administer simple health care and referrals and to supply basic drugs. Some nutrition surveillance measures will be taken, but the interventions do not include nutrition-related actions. (Brinkerhoff, 1980)

PSR - ACTIVITIES: The PSR was designed to improve the state of public health in two cercles of Mali: Koro, in the Mopti Region, and Yelimane, in the Kayes Region, while testing the possibility of replicating certain approaches to primary health care in other districts of the country. Activities included training village health workers, improving services available at cercle-level health centers, and village-level improvements such as well-digging and vegetable gardening. (Gray and Sankare, 1981)

PSR VILLAGE HEALTH WORKERS: The village health workers (VHWs) trained by the PSR were of two types: hygienistes-secouristes (H-S; sanitation/first aid agents), and accoucheuses traditionnelles (A-T; traditional birth attendants). (Gray and Sankare, 1981)

PSR DEVELOPMENT ACTIVITIES: With assistance from villagers and from CARE, PSR staff have promoted development activities such as the rebuilding of a dam in Yoro; distributing tools, vegetable seeds and fruit tree seedlings in Yoro; conducting surveys of village water supplies in both Koro and Yelimane districts; initiating deepening of village wells in Koro; preparing a detailed program and arranging financing for drilling 21 new wells and deepening 8 old ones in 24 villages of Yelimane; and drawing up plans for gardening projects in other villages and a rabbit-raising scheme for Koro. (Gray and Sankare, 1981)

AMERICAN FRIENDS SERVICE COMMITTEE: The American Friends Service Committee provides training and startup funds for implementing activities aimed at increasing women's income and thus improving family well-being and nutrition. (TAICH, 1980)

WORLD BANK - ONCHOCERCIASIS PREVENTION: The World Bank agreed to contribute to a \$123 million, 20-year campaign led by the UN to eliminate onchocerciasis (river blindness) from the Upper Volta River Basin, which includes parts of Mali. (DuBois, 1974)

RADI AND AGRICULTURE: Radio Rurale, a division of Radio Mali, has a small staff which travels throughout the country, recording farmers' descriptions of agricultural practices, discussions with development agents, and reactions to new farming ideas and various government development policies. These recordings are brought back to Bamako and edited into daily programs for broadcast in the major languages of the country. (Kulakow, 1979)

6. COMMENTARIES

NATIONAL

OBSTACLES TO NUTRITIONAL IMPROVEMENTS: Major obstacles to improving nutrition status of the population, especially young children, included: lack of nutrition experts; economic constraints; and inadequate means of transport in most States. (West African Conference, 1968)

ENERGY STANDARDS: The conception of energy expenditure and energy balance as viewed in the laboratory is probably not applicable to populations obliged to suffer a relative shortage of food; the author found that energy intake did not cover energy expenditure, and concluded that we should exercise caution and moderation in applying the standards used in "rich" countries to "less favored" populations. This is a fundamental problem of human physiology, which may lead in practice to a change in approach. (Mondot-Bernard, 1981)

RURAL

PSR IMPLEMENTATION OBSTACLES: Problems encountered in establishing a system of village health workers included curative orientation of VHWs and their trainers; villagers willing to pay for medicines, but not for support of VHWs; extensive rural exodus, leaving few literate men under age 40 in some villages; lack of qualified higher-level personnel, such as medical chiefs; and irregular record-keeping (births and deaths). (Cisse, 1981)

OBSTACLES TO EFFECTIVENESS OF VHWS: VHWs were not as effective as anticipated because of inadequate training, lack of the drugs they had been taught to use, unwillingness of villagers to pay them, women's lack of money to pay them, and lack of support services to which the VHWs could refer cases beyond their own capacities to treat. VHWs also had not developed a preventive attitude, but mainly treated existing ailments. (Brown, 1981)

EFFECTIVENESS OF VHWS: To enhance the effectiveness of VHWs, the following changes were recommended: retrain workers, emphasizing the four major health problems on which they could have an impact (malaria, diarrhea, infant malnutrition, and midwifery); de-emphasize village sanitation; conduct refresher courses; introduce family planning; and change drug stocks, by eliminating penicillin and adding a skin antiseptic and an antacid, and by changing the dosage of chloroquin to correspond to the dosage level used in the supplies available from sources outside the project. (Brown, 1981)

NUTRITION EDUCATION TARGETS: Although women prepare the food, men should be a target of nutrition education, because it is they who most often pay for expensive foods such as meat and fish. (Letarte, 1981)

VILLAGE HEALTH WORKERS TRAINING: The government training program for village health workers (VHWs) focuses on the use of drugs for curing a

6. COMMENTARIES (Cont)

limited range of ailments, not including malnutrition, anemia, or diarrhea. The VHW training demonstration project goals were determined by the participating villages. (Brinkerhoff, 1980)

WOMEN'S WORKLOADS: Workloads are not reduced for pregnant women or nursing mothers. The average work day is 10 to 12 hours long. Although activities vary from season to season, total work output varies little. (Mondot-Bernard, 1981)

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Abel, J.

- 1981 Evaluation Report on the Activities of the Traditional Birth Attendants of the Koro Cercle. Bamako: Projet Sante Rurale, February 1981 (mimeograph, 21 pp.)

This report describes the evaluation of the midwife-training component of the PSR project's Koro site. The goal of the mission was to evaluate the training, activities, and knowledge of the traditional birth attendants (TBAs) who had been re-trained within the Koro project. The report includes the schedule, methods, findings, and recommendations of the evaluator; the major portion of the paper is made up of specific recommended activities to improve the training program, including program content; and recommendations for the supervisory personnel's skills and activities.

Ball, N.

- 1978 Drought and Dependence in the Sahel. International Journal of Health Services 8(2):271-298, 1978.

This article discusses the history of drought in the Sahelian countries, the effects of underdevelopment, and interaction with the international economic system from a historic perspective. The article then discusses current trends in agriculture in the Sahel, and the effects on the cultures and ecosystems of the area. Finally, the author proposes an alternative development strategy which might preserve the ecosystem and encourage indigenous development.

Belloncle, G., Balique, H., Rougemont, A., and Ranque, P.

- 1980 A Community Helps Write Health Manual. Salubritas 4(4): 1,7.

Salubritas is a "health information exchange" published by the American Public Health Association and the World Federation of Public Health Associations. Health officials and linguists in Mali enlisted the help of village elders, newly literate young farmers, and other interested villagers to help develop a handbook using local language and integrating local beliefs and health practices.

Brinkerhoff, D.W.

- 1980 Projet de Sante Rurale: A History and Analysis of Nineteen Months of Operation. Cambridge, MA: Harvard Institute for International Development, and Newton, MA: Education Development Center, Inc., January 1980.

The Projet de Sante Rurale began in 1978 as a joint effort of the Mali government and the Harvard Institute for International Development, funded by U.S.A.I.D. The project is the central component of Mali's effort to provide improved health services to the rural poor. The PSR, a four-year project, is planned to test the feasibility of

BIBLIOGRAPHY (Cont.)

expanding the health care system in certain areas: training, drug distribution, village pharmacies, community development, data gathering and evaluation, and project management. This will be achieved through the development of a demonstration rural health system in two cercles.

Brown, R.C.

- 1981 Public Health Physician's Evaluation Report of the Mali Rural Health Project (688-0208). Washington, D.C.: USAID, November 1981. mimeo, 18 pp.

This report includes the observations and conclusions of an independent physician investigator sent to evaluate the Mali Rural Health Project in the fortieth month of the 48-month study. His recommendations include changes to be made in the conduct of the balance of the study, and activities to be included in an extension of part of the project.

CARE

- 1980 Resume: CARE Projects, Fiscal Year 1980.

This report describes the proposed and ongoing CARE projects in many countries, giving project numbers and projected activity and staffing levels, but no budget information.

Center for Disease Control

- 1975 "Sahel Nutrition Surveys 1974 and 1975," U.S. Department of Health, Education and Welfare, Center for Disease Control, Bureau of Smallpox Eradication.

Original data.

Method: Anthropometric measures and physiological examination of each child.

Sample: Random sample of 35 affected villages in each affected country; households were chosen at random and all children age 6 months to 6 years were examined until at least 25 children had been examined in each village

Location: Sahelian regions of Mali, Upper Volta, Niger, Mauritania and Chad.

A scientific evaluation of the impact of the drought on the nutritional status of the populations of the Sahelian areas was conducted by USAID and the U.S. Public Health Service Center for Disease Control in May, June, and July of 1974, with 2 follow-up studies in 1975.

Chambers, R., Longhurst, R., Bradley, D., and Feachem, R.

- 1979 "Seasonal Dimensions to Rural Poverty: Analysis and Practical Implications," Brighton, England: Institute of Development Studies at the University of Sussex.

This paper reports on a conference on seasonal dimensions to rural poverty in several developing nations. Presentations include specialized papers on climate, tropical diseases, and nutrition and women, as well as multidisciplinary case studies. Generally, the worst times of year are the wet seasons, typically marked by a concurrence of food shortages, high demands for agricultural labor, and high rates of infectious diseases. Including seasonal analysis in rural planning suggests priorities in research, and indicates practical policy measures for health, family, agriculture, and for government planning and administration.

Cisse, M.

- 1981 Rural Health Project Evaluation, Sociologist's Report. December 1981.

This report is a critique of the implementation of the Projet Sante Rurale (PSR) after three years of operation in the cercles of Yelimane and Koro. The author examines the accomplishments of the project, the village health workers' activities and training, and the relationship between the PSR and the villagers. He concludes that the PSR is perceived by the villagers as a curative system, which they needed; that the nature of the records kept makes it difficult to determine the degree of penetration of the project into the various categories of village populations; and that the populations do not feel any obligation to support the project, other than paying for medicines.

DuBois, V.D.

- 1974 "The Drought in West Africa. Part II: Perception, Evaluation, and Response," New York: American Universities Field Staff, Inc.

Review article.

The author presents information gleaned from private agencies, governments, and news and other publications, to present a chronology of events related to the Sahelian drought of the early 1970's. He includes commentaries on the effectiveness of relief efforts and on the potential political impacts of the drought. Data are presented for Mali, Senegal, Mauritania, Chad, Niger, and Upper Volta.

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FAO

- 1979 "The State of Food and Agriculture 1978." Rome: Food and Agriculture Organization of the United Nations, FAO Agriculture Series No. 9.

This document presents FAO data on food and agricultural production, food prices, food aid, fisheries, forestry, international trade, and investment. The section on problems and strategies in developing regions addresses specific production goals and constraints. Most data are presented aggregated on a regional or economic basis.

FAO

- 1977 "The Fourth World Food Survey," Rome: Food and Agriculture Organization of the United Nations. FAO Statistics Series No. 11; FAO Food and Nutrition Series No. 10.

This survey, part of FAO's continuous work in assessing the world food situation, is based on the best data available. Most data presented in this report are aggregated by continent or by development categories. National data are given for agriculture and food production, and for calorie and protein supplies per capita. Calculations are made of the per capita calorie requirement for each nation and for the "critical limit" of calorie intake (set at 1.2 times the estimated Basal Metabolic Rate) below which an individual is nearly certain to be calorie deficient.

Gray, C. and Sankare, N.

- 1981 Notes Towards an Economic Analysis of the Mali Rural Health Project (PSR). Cambridge, MA: Harvard Institute for International Development; and Bamako, Mali: Institut de Productivite et de Gestion Previsionelle, June 1981.

This report describes the goals and operations of the project, as well as outlining a plan for evaluating it during its final phase to determine whether the project should be continued or extended. The economic analysis includes details of operating costs.

Kulakow, A.M.

- 1979 Rural Radio in the Sahel: A Survey of Six Countries. Volume I: Overview and Country Profiles. Washington, D.C.: Academy for Educational Development, July.

This study of rural radio in the Sahel was requested by the Institut du Sahel and was funded by the Sahel Development Program of the Africa Bureau, U.S. Agency for International Development. This report is a review of the survey by Mr. Kulakow, and is not the official report of the Institute. Mali was studied during site visits in June 1979.

Letarte, C.

1981 Note on the Training of Village Health Workers/HS, Koro: March 9-15, 1981.

This report describes in detail the training and personnel involved in preparing the "hygienistes-secouristes" (H-S) of the PSR project. Details are provided on logistics, participants, themes and curriculum, and an evaluation of the training process and suggestions for improving the program.

Licross (Licross/Voltags Steering Committee for Disasters)

1979 Medico-Nutritional Information on Disaster Prone Countries and Glossary of Common Illnesses. Brussels: International Research Center on Disasters Epidemiology, Unit of Epidemiology, School of Public Health, University of Louvain. September 1979.

This series of over 100 1 or 2-page "country fact sheets" was prepared by the Steering Committee to aid in prompt and appropriate responses to disasters; the accompanying glossary was designed for non-medical administrators. Each section describes a country's diet, nutritional deficiencies, medical supplies, health services, capacity for handling refrigerated drugs, and common illnesses. Regional and rural-urban distinctions are included where possible.

Mondot-Bernard, J.

1980a "Satisfaction of Food Requirements and Agricultural Development in Mali," Vol. I Results of Food Consumption Surveys. Paris: Development Centre of the Organisation for Economic Co-operation and Development (OECD).

Original data.

Method: Multistage stratified sample studied during two main seasons of the year. Food consumption survey included observations and a recall questionnaire. Other questionnaires gathered data on childbearing histories and feeding and weaning patterns of young children.

Sample: Within each village studied, seven compounds were selected to represent a range of incomes, and all individuals in the compounds were studied, a total of 1,522 individuals in the rural areas and 609 in urban areas.

Location: The country was divided into three zones, which were homogeneous in terms of agricultural production. In each zone, representative villages were selected by lot, although accessibility was required.

Food habits were studied in relation to various motivations, and a prospective study was attempted in order to determine the foods the population would like to be able to consume. The sociological study covers food taboos. Urban diets were found to be similar to rural

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ones, but slightly better-balanced; both derive a large portion of their calories from grains. Food composition tables were calculated by testing moisture content of foods and adjusting the food composition tables for Africa issued by FAO.

Mondot-Bernard, J., Monjour, L., and M. Karam

- 1980b "Satisfaction of Food Requirements and Agricultural Development in Mali," Vol. II: Results of Medical and Nutritional Surveys. Paris: Development Centre of the Organisation for Economic Co-operation and Development (OECD).

Original data.

Method: Biochemical analyses of blood and stool samples; weight, height, skinfold, arm and head circumference for children under age six; assessments based on National Center for Health Statistics/Center for Disease Control Reference Population for Anthropometry; maternal declarations of births and other fertility factors.

Sample: Hematology: 340 persons age 6 months to adults; stool samples: 621; anthropometrics: 139 children age 6 to 71 months; 555 women in fertility survey; 1750 maternal declarations of birth.

Location: Villages of Gakoura, Diabadji, Banankoro, and Sidougou N'Tjila: all phases; Bamako, Famsara, Tien el Barka and Tin Azir (malaria and parasites only); and Kokonto (parasites only).

This report is the medical section of the nutrition survey conducted in 1977 and 1978. The four villages are not necessarily representative of the population as a whole, and the authors caution against extrapolating the data. The study was conducted in two phases in order to account for seasonal variations.

Mondot-Bernard, J.

- 1981 "Satisfaction of Food Requirements and Agricultural Development in Mali," Vol. III: Results of Surveys on Workers' Activities and Calculation of Energy Expenditure. Paris: Development Centre of the Organisation for Economics Co-operation and Development.

Method: Subjects were followed for seven days; all activities were recorded and timed. Others were questioned about their schedules. Some data was collected during July and August, the time of rain and intensive agricultural activity; the remainder, during January through March, the dry season, when there was little agricultural activity.

Sample: Four individuals in each village studied: women; pregnant women or nursing mothers; men; and children age 8 to 12 years.

Location: 6 villages: Gakoura R.D., Diabadji, Banankoro, Sedougou N'tjilla, Kokonto, Tien el Barka, and Tin Azir. Data are presented based on villages, on the compound level, and on an ethnic basis.

Semega, D. and Toureau, S.

1980 Project to Combat Vitamin A Deficiency in Mali. Bamako: Ministry of Public Health, July 1980.

Method: Medical statistics were reviewed at the regional hospital and at two peripheral health units.

Sample: Records of 2794 children in Region I (Kayes) in 1979; 115,403 records over 1974-1980 in Region V (Mopti), which would include repeats if a child were seen in more than one year; and in Gao (Region VII), 108,252 records for 1974-1980.

Location: Hospitals, clinics and dispensaries in Regions I, V, and VII.

This survey was conducted to identify the extent of vitamin A deficiency in the regions studied, and to serve as baseline data for a planned intervention program. Baseline data and needs assessment include reviews of older studies of vitamin A status, and descriptions of resources in food, personnel, training institutions, and government organization. The proposed program would include intervention on many levels, including education in vegetable raising and cooking, fortification of staples or weaning foods, and direct supplementation with vitamin A capsules.

Sivard, R.L.

1979 "World Military and Social Expenditures, 1979," Leesburg, VA: World Priorities, Inc.

Not original data.

Using data from many sources, including WHO, USAID, and FAO, the author profiles nations, regions, and groups of countries by development status, to illustrate the dearth of social and human services worldwide and the large share of world resources spent on military activities. Calorie and protein supplies per capita were estimated at the retail level, after making allowances for animal feed, seed, storage and marketing losses, and waste.

TAICH

1980 "TAICH Country Report - Mali", American Council of Voluntary Agencies for Foreign Service, Inc. Technical Assistance Information Clearing House.

The Technical Assistance Information Clearing House of the American Council of Voluntary Agencies for Foreign Service, Inc. solicits information from U.S. non-profit agencies concerning the funding, scope, and nature of their development programs. The report discusses the project of 22 agencies, including one directly related to the nutritional well-being of mothers and infants.

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U.S.A.I.D.

- 1981 United States Agency for International Development (USAID) Activities in Mali: A Briefing Paper. February 1981.

This summary report describes the U.S.A.I.D. mission to Mali, its goals and strategy, and its activities by sector. Projects in agricultural development, general development, and the Sahel Institute are described.

U.S.A.I.D.

- 1976 West Africa Fertilizer Study. Vol. 3: Mali. Florence, Alabama, U.S.A.: International Fertilizer Development Center.

This report focuses on the current and projected agricultural production of the nation, estimating current and projected fertilizer production and needs. Also included are an overview of the population and agriculture in terms of food needs.

USDA (U.S. Department of Agriculture)

- 1978 Food for Peace: 1977 Annual Report on Public Law 480. Washington, D.C.: U.S.D.A., July 10, 1978.

This report describes the PL-480 Title I (sales) and Title II (donations) activities for Fiscal year 1977, giving activity summaries and highlights, and tables showing the commodities, countries, recipient categories and sponsors of food distribution programs.

U.S.D.H.E.W.

- 1973a "Nutrition Surveillance in West Africa," Atlanta, GA: Department of Health, Education, and Welfare, Public Health Service, Center for Disease Control, July-August.

Original data.

Method: Heights and weights were taken on children, ages unspecified.
Sample: 35 in Timbuctu; 50 nomads and 124 sedentary children in July in Gao; 51 nomads and 112 sedentary in September in Gao; 126 sedentary children in August in Nioro; and 182 sedentary children in August in Nara. Edema exam: 25 children (0-4 years) in the Timbuctu nomad camp and 19 in the Gao nomad camp. 209 children from sedentary groups.
Location: Villages in Nara, Nioro, and Gao, and nomads from government camps in Gao.

This series of reports from the field was submitted by the CDC team sent to assess the nutrition situation in Sahelian countries (Mauritania, Niger, Mali, and Upper Volta) and to assess food distribution.

U.S.D.H.E.W.

- 1973b "Nutrition Surveillance in West Africa, Summary #7," Atlanta, GA: Department of Health, Education, and Welfare, Public Health Department, Center for Disease Control, August 31.

U.S.D.H.E.W.

- 1973c "Nutrition Surveillance in West Africa, Summary #6," Atlanta, GA: Department of Health, Education, and Welfare, Public Health Department, Center for Disease Control, August 27.

West African Conference on Nutrition and Child Feeding

- 1968 "Proceedings of the West African Conference on Nutrition and Child Feeding, Dakar, Senegal, March 25-29, 1968," Sponsored by the Republic of Senegal and the United States Agency for International Development.

This conference brought together planners, administrators, and technical personnel from 13 English and French-speaking countries of West Africa to discuss problems of food supply and nutrition, to exchange information, and to review past developments and perspectives for the future. Each country presented a report on food production and nutrition activities according to a prearranged outline. Experts presented discussions of six major themes, including Nutrition and Child Feeding, and Nutrition and Education. Committee meetings and reports followed the six themes.

WHO (World Health Organization)

- 1980 "The incidence of Low Birth Weight: A Critical Review of Available Information," World Health Statistics Quarterly, 33 (3): 197-224. Division of Family Health, World Health Organization, Geneva.

This review article, in French and English, summarizes studies of low birth weight incidence and causes in discussion and tabular form. Additional tables present data on total live births and low birth weight rates in specific countries and on regional bases. Extensive bibliography.

World Bank

- 1981 World Development Report, 1981. Washington, D.C.: International Bank for Reconstruction and Development/The World Bank, 1981.

This document is the fourth in an annual series assessing key development issues; the focus of this year's work was the international context of development. Chapters are devoted to trade, energy, finance, human development, and countries' experiences in managing adjustment. Annexes provide tables of country-specific development indicators, including factors in population, economics, labor, and government budgets. The per capita supply of calories was

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computed from the net food supplies available from domestic production, imports less exports, and changes in stock; net supplies exclude animal feed, seeds, quantities used in food processing, and losses in distribution. FAO requirements are based on physiological needs for normal activity and health considering environmental temperature, body weights, age and sex distribution of the population, and allowing 10% for waste at the household level. The World Bank notes that this document should not be quoted as representing the views of the Bank, nor does the Bank accept responsibility for the accuracy or completeness of the report.

World Bank

- 1980 World Economic and Social Indicators. Washington, D.C.: World Bank, Economic and Social Data Division, Report No. 700/80/2, October 1980.

This document summarizes, in tabular form, aggregate and country-specific data on economic indicators such as commodity prices, consumer prices, and industrial production as well as socioeconomic indicators. The World Bank notes that this document should not be quoted as representing the views of the Bank, nor does the Bank accept responsibility for the accuracy or completeness of the report.