

DETERMINANTS OF FOOD STATUS AND MATERNAL TECHNOLOGY
AND THEIR EFFECTS ON THE GROWTH OF RECENTLY WEANED CHILDREN
IN RURAL WEST PROVINCE (CAMEROON)

BY

PHILOMINA NDAWOH GWANFOGBE

Licence (B.Sc.,) Yaounde University, 1975
Diplome D'Etudes Superieur, Yaounde University, 1976
M. S. P. H., Tulane University, 1981

A DISSERTATION

submitted in partial fulfillment of the
requirement for the degree

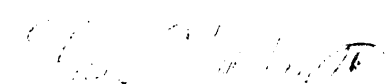
DOCTOR OF PHILOSOPHY

Department of Foods and Nutrition
College of Human Ecology

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1994

Approved by:



Major Professor



ABSTRACT

A11212 584265

Knowledge of the household food security of a community is necessary for understanding nutritional status of individuals and for effective policy planning.

Food status of 300 rural households in West Province, Cameroon, with children between 15 and 36 months of age was studied. Most (47.9%) of the households were low food secure, 36.3% moderately food secure, and only 16.6% highly food secure. Household food security was positively correlated ($p < 0.05$) with total number of food crops grown; total number of days per week food crops were eaten; total number of days per week fruits, green leafy vegetables and other vegetables were eaten; and negatively correlated ($p < .0000$) with total number of food crops bought by households.

Malnutrition still exists in the rural areas of the West Province of Cameroon. We observed that 27% of the children were stunted, 17.3% wasting, and 0.3% acutely undernourished. Household food security as measured did not independently influence growth status (chronic or wasting) of children, although it interacted with other variables to explain differences in undernutrition. Household food consumption practices (variety and frequency of eating various foods), good hygienic and health practices, and weaning ages of children were associated with reduced stuntedness.

Interaction among variables indicated that areas of maternal technology such as mothers experience, physically assisting the child at meals, and preparing and serving

various foods frequently contributed positively to good growth of children.

There were more children (36.7%) with good growth in low food secure households (positive deviants) than there were stunted children (4.7%) in high food secure households (negative deviants). More mothers of positive deviant children left their children with other people at an older age, had better hygienic practices, and served food to their children before themselves than mothers of negative deviants children.

Because some culturally acceptable practices such as quality of dirt disposal, age at which mother started leaving the child at home, serving position of the child, mothers' experience, physically assisting the child at meals, frequently preparing and serving various food, and washing of hands were found to be different in households with adequately nourished and poorly nourished children these areas can be emphasized in nutrition education and intervention programs.

TABLE OF CONTENTS

<u>TITLE</u>	<u>PAGE</u>
List of Tables	iii
Acknowledgements	iv
 Chapter 1. Literature Review	
Malnutrition in Developing Countries	1
Designing Nutrition Intervention Programs	4
International Measurements of Nutritional Status	12
Application of International Standard to Cameroon	17
Nutritional Status of Children in Cameroon	19
Nutritional Status of Children in the West Province	24
Definitions of Food Security	29
Dimensions of Food Security	30
Food Insecurity	31
Measurements of Food Security	32
Levels of Food Security	36
Measurements of Household Food Security	38
Food Security, Food Consumption and Nutrition	41
Food Security and Nutritional Status	43
Women, Household Food Security and Consumption	46
Maternal Technology and Positive/Negative Deviants	48
Mothers of Well-nourished and Malnourished Children in a Community	52
Overall Objectives	59
Specific Objectives	59
Hypothesis	59
Sub-hypotheses	59
References	60
 Chapter 2. Food Status in the West Province: Production, Supplies and Consumption	
Abstract	75
Introduction	76
Materials and Methods	80
Results and Discussion	82
References	102
 Chapter 3. Household Food Security, Maternal Technology, and Child Nutritional Status	
Abstract	105
Introduction	106
Materials and Methods	111
Results and Discussion	120
References	136

Chapter 4. Recommendations from the Research

Recommendations	141
---------------------------	-----

Appendix

I -- Questionnaire	145
II -- Sampling Plan	194
III -- French version of Questionnaire	199

LIST OF TABLES

Chapter 2

Table 1	Percentage of households that produce, ate, sold saved or give gifts of various crops	85
Table 2	Percentage of household that raised, ate, and/or sold animals and average number of animals per household	86
Table 3	Household consumption and acquisition of various foods	88
Table 4	Household consumption of food categories during times of scarcity	91
Table 5	Food crops that households wanted, but were unavailable	92
Table 6	Sources of income and percentage of women who earn income from those sources	94
Table 7	Types of expenditures on non-food items	96
Table 8	Percentage of households and the number of crops that lasted all year round	98
Table 9	Variable means and differences among levels of food security	99

Chapter 3

Table 1	Food security indices	119
Table 2	Number and percentage of stunted and wasting children in low, moderate, and high food secure households	121
Table 3	Percentage of stunted children for some consumption and maternal technology variables	124
Table 4	Classification of households by food security and stuntedness	133
Table 5	Significant variables that explained positive and negative deviant children	135

ACKNOWLEDGMENTS

I wish to express my sincere thanks to my major professor Dr. Edgar Chambers IV whose advice, constructive criticism and encouragement given me in times of need were valuable for my progress and successful completion of my Ph.D program.

My appreciation is given to my committee members, Dr. David Balk, Dr. Walter R. Schumm, Dr. Carol Ann Holcomb, and Dr. Fred Schwenk for critical reading of the dissertation and providing their expertise in developing this manuscript in a better format. Dr. Meredith Smith also merits appreciation for her input at the embryo stage of the project and especially for helping get started in Cameroon.

To thank my host families Laurie and William Tobald, Adyce and Norman Tinkler, Melinda and Steve, for their wonderful hospitality, taking care of my children, giving me time to put in my studies, for insulating me from homesickness, and providing me with a loving and caring environment.

I would like to thank Dr. Sarah Gwangwa'a, Dr. Peter Ndumbe, Dr. Kouemeni Lysette, Dr. Rikong Honorine, Mr. and Mrs. Charles J. Ndifon, Cecilia M. Chiangong, Tchendjou Francois, the interviewers, community development and village extension workers in the six sub-divisions selected, Mr. and Mrs. Samuel Fothung, Mr. and Mrs Fang, and Ndasi Florence Manguh whose continuous support in Cameroon was vital to successful data collection in the field.

I thank Dr. Katharine Grunewald for her patience and help for the many times I have bombed in to her office with emergencies without prior notice.

The generosity of the donors of research funds: The Rockefeller Foundation and the United States Agency for International Development is deeply appreciated.

I appreciate my affectionate children, who sacrificed a lot for me to complete my graduate study in Kansas, the land of OZ (Ahs).

I thank God for creating all the above named persons and me and I pray that if this dissertation means victory, He will get the glory from it in some way.

CHAPTER 1

LITERATURE REVIEW

MALNUTRITION IN DEVELOPING COUNTRIES

Malnutrition, specifically undernutrition, is wide spread among young children in developing countries and in poor communities of developed countries. In spite of the marked scientific improvement in the diagnosis and treatment of the disease (Ojofeitimi, 1987) and substantial efforts to alleviate suffering and to improve the quality of life (Maribe, 1992), malnutrition still is very common in those areas. More than 340 million people in the nations of Africa, Asia, and Latin America are affected by severe undernutrition (Adams, 1992). Barrett et al. (1982) and Garfield and Rodriguez (1985) suggested that if all categories of malnutrition among children under five years are considered, the prevalence of malnutrition in these children may be as high as 85% in many developing countries. According to Food and Agricultural Organization's (FAO) Fifth World Food Survey (1987) "... the proportion of the population suffering from undernutrition has declined, even though the absolute numbers of the undernourished have increased..."

A recent report (FAO, 1992) indicated that approximately 192 million children under five years of age suffer from acute or chronic protein-energy malnutrition. According to the

report, the percentage of underweight children under 5 years of age has declined in the last 15 years, but the absolute numbers have remained fairly stable because of population increases. In Africa, this absolute number has increased; the percentage of underweight decreased from 35 to 32 but the absolute number of undernourished children increased from 8.3 million to 12.2 million. In sub-Saharan Africa, the number of underweight children increased approximately 25% from 1980 to 1984 (UNICEF, 1985).

By 1980, the total number of infant and child deaths was estimated at 2.3 and 1.4 million respectively in mainland African countries (United Nations Organization (U.N.O.) report, 1987). The report stated that sub-Saharan Africa was the only region in which the total number of infant and child deaths rose over the ten year period between 1970-75 and 1980-85. According to the UNO's (1987) first report on world nutrition, "malnutrition generally has increased in much of Africa, remained stable in South America, and decreased in Asia and Central America". That report concluded that although infant mortality rates have fallen rapidly throughout the developing world, and by half in some countries, the number of infants and pre-school children dying each year in Africa has risen. Malnutrition contributes to a substantial proportion of many of the deaths.

The potential of protein-energy malnutrition to lower disease resistance, productivity, and physical and mental

development has been well documented (Scrimshaw et al., 1968; Scrimshaw, 1971; Cravioto and Delicardie, 1973; De Muralt, 1973; Wenlock, 1981; Dattal et al., 1988; Marangu, 1989; Zeitlin et al., 1990; Adams, 1992; FAO, 1992). Of the 340 million people suffering from undernutrition in Africa, Asia, and Latin America, an estimated 140 million children suffer from stunted intellectual and physical capacity. Consequently, governments of many countries are giving political, as well as humanitarian, priority to improving the nutritional status of young children, although the political urgency is not always reflected in budgetary allocations (Obi, 1976 and Csete, 1989) meaning that political decisions on health and nutrition are postponed (Monckeberg, 1992). Another problem is that policies and programs to combat malnutrition often are designed without sufficient knowledge of the most important determinants of child nutritional status. Mata (1978) states, "Individuals responsible for advice on specific actions commonly do not know enough about the origin and nature of the problem". Caliendo et al. (1976) recognized the scarcity of data available for designing appropriate programs. They indicated that it was obligatory to take an interdisciplinary approach in further research in order to avoid exclusion of some of the factors involved, which could lead to misplaced emphasis in intervention programs.

PROBLEMS IN DESIGNING NUTRITION INTERVENTION PROGRAMS

The nutritional status of young children is a reflection of the well-being of the family, the community and nation, and the primary indicator of successful development of a country (Williams, 1988). Unfortunately, nutrition improvement programs have been running ahead of the conceptual understanding of the determinants of malnutrition (Rukuni and Eicher, 1987). Those authors thought that posing the malnutrition problem either as a food production (lack of available food) or a poverty problem (Hiwa, 1988) was an oversimplification of the issues involved. For example, Behrman and Wolfe (1984) found that higher income, up to a threshold, was a strategic factor in improving household nutrition at low levels of income. However, to their surprise, as income levels continued to increase, the impact of income on nutrient demand faded and other factors such as women's schooling, and non-nutritive characters of food such as taste, convenience, status conferral and time intensity, all played a role in influencing the nutritional status of households. In an agricultural community in rural Mexico, DeWalt (1983) showed that although increasing income was associated with consumption of purchased foods, especially foods of animal origin, and not with the consumption of staple foods produced within the household, diets that included purchased foods did not necessarily meet nutritional needs more adequately than diets which relied on agricultural

production and gathered foods. Conceptual and operational problems are causing some donors to pull back from nutrition improvement projects. For example, in fiscal year 1986, the World Bank approved only one new nutrition project worldwide - a 33.4 million dollar (U.S.) nutrition and community-health project in Indonesia (World Bank, 1986a). Donors are becoming aware that nutrition interventions are dependent on other factors, such as improved health and hygienic practices and clean water, for successful execution (World Bank, 1986a). In the case of pre-school children, knowledge, attitudes and current practices of mothers related to food choices and selection, food preparation, feeding techniques and general child care are other factors to be considered.

Three factors are required to design an effective program to combat malnutrition: 1) knowledge of who the malnourished are, 2) what they eat or do not eat, and 3) why they eat or do not eat what is available to them. Traditional nutrition studies often have attempted to determine in which groups (children from 0 to 5 years, pregnant and/or lactating mothers, adolescence, and most recently, the elderly) malnutrition is common (Weerasinghe and Karaleidde, 1982; Oni et al., 1991; Dattal et al., 1988; Hortwitz, 1992; Adams, 1992).

Some data on what is eaten have been collected from dietary recalls and records, food frequency and food consumption studies and surveys. However, data on why foods

are eaten generally are speculative and still scarce in both developed and developing countries. Basic information on the determinants of chronic malnutrition and on the socioeconomic characteristics of the malnourished is sparse in much of Africa.

A developing nation needs to keep informed on the food and nutrition status of its people so that it can anticipate problems in both production and marketing and can take steps to assure adequate supplies, equitable distribution, and efficient utilization of food (Burk and Ezekiel, 1967). The first requirement for such information is a knowledge of the factors that underlie and influence food consumption practices, i.e., basis on which people choose their food, beliefs and cognition underlying local food ways of the people (Burk and Ezekiel, 1967; Reddy, 1968; Jenkins and Heywood 1984). It is recognized that the prevalent beliefs and therapeutic practices (Kumar et al., 1985) and the environmental and attitudinal factors contributing to existing food consumption patterns (Reddy, 1968) must be studied in order to develop a more effective, acceptable, and lasting intervention program that fits into an existing system of thoughts and beliefs.

Micro-level ethnographic studies of all kinds (households, community, dietary habits) have been recommended as relevant for effective policy recommendations in development planning, particularly in the light of current

socioenvironmental and economic crises in Africa (Dei, 1990, 1991). To take an interdisciplinary approach requires going beyond food production, availability and consumption to understanding why people eat what they eat (Burk and Ezekiel, 1967). This involves using combined methods of ethnography and nutrition in a single study. We need to analyze the food habits of persons to aid in identifying salient characteristics of their food patterns and to determine the extent, location, and the reason behind inadequacies (if any) in their diet if we intend to improve their nutritional status (Caliendo et al., 1976).

A more meaningful approach to such research lies in the investigation of positive elements existing in the population's present food habits and to work within that given framework to produce healthy, acceptable changes (Sanjur and Scoma, 1971). "Food habits are among the oldest and most deeply entrenched aspect of many cultures and cannot, therefore, be easily changed, or if changed, can produce a further series of unexpected and often unwelcome reactions" (Cassel, 1957). However, this only can occur when the changes do not fit into the existing system of thoughts and beliefs within which the changes are made (Reddy, 1968). For instance, Gerlach (1964) described the difficulties of a government program distributing free powdered milk among the Nyika (Bantu-speaking peoples of the Kenya and Tanganyika Coast). The distribution of powdered milk for infants and the

sick ran counter to certain sexual taboos and to the local belief that animal foods were suitable only for healthy adults. The result was increased African enmity towards Indian merchants and the government agents who made this distribution possible. That retarded the development of native African traders in food. In Sri Lanka, temporary food avoidances during pregnancy, puerperium (period or state of confinement during and just after child birth), and lactation that were influenced by beliefs, attitudes and customs were able to persist in spite of innovations (urbanization) (Weerasinghe and Karaliedde, 1982). However, those authors observed that a majority of avoidances affected only those foods whose consumption was optional, and not staples. They also noticed that no restrictions were apparent when a new fruit was introduced. Burgess (1961) suggested that the battle against hunger and malnutrition must take account of food habits and must include efforts to get people to want better diets and to help them improve their consumption practices in addition to efforts to increase agricultural production and improve distribution.

The importance of socio-cultural influences on food patterns such as production, processing, selection, consumption, and utilization of the portions of the available food supply has long been recognized (Mead and Guthe, 1945; de Garine, 1972). Messer (1989) noted that "a better understanding of socio-cultural factors in food selection can

contribute to the modelling of, and solutions to nutrition problems". General food beliefs that are deeply entrenched in the minds of any group or community and that are practiced by that group can, therefore, significantly influence the nutritional status of the community and become a factor of importance in any nutrition program (Weerasinghe and Karaliedde, 1982). Foods habits and attitudes of any particular human, which are the best predictors of food preferences, are primarily determined by cultural processes (Rozin, 1982). Food habits are determined by factors such as attitudes, beliefs, customs, traditions, knowledge and understanding a person has about food and its relation to health (Rao, 1986). Messer (1989) and Ellsworth and Shapiro (1989) observed that the desire to obtain food revolves around seasonal patterns of celebration and ceremonies largely determined by tradition and culture. Sahn (1989) stated that "Whether it be during religious holidays or other festivals, there may indeed be regular periods when either food consumption and sharing increase, or changes in the composition of the diet are attributable to traditional beliefs and culturally determined food practices".

Many researchers studying food patterns of the developing countries stressed the importance of cultural factors on food consumption (Burk and Ezekiel, 1967; Mata, 1980) although very few attempted to quantify any of the factors. Those authors suggested that people's values, attitudes, and cultural

practices often may be more important determinants of food consumption, which directly influences growth, than income, urbanization and/or food availability. Messer (1989) remarked that "Beyond ecological and economic availability, traditional knowledge and beliefs about the qualities of foods may also affect eating behavior in particular seasons". Eating behavior directly influences nutritional status or growth. It has been documented that people have beliefs about healthfulness or harmfulness of some foods in particular seasons or physiological conditions such as pregnancy, lactation or child growth. Messer pointed out that anthropological and economic studies seem to indicate that among households within the same culture and socioeconomic constraints, some fare better than others.

Several studies (Jelliffe, 1962; Fonaroff, 1968; Ojofeitimi, 1982; Jenkins et al., 1983; Jenkins and Heywood, 1984; Ojofeitimi et al., 1987 and Jenkins, 1988) have suggested that cultural concepts and practices concerned with child feeding and care are responsible for the observed poor growth in preschool children in developing countries especially in the rural areas. The underlying assumption is that the observed malnutrition may be due to culturally sanctioned food prohibitions and requirements (Jenkins, 1988) and/or ignorance about nutritional needs of children and deep-seated wrong beliefs regarding feeding of sick children (Dattal et al., 1988). Ojofeitimi et al. (1987) observed that

until the 1980's, studies specifically planned either to monitor or evaluate growth and health care of children in rural areas did not take into consideration the importance of cultural food practices and food habits as causes of childhood malnutrition. Yet, Mata (1980) indicated that traditional cultures offer positive features for child growth and survival, enabling them to thrive under adverse environmental conditions and develop into individuals who are healthy in body and mind.

Sharman (1970), observed that the care and skill with which women rationed or distributed food and not household food supply determined which households were seasonally or permanently malnourished or well-nourished. Her comparison of rural Ugandan households indicated that individual household food sufficiency varied seasonally according to the management skills of the female household member.

Few studies (Munoz et al., 1974; Romero de Gwynn and Sanjur, 1974; Alvarez et al., 1982; Chaiken, 1986) have tested the assumption that malnutrition may be partly dependent on culturally acceptable food practices with data on both malnourished and well-nourished children in a single study. Jenkins (1988) urged nutrition researchers to go beyond the mere catalogue of food taboos usually presented and discover the cultural context which underpins and gives meaning to food beliefs on the one hand and to collect behavioral data on the other. She emphasized the need to document and measure food

beliefs and practices before linking nutritional and growth outcomes to them. Although there is some evidence to support the idea that cultural practices affect nutritional status of children, the hypothesis warrants empirical testing (Jenkins and Heywood, 1984) because little information is provided on either local behavior or accompanying beliefs or the association between traditional concepts and feeding practices and nutritional status of children.

INTERNATIONAL MEASUREMENTS OF NUTRITIONAL STATUS

For practical purposes, anthropometry is the most useful tool for assessing nutritional status of children (WHO Working Group 1986). However, growth deficit is not necessarily the most sensitive indicator of inadequate nutrition (Torun and Viteri, 1981) because marginally inadequate energy intake may reduce physical activity before there is any impairment of growth. "Growth and achieved size are markers of many influences and constraints operating in early childhood and not specific markers of nutritional (food) problems" (Beaton, 1989). The extent to which genetic factors, both within and between populations, may affect growth has been recognized and cannot be ignored. With these caveats, the WHO Working Group (1986) recommended that we continue to accept the central role of anthropometry in nutritional assessment, particularly of children in groups or communities. In clinical practices, biochemical and immunological tests are other methods used in assessing nutritional status.

Waterlow et al., (1977) recommended that anthropometric measurements be reported in relation to international reference values. They recommended the use of the reference population defined by the US National Center for Health Statistics (NCHS) (US Food and Nutrition Board, 1974). This recommendation was subsequently endorsed by WHO (1983).

Anthropometric measurements (heights, weights, mid-arm circumference, triceps skinfold, head circumference) and age of young children provide objective indicators of their nutritional status. The three practical indicators of nutritional status that are commonly used and can be derived from these measurements are: height-for-age, weight-for-height, and weight-for-age. However, (FAO, 1990) recommended using both height-for-age and weight-for-height as indicators of nutritional status because weight-for-age does not differentiate between acute wasting (low weight-for-height) and chronic (low height-for-age) malnutrition. Also, if height-for-age and weight-for-height are known, weight-for-age gives no additional information because it cannot indicate whether malnutrition is due to acute or chronic low food intake. Weight-for-age often is used by health services to observe progress in nutritional status and growth of children, but its value as an indicator is limited when only a single measurement is available as is often the case in cross sectional surveys. FAO (1990) also suggested that upper mid-arm circumference is a less reliable indicator of

nutritional status because the measurement is small and errors tend to be proportionally large. However, it can be used when age and weight or height cannot be measured.

A child's weight indicates her/his nutritional status when it is compared to the median weight of normal or 'reference' children of the same sex and age or height (FAO, 1990). Similarly, a child's height can be compared to the median height of 'reference' children of the same sex and age. The median (or 50th centile) weight and height of 'reference' children called 'reference values' provide a yardstick against which other children can be compared but are not necessarily 'ideal' or 'standard' values. The international reference population known as the NCHS/CDC/WHO standard was established from the anthropometric measurements of children less than 5 years of age in good health. The prevalence of malnutrition among those children was 1.0%. (From here on in this dissertation, the international reference population will be referred to as the international reference standard or simply international standard unless otherwise specified.) It was agreed that the international standard values could be used for any group of children of the same age group who are not sick from any part of the world provided that their growth model is similar to that of the standard (Waterlow et al., 1977; NCHS 1974; and WHO 1983, 1986). However, this does not exclude the use of local values if reliable ones exist. Data from the reference group were normalized to follow a normal

distribution in which the median and the average were identical.

FAO (1990) suggested how measurements can be expressed as anthropometric indicators. A weight or height becomes an indicator when it is expressed as one of the following: a percentage of the reference value; a standard deviation from the reference (median) value, sometimes called Z-score; or compared to a selected cut-off value. A percentage of the reference value is useful when examining individual children or examining the distribution of children within a population. Similarly, Z-scores, which are more meaningful than percentages, can be used for individuals or to study the distribution of people. However, the Z-score generally is considered to be difficult to understand and, therefore, less useful. Cut-off values, generally 80 and 90 percent of the median reference value or the third centile or two standard deviations from the median reference value, are also especially useful when a comparison of people with acceptable versus unacceptable weights or heights is made.

Height-for-age is an indicator of growth retardation usually referred to as stuntedness. Stunted children usually are smaller/shorter than children of the same sex and age. This occurs when a child has not had enough food to eat for a long period of time, has had a chronic sickness for a long period, and/or repeated occurrences of ill health. Stunting is more common in older children (3-5 years) because there has

been a longer period of slow height growth (FAO, 1990). While the height of such a child is lower than the average for his age, his weight may be normal for his height. For example, a stunted child can have a normal weight-for-height. Consequently this form of undernutrition (low weight-for-height) is not always "visible" in a population because a stunted (low height-for-age) child of three years can pass for a two year old who is well nourished (has normal weight-for-height). Children with height-for-age situated at less than 2 standard deviations of the median reference standard are considered suffering from chronic undernutrition while those at less than 3 standard deviations of the median reference standard suffer from severe chronic undernutrition.

Weight-for-height is an indicator of current nutritional status. Low weight-for-height (current, acute, or wasting) can result from insufficient food intake for a short period preceding the measurement, or sicknesses which has provoked severe weight loss such as diarrhoea or anorexia associated with sickness. Children with weight-for-height less than two standard deviations of the median reference standard have attained acute undernutrition and children with weight-for-height less than three standard deviation of the median reference standard are suffering from severe acute undernutrition.

A child's weight (or height) also can be classified as above or below a specified 'cut-off value'. The cut-off

values chosen depend on local conditions and needs. FAO (1990) has suggested the cut-off values to distinguish malnourished from normal children:

- * height-for-age 90% of the median reference standard
- * weight-for-height 80% of the median reference standard
- * weight-for-age 80% of the median reference standard

These percentage values are approximately equivalent to two standard deviations below the reference values.

APPLICATION OF INTERNATIONAL STANDARD TO CAMEROON

The team that conducted the 1978 Cameroon National Nutrition Survey measured a "special group " of 506 children under five years from selected areas in Douala. Those children were from families with relatively high socio-economic status (better nutrition and less frequent sickness) and it was assumed that their nutritional status was superior relative to the rest of Cameroon in order to serve as a comparison to the international standard. The results of their measurements were compared with those of the international reference group of children to confirm that the international reference could be used for Cameroon children. Based on the international standard, out of the 506 children, only 4.2% were chronically malnourished (<90% of the median reference standard), none with acute malnutrition, and 3.6% were underweight (<80% of the median reference standard). The National Nutrition Survey (1978) indicated 22.1% chronic undernutrition, 1.0% acute undernutrition, and 21.1% under

weight. In general, total prevalence of malnutrition in Cameroon at the time was 5 times greater than that of the special group, indicating that given favorable conditions, the nutritional status of Cameroon children could be ameliorated. The mean curve of the special group, in particular that of weight-for-age corresponded directly to 100% of the median reference. A low total prevalence of malnutrition (3.9%) found in the special group also was an indication that the anthropometric values of the group corresponded with those of the median reference. The data suggested that if given the chance to grow to their genetic potentials, Cameroon children would be less stunted and less wasted.

Similarly, Rikong et al. (1990) determined the nutritional status of 439 children in two private schools in Yaounde (capital of Cameroon). The authors observed that the heights and weights of the majority of the children were above 100% of the median reference standard. Weights were especially high, averaging 105% of the reference for children 2 to 5 years and 108% of the reference for children 6 to 8 years. No cases of weight-for-height less than 85% of the reference standard were observed. On the contrary, 7.3% of the children between 2 to 5 years and 10.0% of the 5 to 8 year olds were obese (>120% of the median reference for weight-for height). Because only parents who are in a high socioeconomic category could afford to send their children to such schools, their nutritional status was assumed to be superior.

The results of the two studies in Douala and Yaounde indicated that the anthropometric values of those children were comparable to those of the reference population and, thus, confirmed the use of international reference values as a yardstick to determine nutritional status of Cameroon children.

NUTRITIONAL STATUS OF CHILDREN IN CAMEROON

A National Nutrition Survey was conducted in Cameroon from October 1977 to April 1978. The investigators derived their population estimates from the 1976 census results and stated that approximately 16% of the total population of Cameroon in 1977 were children under five years. They surveyed a total of 5689 children aged 3 to 59 months and their results indicated that 22.1% were chronically malnourished (<90% of the reference standard), 1.0% acutely malnourished (<80% of the reference standard) and 21.1% underweight. In general, chronic undernutrition was higher in rural areas (22.4%) than in urban areas (19.4%). The prevalence of chronic undernutrition was highest in the rural West Province (30.8%) while the percentage of underweight children was highest in the North Province (27.2%) and second highest in the West Province (22.0%). On the whole, the West Province had the greatest amount of malnutrition both in quantity and in quality in the rural area.

The food situation in the West Province in 1978 suggested that malnutrition there was not caused by an overall per

capita food shortage at the market or province level (Nkwain et al., 1988). Whether the malnutrition was caused by a lack of food security for children or some factors related to maternal "technology" is not known. Since the National Nutrition Survey, no large studies have been conducted in Cameroon in general or in the West Province in particular. Spot studies on the nutritional status of children have been carried out in the West Province and in other parts of the country. The nutritional status of children from 0 to 5 years was studied by Alim (1975) in Garoua in the North Province; Lantum (1977) in the North West and Central Provinces; and Moukam (1979) in rural villages near Ngoundere in the North Province. Their results indicated that the percentages of children suffering from chronic undernutrition and underweight (24.3% and 27.5%) were higher than those found in the National Nutrition Survey (22.1% and 21.1%). Although none of those three authors indicated collecting any data on mothers' knowledge and practices, they attributed the observed malnutrition to inadequate knowledge of infant nutrition especially during the weaning period, parasitic and infectious diseases, food shortages, and short length of breast feeding. However, all three studies had an potential biases because of selection procedures. Alim carried out the study in a maternal and child health center while Lantum and Moukam conducted their studies by having mothers and children come to central "collection sites".

In 1983, Fomukong and Toko working separately in the Ngendzen village in North West and in the Mokonje Rubber Estate in South West Provinces respectively, recorded 34.4% and 24.2% stunted cases and 10.6% and 16.6% acute cases of child malnutrition. Both stunted and acute cases were higher than those (22.1% stunted and 1.0% acute) observed in the 1978 National Nutrition Survey.

Moitoka (1983) investigated the effects of food availability on the nutritional status of children aged 0 to 23 months in Gazawa, Extreme North Province and reported 46.3% chronic malnutrition in September and 51.3% in December. She did not indicate whether there was a significant difference between the two months or not. However, during the rainy seasons (from June to September) there is low food availability in this area (Bergeret et al., 1959). She attributed the malnutrition in Gazawa to socio-cultural practices of the people and seasonal availability of food, although she did not mention how these were measured.

Rikong et al. (1985) took anthropometric measurements of 222 children aged 0 to 23 months on a monthly basis for 13 months in a rural area (Mvolye) near Yaounde, in the Central Province. During this period of time these children were regularly vaccinated and treated for their common diseases and their mothers were educated on child care and appropriate feeding practices. Operations were carried out at village collecting centers where the women were told to gather

monthly. The average weight-for-age and height-for-age of these children were around the upper limits (100%) of the median reference standard for the first six months after which they decreased slightly with age. Based on the international reference standard, the prevalence of chronic, acute, and underweight forms of protein energy malnutrition were only 5.4%, 0.9%, and 12.6% respectively, reasonably lower than what was observed in that Province (chronic, 18.8%; acute, 0.7%; and underweight, 14.8%) in the 1978 National Nutrition Survey. No cases of severe malnutrition were encountered. The authors concluded that in general, malnutrition was not a problem in this area despite the village condition and the low socioeconomic conditions. They attributed that finding to regular surveillance of growth, early management of childhood diseases, and health and nutrition education given to the mothers during the period of study.

Gwangwa'a et al., (1989) using the international reference standards, recorded 43% cases of obesity in infants up to one year in rural Awing, North West Province. The authors found 18.3% chronic and 4.7% acute cases of undernutrition. The chronic cases were lower than those found in this region (24.2%) in the 1978 National Survey, while the acute cases (4.7%) were higher than in 1978 (0.7%) for the province. Generally, these findings of obesity and lower chronic malnutrition were an indication of improved eating by the children studied. It was interesting to have found such

a high percentage of obesity, a form of malnutrition most common in children in developed countries and urban areas of developing countries.

Based on the most recent epidemiological studies, researchers in the Center for Nutrition (Epidemiologic laboratory, 1989) summarized the results of anthropometric studies carried out independently and by different groups of individuals using techniques that were not strongly standardized in different specific zones of the country. The authors observed that in general, during the first year of life, Cameroon children are very close to the international standards: around 97% for height, 100% for weight, and 108 % for weight-for-height. This good performance seemed to diminish between the first and second year of age. The question is what is the cause of this decreased performance? Is it lack of food security for the children, some aspects of mother's knowledge or both?

Barrère (1992) observed 24.4% chronic undernutrition (minus 2 standard deviations from the reference for height-for-age) of which approximately one-third (8.9%) suffered from severe chronic undernutrition (minus 3 standard deviations from the reference for height-for-age). More children (29.6%) in rural areas than urban (16.9%) suffered from chronic malnutrition, with 11.4% from rural and 5.2% from urban area suffering from severe chronic malnutrition. Consequently, the same proportion of children (3.0% urban, and 2.9% rural)

suffered from acute malnutrition while 11.2% from urban and 15.3% from rural areas were underweight. The prevalence of stuntedness (24.4%) and acute undernutrition (3.0%) in this survey is higher than those (22.1% and 1.0%) found in the 1978 National survey. This is an indication that malnutrition probably exists among children in rural areas of Cameroon.

NUTRITIONAL STATUS OF CHILDREN IN THE WEST PROVINCE

Van Eijk (1986) compared anthropometric measurements of children aged 0 to 5 years from three ethnic groups (Bamileke from the West Province, and Bagandu and Baka from the East Province). The measurements used in this study were collected in 1978, the year the National Nutrition Survey was conducted. The author observed a strong prevalence of kwashiorkor (8%) among the Bamilekes and few cases among the Bagandus and the Bakas. Birth weights of children in Mbouda (Bamileke) were 3155g for boys (n=2893) and 3040g for girls (n=2833). Birth weights of children in the other two ethnic groups were not reported. The percentage of children with weight-for-height less than 80% of the median reference was relatively small in the three populations and the percentage of children with weight-for-height greater than 90% of the median reference was comparable among the three groups. Van Eijk observed that by the age of 2 years the "stuntedness" increased by 5% in Bakas children, by 3-4% among the Bagandus, and by 10% in the Bamileke. He interpreted this as a sign of regular slow growth in Bamileke children from birth to 2 years.

He analyzed the food situation of the three groups, and concluded that the Bamileke in Mbouda have richer and more fertile soil and produced a greater variety of food crops than the other two groups who lived on picked roots and tubers, fruits, and nuts and hunted meat. Yet there was more malnutrition in Mbouda, West Province than in Bagandu and Baka. The data for this study were collected in the same year the National Nutrition Survey was conducted (1978) which showed the highest prevalence of chronic undernutrition (30.8%) in the rural West Province. That same year, Nkwain et al. (1988) demonstrated that the food situation in the West Province suggested that the malnutrition observed was not caused by an overall per capita food shortage at the market or Province level. The malnutrition might be attributed to some aspects of maternal technology.

A study (Ecole National D'infirmiers, 1990) conducted in the maternal and child health center (PMI) in Bafoussam, the headquarters of the West Province, on children 12 to 60 months observed average weight-for-age was 110% of the NCHS standard and varied according to age groups: 107% at 1 year of age, 111% at 2 years of age 117% at 3 years of age, 100% at 4 years of age, and 116% at 5 years of age. Approximately 2.3% of the children had weight-for-height less than 80% of the NCHS standard, 5.4% less than 85% and 26.2% greater than 120% of the standard. That data indicated more overnutrition (obesity) rather than undernutrition in those children. It

can be concluded that this study revealed the problem of overnutrition in children in the town of Bafoussam, an urban area. Because of the small sample size, the author recommended the need to verify the results by collecting data on children from Bafoussam town itself and not only from the PMIs. In addition, the use of PMI in Bafoussam is potentially biasing because these individuals are using a health center and come from an urban area. Therefore, the data cannot be extrapolated to the population at large.

Tabod (1991) studied malnutrition in 460 children, aged 5 to 59 months, from five Maternal and Child Health Centers in Bangang village in West Province. She concluded that although nutritional status of those children was improved compared to the 1978 National Nutrition Survey, it was not satisfactory and malnutrition was still a problem in the rural areas of this Division. In these children, 19.6% were underweight, 24.0% stunted, and 2.4% acutely malnourished. In the 1978 National Nutrition Survey, 22.0% were underweight and 30.8% stunted in the West Province. Tabod found few children in the 25 to 59 months age group and thought that this was because mothers believed that once a child can talk, walk, and eat on its own and has had all its immunizations, the child has nothing to gain from the center and is not taken there. Therefore, some children who qualified for the study were left out because she selected her sample from children attending a Maternal and Child Health Center and not from the community.

Barrère (1992) found that in the West Province, 26.2% of children suffered from chronic and 1.5% suffered from acute undernutrition while 6.5% were underweight. The percentages of stunted and underweight children (26.2% and 6.5%) in 1991 were lower than in 1978 (30.8% chronic and 22.0% underweight) in this Province.

Although the three most recent studies from the West Province (Ecole National D'infirmiers, 1990; Tabod, 1991 carried out in Maternal and Child Health centers; and Barrere 1992) indicated some slight improvement in the nutritional status of children, it is still not satisfactory. On the whole it can be concluded that malnutrition still exists in the West Province despite overall food availability there.

Barrère (1992) concluded that feeding practices and morbidity are determinants of child nutritional status, which in turn affects morbidity and mortality of children. The study found that although breast feeding was uniformly spread throughout the country, the time mothers begin breast feeding and the length of breast feeding varies from region to region and from mother to mother. In general, mothers did not breast feed within the first 24 hours (day) immediately after birth with only 35.7% of infants fed from the first day of life. In addition, most babies were given different types of liquids prepared under various conditions within the first month of life. The majority of babies (54.8%) received water in addition to breast milk during this first month and an

additional one third (34.1%) of babies of that same age received complementary feeding such as milk other than the mother's, other liquids, gruel (pap), or juices. The study concluded that early introduction of other liquids and foods and the use of bottle feeding are potentially detrimental to the health and nutritional status of children because children are exposed to pathogenic microbes and the consumption of their most appropriate food (mother's milk) is reduced. However, this study, like most studies in Cameroon, found that the nutritional status of children 0 to 6 months compared favorably with the reference standard. This survey found only 1.7% of infants from 0 to 6 months were chronically undernourished. This percentage gradually increased to 8.9% in children between 6 months and 1 year and finally to 30% after 1 year of age.

Most of the studies (Alim, 1975; Lantum, 1977; Moitoka, 1983; Van Ejik, 1986; Tabod, 1991 and Barrère, 1992) concluded that protein-energy malnutrition in children in Cameroon was most probably associated with a variety of factors: illiteracy, large family size, birth position of child in the family, feeding patterns, health care practices, socio-cultural practices, food shortages, and seasonal availability of food. None of the studies investigated household food security and how it affects the nutritional status of the children, nor did most authors interview mothers to obtain information on what the mother knew or how the mother coped in

the household. The few that interviewed mothers did so either in clinical or health settings, or collecting centers. Consequently, for most of those authors, the association of malnutrition in children to the above factors was based only on self-reported measurements in mostly clinical settings. Also, most of those authors grouped children from 0-5 years of age, which includes both breast-fed and weaned children in the same group. Because the quantity of breast-milk, rather than supplemental feeding seems to impact child growth before weaning and there is little evidence to suggest that the effect "carries over" after weaning (Zeitlin et al., 1990; Muñoz et al., 1974; Van Arsdell, 1983; Way, 1986), combining breast-fed with weaned children does not appear to be appropriate.

DEFINITIONS OF FOOD SECURITY

Various authors have defined food security slightly different. The Director General of the Food and Agricultural Organization (FAO) of the United Nations (1983) broadly defined food security to encompass three specific aims: 1) ensure production of adequate food supplies, 2) maximize stability in the flow of food supplies, and 3) secure access to food supplies by those who need them. The World Bank (1986) defined food security as "access by all people at all times to enough food for an active and healthy life". Leidenfrost (1993) collected different definitions of food security by several individuals or groups and developed a

definition from this collection. According to that author, food security can be defined as, access by all people at all times to culturally acceptable, nutritionally adequate, and safe food, in socially acceptable ways, for an active and healthy life. That definition excludes having to resort to emergency food supplies, scavenging, stealing, or other extreme coping strategies such as reduction of the frequency of meals in the months before harvest (practiced by food insecure households) which usually results in the rise of the incidence of child malnutrition (Msukwa, 1989).

In addition to a general definition of food security, several authors (Eicher and Staaz, 1984; Alamgir and Arora, 1991; Sahn, 1989) have attempted to describe food security from the household standpoint. A household generally is considered food secure when it is able to access --- through production, purchase, or transfers --- enough food in qualities and quantities, needed for individual family members to live healthy, active, and productive lives at all times.

DIMENSIONS OF FOOD SECURITY

Three dimensions of food security: availability, accessibility, and adequacy have been suggested (Busch and Lacy, 1984; Witter, 1984). In order to accomplish availability, a production system that 1) produces enough in the short term, 2) is sustainable, 3) does not place undue risk on agricultural producers, and 4) responds rapidly to disruptions in the food supply due to disasters, civil

disturbances, environmental imbalances, and other causes is required (Busch and Lacy, 1984). Those authors emphasized the need to be able to acquire the food that is made available, because simply making food available is not enough. Food may be available, but if it can not be acquired (purchased, traded, or received free), it cannot meet its ultimate purpose -- consumption. At the household level, food can be acquired through home production, food transfer (traded or received free), and/or purchase in the markets (Rukuni and Eicher, 1987). Also, the available and accessible food has to be adequate to provide for the differing nutritional needs of the various segments of the population.

FOOD INSECURITY

"Food security came of age in the early 1980's" (Rukuni and Eicher, 1987). The terms "food security" and "food insecurity" now are widely used by policy makers and scientists such as economists, anthropologists, sociologists, and nutritionists. Usually those terms refer to one or a combination of world, national, regional, community, household or individual food securities or insecurities. Each group of scientists or policy makers determines slightly different indicators for measuring food security depending on how they view it and on what level they are interested in it. Pinstруп-Andersen (1989) defined food insecurity based on the World Bank's definition as "Lack of access to enough food for an active and healthy life". Food insecurity can either be

chronic or transitory (Reutlinger and Pellekaan, 1986; Weber et al., 1988; Jayne et al., 1990). Chronic food insecurity occurs when there is a continuously inadequate diet caused by the inability to acquire food. Chronic insecurity affects households that persistently lack the ability either to buy enough food or to produce their own. Transitory food insecurity is a temporary decline in a household's access to enough food. This can be caused by instability in food prices, inadequate food production, or a downward shift in household income. Staatz et al. (1990) noted that food insecurity also includes unequal distribution of food at the household level.

Food insecurity and malnutrition are serious problems that appear to affect 25% of the population in sub-Saharan Africa (Pinstrup-Andersen, 1989). "Africa's food situation is precarious. One-quarter of Africa's population - 100 million people - do not have access to sufficient food at all times to ensure an active, healthy life" (Ushewokunze, 1990).

MEASUREMENTS OF FOOD SECURITY

There currently is a plethora of general understanding of the concept of food security (Busch and Lacy, 1984; FAO, 1985; Rukuni and Eicher, 1987; Cohen and Burt, 1989; Horwitz, 1992; Alamgir and Arora, 1991; and Leidenfrost, 1993), but the key indicators for measuring food security at the household level still are not available. Some measurements of food security at the global, national, and sub-national levels have been

attempted; the most common being food production or food availability per capita per year (Nkwain et al., 1988; Alamgir and Arora, 1991). However, neither decreases in per capita food production nor the negative consequences of the decrease on economic growth and agricultural sector incomes are likely to be reliable indicators of changes in household-level food security and nutritional status (Pinstrup-Andersen, 1989). That author also stated that although there generally is an association between growth retardation and per capita food availability at the national level (UNO 1987), this could be caused by growth retardation leading to low food consumption or vice-versa.

In Chile, Monckeberg (1992) noted a progressive and continuous improvement in the health and nutrition of preschool children in the past 30 years, a period during which per capita gross national product (GNP) had not changed much. That author also observed improvement in maternal nutrition.

Per capita food availability, based on only one or two crops, does not represent food security as defined even at the national level to a nutritionist. Although the nutritionist may see the crops as necessary to meet nutritional needs, those few crops are not sufficient to meet all needs. In Zimbabwe, Jayne and Chisvo (1991a) and Chisvo (1992) observed that annual per capita grain availability was not a significant factor explaining nutritional outcomes of children. Jayne and Chisvo (1991b) noted that in Zimbabwe

widespread inadequate access to food and chronic malnutrition persisted through out the 80's despite a "threefold expansion of grain sales by smallholder... and overflowing state grain silos". Kaluwa et al. (1989) pointed out that it would be unwise to ignore other food crops despite the high per capita maize availability, because alternative food crops might dominate in diets in certain areas. For example, in Mali, Staatz et al. (1990) demonstrated that although per capita grain (millet, sorghum, and maize) production was 16% to 65% higher in the south than in the north, ranking households in terms of food consumption security did not show any significant difference between the south and the north. Food consumption security indicators used by those authors were: number of meals eaten per day, number of meals which included meat or fish, number of meals ingredients in the sauce served with the main staple, and number of times per day a nutrient-poor gruel was prepared as the main meal.

Several authors (Rukuni and Bernstein 1988; Mudimu et al., 1988; Alamgir and Arora 1991) identified some components of household food security: net production, availability of income from sales of farm products, livestock and labor to purchase food, and inter-household food transfers. Pelto (1988) suggested that, "in most areas of intensive agriculture, modes of land ownership and cropping patterns are nearly always relevant to an understanding of local and household differences in food availability". Those components

would vary from region to region and within region from community to community. For example, land, one of the variables for production, may not be a problem in some regions and may be a tremendous problem in other regions. The Center for Social Research (1988) and Peters (1989) showed that land holding size was positively correlated with income and the ability to meet food requirements. Some indicators, such as available income and food exchange may be very difficult to measure especially in rural areas.

The 1987 United Nations' report suggested that the correlation of food security and nutritional status of specific groups of households with the national averages for changes in economic growth, agricultural sector incomes, or food production may be a weakly causal link. That UN report noted that unavailability of data constrained the choice of indicators to use in estimating prevalence and trends in indicators of access to food. Because it was rare to obtain direct measures of dietary intake or consumption from nationally representative samples, they inferred possible trends in average food consumption from changes in "dietary energy supply" (DES provided by FAO) which refers to the total food nationally *available for human consumption*, expressed on a per person per day basis (Kcal/per person/day), for each country and year. Obvious limitations in the use of DES as an estimate of *consumption* are that it does not allow for waste, losses through food preparation or losses at the food plate

level. Also, DES data is from food balance sheets and are rough guesses, at best, for a number of countries, particularly for poorer ones. National food availability does not assure household food availability and household food availability is insufficient to guarantee good nutrition of specific individuals in the household.

Another indicator used for measuring food security was the proportion of the population estimated to have access to less than an absolute minimum amount of food energy (based on 1.2 times the basic metabolic rate for adults). These estimates are calculated from DES and additional data on distribution using methods used by FAO in the Fifth World Food Survey (FAO, 1987), but they are not based on direct measures of consumption. The exact dimensions of food security that need to be measured depend on the unit (national, community, household, or individual) being analyzed (Life Sciences Research Office, FASEB 1990).

LEVELS OF FOOD SECURITY

The concept of food security at three levels: sub-national (province, district, village, household), national and global has been proposed (Alamgir and Arora, 1991). However, those authors pointed out that the concept of food security can be understood better by considering the household as a fundamental unit. Although general understanding of the regional environment and food availability is necessary to understanding the potential concerns and problems of food

security in households (Alamgir and Arora, 1991), food security at any higher level does not necessarily assure food security at the next lower level. For example, food surpluses at the Southern African Development Coordination Conference (SADCC) sub-region of southern Africa did not necessarily assure household food security in countries in the region (Maribe, 1992). She indicated that although the 1990 Food Security Bulletin of SADCC noted that domestic food availability was expected to be 106% of the total requirement at the regional level, the majority of countries in this region continued to experience food insecurity at the national and household levels. She also noted that problems of access to food were experienced at the household level among significant population groups, such as children, even in countries with net food surpluses. She indicated that the magnitude of the problem of food accessibility was shown by examining the relative malnutrition in children, which ranged from 11 percent in Zimbabwe to 56 percent in some parts of Malawi in the SADCC region. Staatz et al. (1990) observed that despite a higher per capita grain production in the South than in the North of Mali, children (0-7 years) in the northern areas had significantly lower levels of chronic protein energy malnutrition than those in the south (23% versus 43%). Although there was no significant difference in the prevalence of wasting between the north and the south, mean weight-for-height was significantly lower in the south

($t=2.96$, $p < 0.003$). Those authors attributed their findings to cultural differences such as child feeding practices between the two sub-zones.

Toole (1987) indicated that paying attention to national food security issues was a necessary, but often insufficient, condition to guarantee food security and/or adequate nutritional status at the household level. That is because national food security, usually measured in per capita food production or market supply, gives an overall picture of the food situation in the nation without taking into consideration distribution constraints from high food production to low food production regions. Guillaumaud (1989) observed that estimates adequate for determining aggregate cereal requirements at the country level were not likely to apply for specific zones. Furthermore those estimates were irrelevant as measures of household food sufficiency. Nkwain et al. (1988) demonstrated that overall per capita food availability at the market or provincial level did not correlate with nutritional status of children in the West province of Cameroon.

MEASUREMENTS OF HOUSEHOLD FOOD SECURITY

Not only is household food security insufficient to assure good nutrition, but it is an area where reliable information is scarce and consensus is lacking as to what data would be practical to collect and use, and what actions are needed (Latham et al. 1992). Staatz et al. (1990) pointed out

that information on household or individual entitlement to food was lacking.

Although many studies have discussed various components of household food security, few have successfully classified households into food secure and food insecure. Sundberg and D'Agostino (1990) grouped households into food secure, food insecure, and those not falling clearly into either category according to the following indicators: per capita net grain availability (using production and transaction data); number of meals per day; quality of sauces accompanying the staple grains in family meals; and the rankings of the two interviewers who lived in or near the sample villages and had administered the consumption and expenditure questionnaire. After such grouping, 26 households were found to lie at either extreme of the food security spectrum. Further investigation by open-ended discussion with the heads and at least one woman from each of the 26 households revealed some important differences among the food secure and insecure households. For example, the food secure households had more diverse crops (mean number of crops = 5) on family fields than the food insecure households (mean number of crops = 3.7). Also a much greater percentage of the food secure households than food insecure households owned agricultural equipment. The food secure households were able to time purchases so as to take advantage of seasonal fluctuations in prices. Because food secure households tended to have liquidity, they were able to

buy in the immediate post-harvest period when prices were at their lowest, whereas purchases of the food insecure households were concentrated in the rainy season when prices were at their peak. D'Agostino and Staatz (1989) observed that "Price volatility hits hardest those poor households that sell grain early in the season to meet pressing needs (especially tax payment) and repurchase grain late in the season to meet consumption needs".

Zerfas et al. (1982) used the percentage of families consuming a food category item as a crude index of food security. They calculated the percentage of children and their families consuming at least one member of a food category (for example oils) during 24 hours. If, for example, 90 per cent of families consumed any oil, at least one item of that food category was potentially available to the child in these families. However, if 40 per cent of children in those families did not consume any oil during 24 hours, such 'deficits' were considered an indication of a potentially problematic intra-family food distribution pattern, i.e. foods were available, but under-used in feeding young children. Based on their crude index of food availability, they found out that in rural Sierra Leone, there was high under-usage of all food categories except cereals and fruits in children aged 6-11 months. More important was that, in general, animal protein was one of the food categories available, yet under-used for feeding young children. Those authors did not

determine why animal protein was under-used by children, but it may be because of attitudes and current practices of mothers as influenced by the culture in which the family lives. Educating a mother to provide her child with foods that are not available, probably will not be successful, but in cases where the foods are available, it is important to determine why available foods are under-used.

FOOD SECURITY, FOOD CONSUMPTION, AND NUTRITION

Household food security is not sufficient to assure good nutrition of individuals in the households (Johnson, 1985 and Pinstруп-Andersen, 1989). Researchers (Rukuni and Eicher, 1987 and Maribe, 1992) have shown that an increase in food production does not necessarily result in increased food consumption of members of a household, particularly preschool children. Adams (1992) observed that increases in the food supply alone will not ensure the after goal of food security as defined by the World Bank in 1986. For example, widespread undernutrition, especially in rural areas, was co-existing with food production 'surpluses' in India, when the government observed that India had achieved food self-sufficiency (Mangahas, 1984).

Food consumption is what directly influences nutritional status of individuals in a household. Adequate household food supply is not a sufficient condition for good nutritional status of children because of intervening variables such as: relative roles of household diet, weaning practices, child

morbidity, and general child care (Delisle et al., 1991). Those authors found out that despite comparable household food adequacy in two regions (Mao and Moussoro regions) in Chad, child protein energy malnutrition rates were roughly twice as high in Mao as in Moussoro. They observed that socio-economic conditions were better in Moussoro as the nutritional status of children tended to reflect, and the rate of diarrhoea among children of Moussoro was lower than in Mao at the time of the survey. They concluded that this suggested a strong morbidity component, rather than food, in the etiology of child protein energy malnutrition in Mao. Staatz et al. (1990) observed very few correlations between nutritional status (stuntedness and wasting) of children 0-7 years of age, and indicators of household food security. Their indicators of household food security were: grain production, purchases, and availability; number of farm workers in the household (size of farm labor force); and number of revenue sources per household.

Zeitlin and Ghassemi (1986) demonstrated the importance of household food consumption practices rather than household food availability and 'food security' to good nutrition and growth of children. They observed that in Pakistan, children from 38 households in which all the children under five years were above 90 per cent of weight-for-age had a higher consumption of edible oils, legumes "dhal", eggs and rice, and the children were born at longer intervals than children from 134 households having at least one child below 60% of the

standard weight-for-age. Those two groups of households had equal income and food expenditure. Assuming that equal income and food expenditure are indicative of food availability at the household level, the main difference between mothers of well-nourished and malnourished children was food consumption practices. This may indicate that maternal influence on what is fed is as important or more important than food availability.

FOOD SECURITY AND NUTRITIONAL STATUS

Researchers have not fully explained the co-existence of malnutrition and food surpluses or food security at either national or sub-national levels. That probably is because the concept of food security at the sub-national level (village, district, or province) is not precise and its link with individual food intake is not always obvious (Alamgir and Arora, 1991). Because of factors such as household's food consumption, health, and hygienic practices, food security at the household level is not the only measurement for determining an individual's nutritional status in a household. Sundberg and D'Agostino (1990) observed a lack of positive correlation between child nutritional status, both acute and chronic, and ownership of agricultural equipment, a factor shown to be correlated with household food security. Those authors identified intervening variables such as levels of parental education, health status, and feeding practices as responsible for the lack of correlation.

Changes in household food acquisition may be a poor proxy for the impact of food security on an individual member's nutritional status (Pinstrup-Andersen and Garcia, 1990). Changes in an individual's food consumption, influenced by household food allocation behavior, health status of the individual, sanitary conditions, and child care in the case of children, impact on household members' nutritional status (Pinstrup-Andersen, 1989). He observed that food access or entitlement was different from actual consumption. The translation of entitlement into actual consumption is influenced by a series of other factors such as: individual preferences, perceived food and nutritional needs, intra- and inter-household food allocation, income and budget control, women's time allocation and constraints, sanitary conditions, health status of the individual and, in the case of children, child care as influenced by the culture in which the household lives.

An understanding of how various factors determine the extent to which food entitlement is translated into consumption would give insight into the link between household food security and nutritional status of individuals in the household. The factors would differ slightly depending on which specific groups of individuals in a household is being studied. For children, who are almost totally dependent on their mothers and/or caretakers for food acquisition, preparation, feeding and general care, the extent to which

entitlement is translated into consumption would be determined by the mother's ability to choose, select, and prepare food and feed and care for the child. Clearly, the mother's knowledge how or her "technology" appears likely to affect nutritional status.

Food security of a household can be translated almost directly into improved nutritional status of adults, but not necessarily of pre-school children. The existence of inequality in food adequacy between adults and children in a household has been observed (Obi, 1976; Valenzuela, 1977; Aligaen and Florencia, 1980; Pinstруп-Andersen, 1990). Kennedy and Cogill (1987) showed that improved household food security among low-income Kenyan farmers resulted in higher incomes and expanded food consumption, but the nutritional status of preschoolers did not change. Several explanations for this are possible, including: 1) pre-schoolers have proportionately higher requirements for elusive nutrients and a limited bulk capacity of the stomach, 2) the combination and interaction of infection and digestibility problems may affect children more than adults, and 3) mothers' beliefs relating to child feeding and health care, which may result in inadequate feeding even when a household is food secure or in adequate feeding when a household is food insecure. Those factors, which influence the effects of nutrition intervention programs, often are ignored when attempting to establish a direct causal link or an association between individual

anthropometric measurements (growth status) and the effects of nutrition intervention programs (Pinstруп-Andersen and Garcia, 1990). It may not be possible to study all of them but at least some of them should be included in research studies. Nutritional status of individuals in a household especially pre-school children is more directly affected by food consumption practices than food security.

WOMEN, HOUSEHOLD FOOD AND CONSUMPTION SECURITY

Women's contribution to food security, food consumption and ultimately to the nutritional status of members of a household (especially pre-school children) is of paramount importance (Gittinger et al., 1990; Alamgir and Arora, 1991a; Horwitz, 1992; Gopalan, 1992). The majority (85%) of rural women in Africa today are involved in agriculture and produce about 80% of the food consumed by the family. Women are the ones charged with the bulk of the labor and maintenance of the agrarian societies (Carew, 1981). Those women are equally involved in food processing and storage, and are the main income earners for their families because they are responsible for the distribution of the majority of consumer goods through local trading activities.

Messer (1989) observed that the particular skill of a mother at managing work and child care, along with the cultural mechanisms for providing surrogate mothers of greater or lesser quality, has an important impact on nutrition and health of children.

Lustig (1984) suggested that, because of intra-household decision-making processes and prevailing priorities in the home, some of its members may not be adequately fed even if the household unit has an income sufficiently large to guarantee adequate food supplies for all its members.

Sharman's (1970) comparison of rural Ugandan households suggested that individual household food sufficiency varied seasonally according to the management skills of the female head of the household. She suggested that it was not household food supply, but the care and skill with which women distributed food that determined in which households children were seasonally or permanently malnourished or well-nourished. Growth of a child, an indicator of nutritional status assessed by anthropometric measurements, is an outcome variable resulting from the interaction of many factors, the two most important of which are food intake and general health care with particular reference to infection (Delisle et al., 1991). Consequently, poor or good growth performance detected by anthropometric assessment may not be caused by lack of or presence of food in a household, but also how the available food is used to feed its members.

Consequently, although food security seems to be a legitimate concern, translation of entitlement to actual consumption probably is more germane than food entitlement in determining the nutritional status of individuals in a household, particularly children under five years.

MATERNAL TECHNOLOGY AND POSITIVE/NEGATIVE DEVIANTS

Mata (1980), writing on child malnutrition in Guatemala and Costa Rica, discussed "Maternal technology" as an important determinant of the malnutrition complex. He defined maternal technology as "practices, traditions, and beliefs relating to food preparation, feeding techniques, child care during illness and convalescence, handling of drinking water and of feces, and personal hygiene". He observed that some mothers exhibited a high level of technology independent of their upbringing or schooling, and he suggested that this "technology" was why some infants and young children in a community thrive well under village conditions. Generally, maternal attitudes are stressed because "Women are primarily responsible for provision of food and basic necessities for children" (Chaiken, 1986). Alvarez (1982) recognized maternal cultural deficiencies as important intervening variables influencing nutritional status of children.

Maternal cultural efficiencies also are important intervening variables that can influence the nutritional status of children. For example, Dettwyler (1986) in Mali observed that "within the same general cultural framework, and in the face of abject poverty, subtle differences in maternal attitudes result in some children who thrive, while others suffer varying degrees of malnutrition".

Several researchers have observed the important role of maternal technology on health, growth and general well being

of children, especially children under 5 years of age. Hegsted (1967), Wray (1972), and Greaves (1979) observed that some mothers managed to rear healthy and active children, yet belong to the same community as those who do not. Therefore, those authors advocated the need to study practices of "successful mothers" and the reasons for nutritional successes rather than nutritional failures. Wishik and Van der Vynckt (1976) also advocated the need to identify the unusually well-nourished members of poor communities and determine how they have managed to thwart prevailing conditions there. They proposed that the group of well-nourished people be studied anthropologically in order to uncover any beneficial practices related to food sources, storage, preparation, and consumption.

Zeitlin et al. (1990) used the term "positive deviance" to describe social, behavioral, and physiological adaptability to nutritional stress. She defined positive deviants as "children who grow and develop adequately in low-income families living in impoverished environments where a majority of children suffer from growth retardation and malnutrition". She noted that very few studies in nutrition have systematically examined the households whose children are at the top end of the growth performance curve in order to learn from successful practices. One possible reason for not systematically examining the households with children at the top end of the growth performance curve could be that the

majority of nutrition surveys have always identified an alarming number of malnourished as compared to well-nourished children. Muñoz et al. (1974) pointed out that it was usual to find a large proportion of children suffering from malnutrition co-existing with some well-nourished ones in some rural communities. In general, researchers (Ojofeitimi et al., 1987; Kumar et al., 1985; Sukkary-Stolba, 1987; Birem-Etchebes and Gonzalez, 1988) have identified more malnourished than well-nourished children in their surveys. Such numbers probably have forced nutrition researchers to focus on finding ways to help the malnourished majority rather than attempt to understand why a minority of children are not malnourished. Consequently, researchers have given little attention to understanding households with well-nourished children. Mata (1980) observed that in the past, too much support has been given to clinical and laboratory studies of severe protein-energy malnutrition and too little emphasis has been placed on long-term epidemiologic studies of its causality and preventive aspects.

Based on Zeitlin et al. (1990) it would appear that systematically examining households with malnourished children does not provide sufficient information required to design an effective nutrition intervention and/or national development policy. Perhaps examining households with well-nourished and households with malnourished children in the same study would give a better understanding of the factors

contributing both positively and negatively to child nutritional status in a community.

Young and Young (1968) showed that some families functioned on a higher level of "complexity" than others within the same community. Anthony and Cohler (1987) used the positive deviance approach to investigate the complex reasons why some children, but not others, developed into psychologically healthy adults despite poor nurturing or early traumatic circumstances.

The effects of the mother-child interaction on the nutritional status of infants and young children also has been investigated. Alvarez et al. (1982) examined the differences in some characteristics of mother's verbal and non-verbal interactions between mothers of malnourished and well-nourished children. Non-verbal interactions included all the gestural manifestations (caresses, slaps, gestural expression of anger, kisses, smiles,) directed to the child which bear an emotional connotation. Mothers of malnourished infants had a significantly lower degree of verbal and non-verbal language expressiveness and lower satisfaction with their family life than those of well-nourished mothers. Ojofeitimi et al. (1987) interviewed 80 mothers whose children were suffering from malnutrition to get information on the names given to protein energy malnutrition, its causes and prevention, and infant feeding and cultural food practices. Those authors began by studying the children of 120 women, and found 80 had

malnourished children. As is typical with any studies, they only continued the interviews with the 80 women with malnourished children they found. It would have been interesting had they also interviewed the 40 mothers whose children were well-nourished in order to determine what those mothers were doing differently that contributed to their children's growth. Had both groups been studied, it may have been possible to find a meaningful relationship between nutritional status of children and maternal technology.

MOTHERS OF WELL-NOURISHED AND MALNOURISHED CHILDREN IN A COMMUNITY

Very few studies have examined households with malnourished and well-nourished children identified in a single study conducted in a community. Muñoz et al., (1974) analyzed the differences in food, child feeding techniques during weaning, mother's beliefs and attitudes during pregnancy and lactation, and child care and health practices between low socioeconomic households with well-nourished and malnourished children. They found differences in some characteristics of the mother-child pair: more well-nourished children were males and were older; mothers with well-nourished children had a better diet both current and past, especially during pregnancy; and weaning was more gradual and involved a greater number of foods. The families of the well-nourished children had less prejudices towards food and had more modern concepts and beliefs about food and illness.

Romero de Gwynn and Sanjur (1974) interviewed mothers of well-nourished and malnourished children to identify dietary, demographic, and health-related correlates associated with malnutrition. Those authors observed that frequency of diarrhoea and fever, food deprivation during diarrhoea, the number of children under five years of age and lack of breast feeding correlated significantly with the child's nutritional status. However, the authors only interviewed low socioeconomic mothers who had come to a health center for various reasons. Bias in the sample may have resulted in some of the findings related to health practices because children whose mothers do not go to health centers may have different beliefs and practices. Chaiken (1986) determined the nutritional status of children and examined child care and feeding practices of mothers of those children residing in the Mbita Division in Kenya. The author did not divide the sample into households with malnourished and well-nourished children, yet concluded that malnutrition in Mbita was directly linked with child care and feeding practices.

Jenkins and Heywood (1984) stressed that it was important to note the cultural and ecological context in which food habits, beliefs, and practices occur; the segment of the population most affected; and the specific phrasing of the belief or taboo. Cultural studies of feeding practices of young children must go beyond determining 'what is fed' and

include an analysis of 'how' and 'why' food is fed as well as other child care activities (Pelto, 1987).

Research in which the effects of maternal technology on the growth of children has been studied, generally has been conducted by first determining the nutritional status of the children or the maternal technology of the mothers in a given community. Then one or two years later, the researcher gathers information (either nutritional status or maternal technology) not collected in the previous years. Often the information is not collected from the mothers whose children's nutritional status was determined or vice versa. The researchers then attempt to establish a relationship between maternal technology and child nutritional status.

For example, Beaudry-Darismé et al. (1972) used data on nutritional status of pre-school children collected in 1967 to ascertain whether the incidence of malnutrition observed by the Caribbean Food and Nutrition Institute could be explained by infant care and feeding practices; attitudes concerning foods consumed during pregnancy and lactation; and socio-economic correlates (which were measured more than six months later).

Birem-Etchebes and Gonzales (1988) concluded that malnutrition in the Central African Republic was caused by poor food hygiene, traditional and cultural food taboos, and an absence of good food storage that led to food insufficiency. Information on cultural and traditional food

taboos, and poor hygienic and storage practices was collected from a previous (about 1 year) study and was not necessarily collected from the mothers of the malnourished children the authors studied.

In other instances, sociological researchers have examined beliefs and practices of mothers in communities where other researchers have identified malnutrition to be a problem, but the sociological researchers did not restudy the nutritional status of children. For example, Jenkins (1988) noted that the majority of researchers working in Papua New Guinea examined beliefs and practices concerning food in rural areas where malnutrition is a problem. However, they did not reevaluate the nutritional status of the participants. She concluded that the underlying assumption in those studies is that the observed malnutrition may be caused by culturally sanctioned food prohibitions and requirements.

Because malnutrition had been identified in 1983 in Mbita in the Nyanza District in Western Kenya, Chaiken (1986) conducted a study to help identify the key factors that contributed to the high infant mortality and malnutrition rates. She examined socioeconomic status of the family, income levels, intra-household resource allocation, occupational and educational backgrounds, food production preparation and consumption patterns, use of health care facilities, child rearing practices and fertility and mortality. Without establishing any relationship between the

nutritional status of children and beliefs and practices of mothers, she concluded that malnutrition in Mbita could be most directly linked with child care and feeding practices.

Because other studies showed that many preschool children in Ivory Coast have considerable growth deficits by Western standards Clayton et al. (1984) decided to review current practices of infant feeding and to examine the factors that influence the choices made by mothers. Those authors stated that it was not enough to examine the growth and welfare of infants in isolation, because a mother always considers the well-being of her whole family and not just her infant when making decisions about feeding. They concluded that the choices made by mothers about the feeding of infants are likely to be rational within their value system and within the resources and commitments of the whole family. Those choices are influenced by the culture in which the mother lives.

Kumar et al. (1985) decided to study the maternal beliefs and therapeutic preferences related to diarrhoeal disease in both rural and urban settings in North India when they observed that another study showed a large number of deaths in preschool children were caused mainly by dehydration and malnutrition. Those authors were convinced that dehydration and malnutrition could be prevented and easily treated with appropriate measures adopted during the early stages of the disease. Those authors interviewed families with children below the age of 3 years. However, there was no significant

difference in beliefs regarding causation of diarrhoea among mothers from villages with health centers and those without health centers.

Two previous reports on temporary food avoidances and poor weaning practices among Sinhata Buddhist women led Liyanage and Wikramanayake (1984) to study socio-cultural impacts on malnutrition in the estate sector of Tamil Hindu (Sri Lanka estate). Those authors studied food avoidances during pregnancy and lactation and studied weaning practices. They found out that some food taboos (e.g., avoidance of non-vegetarian foods other than milk, the belief that fruits are a major source of danger after delivery, avoidance of pineapple because it induces abortion) were maintained despite exposure to clinics and hospitals. What they did not do was determine and compare the nutritional status of children from estate workers and South Indians to find out how food avoidances and weaning practices affected the nutritional status of their children.

Some researchers simply studied attitudes and practices without knowledge of the underlying malnutrition problem. For example, Dattal et al. (1988) surveyed mothers with children less five years old in both rural and urban areas of India (Himachal Pradesh) about the mother's knowledge and beliefs on feeding children during times when the child was sick. Those authors only interviewed the mothers and did not determine the nutritional status of the children. They found that ignorance

and incorrect beliefs regarding the feeding of sick children, rather than poverty or educational standards of the mother, affected the administration of food. For example, many women believed that sick children should be fed with the same amount or more food to restore health, but many others believed less food or nothing at all should be given to a child during sickness. Determination and comparison of the nutritional status of the children from those two groups of mothers would have given a clue to whether those beliefs actually affected child growth.

There is no doubt that some aspects of traditional beliefs, practices, and food taboos can help to explain some of the malnutrition statistics, but a more meaningful relationship could be established if the information actually was obtained from the mothers of specific malnourished children. Such information collected from mothers of well-nourished children residing in the same community as the mothers of malnourished children also would give an insight into what beliefs and practices, influenced by the same culture, contribute to malnutrition or good nutrition of children in that community.

The purpose of this study is to determine the effect of household food security and maternal technology on the growth of post-weaning children in rural Cameroon (West Province).

OVERALL OBJECTIVES

To identify those components of maternal technology that positively or negatively influence the growth of post-weaning children.

SPECIFIC OBJECTIVES

1. Determine household food security.
2. Determine the proportion of post-weaning children with adequate and in adequate growth.
3. Identify traditions, beliefs, and current practices of mothers' related to food preparation and child feeding that influence growth of post-weaning children.
4. Determine the effect of household food security on the growth of post-weaning children.

MAIN HYPOTHESIS

Maternal technology affects children's growth independent of household access to food resources.

SUB-HYPOTHESES

1. Some aspects of maternal technology have a positive impact on children in households with inadequate access to food resources, causing them to have an unexpectedly good growth.
2. Some aspects of maternal technology have a negative impact on children in households with adequate access to food resources, causing them to have unexpectedly poor growth.

REFERENCES

- Adams, R. M. (1992). Forward. In Kotler, N.G. (Eds.), Frontiers of Nutrition and Food Security in Asia, Africa, and Latin America. ILSI N.A. Smithsonian Institution Press, Washington and London, pp.vii-viii
- Alamgir, M. and P. Arora (1991). Concepts and Elements of Food Security. In A. Alamgir, and P. Arora (Eds.), Providing Food Security For All. IFAD Studies in Rural Poverty No.1. New York University Press, Chapters 1 and 2, pp.1-9.
- Alamgir, M. and P. Arora (1991a). Famine in South Asia: Political Economy of Mass Starvation. Oelgeschlager, Gunn and Hain, Cambridge, Mass., pp1-420
- Aligaen, M. and Florencio (1980). Intrahousehold nutrient distribution and adequacy of food and nutrition intake of Filipino urban households, Philippine J. Nutr., 1, 11-19.
- Alim, A. (1975). Implication des modalités alimentation sur l'état nutritionnel des enfants d'âge pre-scolaire examinés en consultation de PMI à Garoua, Nord Cameroun. Thèse de Doctorat en Médecine CUSS Yaoundé.
- Alvarez M.L., F. Wurgaft and H. Wilder (1982). Non verbal language in mothers with malnourished infants. Soc. Sci. Med., 16, 1365-1369.
- Anthony, S.J. and B.J. Cohler, eds. (1987). The Invulnerable Child. Guilford Press, New York.
- Barrère, B. (1992). Allaitement, nutrition et état nutritionnel. In M. Balépa, M. Fotso, and B. Barrère (Eds.), Enquête Démographique et de Santé Cameroun, 1991. Macro International Inc., Columbia, Maryland USA, chapter 8, pp. 119-130.
- Barrett, D.C., M.R. Radke-Yarrow and R.E. Klein (1982). Chronic malnutrition and child behavior: Effects of early caloric supplementation on social and emotional function at school age. Dev. Psychol. 18, 541-556.
- Beaton, G.H. (1989). Small but healthy? Are we asking the question? Euro. J. Clin. Nutr., 43, 863-875.
- Beaudry-Darismé, M.N., L.C. Hayes-Blend and A.G. Van Veen (1972). The application of sociological research methods to food and nutrition problems on a Caribbean Island. Ecology of Food and Nutri., 1, 103-119.

- Behrman, J.R. and B.L. Wolfe (1984). More evidence on nutrition demand: Income seems overrated and schooling underemphasized. J. of Develop. Econ. 14, 105-128.
- Birem-Etchebes, S. and Gonzalez, J.P., 1988. Utilisation des ressources alimentaires villageoises dans la réhabilitation des enfants atteints de malnutrition en République Centrafricaine Bulletin Soc. Path. Ex., 81, 769-776.
- Burk, C. M. and Ezekiel, 1967. Food and Nutrition in Developing Economy. In: H.M. Southworth and B.F. Johnston, (Eds.), Agricultural Development and Economic Growth. Cornell University Press, Ithaca, NY. pp. 327-358.
- Burgess, A. (1961). Nutrition Education in Public Health Programs- What Have we Learned?. Am. J. Public Health. 51, 11715-11725.
- Busch, L. and Lacy, W.B. (1984). What does Food Security mean? In L. Busch and W.B. Lacy (Eds.), Food Security in the United States. Westview Press, Boulder, CO, pp. 1-26.
- Caliendo, M.A., D. Sanjur, J. Wright and G. Cummings (1976). Use of path analysis as a statistical technique for the analysis of qualitative nutritional data. Ecology of Food Nutr., 5, 75-81.
- Carew, J.G. (1981). A note on women and agricultural technology in the Third World. Labour and Society, 6, No. 3, 279-285.
- Cassel, J. (1957). Social and cultural implications of food and food habits. Am. J. Public Health. 47, 734-740.
- Center for Social Research (CSR) (1988). The Malawi Maternal and Child Nutrition Study (MMCN): Interim Findings from the Baseline Census. In, Report of the Workshop on: Household Food Security and Nutrition, Zomba, Malawi 28th to 31st August, 1988, Volume II, Papers presented, Center for Social Research, University of Malawi, Zomba, Malawi. pp. 114-178.
- Chaiken, M.S. (1986). Traditional patterns and modern dilemmas: Designing locally appropriate health interventions. Working Paper No. 442. Institute for Development Studies, University of Nairobi, Nairobi, Kenya. pp. 1-20.

- Chisvo, M. and T. S. Jayne (1992). Is grain availability an important determination of variation of nutritional status among children? Preliminary evidence and policy implications from Zimbabwe's communal areas. In J. B. Wyckoff, and M. Rukuni (Eds.), Food security research in Southern Africa: Policy Implications. University of Zimbabwe, Harare, Chapter 13 pp. 250- 264.
- Chisvo, M. (1992). Household Food Security and Nutrition in Zimbabwe, UNICEF, Zimbabwe, pp. 1-39.
- Chopak, C. (1989). Family Income Sources and Food Security, In G. Mudimu, and H. Bernstein, (Eds.), Household and National Food Security in Southern Africa. October 31-November 3, 1988. University of Zimbabwe, Harare, pp. 193-208.
- Clayton, D., S. Orwell and A.E. Dugdale (1984). Infant feeding in the Ivory Coast. Food and Nutr. Bull., 6 (2), pp. 2-6.
- Cohen, B.E. and M.R. Burt (1989). Eliminating hunger: Food Security Policy for the 1990's. The Urban Institute. Washington, DC. pp. 1-53.
- Cravioto, J. and E.R. Delicardie (1973). Nutrition and Behaviour and Learning. World Review of Nutr. and Dietet., 16, pp. 80-96.
- Csete, J. 1989. Determinants of Young Children's Nutritional Status in a Rwandan Highland Region with Special Attention to the Gishwati Potato Scheme. U. M. I. Dissertation Services. Ann Arbor, MI.
- D'Agostino, V.C. and J.M. Staatz (1989). The impact of import and export policies on Malian coarse grain producers. Agric. Econ. Staff Paper No. 85-89. Michigan State University.
- Dattal, M.S., L. Behl, R.K. Kaushal and S.I. Sharma (1988). Beliefs of Himachal women regarding feeding of marasmic or otherwise sick children. J. Indian Acad. Pediat., 25, 966-971.
- De Garine, I. (1972). The socio-cultural aspects of nutrition. Ecology of Food Nutr., 1, 143-146.
- Dei, G.J.S. (1990). Indigenous knowledge and economic production: The food crop cultivation, preservation and storage methods of a West African community. Ecology of Food and Nutr., 24, 1-20.

- Dei, G.J.S. (1991). The dietary habits of Ghanaian farming community. Ecology of Food and Nutr. 25, 29-49.
- Delisle, H., M. Alladoumgué, F. Bégin, K. Nandjingar, and C. Lasorsa (1991). Household food consumption and nutritional adequacy in Wadi Zones of Chad, Central Africa. Ecology of Food and Nutr. 25, 229-248.
- DeMuralt, A. (1973). Le problème de la malnutrition en Afrique - expérience faites en Côte d'Ivoire. Bulletin de L'Académie Royale de Médecine de Belgique, 128, 781-802.
- Dettwyler, K.A. (1986). Infant feeding in Mali, West Africa: Variations in belief and practice. Soc. Sci. Med., 33, 651-664
- DeWalt, K.M. (1983). Income and dietary adequacy in an agricultural community. Soc. Sci. Med., 17, 1877-1886.
- Ecole Nationale d'infirmiers (1990). Passage unique enfants 12-60 mois: Poids-taille-périmètre du bras, pli cutané tricipital et tour de la poitrine. La situation nutritionnelle au Cameroun d'après les enquêtes épidémiologiques les plus récentes. Centre de Nutrition, IMPM, MESIRES, Yaounde, Cameroon, pp. 10-11.
- Eicher, C and J. Staatz (1984). Agricultural Development in the third world. The Johns Hopkins University Press, Baltimore, Md.
- Ellsworth, L. and K. Shapiro (1989). Seasonality in Burkina Faso grain marketing: Farmer strategies and government Policy. In D.E. Sahn (Eds.), Seasonal Variability in Third World Agriculture. The Johns Hopkins University Press, Baltimore and London. Chapter 12, pp. 196-205.
- Epidemiology laboratory (1989). La situation nutritionnelle au Cameroun d'après les enquêtes épidémiologiques les plus récentes. Centre de Nutrition, I.M.P.M., Yaounde , Cameroon.
- FAO (1985). World Food Security: Selected themes and issues. Economic and Social Development Paper 53, Food and Agriculture Organization of the United Nations, Rome, Italy, pp, 1-104.
- FAO (1987). The Fifth World Food Survey. Food and Agriculture Organization of the United Nations. Rome Italy.

- FAO (1983). Director-General's Report on World Food Security: A Reappraisal of the Concepts and Approaches Committee on World Food Security, Food and Agriculture Organization of the United Nations. Rome Italy.
- FAO (1990). Conducting small-scale nutrition surveys: A field manual. Handbook No. 5 Nutrition in Agriculture. Food and Agricultural Organisation of the United Nations Rome. pp. 1-186.
- FAO (1992). Food, Nutrition, and Agriculture. Food policy and nutrition division, Food and Agricultural Organization of the United Nations, Rome Italy. No. 5/6 pp. 1-64.
- FASEB (1990). Core indicators of nutritional state for difficult-to-sample populations. Anderson, S.A. (Ed.), Life Sciences Research Office, Federation of American Societies for Experimental Biology, Washington, D.C. pp. 21-22.
- Fomukong, A. (1983). A study of some etiological factors responsible for malnutrition in a rural community of Cameroon, (the case of Ngendzen village of Bui Division). Thesis, Doctor of Medicine, U.C.H.S., University of Yaounde.
- Fonaroff, A. (1968). Differential concept of protein-calorie malnutrition in Jamaica: An exploratory study information and beliefs. J. of Trop. Pediatrics. 14, 82-101.
- Garfield, R.M. and P.F. Rodriguez (1985). Health and health services in Central America. J. Amer. Med. Assoc., 245, 936-943.
- Gerlach, L.P. (1964). Sociocultural factors affecting the diet of the Northeast Coastal Bantu. J. Am. Dietet. Assoc., 45, 420-424.
- Gittinger, J.P., S. Chemick, N.R. Horenstein and K. Saito (1990). Household Food Security and Role of Women. World Bank Discussion Papers. World Bank, Washington, DC. pp. 1-45.
- Gopalan, C. (1992). International conference on nutrition: An overview and commentary. In. Food and Agriculture. Food and Agricultural Organization of the United Nations, Rome Italy. No. 5/6 pp. 50-55.
- Greaves, J.P., 1979. Nutrition Delivery System. Indian J. Nutr. Diet. 16, 75-82.

- Guillaumaud, J. (1989). Programme intégré de sécurité alimentaire au Tchad. Document de travail. Bases d'évaluation des besoins alimentaire et des besoins normaux en céréales par habitant. (Unpublished).
- Gwangwa'a S., G. Koppert, H. Rikong, N. Metz, N. Venema, M. Kombou (1989). Preliminary results of a demographic and anthropometrical study in Awing, North West Province of Cameroon. Presented, 1er Congrès Comité Camerounais des Biosciences, Ngoundéré, Cameroun.
- Hegsted, D.M., 1967. Comment on Agricultural and Economic Growth. In: H.M. Southworth and B.F. Johnston, (Eds.), Agricultural Development and Economic Growth. Cornell University Press, Ithaca, NY. pp. 361.
- Hiwa, S.S. (1988). Agricultural development policy and food production. In Report of the Workshop on: Household Food Security and Nutrition, Volume II, University of Malawi, Zomba, pp. 17-32.
- Horwitz, A. (1992). Introduction. In Kotler N.G. (Eds.), Frontiers of Nutrition and Food Security in Asia, Africa, and Latin America. ILSI N.A. Smithsonian Institution Press, Washington and London, pp. 1-5.
- Israel, R., J. Nestor, E.B. Taylor, and S. Wirtz. (1982). Maternal and Infant Nutrition Reviews: Cameroon: A guide to literature. International Nutrition Communication Service - Clearinghouse on Infant Feeding and Maternal Nutrition, Washington, D.C., pp. 1-59.
- Jayne, T.S. and M. Chisvo (1991a). Unravelling Zimbabwe's food insecurity paradox. Food Policy, 16 (5),
- Jayne, T.S. and M. Chisvo (199b). Zimbabwe's grain marketing policy in the 1990's: Short run versus long run options. Paper presented at the 7th annual Conference on Food Security Research in Southern Africa, 28-30 Oct. 1991, Makasa Sun Hotel, Victoria Falls
- Jayne, T. S. and M. Rukuni (1991). Toward a Food and Nutrition Policy for Zimbabwe: Introduction. In Proceedings of the Second National Consultative Workshop on Integrating Food, Nutrition and Agricultural Policy. University of Zimbabwe, Harare

- Jayne, T. S., M. Chisvo, B. Hedden-Dunkhorst, and S. Chigume(1990). Unravelling Zimbabwe's Food Insecurity Paradox: Implications for Grain Marketing Reform, In T. S. Jayne, M. Rukuni, and J. B. Wyckoff (Eds.), Integrating Food and Nutrition Policy in Zimbabwe: Proceedings of the First Annual Consultative Workshop on Food and Nutrition Policy. University of Zimbabwe, Harare, pp. 25-44.
- Jelliffe, D.B. (1962). Culture, social change and infant feeding - Current trends in tropical regions. Am. J. Clin. Nutr., 10, 19-42.
- Jenkins, C. and P. Heywood (1984). A method for eliciting beliefs about food and child feeding in Papua New Guinea: The Machik interview. Papua New Guinea Med. J., 7,(1), p11-15.
- Jenkins, C. (1988). Foodways in Papua New Guinea: Philosophy and practice. Papua New Guinea Med. J., 31, 125-131.
- Jenkins, C., A.K. Orr-Ewing, P.F. Heywood (1984). Cultural aspects of early childhood growth and nutrition among the Amele of Lowland Papua New Guinea. Ecology of Food and Nutr., 14, 261-275.
- Johnson, D.G. (1985). Alternatives to International Food Reserves. In World Food Security: selected themes and issues- Symposium On World Food Security- Papers and Summaries of Discussion. Economic and Social Development paper 53, Food and Agriculture Organization of the United Nations, Rome, pp. 67-81.
- Kaluwa, B.M., B.F.Kandoole, G.Y.Mkamanga, and P.Heisey (1989). Improving Household Food Security: Interactions between technology, marketing, and trade. The Malawi Case: Recent Findings and Emerging Policy and Research Issues. In M.Rukuni et al., (Eds.), Improving Household Food Security. University of Zimbabwe, Harare, pp. 157-168.
- Kennedy, E. and B. Cogill (1987). Income and nutritional effects of the commercialization of agriculture in Southwestern Kenya. IFPRI Research Report 63. International Food Policy Research Institute, Washington D.C.:
- Kumar, V., C. Clements, K. Marwah, and P. Diwedi (1985). Beliefs and therapeutic preferences of mothers in management of acute diarrhoeal disease in children. J. Trop. Pediatrics, 31, 109-112

- Lantum, D. N. (1978) Report of the Nutrition Survey of Pre-school Age Children of Jakiri and Mbandjock Districts of Cameroon conducted in May 1977. University of Yaounde, Cameroon.
- Latham, M.C., Anderson-Brolin, L., Antonsson-Ogle, B., Michanek, E., Mpanju, W.F.K. and Wago, J.W. (1992). Thoughts for Food: An Evaluation of the Tanzania Food and Nutrition Center. SIDA Evaluation Report 1992/2, Tanzania. pp. 74-77.
- Leidenfrost, N. B. (1993). Definitions Concerned with Food Security, Hunger, Undernutrition, and Poverty. US Dept. of Agriculture, Washington, D.C., pp. 1-50.
- Liyanage, C. and T.W. Wirkramanayake (1984). Food beliefs and practices among Sri Lankans. J. National Sci. Council Sri Lanka, 12, 103-111.
- Lohman, T.G., A.F. Roche and R. Martorell (1988). Anthropometric standardization reference manual. Human Kinetics Books, Champaign IL.
- Longo, L.D. (1964). Sociocultural practices relating to obstetrics and gynecology in a community of West Africa. Am. J. Obstet. Gyn., 89, 470-475.
- Lustig, N. (1984). Direct and Indirect Measures to Ensure Access to Food Supplies. In World Food Security: selected themes and issues - Symposium On World Food Security- Papers and Summaries of Discussion. FAO Economic and Social Development paper 53, Food and Agriculture Organization of the United Nations, Rome. pp.38-51.
- Maclean, C.M.U. (1966). Yoruba mothers: A study of changing methods of child-rearing in rural and urban Nigeria. J. Trop. Med. Hygiene, 69, 10, 253-263.
- Mangahas, M. (1984). Relative Emphasis on Domestic Food Self-sufficiency and Trade-Oriented Self-Reliance. In World Food Security: Selected Themes and Issues- Symposium On World Food Security- Papers and Summaries of Discussion. Food and Agriculture Organization of the United Nations, Rome. pp. 1-17
- Marangu L. (1989). Food crisis in Africa. Révue Canadienne d'économie familiale. 39, 4, 144- 148.

- Maribe, T.O. (1992). Food and Nutrition Security in East, Central, and Southern Africa: A Study of Two Regional Initiatives. In N.G. Kotler, (Eds.), Frontiers of Nutrition and Food Security in Asia, Africa, and Latin America. ILSI N.A. Smithsonian Institution Press, Washington and London, Chapter 4, pp. 37-49.
- Masundire, R. T. (1990). Current Status and Future Plans of the SADCC Early Warning Unit (REWU). In M. Rukuni, and J. B. Wyckoff (Eds.), Market Reforms, Research Policy, and Food Security in the SADCC Region, Proceedings of the sixth Annual Conference on Food Security Research in Southern Africa. University of Zimbabwe, Harare
- Mata, L.J. (1978). The children of Santa Maria Couque: A prospective field study of health and growth. M.I.T. Press, Cambridge MA
- Mata, L.J., (1980). Child Malnutrition and Deprivation Observations in Guatemala and Costa Rica. Food Nutrition (Rome), 6 (2) 7-14.
- Mead, M. and C.E. Guthe (1945). Manual For The Study Of Food Habits. Report of the Committee on Foods Habits. National Research Council, Nat. Academy of Sciences, Washington, D.C. No. 111 pp. 3-52.
- Mellor, Y. W., and B. F. Johnston (1987). The World Food Equation: Interrelations among development, employment, and food consumption. In J.P. Gittinger, J. Leslie, and C. Hoisington. (Eds.), Food policy. Integrating supply, distribution, and food equation: interrelations among development, employment, and food consumption. Johns Hopkins University Press. Baltimore and London pp. 39-71.
- Messer, E. (1989). Seasonality in Food Systems: An Anthropological Perspective on Household Food Security. In D.E. Sahn (Ed.), Seasonal Variability in Third World Agriculture. The Johns Hopkins University Press, Baltimore and London. Chapter 10, pp. 151-175.
- Ministère de la Santé Publique (1992). Situation Alimentaire et Nutritionnelle du Cameroun (version finale). Preparation de la conférence Internationale sur la Nutrtrition Rèpublique du Cameroun, Yaounde, Cameroon pp. 1-34.
- Moitoka, R. (1983). Effets de la disponibilité alimentaire sur l'état nutritionnel des enfants de 0 à 23 mois en zone rurale Exèmple du village Gazawa près de Maroua, Extrême Nord. Thèse de Doctorat en Médecine, C.U.S.S., University of Yaounde, Cameroon

- Monckeberg, B.F. (1992). Integrating national food, nutrition, and health policy: The children experience. In N.G. Kotler (Eds.), Frontiers of Nutrition and Food Security in Asia, Africa, and Latin America. ILSI N.A. Smithsonian Institution Press, Washington and London. Chapter 5 pp. 50-73.
- Moukam, R. (1979). Etude de L'état nutritionnel des enfants des 0 à 60 mois au Cameroon: application a l'arrondissement de Ngoundéré. Thèse de Doctorat en Médecine, C.U.S.S., University of Yaounde, Cameroon.
- Msukwa, L.A.H. (1989) Household food security and nutrition: The case of Malawi. Paper presented at the UNICEF Regional Network Meeting on "Household Food Security and Nutrition". 6 April.
- Mudim G., C. Mbwanda S. Chigume, and J. Govere (1988). Household food insecurity in low-rainfall areas of Zimbabwe: Initial findings in Mudzi, Mutoko and Buhera communal areas. In Southern Africa: Food security policy options/Harare, Zimbabwe: UZ/MSU Food security research in South Africa - Project, Department of Agricultural Economics and Extension, University of Zimbabwe, Harare pp. 217-233.
- Muñoz De Chavez, M.M., P. Arroyo, S.E.P. Gil, M. Hernanez, S.E. Quiroz, M. Rodriguez, M.P. De Hermelo and A. Chávez (1974). The epidemiology of good nutrition in a population with a high prevalence of malnutrition. Ecology of Food Nutr. 3, 223-230.
- Nkwain, S.J.; Ayissi M.J.P.; and Njwe, R.M., (1988). Cameroon's Food Consumption and Consumption Projections. USAID, Washington, D.C.
- Obi, J.O. (1976). Rehabilitation of patients with protein calorie malnutrition in Benin City, Nigeria. J. Trop. Pediat., 22, 211-213.
- Ojofeitimi, E.O. (1982). Causes of protein energy malnutrition as viewed by the clients' mother. J. Tropical Pediat., 28, 147-148.
- Ojofeitimi, E.O., O.Ajao, and J.E. Ighere (1987). Infant protein energy malnutrition in Nigeria. J. Royal Soc. of Health, 107 (3), 95-97.

- Ouden, J.H.B. (1981). Changes in land tenure and land use in a Bamileke Chiefdom, Cameroon, 1900-1980: A historical analysis of changes in control over people, land, and production. In R.A.J. Van Lier (Ed.), Essays in Rural Sociology. The Agricultural University Press. Wageningen, Netherlands pp. 171-262.
- Oni, G.A., K.H. Brown, M.E. Bentley, K.L. Dickin, B. Kayode and I. Alade (1991). Feeding practices and prevalence of hand-feeding of infants and young children in Kwara State, Nigeria. Ecology of Food Nutr., 25, 209-219.
- Pelto, H.G., 1987. Cultural Issues in Maternal and Child Health and Nutrition. Social Sci. Med. 25, 553-559.
- Peters, P.E. (1988). The links between production and consumption and the achievement of food security among smallholder farmers in Zomba South. In Report of the Workshop on: Household food security and nutrition, Zomba, 28th to 31st August 1988, Volume II, Papers presented. University of Malawi, Zomba, pp. 33-113.
- Pinstrup-Andersen, P. (1989). Government Policy, Food Security and Nutrition in Sub-Saharan Africa. PEW/Cornell Lecture Series on Food and Nutrition Policy, Cornell university Press, Ithaca, NY, pp. 1-39.
- Pinstrup-Andersen and M. Garcia (1990). Data on food consumption by high-risk family members: Its utility for identifying target households for food and nutrition programs. In B. Rogers and N. Schlossman (Eds.), Intra-household resource allocation: Issues and methods for development and policy planning. United Nations Press, Tokyo, chapter 12, pp. 164-174.
- Rao, M. (1986) Knowledge, attitude and practice regarding nutrition among pregnant women in rural Dharwad, Karnataka, India. Ecology of Food Nutr., 18, 197-208.
- Reddy, S. (1986). Practical problems with obtaining valid and reliable information on household food utilisation. J. of Trop. Pediat., 14, 2, 66-70.
- Reutlinger, S. and J. Van Holst Pellekaan. (1986). Poverty and Hunger: Issues and options for food security in developing countries. World Bank, Washington, D.C. pp .1.
- Rikong, H.A., G.E. Martin, L. Noubi, and M.T. Garba (1985). Prevention de la malnutrition protéino-energetique en zone rurale. Révue Science et Technique, (Sci. Santé), Tome II, no. 1-2, 7-20.

- Rikong, H.A., N Jiogo, N.Vd Ven, Y. Vd Poel, and P. Ngouajio (1990). Les populations favorisées: Les petits enfants. La situation nutritionnelle au Cameroun d'après les enquêtes épidémiologiques les plus récentes, Centre de Nutrition, IMPM, MESIRES, Yaounde, Cameroon, pp. 1-8
- Romero de Gwynn, E. and D. Sanjur (1974). Nutritional anthropometry: Diet and health-related correlates among pre-school children in Bogota Colombia. Ecology of Food Nutr., 3, 273-282.
- Rozin, P. (1982). Human food selection: The interaction of Biology, Culture, and Individual Experience. In L.M. Barker (Ed.), The Psychology of Human Food Selection. Avi Publishing Company, Inc. Westport, Connecticut pp. 225-254.
- Rukuni, M. and C.K. Eicher, (1987). The Food Security Equation in Southern Africa. Reprint No. 5 Dept. of Agri. Economics, Michigan State University, East Lansing, pp.1-32.
- Rukuni, M. and R.H. Bernstein (1988). Major Issues in Designing a Research Programme on Household Food Security. In Southern Africa: Food security policy and options. University of Zimbabwe, Harare.
- Sahn, D.E. (1989). A Conceptual Framework for Examining the Seasonality Aspects of Household Food Security. In D.E. Sahn (Ed.), Seasonal Variability in Third World Agriculture. The Johns Hopkins University Press, Baltimore and London. Chapter 1, pp. 3-16.
- Sanjur, D. and A. Scoma (1971). Food habits of low-income children in Northern New York. J. Nutr. Educ., 2, 85-94
- Schuftan, C. (1981). Nutritional intervention programmes for rural areas: African Experiences. J. Trop. Pediat. 27, 177-181.
- Scrimshaw, N.S., C.E. Yaylor, and J.E. Gordon (1968). Interactions of Nutrition and Infection. World Health Organisation Monograph No.57, Geneva.
- Scrimshaw, N.S. (1971). Environmental Factors in the Interrelationships of Nutrition and Infection. In Proceedings of the First Asian Congress of Nutrition. Nutrition Society of India, Hyderabad.
- Sharman, A. (1970). Social and Economic Aspects of Nutrition in Padhold Dukedi District, Uganda. Ph.D. diss., University of London.

- Staatz, J. M., V. C. D'Agostino, and S. Sundberg (1990). Measuring Food Security in Africa Conceptual, Empirical, and Policy Issues. Am. J. of Agricul. Econ., 72, 1311-1317.
- Sukkary-Stolba, S. (1987). Food classifications and the diets of young children in rural Egypt. Social Sci. and Med., 25, 401-404.
- Sundberg, S. and V. D'Agostino (1990). Household production and income strategies as indicators of consumption security in South Central Mali. Paper presented at "The Agricultural-Nutrition Linkage Workshop", Arlington, Virginia, February 12-13 pp. 1-10.
- Tabod, A.A. (1991). A nutrition survey of Pre-school age children of Bangang village, Bamboutous Division, Western Province, Cameroon. Thesis, Doctor of Medicine, U.C.H.S., University of Yaounde, Cameroon
- Tagwireyi, J. (1990). Food access and nutrition linkages. Policy issues and programme options in Zimbabwe. In Rukuni, M. and J. B. Wyckoff (Eds.,) Market Reforms, Research Policy, and Food Security in the SADCC Region, Proceedings of the sixth Annual Conference on Food Security Research in Southern Africa. University of Zimbabwe, Harare
- Toko, H.A. (1983). Evaluation of primary health care services of Mukonje Rubber Estate of Cameroon Development Corporation, S.W. Province of Cameroon. Thesis, Doctor of Medicine, U.C.H.S., University of Yaounde, Cameroon
- Toole, D. (1987). Household food security: Some initial conclusions from recent UNICEF experiences in Africa. Paper presented at the Cornell University/UNICEF Seminar on nutritional surveillance in Eastern and South Africa, Mauritius September 14 to October 23.
- Torun, B. and F.E. Viteri (1981). Energy requirements of pre-school children and effects on protein metabolism. Food and Nutr. Bulletin, 5 (Suppl.), 229-241.
- UNICEF (1985). Within Human Reach. A Future for Africa's Children. United Nations Children Fund. New York pp. 11-15.
- UN, (1987). United Nations First Report on World Nutrition Situation. United Nations, New York, pp. 1-16
- USAID, 1978. United Republic of Cameroon National Nutrition Survey. Office of Nutrition Development Support Bureau

- Ushewokunze, H. (1990). Opening remarks. In J.P. Gittinger, S. Chernick, N.R. Horenstein, and K. Saito (Eds.), Household Food Security and the Role of Women. World Bank Discussion Papers No 96. World Bank, Washington, D.C., pp vii.
- Valenzuela, R. (1977). A Study of Nutrient Distribution within the Family and Factors Affecting Nutrient Intake. University of the Philippines, Quezon city.
- Van Arsdell, H.E. (1983). Growth failure in breast-fed Thai infants. Ph.D. thesis. Massachusetts Institute of Technology, Amherst
- Van Eijk, R. (1986). "Naître et croître au Cameroun". Etudes anthropobiologiques dans trois groupes ethniques Bamiléké, Bangandu et Baka. Thèse, doctorat en médecine. University of Utrecht, Netherlands
- Waterlow, J.C.; Buzina, R.; Keller, W.; Lane, J.M.; Nichaman, M.Z. and Tanner, J., (1977). The presentation and use of height and weight data for comparing the nutritional status of groups of children under the age of ten years. Bull. WHO 55, 4, 489-498.
- Weber, M.T., J.M. Staatz, J.S. Holtzman, E.W Crawford, and R. H. Bersten (1988). Informing food security decisions in Africa: Empirical analysis of policy dialogue. Am. J. of Agricul. Econ., 70, 1044-1052.
- Weerasinghe C., S. Karaliedde, and T.W. Wirkramanayake (1982). Food Beliefs and practices among Sri Lankans. 1) Temporary food avoidances by women. J. Nat. Sci. Council Sri Lanka, 10, 1, 59-70.
- Wenlock, R.W. (1981). Nutritional Risk in the Family Environment in Zambia. Ecology of Food Nutr., 10, 79-86.
- WHO, (1986). Use and interpretation of anthropometric indicators of nutritional status. Review Analyses. Bulletin of the World Health Organization, 64, 929-941.
- WHO, (1983). Measuring change in nutritional status: Guidelines for assessing the nutritional impact of supplementary feeding programmes for vulnerable groups. WHO, Geneva.

- Williams, K. (1988). Food and Nutritional Surveillance. In Center for Social Research (Eds.), Report of the Workshop on: Household Food Security and Nutrition, Zomba, 28th to 31st August. Volume II Papers presented. University of Malawi, Zomba pp. 12-16.
- Wishik, S.M. and S. Van der Vynckt, 1976. The Use of Nutritional Positive Deviants to Identify Approaches for Modification of Dietary Practices. Am. J. Public Health. 66, 1, 38-42.
- World Bank. (1986a). World Bank Annual Report. World Bank, Washington DC. pp. 129-130.
- World Bank. (1986b). Poverty and Hunger: Issues and Options for Food Security in Developing Countries. World Bank, Washington D.C.
- Wray, J.D., 1972. Can We Learn from Successful Mothers? J. Trop. Pediat. Environ. Child Health, 18, 279-283.
- Young, F.W. and R.C. Young (1968). The differentiation of family structure in rural Mexico. J. Marriage Family, 30, 154-160.
- Zeitlin, M.F.; Ghassemi, H.; and Mansour, M., 1990. Positive Deviance in Child Nutrition, with Emphasis on Psychosocial and Behavioral Aspects and Implications for Development. The United Nations University, Tokyo
- Zeitlin, M.F. and H. Ghassemi (1986). Positive deviance in nutrition. Adequate growth in poor households. In J. Libbey (Ed.), A Workshop Report-Proceedings of the 13th International Congress of Nutrition. London. pp. 158-161.
- Zerfas, A.J., W.D. Browdy, I.J. Shorr, D. B. Jelliffe and E.F.P. Jelliffe (1982). Focused National Nutrition Surveys. In D.B. Jelliffe and E.F.P. Jelliffe (Eds.), Advances in International Maternal Child Health. Oxford University Press, New York and Toronto, Vol. 2, Chapter 5, pp. 56-86.

CHAPTER 2

FOOD STATUS IN WEST PROVINCE: PRODUCTION, SUPPLIES, CONSUMPTION, AND HOUSEHOLD FOOD SECURITY

ABSTRACT

Household food security is an area where reliable information is scarce. Observed diversity in sub-regional correlates of household food security suggest that indicators to monitor household food security need to be area specific. Although several researchers have studied food production, food supplies, or food consumption in Cameroon at the national or in the West Province at regional level, no one has studied household food access in the rural areas.

Food status of 300 rural households with children between 15 and 36 months was studied. Number of crops stored by a household that lasted throughout the year was used as a proxy for household food security. Most (47.9%) of the households were low food secure, 36.3% moderately food secure, and only 16.6% highly food secure. Household food security was positively correlated with total number of food crops grown; total number of days per week different food crops were eaten; total number of days per week fruits, green leafy vegetables and other vegetables were eaten; and negatively correlated with total number of food crops bought by households. Knowledge of households food security of a community is necessary for determining nutritional status of individuals in the households and for effective policy planning.

INTRODUCTION

Developing nations need to keep informed about the food status of their people so that they can anticipate problems in both production and marketing and can take steps to assure adequate supplies, equitable distribution, and efficient utilization of food (Burk and Ezekiel, 1967). Dei (1990, 1991) recommended that studies needed to be conducted at micro-levels (e.g. household and community) to provide effective information for policy planning in Africa.

Israel et al. (1982) reviewed studies on the food status in Cameroon from 1961 to 1981. Most of the studies based their estimations on per capita food production and consumption, or supplies of selected food crops. A few of the studies listed national and regional principal agricultural products and supporting crops, but only one study, the 1978 National Nutrition Survey, examined the food status at the household or family level. Since 1978, several authors (Van Ejik, 1986; Nkwain et al., 1988; Gwangwa'a et al., 1989; Ministère de la Santé Publique, 1992) have examined the food status in Cameroon. Those authors mainly studied food production and availability in some villages and cities in the country. Nkwain et al. (1988) reported food production and availability on a per capita basis in six cities while the other authors simply described the food status as observed. None of them studied food status at the household level, and

only one (Gwangwa'a et al., 1989) reported on food in rural areas.

The West Province of Cameroon is known as the "granary" of the country as it is located within the most fertile ecological zone of Cameroon. In this province is grown at least a little of all food crops produced in Cameroon (Ministère de la Santé Publique (1992)). Nevertheless, according to the 1978 National Nutrition Survey, protein energy malnutrition (PEM) among children under 5 years of age in Cameroon was at its highest levels (30.8%) in rural areas of the West Province. In Cameroon as a whole, a higher percentage (22.4%) of children in rural areas than in urban areas (19.4%) suffered from chronic undernutrition. Since the 1978 National Nutrition Survey, spot studies (Van Ejik, 1986; Tabod, 1991; Barrère, 1992) carried out in the West Province showed that malnutrition among children under five years of age still exists despite overall food availability.

Variability in nutritional status of children determined by anthropometric measurements is explained by factors that are both endogenous and exogenous to the household (Chisvo and Jayne, 1992). A main endogenous (i.e. controlled by the household) factor is the food grown and eaten by the household. Similarly, a major exogenous factor is food that may or may not be available either from distribution or price considerations. Some researchers (Jayne et al., 1990a; Tagwireyi, 1990; Jayne and Rukuni, 1991) in Zimbabwe, argued

that the health and nutrition outcomes of children under five years of age living in the household are by and large the result of the food security status in that household. The World Summit for Children Plan of Action (1990) noted that one of the underlying causes of malnutrition in children is inadequate household food security.

Household food security is an area where reliable information is scarce and consensus is lacking as to what data would be practical to collect and use, and what actions are needed (Latham et al., 1992). Staatz et al. (1990) pointed out that information on household or individual entitlement to food was lacking. Chisvo (1992) noted that development of indicators of household food security is a difficult task. He observed that because of a lack of explicit indicators for household food security, researchers by default used measurement of national food security to assess households food security in individual Southern African Development Coordination Conference (SADCC) states. For example, Masundire (1990) applied forecasted supply and demand per capita of staple foods and a commodity base concept which uses Maize Equivalent (M.E.) to assess household food security.

Efforts to develop indicators of household food security that included food access have not been entirely successful. For example, Chopak (1989) used three indicators: 1) annual net per capita household income, 2) food adequacy, and 3) seasonal variability of food adequacy, to determine the

incidence of household food insecurity in two low rainfall areas in Zimbabwe. The author concluded that those indicators were useful, but not sufficient, to determine household food security. Staatz et al. (1990) and Sommers (1993) concluded that observed diversity in sub-regional correlates of household food security suggested that any attempt to develop indicators to monitor household food security needs to be area specific.

Pinstrup-Andersen (1989) indicated that household's access to food is very important to nutritional status. In Mali, Staatz et al. (1990) observed that agricultural production remained vital to both the overall food security of the household and nutritional status of its vulnerable members, in spite of the importance of non-farm activities in the northern households' income strategy. Developing better indicators of household food security that incorporate food access, especially for the rural poor who derive all or most of their livelihood from agriculture (subsistence or semi-subsistence farmers), would include: the household's own production; household's own storage; and household supplies (purchased food, gifts and food exchanges). For the rural poor those indicators may represent both available and accessed food to the household. Rukuni and Eicher (1987) pointed out that at the household level, food can be acquired through home production, food transfer (traded or received free), and/or purchase in the markets.

Although several researchers have studied food production, food supplies, or food consumption in Cameroon at the national or in the West Province at regional level, no one has studied food access in the rural areas. Therefore, the purpose of this paper is: 1) to examine the household food status in rural areas of the West Province of Cameroon, and 2) to develop an index or proxy for determining household food security.

Emphasis was placed on households with young children between 15 and 36 months, because of the high incidence of malnutrition in those children.

MATERIALS AND METHODS

Population

The target population for this study was all rural households with mother/child pairs in which the child was 15 to 36 months of age and was living with its mother. Households for this study were defined to consist of a woman, her husband, her children, and any other relatives residing in her house and eating from the same cooking unit or "pot" in the local parlance. In polygynous families, consisting of a husband with more than one wife and possibly, unmarried brothers, father's wives, and other relatives, only one of the wives was interviewed and her child measured. That was to avoid counting the father more than once as a member of a household. A stratified random sample of households

representing 3 (Noun, Menoua, and Haut-Nkam) of the six Divisions in the West Province was obtained. Approximately, 478 pairs were contacted but 140 were not eligible because the mother was married to the same husband as another mother who had already been surveyed; only one mother from any polygynous household was surveyed and only one child from any mother was assessed. Assessments were made on 338 eligible children, but in 21 cases the mother refused an interview and in 17 cases she provided interview data that were too incomplete to allow for subsequent analysis. The final sample included 300 mother/child pairs. Demographic data from the pairs that were eliminated or not fully tested is not complete enough to determine if they had characteristics different from the tested population. However, the percentage of completed questionnaires from eligible contacts was high (88.7%) and probably represents the rural West Province Population.

Questionnaire and Administration

A questionnaire was designed to obtain information on household food production, storage, selection, preparation, and consumption practices. The questionnaire was initially developed in English, translated into French (the official language of the West Province), pre-tested in the West Province of Cameroon on women who would not be part of the study, modified, and independently translated back into English to check for accuracy of translation. Nine interviewers were hired and trained for this project in April

1992 in Bafoussam, the capital of the West Province. Each interviewer was bilingual in both French and the local dialects of the villages to which she was to be assigned. The interviews were conducted face-to-face (going from house to house) by the trained interviewers and the principal author between May and July 1992, in the local dialect of each village, with the interviewer recording the answers on the copy of the questionnaire, in French.

RESULTS AND DISCUSSION

Demographics of Sample

Most of the mothers (89.7%) sampled were married; a few (8.0%) had never married, were separated (0.7%), or divorced (1.7%). The mothers' mean age was 29.5 years (SD = 7.89) with a range of 16 to 56 years; median age was approximately 28.3 years.

Out of the 300 women interviewed, 18.3% had never been to school, 14.7% had up to three years of schooling, 54.7% four to six years of schooling, and 12.3% seven to eleven years of schooling. The highest educational level attained by any subject was eleven years. The literacy rate for the mothers was 63.3%, which was highly correlated with educational attainment ($r = 0.80$, $p < 0.0001$). The national literacy rate is 65% (Hoffman, 1992) with our sample corresponding closely to the national average for this variable.

Household size ranged from two to seventeen, with an average of 6.20 ($SD = 2.15$); 42.7% of the households had five or fewer members while 57.3% had six or more. For polygynous households in this study a household included only one wife, her children, her husband, and relatives living with her. Slightly more than half (53.7%) of the children measured were boys and the rest (46.3%) were girls.

Crop Production and Use

To have an idea of their food production, consumption, and storage practices, women were asked if they grew various food crops and if they ate, sold, saved or gave as gifts the food crops that they grew (Table 1). Crops such as corn, cocoyam, and ground nut were grown and eaten by almost all households. More than 40% of the women produced and consumed most of the other food crops usually grown in the province including cassava, taro, plantain, red beans, yam, sweet potato, banana, okra, nkui, and green leafy vegetables. Some crops such as soy bean, bambara ground nuts, egusi, white beans, cow pea, and fruits, other than avocado pears and plums, were produced and consumed by less than 40%. Not more than 50% of the women sold any specific food crop produced.

Most women gave some of the food crops, especially corn, cocoyam, and ground nut, they produced as gifts to friends and other members of the family. Food sharing with family and non-family members is an African food ethic that needs to be

clearly understood when examining the African food and nutrition system (Schuftan, 1981 and Chisvo, 1992).

Selling a variety of crops was not widely practiced in the rural areas studied here. That is because: 1) other people in the same village grew similar crops, 2) crops are shared, not sold, to neighbors and village relatives and 3) a poor road infrastructure and lack of good storage facilities makes selling outside the village difficult.

Animal production and use

When we asked respondents if they raised animals and, if they did, which ones, more than half (63.3%) of the respondents said they kept some animals including chickens, goats, pigs or ducks (Table 2). The average number of specific animals owned per household, ranged from 1.8 (pigs) to 6.5 (ducks). No household owned cows and only one respondent owned a rabbit or guinea pig. Almost all households ate a variety of meats from the animals they raised, although they did not eat the meats daily.

Each of the meats from animals raised by the households were consumed by more than 83% of the households (Table 2). More than 56.5% of the families sold some animals that they raised. When goats, pigs and ducks were sold, more men (78.6%, 74.4%, and 58.3% respectively) than women (11.9%, 17.9%, and 33.3% respectively) kept the money. When chickens were sold more women (67.8%) than men (30.6%) kept the money raised.

TABLE 1
Percentage of households that produced, ate, sold, saved or
gave gifts of various crops.

Crops	Grew %	Ate ¹ %	Sold %	Saved %	Gave %
Corn	97.3	97.7	44.7	97.0	65.0
Cassava	85.7	78.0	39.3	60.0	48.7
Taro	70.0	68.0	25.3	41.0	36.7
Yam	69.7	58.3	22.0	19.3	33.3
Cocoyam	93.7	84.7	46.7	69.0	50.3
Sweet potato	72.0	61.7	35.3	29.7	38.3
Potato	50.0	42.3	16.3	24.3	23.7
Plantain	85.7	74.0	45.7	4.7	43.0
Banana	81.7	63.3	36.3	3.3	32.0
Bean	89.3	76.3	51.3	68.0	48.3
Cow pea	13.3	14.0	7.0	10.0	8.3
Soy bean	17.3	12.7	6.0	11.3	9.3
Ground Nut	94.3	90.7	45.3	86.3	59.0
Bambara nut	14.0	14.7	8.0	11.0	6.0
Egusi	50.3	35.3	12.3	21.0	16.0
Pumpkin	53.3	39.0	19.3	5.7	23.0
Green leaves	86.3	74.7	36.0	4.7	45.0
Okra	56.7	54.7	23.0	32.0	28.3
Nkui	56.3	54.3	13.0	14.7	22.3
Orange	13.0	5.3	2.3	1.0	2.3
Avocado pear	61.0	44.3	19.3	1.7	25.7
Mandarin	3.3	2.0	1.0	0.3	0.7
Plum	61.0	49.7	22.3	2.7	32.7
Papaya	43.7	26.3	10.3	1.7	16.7
Mango	57.7	37.7	15.0	1.7	21.7
Pineapple	43.3	28.0	8.7	2.0	19.0
Guava	32.3	31.3	13.7	1.3	20.7

¹Percentage of the total population who grew and subsequently ate the crop. Does not include households who ate the crop but did not grow it. See Table 3.

Table 2
Percentage of households that raised, ate, and/or sold animals
and average number of animals per household.

Animal/ Product	Raised %	Number kept ¹	Ate %	Sold %
Goats	18.7	3.1	94.6	76.4
Pigs	14.3	1.8	83.3	90.7
Ducks	6.3	6.5	85.0	60.0
Duck egg			95.0	
Chickens	53.7	5.8	98.1	56.5
Chicken egg			93.1	

¹Average for households that owned the specific animal; does not include households that did not raise that animal.

Food Consumption Practices

Table 3 indicates the percentage of families that ate specific foods; grew, bought, and/or received as gifts those foods that they ate; and the number of days per week each family ate the foods. The majority of households (52-99%) consumed almost all food crops available in the province, except carrots, mandarins, limes, and ground nut oil which were consumed by only 36.7%, 30.7%, 21.3%, and 43.3% respectively. More than half (50-79%) of the families produced almost all the types of food crops, except for fruits, that they consumed. A high percentage of the families (52-97%) bought food items (meat, oil, sugar, rice, soda pop, and bread) that they could not produce, perhaps indicating that many of the households generally were food secure.

In order to understand how available foods crops were translated into actual consumption, respondents were asked how many days per week their households ate each food and whether they produced, bought, or received as gifts (Table 3) some of these crops. We considered foods consumed two or more days per week as those which were actually translated into consumption by the household. Most of the foods were consumed in excess of two days per week. It is important to note that although 98 percent of households consumed palm oil an average of 6.5 days a week, most of the oil is used only for seasoning of foods (vegetables, pulses, sauces, and others) indicating that the amount usually is not much. This observation also was

TABLE 3
Household consumption and acquisition of various foods

Food	Ate %	Days per week eaten	Grow %	buy %	Receive as gift, %
Corn	99.3	3.9	97.3	41.7	57.7
Ground nut	98.7	4.1	94.3	88.3	48.7
Bean	95.7	2.1	89.3	36.0	46.7
Soy bean	27.7	2.0	17.3	15.7	12.7
Cassava	93.7	2.2	85.7	39.0	44.0
Cocoyam	98.3	2.5	93.7	36.3	47.0
Taro	77.3	1.7	70.0	18.3	30.0
Yam	80.0	2.3	69.7	25.0	36.3
Sweet yam	71.3	2.7	61.0	22.3	32.0
Plantain	95.7	2.3	85.7	28.3	47.7
Banana	91.3	2.2	81.7	25.3	41.0
Irish Potato	77.7	2.4	50.3	40.3	34.0
Sweet potato	85.3	2.1	72.0	27.3	40.0
Carrot	36.7	1.0	11.0	29.0	13.3
Cabbage	77.3	2.2	38.0	54.0	32.0
Tomato	74.3	4.1	31.7	57.0	27.7
Egusi	70.0	2.3	50.3	46.0	30.7
Pumpkin	65.3	2.0	53.3	24.7	35.0
Orange	52.0	2.8	13.0	46.0	22.0
Avocado pear	91.0	3.5	61.0	48.3	45.7
Mandarin	30.7	1.8	03.3	29.3	12.7
Plum	89.7	4.0	61.0	51.0	46.3
Papaya	64.0	2.6	43.7	28.7	30.0
Mango	87.3	3.8	57.7	44.7	42.0
Pineapple	69.3	2.2	43.3	38.3	31.0
Lime	21.3	1.4	4.3	16.7	10.0
Cafe	29.0	5.0	14.7	27.7	7.7
Greenleaf	97.0	3.1	86.3	38.7	53.7
Palm oil	98.7	6.5	27.3	92.0	49.3
Corn oil	9.0	2.3	*	9.0	2.7
Grd. nut oil	43.3	2.3	*	42.7	13.3
Sugar	60.9	4.6	*	60.5	22.4
Meat	82.3	1.5	*	81.3	25.4
Chicken	72.9	1.2	*	69.9	26.4
Sardine	54.8	1.6	*	52.8	19.1
Crayfish	52.5	2.4	*	51.8	14.7
Dry fish	97.3	4.7	*	96.3	39.8
Fish	93.0	2.0	*	91.3	29.4
Rice	97.7	2.6	*	96.7	35.8
Bread	82.9	3.5	*	81.3	32.1
Nkui	67.9	1.8	56.3	17.4	21.1
Soda pop	71.9	1.8	*	66.9	41.5

* not grown

noted in a study where the number of meals per day and the foods included in the daily diet of households were recorded (Rao, 1986).

Some categories of foods in our study, meat for example, were consumed less than two days per week indicating limited availability or poor translation of available animal resources into adequate meat intake. Nkwain et al., (1988) showed that Bafoussam, the capital of the West Province, had one of the lowest prices for meat per kilogram among six Cameroon cities studied. The low meat consumption by households in this study may be because the inexpensive meat in Bafoussam either was not available in rural areas or was available, but priced much higher. It was interesting to observe that crops such as carrots, taro and nkui were consumed (1.0 to 1.8 days per week each) not as frequently as the rest of the crops (> 2 days per week), although taro and nkui are produced in this province. We observed that foods such as rice, bread, sugar, soda pop, meat, crayfish and fish were consumed by 52.5 to 97.7% of the respondents, but were not produced by any respondent. Schuftan (1981) noted that most African countries often produce what they do not consume and consume what they do not produce.

Times of food scarcity

Women were asked whether there were times during the year they did not have enough food to feed their families. The majority (93.3%) felt that at least once during the year they

did not have enough food, but most women (76.3%) believed they had enough food except during the planting season. It appears from this data that most households felt food secure during the greatest portion of the year.

The types of food that were difficult to get during periods of food scarcity and those that were usually eaten during such periods are given in table 4. Apparently, tubers and cereals were difficult to obtain, but were eaten anyway, perhaps because they are staple parts of the diet. It is interesting to note that few people ate animal protein foods during times of food scarcity yet, only 36% of those people said it was scarce. This result may be because animal foods usually are difficult to obtain, are eaten only in small quantities, and therefore, are not considered any more difficult to obtain during periods of food scarcity than at other times. Delisle et al. (1991) observed that animal protein intake did not vary significantly among three population groups although measurement in one of the groups was taken during the lean season.

We were interested in determining foods that respondents liked to eat that were not available or could not be acquired. Rice was named most often as a desired food that was not available or acquirable (Table 5). Because rice was shown to be reasonably inexpensive in this province (Nkwain et al., 1988), our finding indicates that it probably was not readily available in the rural communities covered in this survey.

TABLE 4
Household consumption of food categories during times of
scarcity

Food Category	Eaten during general periods of food scarcity %	Households that said specific food category was scarce %
Tubers	77.3	78.4
Cereals	64.0	69.8
Legumes/oil seeds	15.0	46.7
Animal protein	13.7	36.6
Green leafy vegetables	12.3	10.8
Fruits	25.0	12.0

TABLE 5
Foods crops that households wanted but were unavailable.

Foods	Households that named the food first ¹ %	Total households that named the food %
Corn	7.7	17.3
Cocoyam	2.0	9.7
Irish potato	8.3	6.7
Beans	1.5	9.3
Cow pea	0.7	22.7
Rice	36.7	56.0
Meat	17.0	49.0
Fish	3.7	30.7

¹Women were asked to name up to six foods, this column includes only the percentage of women who named the food first.

Meat was mentioned by almost half of the participants (49%) as desired but not available/affordable, although it was mentioned at first by a smaller percentage than rice. Corn, irish potatoes, cow peas, and fish also were mentioned by over 15% of the participants as food that they would like greater access to. However, these products were not often mentioned first, perhaps indicating that although people desired those foods they were a lower priority for scarce resources than rice and meat.

Sources of Income, Savings and Money Usage Practices:

The majority of respondents (69.3%) said selling of food crops was their main source of income (Table 6). Mkamanga (1989) noted that in Malawi where subsistence or smallholder farming accounted for about 85 percent of all agricultural production, selling of food crops was the single largest source of income for the majority of the population. All our respondent households depended on subsistence farming. Mellor et al., (1987) concluded that agriculture has a dominant position as a source of income and employment in developing countries. In addition to selling agricultural products, about one-fourth (26.0%) of the respondents in this study earned money from selling provisions such as kerosene, matches, soap, corn beer, spices, and less than 20% made money from selling handicrafts or working for others.

The women were asked to discuss how they spent the money they earned. The majority of the households (85.3%) used the

TABLE 6
Sources of income and percentage of women who earned income
from those sources

	women %
Sell food crops	69.3
Sell provisions	26.0
Sell handicrafts	13.3
Weed fields	6.7
Make sun dried blocks	5.7
Carry loads	1.7
Receive from relatives and/or husband	19.3

money they earned to buy what they could not produce. These included food such as fish, meat, and red palm oil (Table 3) and basic necessities such as soap, oils for the skin, kerosene, and matches (Table 7). Only 14.3% gave some to their husbands, 24.0% save some at home, 0.7% saved in the bank and 42.7% saved in a tontine (Table 7). A tontine is a group of women who meet regularly and give a certain sum of money to a treasurer to keep. The money in the custody of the treasurer is more accessible than in the bank and members can borrow at an interest rate determined by the group. Some members contribute a small amount monthly to the tontine "trouble bank" for use in times of "trouble" such as deaths of a member or a member's relative.

Food storage

The women listed food crops they processed and stored, and how many crops lasted until the following harvest (Table 8). Generally, cereals (maize); tubers (cocoyam, yam, cassava, sweet potato, irish potato, taro,); legumes (beans, ground nut, cow pea, soy bean, pumpkin and egusi seeds); okra and green leafy vegetables were stored. We considered households with 0 to 2 crops that lasted throughout the year as low food secure (47.9%), those with 3 to 4 crops that lasted as moderately food secure (36.3%), and those with 5 to 6 crops that lasted as highly food secure (16.6%). Only 6.7% of the households felt they were food secure all year. Those households were among the 16.6% high food secure households.

TABLE 7
Types of expenditures on non-food items.

	Households %
Give to husband	14.3*
Save:	
home	24.0
tontine	42.7
bank	0.7
Buy what they can't produce:	85.3
clothing	70.3
soap	45.3
matches	1.7
toilet belongings	20.7
school supplies	6.0
medicine	5.3
Pay school fees	6.9
Pay for medical treatment	8.3
Pay traditional healers	11.0

* only one woman gave all her money to her husband.

The proxy for food security, crops that lasted, could be left as the total number of crops that lasted until the next harvest, 0 to 6, or it could be divided into a smaller number of categories. We sought the best way of evaluating food security. First, a median split, coding scores of 0 through 2 and 3 through 6 into low or high food security, was used. However, although the splits were nearly even (47% and 53%), we wondered if a middle group of people were present, who might be similar to the low food secure group for some variables, like the high food secure group for some variables, and different from both groups on other variables. Different groupings were attempted, and we were best able to account for the differences we observed when using three groupings (low, moderate and high) and coding scores of 0 through 2 as low food security, scores 3 and 4 as moderate food security, and scores of 5 and 6 as high food security. The use of the total number of food crops that were stored that lasted all year round to determine household food security is closer to the definition of food security than per capita net grain availability used by Sundberg and D'Agostino (1990).

Associations between food security and related variables were established (table 9). There were significant differences in the total different number of foods grown among low, moderate, and high food secure households, indicating that increases in the total number of foods grown implied increase in food security. High food security households

TABLE 8
Percentage of households and the number of food crops that
lasted all year round.

Crops number	Households %
0	12.3
1	9.3
2	25.3
3	20.0
4	16.3
5	11.3
6	5.3

Table 9
Variable means and differences among levels of food security.

Variables	Food Security			
	Low X (S.D)	Moderate X (S.D)	High X (S.D)	p
FOODGROW	14.52a (6.07)	16.90b (4.71)	19.27c (3.90)	.0001
Sugar	3.08a (3.56)	3.31a (3.93)	4.69b (3.72)	.0312
FOODEAT	30.29 (7.17)	30.10 (6.09)	30.80 (5.16)	.8236
Cereals	5.34 (3.61)	5.39 (3.45)	6.31 (4.24)	.2552
Plant Protein	6.21x (3.79)	6.81xy (3.46)	7.24y (3.51)	.1740
Fruits	11.47a (10.19)	13.92ab (10.06)	15.54b (9.07)	.0247
Leafy Vegetables	3.38a (2.46)	3.95ab (2.31)	4.76b (2.68)	.0023
Other Vegetables	3.70a (3.81)	3.41a (3.31)	5.65b (4.21)	.0015
Fats and Oils	7.04x (2.54)	7.15x (2.15)	8.00y (2.96)	.0592
Carbohydrates	14.96 (8.30)	15.43 (9.31)	15.61 (7.67)	.8668
FOODWEEK	63.95a (32.70)	68.40ab (35.20)	77.67b (32.02)	.0485
FOODBUY	63.58a (9.62)	59.62b (8.68)	57.63b (6.32)	.0000
FOODGFT	54.25x (10.96)	56.62y (8.63)	55.02xy (9.67)	.1731
WIFEWORK	3.16 (0.52)	3.10 (0.38)	3.18 (0.44)	.5188
HOUSING	17.65 (2.98)	18.14 (2.65)	17.74 (2.54)	.3787
EQUIPMENT	6.48 (1.38)	6.33 (1.34)	6.52 (1.09)	.5853

a,b,c Means followed by the same letter are not significantly different from each other (p <0.05).

x,y Means followed by the same letter are not significantly different from each other (p <0.10).

consumed more sugars (sugar and soda pop) and fats and oils than low food secure households. This could mean that because high food secure households store more crops that lasted the whole year round, they were able to sell some and spend the money on sugars, fats and oils. There was no significant difference in the varieties of food eaten by low, moderate, and high food secure households. Cereals and carbohydrates being staples were not eaten more by any of the groups of households. Thus consumption of grain had nothing to do with household food security. High food secure households consume more fruits, leafy, and other vegetables than low food secure households. The total number of days per week food was eaten was higher for high than low food secure households. Low food secure households bought more food crops than high food secure households because they stored none or few crops that lasted until the following harvest. No significant difference in food gifts among the three groups is an indication that inter-household gifts of foods are not related to need.

Mothers' sources of income, types of equipment owned, and type of housing did not differ significantly among the three groups of households.

Conclusion

The use of the total number of food crops that were stored and that lasted until the following harvest appears to provide information to define household food security, i.e. ability to access at all times by all members of the

households enough food for a healthy active life. Household food security for the population studied did not seem to depend on socioeconomic status (sources of income, types of electrical equipment or type of housing). Consumption of grains was constant regardless of the level of food security indicating its place as a staple crop. Consumption of meat was low for all groups indicating its scarcity and cost affects its consumption by every one. Variety of other foods, such as green leafy and other vegetables, fruits, and sugar and sugar products was higher when food security was judged to be higher.

Knowledge of household food security of a community is required for effective policy planning to assure adequate supplies, equitable distribution, and efficient use of food by members of the household. Because household food security is influenced by regional, national, and world food security and by public food policy, the link between household food security and other levels of food security must be established in order to design appropriate development strategies and government policies to combat food insecurity and malnutrition.

REFERENCES

- Barrère, B. (1992). Allaitement, nutrition et état nutritionnel. In M. Balépa, M. Fotso, and B. Barrère (Eds.), Enquête Démographique et de Santé Cameroun, 1991. Macro International Inc., Columbia, Maryland USA, chapter 8, pp. 119-130.
- Burk, C. M. and Ezekiel, 1967. Food and Nutrition in Developing Economy. In: H.M. Southworth and B.F. Johnston, (Eds.), Agricultural Development and Economic Growth. Cornell University Press, Ithaca, NY. pp. 327-358.
- Chisvo, M. and T. S. Jayne (1992). Is grain availability an important determination of variation of nutritional status among children? Preliminary evidence and policy implications from Zimbabwe's communal areas. In J. B. Wyckoff, and M. Rukuni (Eds.), Food security research in Southern Africa: Policy Implications. University of Zimbabwe, Harare, Chapter 13 pp. 250- 264.
- Chisvo, M. (1992). Household Food Security and Nutrition in Zimbabwe, UNICEF, Zimbabwe, pp. 1-39.
- Chopak, C. (1989). Family Income Sources and Food Security, In G. Mudimu, and H. Bernstein, (Eds.), Household and National Food Security in Southern Africa. October 31-November 3, 1988. University of Zimbabwe, Harare, pp. 193-208.
- Dei, G.J.S. (1990). Indigenous knowledge and economic production: The food crop cultivation, preservation and storage methods of a West African community. Ecology of Food and Nutr., 24,1-20.
- Dei, G.J.S. (1991). The dietary habits of Ghanaian farming community. Ecology of Food and Nutr. 25, 29-49.
- Gwangwa'a S., G. Koppert, H. Rikong, N. Metz, N. Venema, M. Kombou (1989). Preliminary results of a demographic and anthropometrical study in Awing, North West Province of Cameroon. Presented, 1er Congrès Comité Camerounais des Biosciences, Ngoundéré, Cameroun.
- Hoffman, S. (Ed.) (1992). The World Almanac and Book of Facts, 1993. Pharos Books, New York. p. 739.
- Israel, R., J. Nestor, E.B. Taylor, and S. Wirtz. (1982). Maternal and Infant Nutrition Reviews: Cameroon: A guide to literature. Publishers International Nutrition Communication Service, pp. 1-59.

- Jayne, T. S. and M. Rukuni (1991). Toward a Food and Nutrition Policy for Zimbabwe: Introduction. In Proceedings of the Second National Consultative Workshop on Integrating Food, Nutrition and Agricultural Policy. University of Zimbabwe, Harare
- Jayne, T. S., M. Chisvo, B. Hidden-Dunkhorst, and S. Chigume (1990). Unravelling Zimbabwe's Food Insecurity Paradox: Implications for Grain Marketing Reform, In T. S. Jayne, M. Rukuni, and J. B. Wyckoff (Eds.), Integrating Food and Nutrition Policy in Zimbabwe: Proceedings of the First Annual Consultative Workshop on Food and Nutrition Policy. University of Zimbabwe, Harare, pp. 25-44.
- Latham, M.C., Anderson-Brolin, L., Antonsson-Ogle, B., Michanek, E., Mpanju, W.F.K. and Wago, J.W. (1992). Thoughts for Food: An Evaluation of the Tanzania Food and Nutrition Center. SIDA Evaluation Report 1992/2, Tanzania. pp. 74-77.
- Masundire, R. T. (1990). Current Status and Future Plans of the SADCC Early Warning Unit (REWU). In M. Rukuni, and J. B. Wyckoff (Eds.), Market Reforms, Research Policy, and Food Security in the SADCC Region, Proceedings of the sixth Annual Conference on Food Security Research in Southern Africa. University of Zimbabwe, Harare
- Ministère de la Santé Publique (1992). Situation Alimentaire et Nutritionnelle du Cameroun (version finale). Preparation de la conférence Internationale sur la Nutrition République du Cameroun, Yaounde, Cameroon pp. 1-34.
- Nkwain, S.J.; Ayissi M.J.P.; and Njwe, R.M., (1988). Cameroon's Food Consumption and Consumption Projections. USAID, Washington, D.C.
- Pinstrup-Andersen, P. (1989). Government Policy, Food Security and Nutrition in Sub-Saharan Africa. PEW/Cornell Lecture Series on Food and Nutrition Policy, Cornell university Press, Ithaca, NY, pp. 1-39.
- Rukuni, M. and C.K. Eicher, (1987). The Food Security Equation in Southern Africa. Reprint No. 5 Dept. of Agri. Economics, Michigan State University, East Lansing, pp.1-32.
- Sommers, P. (1993). Practical household food security: An approach from the Pacific. United Nations-Subcommittee on Nutrition, SCN News, 9: 51-53.

- Staatz, J. M., V. C. D'Agostino, and S. Sundberg (1990). Measuring Food Security in Africa Conceptual, Empirical, and Policy Issues. Am. J. of Agricul. Econ., 72, 1311-1317.
- Tabod, A.A. (1991). A nutrition survey of Pre-school age children of Bangang village, Bamboutous Division, Western Province, Cameroon. Thesis, Doctor of Medicine, U.C.H.S., University of Yaounde, Cameroon
- Tagwireyi, J. (1990). Food access and nutrition linkages. Policy issues and programme options in Zimbabwe. In Rukuni, M. and J. B. Wyckoff (Eds.,) Market Reforms, Research Policy, and Food Security in the SADCC Region, Proceedings of the sixth Annual Conference on Food Security Research in Southern Africa. University of Zimbabwe, Harare
- USAID, 1978. United Republic of Cameroon National Nutrition Survey. Office of Nutrition Development Support Bureau AID, Washington, D.C.
- Van Eijk, R. (1986). "Naître et croître au Cameroun". Etudes anthropobiologiques dans trois groupes ethniques Bamiléké, Bangandu et Baka. Thèse, doctorat en médecine University of Utrecht, The Netherlands.

CHAPTER 3

ROLE OF FOOD SECURITY AND MATERNAL TECHNOLOGY ON THE GROWTH OF RECENTLY WEANED CHILDREN IN RURAL WEST PROVINCE (CAMEROON)

ABSTRACT

Malnutrition still exists in rural areas of the West Province of Cameroon. We observed that 27% of the children were stunted, 17.3% wasting, and 0.3% acutely undernourished. Household food security as measured did not independently influence nutritional status (chronic or wasting) of children. Rather, household food consumption practices (meal planning and variety), good hygienic and health practices, and weaning ages of children were significantly associated with reduced stuntedness. Beyond those variables, interaction among variables indicated that areas of maternal technology such as mothers experience, physically assisting the child at meals, and preparing and serving frequently various foods contributed positively to good growth of the children. There were more children (36.7%) with good growth in low food secure households (positive deviant) than there were stunted children (4.7%) in high food secure households (negative deviants). Mothers of positive deviant children started leaving their children with other people at an older age, had better hygienic practices, and served food to their children before themselves than mothers of negative deviant children.

INTRODUCTION

Food insecurity and malnutrition are serious problems that appear to affect 25% of the population in sub-Saharan Africa (Pinstруп-Andersen, 1989). However, even in regions of food security, malnutrition exists. Food security, measured nationally, regionally, or even at the household level, is not sufficient to assure good nutrition of individuals in the household (Johnson, 1985; Pinstруп-Andersen, 1989; Maribe, 1992; Mangahas, 1984), especially children, because of intervening variables such as household food consumption practices, weaning practices, child morbidity, and general child care (Delisle et al., 1991). Food security of a household often can be translated into improved nutritional status of adults, but not necessarily of pre-school children because of inequality in food adequacy between adults and children in a household (Obi, 1976; Valenzuela, 1977; Aligaen and Florencia, 1980; Pinstруп-Andersen, 1990; Kennedy and Cogill (1987) and because these children are among the most vulnerable of groups and are powerless (Jonsson, 1993).

Several researchers (Zeitlin and Ghassemi 1986; Messer, 1989; Sharman, 1970) observed that household food consumption practices and the particular skill of a mother at managing work and child care have more impact than household food availability and food security on nutrition and health of children. The link between household food security and nutritional status of individuals in the household is not

clear because of a lack of understanding of how various factors determine the extent to which secure food is translated into consumption.

Mata (1980) discussed "maternal technology" as an important determinant of the malnutrition complex. He defined maternal technology as "practices, traditions, and beliefs relating to food preparation, feeding techniques, child care during illness and convalescence, handling of drinking water and of feces, and personal hygiene". He observed that some mothers exhibited a high level of technology that was independent of their upbringing or schooling, and he suggested that this "technology" was why some infants and young children in a community thrive well under village conditions. Generally, maternal rather than paternal practices are stressed because women are almost totally responsible for their children's food and other necessities (Chaiken, 1986; Dettwyler, 1986; Sommers, 1993).

Several researchers (Hegsted, 1967; Wray, 1972; Greaves, 1979) observed that some mothers managed to rear healthy and active children, yet belonged to the same community as those who did not. Zeitlin et al., (1990) proposed that unexpectedly healthy children could be thought of as positive deviant; unhealthy children from families with adequate resources could then be considered a negative deviant. Mothers' beliefs and practices relating to child feeding and health care may result in inadequate growth even when a

household is food secure (negative deviant) or in adequate growth when a household is food insecure (positive deviant). Therefore, those authors advocated the need to study practices of "successful mothers" and the reasons for nutritional successes rather than nutritional failures. Zeitlin et al., (1990) noted that very few studies in nutrition have systematically examined the households whose children are at the top end of the growth performance curve in order to learn from successful practices.

Several studies (Jelliffe, 1962; Fonaroff, 1968; Ojofeitimi, 1982; Jenkins et al., 1983; Jenkins and Heywood, 1984; Ojofeitimi et al., 1987; Jenkins, 1988; Dattal et al., 1988) have suggested that cultural concepts and practices concerned with child feeding and care are responsible for the observed poor growth in pre-school children in developing countries especially in the rural areas, although very few researchers have attempted to quantify those factors. Also, information on those factors collected from mothers of well-nourished and malnourished children residing in the same community would give an insight into what beliefs and practices, influenced by the same culture, contribute to malnutrition and good nutrition of children in that community.

Few researchers (Muñoz et al., 1974; Wolf, 1965; Malcolm, 1975; Romero de Gwynn and Sanjur 1974; Dettwyler, 1986) have examined households with malnourished and well-nourished children in a single study and most have concluded that the

attitudes of mothers has a direct influence on child growth. However, those authors generally have studied potentially biased populations such as women who attended health clinics or came to rehabilitation centers. In addition to the potential bias in the population, the interview environment may cause mothers to withhold pertinent information that they would have revealed in the more relaxed setting of their own homes. Also, valuable additional information that can be gleaned by observation by the interviewers in the actual home is eliminated (Reddy, 1968).

Food beliefs and practices that are deeply entrenched in the minds of any group or community and that are practiced by that group can significantly influence the nutritional status of the community and become a factor of importance in any nutrition program (Weerasinghe and Karaliedde, 1982).

The Cameroon National Nutrition Survey (1978) indicated higher chronic undernutrition (22.4%) in rural areas than in urban areas (19.4%). However, the prevalence of chronic undernutrition was highest in the rural West Province (30.8%). Whether the malnutrition was caused by a lack of food security for children or some factors related to maternal "technology" is not known. Spot studies since 1978 (Ecole National D'infirmiers, 1990; Tabod, 1991; Barrere, 1991) on the nutritional status of children carried out in the West Province indicated that malnutrition still exists in that province despite overall food availability there.

A few studies (Van Ejik, 1986; Tabod, 1991 and Barrère, 1991) have concluded that protein energy malnutrition in children in the West Province probably was associated with child feeding patterns, health care practices, socio-cultural practices, food shortages, and seasonal availability of food, although most did not interview mothers to obtain that information. None of the studies investigated household food security and its effects on the nutritional status of the children. Also, most authors grouped children from 0-5 years of age, which includes both breast-fed and weaned children in the same group. Because the quantity of breast milk, rather than supplemental feeding seems to affect child growth before weaning and there is little evidence to suggest that the effect "carries over" after weaning (Zeitlin et al., 1990; Muñoz et al., 1974; Van Arsdell, 1983;), combining breast-fed with weaned children does not appear to be appropriate. Also, age groups 15 to 36 months fall within the age groups (6-36 months) observed by Mata, (1980) and Wray, (1969) to be the most vulnerable age groups (when PEM, growth retardation and mortality are most evident).

The purpose of this study is to 1) identify food secure and food insecure households, 2) determine nutritional status of children based on anthropometric standards, 3) determine the impact of household food security on the growth of post-weaned children, 4) identify traditions, beliefs, and current practices of mothers related to food preparation and child

feeding practices that influence growth of post-weaning children, and 5) use households food security and maternal technology to differentiate between nutritionally positive and negative deviant children.

MATERIALS AND METHODS

Population

The target population for this study was all rural households in West Province, Cameroon, with mother/child pairs in which the child was between three and eighteen months post weaned. Because weaning age varies from child to child, we defined an eligible mother/child pair as one in which the child was 15 to 36 months of age, living with its mother and no longer breast-feeding. We defined a household for this study to consist of a woman, her husband, her children, and any other relatives residing in her house and eating from the same cooking unit or "pot" in the local parlance. Defined accordingly, it is normal to have overlapping households, especially in polygynous families, where a husband is part of more than one household (Ouden, 1981). In polygynous households, only one wife completed the survey to avoid counting the husband twice.

For this study we defined as rural any area that did not contain an administrative unit. Consequently, in our sampling procedure, the headquarters of the West Province, the headquarters of each division, and the headquarters of each

subdivision were considered to be urban areas and were not sampled. Sixty percent of Cameroon is rural (Hoffman, 1992).

Sampling

The West Province was stratified by major political partitions: divisions, subdivisions, enumeration zones (areas), and villages. Enumeration zone (zone de denombrement) is an official geographically defined area that consists of approximately 1000 inhabitants residing in at least 3 villages.

Of the six divisions within the West Province, three were randomly selected: Noun, Menoua, and Haut-Nkam. Two rural subdivisions were randomly selected from each division as follows: Noun (Magba, Foumbot), Menoua (Penka-Michel, Foukoue), and Haut-Nkam (Bandja, Bana). Six enumeration zones were selected within each subdivision. The breakdown of subdivisions, zones, villages, and families interviewed is shown in appendix I. If an adequate number of families (nine to twelve) could be interviewed within the first randomly selected village, no further villages were visited. In some cases, additional villages were randomly selected in order to obtain an adequate number of eligible households from within the zone.

Five villages of the sixty-two that were contacted refused to participate. Refusals occurred in villages when the head of the village refused to allow the interviewers into his area or when mothers either refused the interview directly

or indirectly by leaving the village when the interviewers were present or by sending their children away. Some potential subjects believed that agreeing to the research project would be providing support for a government they resented or would help the government collect overdue taxes. The use of interviewers from the local areas was immensely helpful in overcoming such resistance, but not always successful.

Approximately 478 pairs were contacted, but 140 pairs were not eligible because the mother was married to the same husband as another mother who had already been surveyed. Weight and height were assessed on 338 eligible children, but in 21 cases the mother refused an interview and in 17 cases she provided interview data that were too incomplete for subsequent analysis. The final sample included 300 mothers.

Training

Community development workers in each of the six subdivisions provided a list of potential interviewers who were literate females, bilingual in both French and the local dialects of the villages to which she would be assigned, and from backgrounds similar to the village mothers. From a pool of 14 women, ten were hired and trained for this project in April 1992 in Bafoussam, the capital of the West Province. During training the interviewers became familiar with the questionnaire and the aims of the survey. Each interviewer

was evaluated in trial interviews and one interviewer was dismissed, giving a total of 9 interviewers for the project.

Questionnaire and Administration

The questionnaire initially was developed in English in the United States based on ideas from international surveys on maternal and child health studies. An attempt was made to exhaust all possible factors related to "maternal technology". The questionnaire was evaluated by individuals familiar with survey questions and by African women (students and wives of students) at Kansas States University and adjusted. In Cameroon the questionnaire was translated into French, the official language of the West Province, and independently translated back into English to check for accuracy of translation. The French version of the questionnaire was pre-tested with women from the West Province from areas not included in the actual survey and a final questionnaire consisting of 107 questions, some with multiple parts was prepared. The questionnaire was designed to examine infant care and feeding; attitudes concerning foods consumed during the pregnancy and lactation period with the child under study; household food production and consumption practices; mother's health and hygienic practices; and general demographics.

The interviews were conducted in the local dialect of each village, with the interviewer recording the answers in French. The interviews with the mothers were conducted face-to-face (going from house to house) by the trained

interviewers and the principal author between May and July 1992. It took the interviewers approximately 1 hr 20 min to administer a questionnaire.

The interview team at any given time consisted of two of the trained interviewers, a community development worker and a village extension worker from the subdivision, and the principal investigator. This team visited each of the villages under study for the first time on the day of the interview. However, one or two months prior to the day of the interview, the village extension workers and community development workers visited each area to number the households in order to facilitate the random sampling. The presence of those workers with the interviewers was valuable because they were familiar with the survey areas and were known to the local people.

On arrival at a village, the team went directly to the residence of the chief where the study was explained either to the chief alone or with the elders of his village. The chief then assigned one of his servants to guide the team from house to house. Without the people assigned by the chief, the village men would not have permitted their wives and children to participate in the study. In some areas even with the presence of the chiefs' representatives, some men did not permit their wives and children to participate.

From the chief's residence, the team visited the randomly selected households. If a household had an eligible child and

the parents agreed to participate in the study, the child's measurements were taken and the mother interviewed. Height and weight measurements were made using standardized procedures (Lohman, Roche, and Mantrell, 1988). Height was measured to the nearest 0.1 cm; for children less than two years old, recumbent length was obtained, and for children over two, standing height was measured. Weight without clothing was measured to the nearest 0.1 kilogram using a hanging scale.

Statistical Methods:

a) Index creation

Cronbach's (1951) alpha was calculated by the SPSS-X RELIABILITY routine to measure the internal reliability of each index constructed.

Socioeconomic Status (Housing). A measure of socioeconomic status was derived to serve as a proxy for income because salaried incomes are rare in rural areas. Seven items (type of toilet, flooring material, floor condition, house wall material, house wall condition, roofing material, and roof condition) were used, which yielded an alpha of 0.63. Individual items were scaled, with better materials and better conditions given higher numbers. The standardized alpha was slightly higher at 0.66. All the items used in this income proxy were observed by the interviewers except type of toilet which was self-reported by participants.

Socioeconomic Status (Education). The two education items,

years of formal schooling and literacy were correlated at $r = 0.80$. We decided to use the single items in analyses rather than try to create an education index because the alpha for a created education index was low.

Socioeconomic Status (Employment). Three items (weeding for pay, making construction blocks for pay, and carrying loads for pay) were used to measure out-of-home, paid employment. Fewer than 10% of participant did any one of these things. The alpha for the scale was 0.57.

Food Security. Several scales as shown in Table 1 were created to measure food security more efficiently. Food crops that lasted until the next harvest was the best measure of food security, as defined. We sought the best way to evaluate household food security, which we defined as year round access to food by the family. We developed three indices based on food storage and availability: 1) number of scarce foods, 2) total number of crops stored, and 3) number of stored crops that lasted throughout the year (CROPLAST). Cronbach's alpha was lowest for scarce foods so that index was eliminated. The alpha for total number of crops stored was higher than for crops that lasted, but simply storing many crops did not guarantee that they were available year round. Therefore, CROPLAST was the selected index.

The proxy for food security, crops that lasted, could be left as the total number of crops that lasted until the next harvest, 0 to 6, or it could be divided into a smaller number

of categories.

We sought the best way of evaluating food security. First, a median split, coding scores of 0 through 2 and 3 through 6 into low or high food security, was used. However, although the splits were nearly even (47% and 53%), we wondered if a middle group of people were present, who might

Table 1
Food security indices

Indices	Factors included	Mean	SD	Alpha
Scarce food scale	Total number of foods considered scarce from categories: fruits, green leafy vegetables, animal products, and cooking oils ¹	5.58	0.94	0.53
Food storage	Total number of food crops stored	7.38	2.78	0.72
Crops that lasted	Total number of crops that lasted all year	2.74	1.67	0.62

¹Other categories of foods such as tubers and cereals also were measured, but were not different among various groups of people and, therefore, were not included in this scale.

be similar to the low food secure group for some variables, like the high food secure group for some variables, and different from both groups on other variables. Different groupings were attempted, and we were best able to account for the differences we observed when using three groupings (low, moderate and high) and coding scores of 0 through 2 as low food security, scores 3 and 4 as moderate food security, and scores of 5 and 6 as high food security.

Maternal technology. We were unable to construct any scales for maternal technology with moderate or high Cronbach's alpha. Therefore, only individual questions were used to understand maternal technology effects.

b) Analysis of variance and Regression analysis. Analysis of variance or t-test for unequal sample sizes was conducted using SPSS-X to determine if differences existed in the number of stunted and non-stunted children between groups that differed in food security, maternal technology or interactions of various effects. Backward stepwise regression was conducted to determine if stuntedness could be determined from other variables in the test.

RESULTS AND DISCUSSION

Households were classified into low, moderate, and high food security (Table 2). There was no significant difference in the percentage of stunted or wasting children in those three categories, an indication that household food security,

TABLE 2

Number and percentage of stunted and wasting children in low, moderate and high food secure households.

	Food Security		
	low	moderate	h i g h
Number of households	141	109	50
% of stunted children	28%	26%	28%
% of underweight children	8.3%	5.3%	3.7%

by itself, did not appear to have a direct influence on the nutritional status of children, although it did interact with other variables to produce significant effects. Other researchers (Mangahas, 1984; Johnson, 1985; Rukuni and Eicher, 1987; Pinstруп-Andersen, 1989; Maribe, 1992) also had found that food security was not sufficient to assure good nutrition of individuals in the household, particularly pre-school children. Our method of determining household food security only measured number of stored foods that lasted throughout the year, not the quality of the food. A measure of the quality of available food might be beneficial.

On the whole, 27% of the children were stunted (<90% of the standard median for height-for-age), 17.3% were wasting (<80% of the standard median for weight-for-age), and 0.3% were acutely undernourished (<80% of the standard median for weight-for-height). In the West Province, Tabod (1991) found 24.04% stuntedness, 19.6% wasting and 2.4% acutely undernourished and Barrère (1992) observed 26.2% stuntedness, 6.5% wasting and 1.5% acute undernourishment.

Stuntedness could be explained, in part, by a regression equation that used the total number of crops that lasted all year (CPLAST), total number of crops that households grew (FOODGROW), and total number of days per week each food crop was eaten (FOODWK) as significant ($p=0.1$, $p<0.05$, and $p<0.05$ respectively) variables. Total number of food crops eaten, sum of food crops that were scarce to get during the hungry

season, and total food crops bought by the household were included in the initial regression model but were not significant. As expected, a higher number of crops that lasted (CPLAST) and a higher number of days per week that various foods were eaten (FOODWK) decreased stuntedness.

In this study, seven independent variables were significantly different between households with stunted and non-stunted children regardless of food security (table 3): total number of days per week 1) corn, 2) animal protein, or 3) other vegetables (tomato, carrot, nkui) were eaten in the households; 4) reasons why mother prepared food fresh each time they fed the child; 5) the practice of washing hands before feeding the child; 6) what mothers used in cleaning child feces in the yard; and 7) total number of vaccines the child had. Increased consumption or better hygiene practices resulted in fewer stunted children. That clearly indicated that meal planning (quantity and variety) and good hygiene reduced stuntedness despite household food security. Interestingly, only one mother said feeding the child with a variety of food was important for good growth of the child and only one woman indicated that a problem she had in raising her children was planning the child's meal.

One odd finding in this study was that a higher percentage of children were stunted in the group of children with the most vaccinations. Because the number of children with fewer than 6 of the 11 requisite vaccinations was small

TABLE 3
Percentage of stunted children for some consumption and
maternal technology variables.

Variable	Stunted	P-value
Eating corn, days per week		
0-1	36%	0.001
2-5	29%	
6-7	14%	
Eating animal protein, days per week		
0-1	37%	0.041
2-5	24%	
6-7	17%	
Eating other vegetables ¹ , days per week		
0-1	33%	0.082
2-5	34%	
6-7	14%	
Reasons for preparing food fresh each time the child was feed		
Non-hygienic	40%	0.018
Hygienic	23%	
Washes hands before feeding the child		
No	30%	0.128
Yes	22%	
Method of cleaning child feces in the yard		
Pick up with hands in leaves or papers, leave and cover with soil, domestic animals eat	36%	0.120
Use hoe or other implement to pick up and discard	26%	
Number of vaccines the child has had		
1 through 6	17%	0.044
7 through 11	30%	

¹vegetable other than dark green leafy, e.g. carrot and nkui

n=64), this effect probably was caused by another variable in the study that tended to co-vary with vaccinations.

Number of days per week corn was eaten was an especially important variable in the study. Days per week corn was eaten was significant by itself and in combination with other variables. It is important to note that corn usually is eaten with a variety of sauces such as green leafy vegetables prepared with oilseeds (egusi, ground nut, and occasionally soy bean), meat prepared with oilseeds, and/or green leafy vegetables, small bony fishes, and 'nkui'. Although we did not determine the specific sauces that were eaten with corn, it is probable that in households that ate corn more days per week a wider variety of those sauces and, thus, a wider variety of vegetables and proteins were eaten.

Overall, stuntedness decreased from 36% to 14% when corn was consumed more days per week. In low food secure households, increased days of corn consumption from 0-1 to 6-7 days per week reduced stuntedness from 52% to 8%. The most dramatic trend or results effect in the study was the interaction of food security, corn consumption, and reasons for preparing fresh food for the child. Low food security, little corn consumption and non-hygienic reasons for preparing fresh food resulted in the highest percentage of stunted children (78%, n=9) in the study. But, low food security with high corn consumption, and a focus on hygienic reasons for preparing fresh food gave no stunted children (n=11). Although

the numbers within those low food secure sub-groups were small, the tremendous decrease in stuntedness when the mother prepared corn often (perhaps indicating greater variety of sauces) and when the mother focused on hygiene indicated the complexity of variables that affected nutritional status. This finding indicates that maternal technology is important, especially when limited resources are available. Zeitlin and Ghassemi (1986) in Pakistan and Sharman (1970) in Uganda made similar observations.

We found that at younger weaning ages (12-19 months) the number of days per week corn was eaten in the household did not affect stuntedness. However, at older weaning ages (20-33 months) an increase in the number of days per week corn was eaten resulted in decreased stuntedness from 45% to 8%. The difference in age is not merely an effect of eating household food or not, because more than half (63.3%) of the children were eating at least some household foods at six months of age. One possible explanation is that mothers believed that only fluid sauces were good for infants because they cannot chew. Such a belief may eliminate most nutritious sauces from a young child's diet, but may allow a variety of sauces in the diet of older weaned children who may have developed teeth and may be able to chew. That variety may result in greater overall nutrition and growth in the older weaned children.

In low food secure households, an increase in the number of days per week sugar and sugar products were eaten resulted

in large decreases in stuntedness from 42% to 16%. In high food secure households, the percentage of stunted children remained at 33% to 36% regardless of whether sugar/sugar products were rarely (0-1 day/week) or frequently (6-7 days/week) consumed. Sugar usually is given to children in gruels (corn pap) or in dried milk beverages (dejeuner lacté). Therefore it is possible that consumption of sugar/sugar products in low food secure households accompanied the feeding of more nutritious products such as dry milk beverages or corn. Sugar consumption might also be indicative of some other variable that we did not measure in this study.

In low food secure households, the percentage of stuntedness was lower (22% or 17%) among those who usually ate cereals or protein during the hungry season than those who did not (37% or 30% stuntedness, respectively). However, stuntedness was not different (30% vs. 24%) in high food secure households when cereals were consumed.

Whether the mother fed the child herself or the child was self fed was associated with good nutrition of the child. For example, at low (0-1 day/week) and moderate (2-5 days/week) corn consumptions the percentages of stunted children were lower (27% and 22%) when the mother fed the child than when the child was self fed (38% and 32%). Zeitlin and Ghassemi (1986) observed that well-nourished infants received more physical assistance in eating from their mothers than did malnourished infants. It is possible that having the mother

feed the child contributes to the child eating more food than would be consumed if the child was self-fed. That can occur either because the mother allows fewer distractions to affect child's mealtime and encourages the child to eat the available food or because the mother ensures that the child receives an appropriate portion of food without competition from other children. In low and moderate food secure households where food may be scarce, the additional food eaten provides for improved nutritional status.

In high food secure households, the older the child in this study the lower the stuntedness. The majority of the stunted children in high food secure households (58%) were observed in the youngest weaned age group (15 to 24 months), only 10% of stunted children were in the oldest age groups (31-36 months). However, in low food secure households, there was no difference in the percentage of stunted children among the three age categories (15 to 24 months; 25 to 30 months; 31 to 36 months). For the 31-36 month old children, stuntedness decreased as food security increased. A possible explanation for such an observation can be that at an older age, the children are less dependent on their mothers for food than they were at a younger age and are able to fend for themselves (grab what they would like to eat if it is available). Because in high food secure households food is expected to be more accessible than in low food secure households, the older toddlers can grab with ease what they would like to eat. That

probably contributed to better nutrition of those children in high food secure households than in low food secure households. Muñoz et al., (1974) observed that one of the significant differences between well-nourished and malnourished children in low socioeconomic households was age, with well-nourished children being older. It also is possible that poorly nourished children died before weaning and were not observed in this study.

At both low and moderate food security, stuntedness was lower in children whose mothers gave hygienic reasons for preparing food fresh each time they had to feed their children than those who gave other reasons. Among mothers who did save cooked food for subsequent child feeding, the type of container the mother used had no effect on stuntedness.

Stuntedness also was lower in both low and high food secure households (23% and 17%) when the mother used her own experience in previously bringing up a healthy child, than when she learned child rearing from other sources such as friends, village elders, medical personnel, her mother, mother-in-law, grand mother, other members of the family, or the media (36% and 25%). The result emphasizes the significance of mothers' local wisdom in child nutrition in combination with household food security.

Household food consumption practices, particularly of corn, were more beneficial to child nutrition than mothers' education (both number of years of schooling and literacy).

Our findings are contrary to what other researchers (Van Ejik, 1986; Tabod, 1991; Barrère, 1991; Gwangwa'a et al., 1989) observed. Those authors found that increased number of years of schooling was associated with less protein energy malnutrition in children in Cameroon. In our study, we found that regardless of education, most mothers (69.3%) had poor knowledge about food that was not good for child growth. For example, mothers considered beans and starches (cassava, taro, plantain) other than corn not good for the growth of young children. Future research may need to focus specifically on knowledge as it relates to those beliefs.

In this study, most mothers were the primary selectors (95.7%) and preparers (98.7%) of food and knew most (98.3%) about the eating and feeding habits of the child in the study. The results indicate that mothers' "technology" (current practices, knowledge of hygiene, experience, food consumption) rather than household food security contributed to good growth of children.

Some other differences between non-stunted and stunted children in low food secure households were observed. Mothers of non-stunted children bathed themselves and their children at least twice in a week while mothers of stunted children bathed once a week. More mothers (26%) of non-stunted children belong to a religious group than mothers (3%) of stunted children. In addition, mothers of non-stunted children rested daily for longer periods of time (45 minutes

average) than mothers of stunted children (16 minutes average). Perhaps mothers of stunted children were either busier or less able to manage time than mothers of non-stunted children and, therefore, had less time to rest or care for the children.

In high food secure households, mothers of non-stunted children received more support (food, child, farm, school, health and medical, and buying of household equipment) from their husbands than mothers of stunted children. More mothers (42%) of stunted children served their children last (i.e. after husbands and themselves) at mealtimes than mothers (16%) of non-stunted children. Generally, in this culture, children are served in the second position after their fathers. In this study, 13.8% of the children were served first (before their fathers), 68.3% were served second (normal position), and 17.9% were served after their mothers (third position). Children who are served last may not have ample food available to provide good nutrition and proper growth. The importance of household food distribution practices cannot be overemphasized because children are among the most vulnerable and powerless members of a household. Other authors (Obi, 1976; Valenzuela, 1977; Aligaen and Florencia, 1980) have shown that inequality in food adequacy between adults and children in households contributed to child malnutrition.

An interesting observation was that in low food secure household, all combinations of variables that reduced

stuntedness included improved food consumption practices. This observation was not necessarily true in moderate and high food secure households, indicating that although household food security may be sufficient it is not a necessary factor if mothers had the ability to translate accessible food into consumption by the child. Delisle et al., (1991) observed that intervening variables between food consumption and nutritional status of children such as relative roles of household diet, weaning practices, child morbidity and general child care are more important than adequate household food supply to child nutrition.

POSITIVE/NEGATIVE DEVIANT CHILDREN

Households were classified into low food security, stunted; high food security, stunted; low food security, non-stunted; and high food security, non-stunted (table 4). The majority of the children (36.7%) were "positive deviant", that is, children in households with low food security who might be expected to be stunted, but were not. Approximately 5% were "negative deviant", that is children in high food secure households who should be well-nourished, but were stunted.

Differences between positive and negative deviant children were associated with several aspects of maternal technology such as: age at which mothers started breast-feeding after delivery, length of time mother spent caring for the child, age at which the mother started leaving the child at home, quality of dirt disposal (dirt from the house and its

TABLE 4
Classification of households by food security and stuntedness¹

Food security	Nutritional status	
	stunted	non-stunted
low	13.3%	36.7%
high	4.7%	12.0%

¹Percentages do not total 100% because moderate food secure households were not included

surroundings), household food distribution (e.g. serving the child after father but before mother), and mother washing her hands first thing in the morning (Table 5).

Mothers of positive deviant children began breast feeding slightly later following delivery; started leaving their children at home with other people at an older age; and had a more hygienic dirt disposal than mothers of negative deviant children. More mothers (40%) of negative deviant children served their children in the third position (after themselves) than mothers (20%) of positive deviant children.

Those aspects of maternal technology especially quality of dirt disposal, age at which mother started leaving the child at home, serving position of the child and washing of hands first thing in the morning can be stressed in nutrition education and intervention programs because they already are culturally acceptable practices.

TABLE 5

Significant variables that explained positive and negative deviant children

Variables	Positive deviant non-stunted	Negative deviant stunted	p-value
Days breast-feeding began ¹	2.4a	2.0b	.09
Hours spent with per day ²	0.9b	1.4a	.00
Age child is left with ³ others	40.7a	23.5b	.00
Quality of dirt disposal ⁴	2.0a	1.3b	.10
Child served last ⁵	16.8b	42.9a	.12
Mother washes hands ⁶ in the morning	44.5b	85.8a	.01

a, b, Means followed by different letters are significantly different from each other.

¹Average number of days mother waited before starting to breastfeed the child following delivery

²Mean hours the mother spent caring for the child per day

³Mean age (weeks) at which mother started leaving the child at home with other people

⁴Dirt disposal rated as a scale of 1-4 with 4 being the most hygienic type and 1 being the least hygienic

⁵Percentage of mothers who served their children last

⁶Percentage of mother who washed their hands first thing in the morning when they get out of bed.

REFERENCES

- Aligaen, M. and Florencio (1980). Intrahousehold nutrient distribution and adequacy of food and nutrition intake of Filipino urban households, Phillipine J. Nutr., 1, 11-19.
- Barrère, B. (1992). Allaitement, nutrition et état nutritionnel. In M. Balépa, M. Fotso, and B. Barrère (Eds.), Enquête Démographique et de Santé Cameroun, 1991. Macro International Inc., Columbia, Maryland USA, chapter 8, pp. 119-130.
- Chaiken, M.S. (1986). Traditional patterns and modern dilemmas: Designing locally appropriate health interventions. Working Paper No. 442. Institute for Development Studies, University of Nairobi, Nairobi, Kenya. pp. 1-20.
- Cronbach, L.J. Jr. (1951). Coefficient alpha and the internal structure of tests. Psychometrika 16, 297-334.
- Dattal, M.S., L. Behl, R.K. Kaushal and S.I. Sharma (1988). Beliefs of Himachal women regarding feeding of marasmic or otherwise sick children. Journal of the Indian Academy of Pediatrics, 25, 966-971.
- Delisle, H., M. Alladoumgué, F. Bégin, K. Nandjingar, and C. Lasorsa (1991). Household food consumption and nutritional adequacy in Wadi Zones of Chad, Central Africa. Ecology of Food and Nutr. 25, 229-248.
- Dettwyler, K.A. (1986). Infant feeding in Mali, West Africa: Variations in belief and practice. Soc. Sci. Med., 33, 651-664
- Ecole Nationale d'infirmiers (1990). Passage unique enfants 12-60 mois: Poids-taille-périmètre du bras, pli cutané tricipital et tour de la poitrine. La situation nutritionnelle au Cameroun d'après les enquêtes épidémiologiques les plus récentes. Centre de Nutrition, IMPM, MESIRES, Yaounde, Cameroon, pp. 10-11.
- Fonaroff, A. (1968). Differential concept of protein-calorie malnutrition in Jamaica: An exploratory study information and beliefs. J. of Trop. Pediatrics. 14, 82-101.
- Greaves, J.P., 1979. Nutrition Delivery System. Indian J. Nutr. Diet. 16, 75-82.
- Hegsted, D.M., 1967. Comment on Agricultural and Economic Growth. In: H.M. Southworth and B.F. Johnston, (Eds.), Agricultural Development and Economic Growth. Cornell University Press, Ithaca, NY. pp. 361.

- Hoffman, S. (Ed.) (1992). The World Almanac and Book of Facts, 1993. Pharos Books, New York. p. 739.
- Jelliffe, D.B. (1962). Culture, social change and infant feeding - Current trends in tropical regions. Am. J. Clin. Nutr., 10, 19-42.
- Jenkins, C. and P. Heywood (1984). A method for eliciting beliefs about food and child feeding in Papua New Guinea: The Machik interview. Papua New Guinea Med. J., 7,(1), p11-15.
- Jenkins, C. (1988). Foodways in Papua New Guinea: Philosophy and practice. Papua New Guinea Med. J., 31, 125-131.
- Jenkins, C., A.K. Orr-Ewing, P.F. Heywood (1984). Cultural aspects of early childhood growth and nutrition among the Amele of Lowland Papua New Guinea. Ecology of Food and Nutr., 14, 261-275.
- Johnson, D.G. (1985). Alternatives to International Food Reserves. In World Food Security: selected themes and issues- Symposium On World Food Security- Papers and Summaries of Discussion. Economic and Social Development paper 53, Food and Agriculture Organization of the United Nations, Rome, pp. 67-81.
- Jonsson, U. (1993). UNICEF -- Halving child malnutrition by the year 2000. Report on the opening address at the XV International Congress of Nutrition. SCN News 10, pg 21.
- Kennedy, E. and B. Cogill (1987). Income and nutritional effects of the commercialization of agriculture in Southwestern Kenya. IFPRI Research Report 63. International Food Policy Research Institute, Washington D.C.:
- Malcolm, L.A. (1975). Some biosocial determinants of the growth, health, and nutritional status of Papua New Guinea pre-school children. In E. Watts, F. Johnston, and G. Lasker (Eds.), Biosocial Interrelations in Population Adaptation. Mouton Press, The Hague, Netherlands, pp. 367-375.
- Mangahas, M. (1984). Relative Emphasis on Domestic Food Self-sufficiency and Trade-Oriented Self-Reliance. In World Food Security: Selected Themes and Issues- Symposium On World Food Security- Papers and Summaries of Discussion. Food and Agriculture Organization of the United Nations, Rome. pp. 1-17

- Maribe, T.O. (1992). Food and Nutrition Security in East, Central, and Southern Africa: A Study of Two Regional Initiatives. In N.G. Kotler, (Eds.), Frontiers of Nutrition and Food Security in Asia, Africa, and Latin America. ILSI N.A. Smithsonian Institution Press, Washington and London, Chapter 4, pp. 37-49.
- Mata, L.J., (1980). Child Malnutrition and Deprivation Observations in Guatemala and Costa Rica. Food Nutrition (Rome), 6 (2) 7-14.
- Messer, E. (1989). Seasonality in Food Systems: An Anthropological Perspective on Household Food Security. In D.E. Sahn (Ed.), Seasonal Variability in Third World Agriculture. The Johns Hopkins University Press, Baltimore and London. Chapter 10, pp. 151-175.
- Muñoz De Chavez, M.M., P. Arroyo, S.E.P. Gil, M. Hernanez, S.E. Quiroz, M. Rodriguez, M.P. De Hermelo and A. Chavez (1974). The epidemiology of good nutrition in a population with a high prevalence of malnutrition. Ecology of Food Nutr. 3, 223-230.
- Obi, J.O. (1976). Rehabilitation of patients with protein calorie malnutrition in Benin City, Nigeria. J. Trop. Pediat., 22, 211-213.
- Ojofeitimi, E.O. (1982). Causes of protein energy malnutrition as viewed by the clients' mother. J. Trop. Pediat., 28, 147-148.
- Ojofeitimi, E.O., O.Ajao, and J.E. Ighere (1987). Infant protein energy malnutrition in Nigeria. J. Royal Soc. of Health, 107 (3), 95-97.
- Ouden, J.H.B. (1981). Changes in land tenure and land use in a Bamileke Chiefdom, Cameroon, 1900-1980: A historical analysis of changes in control over people, land, and production. In R.A.J. Van Lier (Ed.), Essays in Rural Sociology. The Agricultural University Press. Wageningen, Netherlands pp. 171-262.
- Pinstrup-Andersen, P. (1989). Government Policy, Food Security and Nutrition in Sub-Saharan Africa. PEW/Cornell Lecture Series on Food and Nutrition Policy, Cornell university Press, Ithaca, NY, pp. 1-39.

- Pinstrup-Andersen and M. Garcia (1990). Data on food consumption by high-risk family members: Its utility for identifying target households for food and nutrition programs. In B. Rogers and N. Schlossman (Eds.), Intra-household resource allocation: Issues and methods for development and policy planning. United Nations Press, Tokyo, chapter 12, pp. 164-174.
- Reddy, S. (1986). Practical problems with obtaining valid and reliable information on household food utilisation. J. of Trop. Pediat., 14, 66-70.
- Romero de Gwynn, E. and D. Sanjur (1974). Nutritional anthropometry: Diet and health-related correlates among pre-school children in Bogota Colombia. Ecology of Food Nutr., 3, 273-282.
- Sharman, A. (1970). Social and Economic Aspects of Nutrition in Padhold Dukedi District, Uganda. Ph.D. diss., University of London.
- Tabod, A.A. (1991). A nutrition survey of Pre-school age children of Bangang village, Bamboutous Division, Western Province, Cameroon. Thesis, Doctor of Medicine, U.C.H.S., University of Yaounde, Cameroon
- USAID, 1978. United Republic of Cameroon National Nutrition Survey. Office of Nutrition Development Support Bureau AID, Washington, D.C.
- Valenzuela, R. (1977). A Study of Nutrient Distribution within the Family and Factors Affecting Nutrient Intake. University of the Philippines, Quezon city.
- Van Arsdell, H.E. (1983). Growth failure in breast-fed Thai infants. Ph.D. thesis. Massachusetts Institute of Technology, Amherst
- Van Eijk, R. (1986). "Naître et croître au Cameroun". Etudes anthropobiologiques dans trois groupes ethniques Bamiléké, Bangandu et Baka. Thèse, doctorat en médecine, University of Utrecht, Netherlands
- Weerasinghe C., S. Karaliedde, and T.W. Wirkramanayake (1982). Journal of National Science Council of Sri Lanka, 10, 1, 59-70.
- Wray, J.D., 1972. Can We Learn from Successful Mothers? J. Trop. Pediat. Environ. Child Health, 18, 279-283.

Zeitlin, M.F.; Ghassemi, H.; and Mansour, M., 1990. Positive Deviance in Child Nutrition, with Emphasis on Psychosocial and Behavioral Aspects and Implications for Development. The United Nations University, Tokyo

Zeitlin, M.F. and H. Ghassemi (1986). Positive deviance in nutrition. Adequate growth in poor households. In J. Libbey (Ed.), A Workshop Report-Proceedings of the 13th International Congress of Nutrition. London. 1.

CHAPTER 4

RECOMMENDATIONS FROM THE RESEARCH

In this study, over 90% of the food consumed in a household whether produced, bought, or exchanged was under the control of women. Therefore, projects to improve household food security and nutritional status of family members should consider women and their role a top priority. It is apparent from the data that several aspects of maternal technology are related to better growth in children from households with low food security.

It is logical that culturally acceptable maternal practices that result in better growth of children should be emphasized in intervention programs aimed at improved nutrition and health in Cameroon. From this data, several practices independent of food security could be emphasized that were associated with decreased stuntedness in children: more frequent consumption of corn, animal protein, and vegetables such as carrots and nkui; more frequent hand washing, improved handling of feces, and preparation of fresh infant food based on hygienic concerns; and serving meals to children in the second position (after the men) rather than last (after all adults).

Improved food consumption, especially the number of days per week corn and associated sauces were consumed, was the best determinant of reduced stuntedness in children. It seems

that encouraging daily consumption of corn, already a staple in the diet, and encouraging variety in the sauces used with corn are the most important factors that should be emphasized in nutrition programs. Because variety in sauces may result in daily consumption of corn and would provide nutrient variety, an important component of intervention programs should be the increased availability, either through growing or trade, of typical sauce ingredients or the introduction of new crops, including the necessary training in food preparation, that are shown to be acceptable ingredients.

Vegetable crops such as carrots, tomatoes, and nkui were under-utilized by participants in this study, but their consumption was related to improved growth of children. In general, these vegetables were consumed by the people in the study, but most were consumed fewer than two days per week, meaning that on a daily basis few of these vegetables were consumed. Even with some consumption of green leafy vegetables, the total vegetable consumption was too low in the diets of many households.

It is unrealistic to expect additional animal protein consumption because availability is low and cost is high. If protein consumption is to be increased, either animals must be provided, which is unlikely; the infrastructure must be improved to accommodate greater accessibility to meat products by the rural areas; or emphasis must be placed on growing and consuming other protein sources such as soybean, winged bean,

white bean, cowpea, and bambara groundnut that were not eaten by more than 40% of the population in the study.

Hygiene was another area that was related to reduced stuntedness and can be emphasized in health education. Specific variables that were studied may have a direct effect on stuntedness and also probably indicate a focus by the mother on hygiene. Individual acts such as washing her hands in the morning and before feeding the child, and using a hoe to discard feces in the toilet rather than simply covering it with soil or leaving it for domestic animals to eat, may have a direct impact on the health status of the children because those good practices discourage the transfer of disease and parasites. In addition to those specific acts, a general focus on hygiene, exemplified in our study by mothers who gave hygienic reasons for preparing fresh food for their infants, also reduced stuntedness in children. Such a focus may indicate more knowledge or interest on her part in the child's well-being and can be encouraged either during formal education or in other informal educational settings.

Good child feeding practices by the mother also should be fostered. In this study two main practices were found that appeared to differentiate among stunted and non-stunted children: 1) the mother physically feeding the child and 2) serving the meal to the child after the men, but before the women. Both of those are common, cultural practices in the areas studied and should be encouraged.

The data indicate that selling of food crops and provisions were the main source of income to over 95% of the women and that most women used that money to purchase food crops they could not grow or raise. Therefore, encouragement should be given to cooperative efforts of women in the villages. Because each women produced a much wider variety of food crops than what she could store and keep year round, cooperative storage facilities might be encouraged. If these types of facilities were available, they might provide increased accessibility to a wider variety of foods to each member of the cooperative, which may translate into improved household food consumption.

In addition, encouraging tontines, which are already used by about 40% of the women, may provide a culturally acceptable way of saving money and provides an easy access to money to purchase food products when the cost is low or when such food is necessary. In addition, small loans often are made that can provide a base for starting small businesses that provide additional sources of income.

APPENDIX I -- QUESTIONNAIRE

Questionnaire No _____

Division: _____ ()

District: _____ ()

Zone: _____ ()

Village: _____ ()

Household: _____

Name of interviewer: _____

Date: _____

Name of Mother: _____

Name of Child: _____

Time interview begins: _____

A. I shall begin by asking you questions about your household.

1. **Marital Status:** circle the one that applies to her

single married separated divorced widowed

(IF MARRIED ASK IF IN A MONOGAMOUS OR POLYGAMOUS RELATIONSHIP.

IF MONOGAMOUS TICK ONLY WIFE, IF POLYGAMOUS TICK HER POSITION

IN THE MARRIAGE.) Ask "What is your position in your

marriage?" and (TICK ONE).

(1) _____ only wife

(2) _____ first wife

(3) _____ second wife

(4) _____ third wife

(5) _____ fourth wife

(6) _____ other (specify)

2. What is your religion?

(1) _____ christian

(2) _____ moslem

(3) _____ no religion

(4) _____ other (specify)

3. Including yourself, how many people - adults and children

- live in this household? _____

Tell me the relationship with you, age and sex of each person in your household.

Relationship	Age	Sex	
		Male	Female
Husband			
wife			

4. Who is considered the head of the household? (TICK ONE)

- (1) _____ Husband
- (2) _____ Me (mother)
- (3) _____ Brother-in-law
- (4) _____ Successor
- (5) _____ Father-in-law
- (6) _____ Other (specify)

5. Which person in the household knows the most about the health and eating habits of (child's name) _____?

- (1) _____ The mother (myself)
- (2) _____ My mother
- (3) _____ The maid
- (4) _____ The child's sister
- (5) _____ Other woman
- (6) _____ Other young girl
- (7) _____ Other (specify)

RECORD RELATIONSHIP TO MOTHER: _____

(If person is not the mother include her in the interview)

6. How many years of school did you complete?

7. Can you read? No _____ (1) Yes _____ (2)

8. Who is the main preparer of food for the family? _____

(1) _____ me

(2) _____ my older daughter

(3) _____ my niece

(4) _____ the maid

(5) _____ other (specify) _____

9. Who decides what to cook?

(1) _____ me

(2) _____ my older daughter

(3) _____ my niece

(4) _____ the maid

(5) _____ other (specify) _____

10. What kind of fire side (cook stove) do you use? (Do Not Read List)

- (1) _____ on the ground between three stones
- (2) _____ charcoal pot
- (3) _____ improved cookstove
- (4) _____ other (specify) _____

11. Where is your kitchen located? (Do Not Read List)

- (1) _____ outside the house in the open air
- (2) _____ outside the house in a separate building
- (3) _____ inside the house (bedroom too)
- (4) _____ inside the house separate from bedroom
- (5) _____ other (specify) _____

B. LET US TALK ABOUT THE FOOD CROPS THAT YOU GROW AND CONSUME.

13. What food crops do you grow?

(DO NOT READ LIST BUT TICK AS THEY NAME CROPS, PROBE FOR MORE, THEN ASK WHAT DO YOU DO WITH EACH OF THEM AFTER THEY ARE HARVESTED.)

CROPS	GROW	CONSUME	SELL	STORE	GIVE AS GIFT
Corn					
Cassava					
taro					
yams					
cocoyams					
sweet potato					
irish potato					
plantain					
banana					
beans					
lima (red)					
lima (white)					

lima (black)					
cow peas					
soy beans					
ground nuts					
bambara ground nuts					
egusi					
pumpkin seeds					
green leafy vegetable					
okra					
'nkui'					
orange					
avocado					
tangerine					
plum					
papaya					

14. Let us talk more about the food crops you store. Does the amount stored last until the next harvest?

_____ none last

FOOD CROP	METHOD OF STORAGE	LAST UNTIL NEXT HARVEST	DO NOT LAST UNTIL NEXT HARVEST

15. Which animals do you have now?

(DO NOT READ LIST BUT PROBE)

No animals _____

ANIMALS	NUMBER	EAT	EAT PRODUCT	SELL	WHO KEEPS MONEY
Goat					
pig					
duck					
Cow					
Rabbit					
Guinea pig					

16. Now tell me about the foods that you usually consume in this house. (Call out the name of food, tick () if they say yes. Then ask how many days per week do you eat each food, one at a time, followed by how do you acquire the food. Check as many responses as apply.

FOOD	EAT	NOT IN SEASON	DAYS PER WEEK	GROW	BUY	GIFT	EXCH ANGE
corn							
g. nut							
beans							
soy beans							
cassava							
cocoyam							
colocasia							
yam							
sweet yam							
plantain							
banana							

irish potato							
sweet potato							
carrots							
cabbage							
tomatoes							
egusi							
pumpkin							
orange							
avocado							
tangerine							
plum							
papaya							
mango							
pineapple							
lime							
coffee							
green leaves							

palm oil							
cotton seed oil							
gr. nut oil							
sugar							
pork							
beef							
sardines							
crayfish							
fish (dried)							
fish (fresh)							
rice							
bread							
nkui							
soft drinks							

17. Is there any time of the year when your family does not have enough foods to eat? (1) _____ no
(2) _____ yes

If no, go to question 17, if yes, ask which period of the year and go to question 18.

- (1) _____ always
(2) _____ during the planting season
(3) _____ from the beginning of the land preparation to the beginning of harvesting
(4) _____ during the dry season
(5) _____ during the rainy season
(6) _____ others (specify) _____

18. IF FAMILY ALWAYS HAS ENOUGH FOOD, ASK "HOW DO YOU MANAGE TO HAVE ENOUGH FOOD THROUGHOUT THE YEAR?" DO NOT READ THE LIST. CHECK AS MANY AS APPLY.

- (1) _____ produce a large variety of foods
(2) _____ produce a large quantity of food
(3) _____ store sufficient foods
(4) _____ save enough money from harvest sales to buy sufficient food until next harvest.
(5) _____ have only a small family
(6) _____ always get foods from my mother or other relatives
(7) _____ other, (specify) _____

19. What foods are hardest to get when food is scarce.

(Do Not Read List. Tick All That Apply)

- (1) _____ cassava, yams, sweet potatoes, irish potatoes, (tubers)
- (2) _____ maize, rice, (cereals)
- (3) _____ beans, ground nuts, soy beans, (protein rich plants)
- (4) _____ beef, pork, fish, (animal protein)
- (5) _____ eggs, milk, (protein rich animal products)
- (6) _____ dark green leafy vegetables
- (7) _____ fruits
- (8) _____ oils
- (9) _____ other, (specify) _____

20. What foods do you usually eat when food is scarce?

- (1) _____ cassava, yams, sweet potatoes, irish potatoes (tubers)
- (2) _____ maize, rice, (cereals)
- (3) _____ beans, ground nuts, soy beans, (protein rich plants)
- (4) _____ beef, pork, fish (animal protein)
- (5) _____ eggs, milk, (protein rich animal products)
- (6) _____ dark green leafy vegetables
- (7) _____ fruits
- (8) _____ oils
- (9) _____ other, (specify) _____

21. When there is (enough) plenty of food to eat, which member of the family do you make sure gets to eat first? Which one next, next, etc. (WRITE THE ORDER AS SHE SAYS IT)

- (1)_____ my husband and other men
- (2)_____ my mother
- (3)_____ the children
- (4)_____ the infant
- (5)_____ myself and other women
- (6)_____ other (specify) _____

22. Does this order change when there is not enough to eat?

- (2)_____yes (1)_____no

If yes, who eats first when food is scarce?

- (1)_____ my husband and other men
- (2)_____ my mother
- (3)_____ the children
- (4)_____ the infant
- (5)_____ myself and other women
- (6)_____ other (specify) _____

23. What foods would you like to eat that are not available or that you can not afford to buy. (list up to 4).

(1) _____

(2) _____

(3) _____

(4) _____

(5) _____ none

24. What things do you do to earn money? (DO NOT READ LIST BUT CHECK ALL THAT APPLY)

(1) _____ sell foods

(2) _____ sell provisions

(3) _____ sell things I make with my hands

(4) _____ offer my labor to weed

(5) _____ offer my labor to make bricks

(6) _____ offer my labor to farm

(7) _____ offer my labor to carry loads

(8) _____ relatives give me money sometimes

(9) _____ sell in the market on market days

(10) _____ other, (specify) _____

25. What do you do with the money you earn or are given?

(1) _____ give to my husband

(1) _____ all

(2) _____ some

(2) _____ save some

(1) _____ in the house

(2) _____ in a tontine (njange)

(3) _____ in a bank

(4) _____ other (specify)

(3) _____ buy certain things I can't make such as:

(check all that apply)

(1) _____ clothes and shoes for the children
and myself

(2) _____ soap (bathing and washing)

(3) _____ matches, kerosene

(4) _____ rubbing oil, personal things

(5) _____ pay school fees

(6) _____ school supplies such as books, pens,
pencils, school bags

(7) _____ medical treatment cost

(8) _____ traditional healers

(9) _____ medication cost

(10) _____ others, (specify)

C. NOW LET US TALK ABOUT THE CHILDREN THAT YOU HAVE HAD

25. Are you pregnant now? (1)_____ no (2)_____ yes

26. How many times have you been pregnant? _____

27. How many of your children were born alive? _____

28. How many died before they were born? _____

29. How many children died before their first birthday?
(Before the month they were born in the following
year?) _____

30. How many died after one year of age? _____

31. How many living children do you have now? _____

**If all of her children are still living, check does not apply
on question 32 and go to question 33.**

32. What do you think were the causes of death of your children who died who were born alive?

causes of death

age at death

- | | |
|---------------------------------|-------|
| (1) _____ diarrheal disease | _____ |
| (2) _____ measles | _____ |
| (3) _____ respiratory infection | _____ |
| (4) _____ witchcraft | _____ |
| (5) _____ malnutrition | _____ |
| (6) _____ eye infection | _____ |
| (7) _____ fever | _____ |
| (8) _____ injuries | _____ |
| (9) _____ handicaps | _____ |
| (10) _____ sudden death | _____ |
| (11) _____ do not know | _____ |
| (12) _____ does not apply | _____ |

33. Where did you give birth to (CHILD'S NAME)

- (1) _____ at home
- (2) _____ at a traditional midwife's
- (3) _____ clinic
- (4) _____ in the hospital (where)? _____
- (5) _____ any other place (specify) _____

34. Who assisted in the delivery?

- (1) _____ relative or friend
- (2) _____ mother-in-law
- (3) _____ my mates
- (4) _____ local healer other than midwife
- (5) _____ traditional midwife other than your mother-
in- law
- (6) _____ medical doctor
- (7) _____ other (specify) _____

35. If the child was born in a hospital or clinic ask:

How much did the child weigh at birth? _____

If the child was born someplace other than a clinic or
hospital ask:

Was the child "light" when it was born?

(1) _____ No (2) _____ Yes (3) _____ I don't know

D. (NOW LET US TALK ABOUT THE TYPES OF FOODS YOU ATE OR DID NOT EAT WHEN YOU WERE PREGNANT WITH (CHILD'S NAME) AND THE REASONS FOR DOING THAT.

36. What foods did you eat when you were pregnant with (CHILD'S NAME) that you normally do not eat?
none_____

FOODS	REASONS FOR EATING

37. What are the foods you did not eat when your pregnant with

(CHILD'S NAME) that you normally eat? none_____

(IF THE RESPONSE TO QUESTION 39 OR 40 IS NONE, GO TO QUESTION 42)

FOODS	WHAT MADE YOU NOT TO EAT?

38. Who taught you the most about foods to eat or not to eat when you were pregnant? (DO NOT READ THE RESPONSES. TICK ONLY ONE RESPONSE).

- | | |
|---------------------------------|----------------------|
| (1) _____ from my mother | (12) _____ a friend |
| (2) _____ from my grandmother | (13) _____ a teacher |
| (3) _____ from the elders | (14) _____ mates |
| (4) _____ from my mother-in-law | (15) _____ other |

(specify)

- (5) _____ from my husband
- (6) _____ my own experiences
- (7) _____ other family members
- (8) _____ health worker
- (9) _____ radio
- (10) _____ television
- (11) _____ doctor

39. What food did you eat more of when you were breastfeeding (CHILD'S NAME),
none _____

FOODS	WHAT MADE YOU EAT THESE FOODS?

40. What foods did you not eat when you were breastfeeding (CHILD'S NAME)?
none _____

FOODS	REASONS FOR NOT EATING

(IF THE RESPONSE TO QUESTION 39 OR 40 IS NONE, GO TO QUESTION 42)

41. Who taught you the most whether to eat or not to eat the foods you have named? (TICK ONLY ONE RESPONSE)

43. WHY did you start at that time?

(1)_____ cleans out the child's stomach first

(2)_____ the first milk is very important for the
child

(3)_____ there is no milk flowing at the beginning

(4)_____ cleans the child's stomach with herb first

(5)_____ the first milk is not good for the child

because: (ASK WHY)

_____ gives the child diarrhea

_____ gives the child stomach cramping

_____ makes the child constipated

_____ gives the child jaundice because of
the color

(6)_____ other, (specify) _____

44. If the mother waited for one or more days ask:

What were you giving the child for those (one, two, or
three days)?

(1)_____ herb

(2)_____ coca cola

(3)_____ water

(4)_____ sugared water

(5)_____ other, (specify) _____

45. Who taught you to give these things to the child?

- | | |
|---------------------------------|----------------------|
| (1) _____ from my mother | (12) _____ a friend |
| (2) _____ from my grandmother | (13) _____ a teacher |
| (3) _____ from the elders | (14) _____ mates |
| (4) _____ from my mother-in-law | (15) _____ other |
| | (specify) _____ |
| (5) _____ from my husband | |
| (6) _____ my own experiences | |
| (7) _____ other family members | |
| (8) _____ health worker | |
| (9) _____ radio | |
| (10) _____ television | |
| (11) _____ doctor | |

46. How old was your child when you first gave him/her a bottle?

_____ days _____ weeks _____ months
_____ never gave bottle

(IF NEVER, GO TO QUESTION 48)

47. Did you do anything with water before putting in the bottle?

(1) _____ non (2) _____ yes

If yes ask, "What did you do?"

(1) _____ nothing

(2) _____ filtered

(3) _____ boiled

(4) _____ other (specify) _____

48. What was the first regular food you gave to (CHILD'S NAME) What form was it in?

FOOD

FORM

(1) _____ Cassava

(1) _____ mashed/pounded

(2) _____ cocoyam

(2) _____ pre-masticated

(3) _____ maize

(3) _____ pap/gruel

(4) _____ other (specify) _____

(4) _____ other

(specify) _____

49. How old was (CHILD'S NAME) when you gave this food?

_____ weeks _____ months.

50. What made you gave (NAME THE FOOD) as first food?

- (1) _____ my mother told me to
- (2) _____ given by most people
- (3) _____ soft/easy to swallow
- (4) _____ good/nutritious
- (5) _____ no reason
- (6) _____ I do not know
- (7) _____ other (specify) _____

51. Why did you start this food at that age?

- (1) _____ was advised to
- (2) _____ baby was crying too much
- (3) _____ it was time for the child to eat other/solid
food
- (4) _____ I do not know
- (5) _____ other (specify) _____

52. How many times a day did you give the food during the first three days?

- (1) _____ first day
- (2) _____ second day
- (3) _____ third day

53. Did you have to prepare the food fresh each time you gave it to him/her?

(2) _____ yes (1) _____ no

(IF NO, GO TO QUESTION 55)

54. Why did you prepare the food fresh each time? (THEN GO TO QUESTIONS 57)

(1) _____ my mother told me to

(2) _____ can get sour

(3) _____ can be contaminated by germs and/or microbes

(4) _____ no reason/I do not know

(5) _____ other (specify) _____

55. To those who give leftovers, where did you store the food until you gave it to the child again? (containers and place)

CONTAINER

PLACE

(1) _____ dish

(1) _____ on the floor

(2) _____ pot

(2) _____ on a raised platform

(3) _____ tin

(3) _____ in the cupboard

(4) _____ flask(

(4) _____ in the refrigerator

(5) _____ other (specify)

(5) _____ other (specify)

56. How long were they stored?

(1) _____overnight

(2) _____ 1 day

(3) _____ 1/2day

57. What were the next foods you fed the child? (IN ORDER)

FOODS	AGE	TIMES/DAY FED	PREPARATION

58. At what age did your child begin to eat the same food as
the rest of the _____ family?

_____months _____years

59. At what age did you completely stop breastfeeding
(CHILD'S NAME)?

_____months _____years

60. What made you stop at that age?

(DO NOT READ LIST)

- (1) _____ he was eating well (better)
- (2) _____ he was healthier than the rest of my children
- (3) _____ I did not have enough breast milk
- (4) _____ he refused to breastfeed on his own
- (5) _____ I was pregnant
- (6) _____ I have not been feeling well since I had
him/her
- (7) _____ I didn't have time to always be around him
- (8) _____ because I had to leave him behind and go to
the farm
- (9) _____ it was the normal age to stop
- (10) _____ my husband told me to
- (11) _____ I decided to
- (12) _____ my mother-in-law told me to
- (13) _____ my mother told me to
- (14) _____ other, (specify) _____

61. What method did you use to stop (CHILD'S NAME) from breastfeeding?

(DO NOT READ LIST)

- (1) _____ smeared the nipples with a bitter-tasting substance
- (2) _____ sent the child away (to a relative, grand mother, another room)
- (3) _____ hid the nipples
- (4) _____ gave alcohol to the child to make him sleep
- (5) _____ gave other liquids when the child wanted to suck on the breast
- (6) _____ other specify) _____

62. When you stop breastfeeding completely, what other changes did you make in the child's diet?

- (1) _____ gave vitamins
- (2) _____ gave eggs
- (3) _____ gave green leafy vegetables
- (4) _____ gave herbs
- (5) _____ increased the quantity of food
- (6) _____ nothing
- (7) _____ other specify

63. What is the one best food for the development of your child? _____

64. What are other good foods for the development of your child?

(1) _____

(2) _____

(3) _____

65. What is the one worst or most dangerous food for your child? _____

66. What are other foods that are not good for your child?

(1) _____

(2) _____

(3) _____

67. Who has been doing the following things for (CHILD'S NAME), since he was born? (READ EACH ACTIVITY)

DUTY	ME	OLDER SIBLING	SISTER	NIECE	MOT HER	OTHER
FEED						
WASH & DRESS						
CARE FOR WHEN ILL						
TEACH MANNERS						
PLAY						

68. How many times did you play with your child yesterday? _____

E. LET US TALK ABOUT THE TYPE OF SICKNESSES THAT HAVE BOTHERED (CHILD'S NAME) AND HOW YOU HAVE HANDLED THE TREATMENT.

69. What did you do when your child had the following illnesses?

(Take each sickness one at a time)

_____ none _____ none _____ none

	Diarrhea	U R I	Fever	Other
Where did you take the child				
What medicine				
Best food				
Worst food				

70. Who do you turn to for advice when _____ is sick?

(DO NOT READ THE RESPONSES. TICK ONLY ONE RESPONSE).

- | | |
|---------------------------------|----------------------|
| (1) _____ from my mother | (12) _____ a friend |
| (2) _____ from my grandmother | (13) _____ a teacher |
| (3) _____ from the elders | (14) _____ mates |
| (4) _____ from my mother-in-law | (15) _____ other |
| | (specify) _____ |
| (5) _____ from my husband | |
| (6) _____ my own experiences | |
| (7) _____ other family members | |
| (8) _____ health worker | |
| (9) _____ radio | |
| (10) _____ television | |
| (11) _____ doctor | |

71. How many times have you taken (CHILD'S NAME), to the following places during the past year? (READ EACH PLACE)

- (1) _____ traditional healer
- (2) _____ health center
- (3) _____ clinic
- (4) _____ hospital
- (5) _____ private doctor

72. How long does it usually take you to go from your home to the place you usually take your child when he/he is sick? (SHOULD BE WHERE THEY TOOK THE CHILD MOST.)

_____hours _____minutes

73. How many days has this child had diarrhea in the past two weeks?

_____days _____none

(IF NONE, GO TO QUESTION 76)

74. How many watery stools did she/he have a day?_____

75. Who has helped you the most in learning how to bring up healthy children?

(1) _____ from my mother (12) _____ a friend

(2) _____ from my grandmother (13) _____ a teacher

(3) _____ from the elders (14) _____ co-wife

(4) _____ from my mother-in-law (15) _____ other

(5) _____ from my husband

(6) _____ my own experiences

(7) _____ other family members

(8) _____ health worker

(9) _____ radio

(10) _____ television

(11) _____ doctor

76. What are the times that you usually wash your hands?

(DO NOT READ LIST, BUT PROBE)

- (1) _____ first thing when I get up in the morning
- (2) _____ each time I am getting ready to cook
- (3) _____ before I eat
- (4) _____ after I finish eating
- (5) _____ before I feed the child
- (6) _____ first thing when I return from the farm
- (7) _____ whenever I finish using the toilette
- (8) _____ whenever I finish cleaning the child each time
he/she excretes
- (9) _____ after I work in the fields
- (10) _____ after I feed the animals
- (11) _____ touch any thing dirty
- (12) _____ other (specify) _____

77. Do you use anything besides water, when you wash your hands?

(2) _____ yes (1) _____ no

If yes, "What do you use?"

- (1) _____ soap
- (2) _____ brush
- (3) _____ sponge

78. When infants and toddlers excrete inside the house how do you clean it up?

DO NOT READ THE RESPONSES

- (1) _____ do not clean it up
- (2) _____ use leaves of plants
- (3) _____ use papers
- (4) _____ let dogs, or pigs eat it up.
- (5) _____ cover with soil
- (6) _____ use hoes or any sharp edge weapon
- (7) _____ other (specify)

79. Where do you throw the feces after cleaning it up

- (1) _____ behind the house
- (2) _____ ditch
- (3) _____ pig sty
- (4) _____ pit toilette
- (5) _____ other (specify) _____

80. When the children excrete in the yard how do you clean it up?

DO NOT READ THE RESPONSES

- (1) _____ leave it there
- (2) _____ use leaves of plants
- (3) _____ use papers
- (4) _____ let dogs, or pigs eat it up.

- (5) _____ cover with soil
- (6) _____ use hoes or any sharp edge weapon
- (7) _____ other (specify)

81. When you sweep the house or the yard (surroundings)
where do you throw the dirt?

- (1) _____ behind the house
- (2) _____ ditch
- (3) _____ pig sty
- (4) _____ pit toilette
- (5) _____ other (specify) _____

82. Where do you fetch drinking water? **(CHECK ALL THAT
APPLY)**

- (1) _____ river, streams, lake
- (2) _____ rain
- (3) _____ spring
- (4) _____ well or pit
- (5) _____ pipe outside the house
- (6) _____ pipe inside the house
- (7) _____ other (specify) _____

83. What types of toilette do you have?

- (1) _____ bush (none)
- (2) _____ pit, latrine with earth floor
- (3) _____ pit, latrine with cement floor
- (4) _____ inside toilet
- (5) _____ other, (specify) _____

84. How often in the last two weeks have you bathed? _____

85. How often have you bathed (CHILD'S NAME) in the last two weeks _____

86. What material is the floor of your house made of?

(ASK IF YOU ARE NOT LET IN, OBSERVE IF LET IN)

- (1) _____ dirt
- (2) _____ wood
- (3) _____ clay/cement
- (4) _____ other, (specify)

(Observe if in _____ good condition _____ bad condition
if _____ clean _____ dirty)

87. What materials are the walls of the house made of?

(1) _____ straw

(2) _____ bamboo

(3) _____ bamboo and mud

(4) _____ mud blocks

(5) _____ plank

(6) _____ cement blocks

(7) _____ stones

(8) _____ other specify

(Observe if in _____ good condition _____ bad condition)

88. What materials is the roof made of?

(1) _____ thatch

(2) _____ grass (straw)

(3) _____ sheets of metal

(4) other, (specify) _____

(Observe if in _____ good condition _____ bad condition)

89. How long did it take you yesterday to carry out each of the following activities? **(READ EACH ACTIVITY)**

For time:

1 = very little time (30 minutes)

2 = one to two hours

3 = half a day (morning till noon or noon till evening)

4 = the whole day

ACTIVITY	TIME	WHO HELPED	CHILD ALONG	DO NOT DO THIS
work field				
working in house				
cooking				
gathering wood				
caring for child				
visiting				
carrying water				
resting				
sleeping				
fetching water				

90. Have you been to any of the following places for the past two weeks?

(READ EACH PLACE)

For time:

1 = very little time (30 minutes)

2 = one to two hours

3 = half a day (morning till noon or noon till evening)

4 = the whole day

PLACE	HOW OFTEN PER WEEK	LENGTH OF TIME	DID NOT GO
farm			
market			
store			
meetings			
ceremonies (crie die)			
visit friends			

91. Who takes care of the child regularly while you are away?

- (1) ____ my older child ____ age ____ sex
- (2) ____ my niece ____ age
- (3) ____ my husband
- (4) ____ my mother-in-law
- (5) ____ my mother
- (6) ____ my grandmother
- (7) ____ a neighbor
- (8) ____ never leave the child

92. At what age did you start leaving this child with people when you go to places? ____ age (in months)

93. How long did you leave the child at that time?
____ hours ____ days

94. How long do you leave the child now?
____ hours ____ days ____ weeks

95. Who feeds _____?

- (1) ____ he feeds himself
- (2) ____ I feed him
- (3) ____ another adult
- (4) ____ older kids
- (5) ____ others, (specify) _____

96. How is he fed?

- (1) _____ with hands
- (2) _____ with spoons
- (3) _____ both

97. At what age the child start feeding himself?

_____ months _____ years _____ does not feed himself

98. Does he/she usually finish the quantity of food given to him/her?

- (1) _____ no (2) _____ yes

If no, what do you do with the leftovers?

(DO NOT READ LIST, BUT PROBE IN CASE.)

- (1) _____ cover and keep to give to him/her later
- (2) _____ throw it away to the animals
- (3) _____ force him/her to eat
- (4) _____ do not know because not always around when he/she eats
- (5) _____ give to the other children to finish eating
- (6) _____ I eat it
- (7) _____ other (specify) _____

99. What would you wish your child to do (be)?

100. Which forms of transportation do you use when you go around the village or to another village?

(DO NOT READ LIST)

- | | |
|----------------------------|-------------------|
| (1) _____ feet | (5) _____ truck |
| (2) _____ burro, horse, ox | (6) _____ taxicar |
| (3) _____ bicycle | (7) _____ car |
| (4) _____ motorcycle | (8) _____ other |
| | (specify) _____ |

101. Which of the following appliances do you have?

(DO NOT READ LIST, PROBE and CHECK ALL THAT APPLY)

- | | |
|--------------------------|-----------------------------|
| (1) _____ none | (4) _____ radio |
| (2) _____ sewing machine | (5) _____ television |
| (3) _____ tape recorder | (6) _____ others, (specify) |
- _____

102. What radio programs do you listen to? **(DO NOT READ)**

(CHECK ALL THAT APPLY)

- | | |
|-------------------------|-------------------------|
| (1) _____ agriculture | (5) _____ luncheon date |
| (2) _____ health | (6) _____ music |
| (3) _____ entertainment | (7) _____ none |
| (4) _____ women program | (8) _ _ _ o t h e r |
| | (specify) _____ |

103. To which of these organizations do you belong?

(1) _____ church group (4) _____ traditional dance
group

(2) _____ njange group (5) _____ cooperative group

(3) _____ women group (6) _____ none

(7) _____ other, (specify)

104. What are the problems you have been facing in raising
your children?

105. How can you grade your personal satisfaction in life?

(1) _____ very satisfactory

(2) _____ satisfactory

(3) _____ less satisfactory

106. How does your husband treat you?

(1) _____ I do not know

(2) _____ not well

(3) _____ well

(4) _____ very well

(5) _____ husband present

(6) _____ I am not married

107. What kinds of support do you get from your husband?

- (1) _____ food support
- (2) _____ child support
- (3) _____ farm work
- (4) _____ school support
- (5) _____ health/medical support
- (6) _____ household equipment expenses
- (7) _____ husband present

Time the interview ended: _____

CHILD'S NAME _____

DATE OF BIRTH _____

DATE OF INTERVIEW _____

SEX _____

WEIGHT _____

HEIGHT _____

APPENDIX II -- SAMPLING PLAN

Subdivision	<u>Enumeration Zone</u>	<u>Village/Quarter</u>	<u>Number of Families</u>
Magba	702	Mabonko	10
	703	Makoupa-le-Grand	6
		Mbakop	3
		Mante Le Grand	11
	705	Koula (*)	2
	706	Machoutvi (*)	1
	707	Kourap	11
	709	Massaroum	6

NOTE: The villages of Gouenmewuo and Matachit I refused and were replaced by other villages (e.g. Mante le Grand).

Foubmot	711	Ngouendam Palais	14
		Koupara (*)	5
	718	Mbeyana (*)	1
		Koupara Carrefou	5
	719	Loumbot	10
	734	Mangoum (*)	5
	739	Njinja	11
	740	Momo	10
Penka-Michel	702	Mila II	11
	703	Sang II	5
	711	Tchomnekeu I (*)	2
		Deudeu (*)	7
		Tchomnekeu II (*)	1
	726	Bakassa I	9
		Balastisso (*)	1

	738	Messing I (*)	4
		Tchuedu (*)	2
	743	Messing II	9
Foukoue	700	Zemgho	3
		Magaison	3
	701	Tchoualeveng	5
		Nko'o (*)	1
	702	Bamenguou	8
		Lepou	5
	703	Nzag (*)	1
		Toufam	9
	704	Nzala	7
		Fiala (*)	1
	705	Madong	3
		Yangtou	1
		Fiala II	1

NOTE: One village in enumeration zone 701 refused.

Bandja	700	Ngakam	8
		Tchikon (*)	3
	703	Bano	9
		Balafi	1
	711	Menda Fondanti	8
		Njah (*)	1
	714	Tchala (*)	3
	715	No participation from the two villages surveyed.	
	720	Feutchap (*)	1

NOTE: There were only 8 eligible pairs in Njah; of those seven refused.

Bana	700	Basso (*)	4
		Tenchou	2
	701	Badoumla	7
		Bapou	3
	702	Batcha	12
	703	Bakam	3
	704	Famako	4
		Katou	2
705	Bakassa Centre	10	
	Pouatcheu	<u>8</u>	
			300

* Indicates that the number of families was low because of refusals rather than because of a lack of eligible families.

APPENDIX III -- FRENCH VERSION OF THE QUESTIONNAIRE

Questionnaire No _____
Département: _____ ()

Arrondissement: _____ ()

Zone de denombrement _____ ()

Village: _____ ()

Ménage: _____

Nom de l'Enqueteur: _____

Date: _____

Nom de la Mère: _____

Nom de l'Enfant: _____

Heure du début de l'entrevue: _____

A. D'ABORD, J'AIMERAI VOUS POSER DES QUESTION AU SUJET DE VOTRE MENAGE.

1. Situation de famille: encircler la mention correspondant a son cas:

(1) célibataire (2) mariée (3) séparée (4) veuve

SI ELLE EST MARIEE, DEMANDER S'IL S'AGIT D'UNE UNION DE TYPE MONOGAMIQUE OU POLYGAMIQUE. EN CAS D'UNION MONOGAMIQUE, COCHER EPOUSE UNIQUE ET EN CAS D'UNION POLYGAMIQUE, INDIQUER LA POSITION DANS LE MARRIAGE

(1) _____ épouse unique
 (2) _____ première épouse
 (3) _____ deuxième épouse
 (4) _____ troisième épouse
 (5) _____ quatrième épouse
 (6) _____ autre (à préciser) _____

2. Quel est votre religion?

(1) _____ Chretien
 (2) _____ Musulman
 (3) _____ Sans religion
 (4) _____ Autres (à préciser) _____

3. Combien de personnes- adultes et enfants, y compris vous-même¹ vivent dans ce ménage? _____

Indiquez pour chaque membre de votre ménage ses liens avec vous, son âge et son sexe.

Lien	Age	Sexe	
		Masculin (1)	Feminine (2)
Mari			
Moi meme			

4. Qui est considéré comme le chef du ménage? (COCHER LE NUMERO CORRESPONDANT)

- (1) ☐ Mari
- (2) ☐ Moi (la mère)
- (3) ☐ Beau frère
- (4) ☐ Successeur
- (5) ☐ Beau-père
- (6) ☐ Autre (à préciser)

5. Qui dans le ménage connaît le mieux l'état de sante et les habitudes alimentaires de (nom de l'enfant)?
_____?

- (1) ☐ La mère (moi meme)
- (2) ☐ Ma mère
- (3) ☐ La bonne
- (4) ☐ la soeur de l'enfant
- (5) ☐ autre femme
- (6) ☐ autre jeune fille
- (7) ☐ Autre (à préciser) _____

S'IL S'AGIT D'UNE PERSONNE AUTRE QUE LA MERE, L'ASSOCIER A L'ENTREVUE

6. Quel a ete la dernière classe que vous-avez fréquentée? _____

7. Savez-vous lire? Non _____ (1) Oui _____ (2)

8. Qui est-ce qui prépare souvent la nourriture dans votre maison?

- (1) _____ moi-même
 (2) _____ ma fille aînée
 (3) _____ ma nièce
 (4) _____ la bonne
 (5) _____ autre personne (à préciser) _____

9. Qui est-ce qui choisit les aliments à préparer?

- (1) _____ moi-même
 (2) _____ ma fille aînée
 (3) _____ ma nièce
 (4) _____ la bonne
 (5) _____ moi-même et autre personne
 (6) _____ autre personne (à préciser) _____

10. Quel type de foyer utilisez-vous? (NE PAS LIRE LA LISTE)

- (1) _____ foyer constitué de trois pierres fixées au sol
 (2) _____ foyer à charbon
 (3) _____ fourneau améliorée (gas ou petrol)
 (4) _____ autre (à préciser) _____

11. Où est située votre cuisine? (NE PAS LIRE LA LISTE)

- (1) _____ à l'extérieur de la maison, en plein air
 (2) _____ à l'extérieur de la maison, dans une case séparée
 (3) _____ à l'intérieur de la maison (combinée avec la chambre à coucher)
 (4) _____ à l'intérieur de la maison (séparée de la chambre à coucher)
 (5) _____ autre (à préciser) _____

B. MAINTENANT, NOUS ALLONS PARLER DES ALIMENTS QUE VOUS PRODUISEZ ET CONSOMMEZ.

12. Quelles plantes vivrières cultivez-vous?
 (NE PAS LIRE LA LISTE MAIS COCHER AU FUR ET A MESURE DES REPONSES ET DEMANDER CE QUI EST FAIT DE CHAQUE CULTURE APRES RECOLT).

CULTURES	CULTIVE	CONSOMME	VEND	CONSERVE	OFFRE DE BON
Maïs					
Manioc					
Taro					

CULTURES	CULTIVE	CONSOMME	VEND	CONSERVE	OFFRE DE BON
Ignames					
Macabo					
Patate douce					
Pommes de terre					
Plantain					
Banane					
Haricot rouge de lima					
Haricot blanc de lima					
Haricot noir de lima					
Niècé					
Soja					
Arachides					
Arachides mbabara					
Pistaches					
Courge					
Fuilles vertes					
Gombo					
'Inkut'					
Oranges					
Avocado					
Mandarine					
Prunes					

CULTURES	CULTIVE	CONSOMME	VEND	CONSERVE	OFFRE DE BON
Papaye					
Mangue					
Anana					
Guayave					

13. Parlons davantage des produits alimentaires que vous conservez
- La quantité stockée dure-t-elle jusqu'à la récolte suivante?

_____ Aucun Conservé

CULTURE	METHODE DE CONSERVATION (1) Séche (2) Champs (3) Enterré	DURE JUSQU'A LA RECOLT SUIVANTE (2)	NE DURE PAS JUSQU'A LA RECOLT SUIVANTE (1)

14. Quels animaux possédez-vous en ce moment?
(NE PAS LIRE LA LISTE MAIS PROCEDER PAR L'INVESTIGATION)

Aucun animal _____ (1)

ANIMAUX	NOMBRE	CONSOMME	CONSOMME LES PRODUITS	VEND	QUI GARDE L'ARGENT?
Chèvres			=====		
Cochons			=====		
Canards					
Poules					
Boeufs					
Lapin			=====		
Cochons d'Inde			=====		

15. Parmi les aliments que je vais citer, dites moi les quelles vous mangez habituellement dans votre maison. (ENUMERER LES ALIMENTS ET COCHER SI LA REPONSE C'EST OUI. PUIS DEMANDER COMBIEN DE FOIS CHAQUE ALIMENT EST CONSOMME PAR SEMAINE, ET COMMENT CES ALIMENTS SONT OBTENUS. COCHER TOUTES LES REPONSES PERTINENTES).

ALIMENTS	CON SOM ME	PAS LA SAISON	NBRE JOURS/SE- MAINE	CULTIVE	ACHETE	RECU EN BON
Maïs						
Arachide						
Haricots						
Soja						
Manioc						
Macabo						

ALIMENTS	CON SOM ME	PAS LA SEASON	NBRE JOUR\SEM AINE	CULTIVE	ACHETE	RECU EN BON
Taro						
Ignames						
Igname sucree						
Plantain						
Banane						
Pomme de terre						
Patate douce						
Carotte						
Chou						
Tomates						
Pistaches						
Courge						
Oranges						
Avocat						
Mandarine						
Prunes						
Papaye						
Mangues						
Ananas						
Citron						
cafe						
Feuilles vertes						
Huile de palme						
Huile de coton				=====		
Huile d'arachide				=====		

ALIMENTS	CON SOM ME	PAS LA SEASON	NBRE JOUR/SEM AINE	CULTIVE	ACHETE	RECU EN BON
Sucre						
Viande de porc ou boeuf				=====		
Viande de poule				=====		
Sardine				=====		
Ecrevisse				=====		
Poisson sec				=====		
Poisson frais				=====		
Riz						
Pain				=====		
nku1						
boissons gazeuses				=====		

16. Y a-t-il une période de l'année où votre famille ne dispose pas d'assez de nourriture? (1)___ non (2)___ oui

Si non, passez a la question no 17, si oui, demandez quelle periode et passez a la question no 18.

- (1)___ toujours
- (2)___ pendant les semailles
- (3)___ du début de la préparation du sol jusqu'au début des récoltes
- (4)___ pendant la saison sèche
- (5)___ pendant la saison pluvieuse
- (6)___ autres (à préciser) _____

17. SI LA FAMILLE A TOUJOURS ASSEZ D'ALIMENTS, POSER LA QUESTION SUIVANTE: COMMENT FAITES-VOUS POUR AVOIR SUFFISAMMENT DE NOURRITURE TOUT AU LONG DE L'ANNEE? NE PAS LIRE LA LISTE. COCHER PLUSIEURS REPONSES S'IL Y A LIEU.
- (1) ☐ produit une grande variété d'aliments
 - (2) ☐ produit une grande quantité d'aliments
 - (3) ☐ conserve une quantité suffisante d'aliments
 - (4) ☐ épargne assez d'argent de la vente des récoltes pour acheter suffisamment de nourriture jusqu'à la récolte suivante.
 - (5) ☐ possède une petite famille
 - (6) ☐ reçoit toujours des aliments de ma mère ou d'autres parents
 - (7) ☐ autre, (à préciser) _____
18. Quels sont les aliments les plus difficiles à obtenir en période de pénurie alimentaire? (Ne pas lire la liste. Cocher plusieurs réponses s'il y a lieu)
- (1) ☐ manioc, taro, ignames, pomme de terre, patate douce
 - (2) ☐ mais, riz
 - (3) ☐ soja, haricots, arachide
 - (4) ☐ viandes de boeuf, porc, poisson, poule
 - (5) ☐ l'oeuf, lait
 - (6) ☐ feuilles vertes
 - (7) ☐ fruits
 - (8) ☐ huiles
 - (9) ☐ autres, (à préciser) _____
19. Quels aliments consommez-vous habituellement en période de pénurie?
- (1) ☐ manioc
 - (2) ☐ igname
 - (3) ☐ riz
 - (4) ☐ plantain
 - (5) ☐ poisson
 - (6) ☐ fruits
 - (7) ☐ autre (à préciser) _____
20. Lorsqu'il y a assez à manger, quel membre de la famille veillez-vous à ce qu'il mange le premier? Qui vient en deuxième lieu, en troisième lieu, etc? (PRECISER L'ORDRE INDIQUE DANS LA REPONSE)
- (1) ☐ mon mari et autres hommes
 - (2) ☐ ma mère
 - (3) ☐ les enfants
 - (4) ☐ les nourrisson
 - (5) ☐ moi-même et autres femmes
 - (6) ☐ autres (à préciser) _____

(3) _____ je m'en sers pour acheter des choses que je ne peux pas produire moi-même, (QUOI PAR EXEMPLE?)

(1) _____ habits et chaussures pour les enfants et pour moi-même

(2) _____ savon (de toilette et de ménage)

(3) _____ allumettes, pétrole

(4) _____ crème de beauté, effets personnels

(5) _____ frais de scolarité

(6) _____ fournitures scolaires: livres, stylos, crayons, cartables, etc

(7) _____ frais médicaux

(8) _____ frais de traitement indigène

(9) _____ médicaments

(10) _____ autres (à préciser) _____

(4) _____ mari présent

(5) _____ refuse de répondre

C. MAINTENANT PARLONS DES ENFANTS QUE VOUS AVEZ EUS.

25. Etes-vous grosse? (1) _____ non (2) _____ oui

26. Combien de fois avez-vous porté des grossesses? _____

27. Combien de vos enfants sont-ils nés vivants? _____

28. Combien sont-ils morts avant la naissance? _____

29. Combien sont-ils morts avant leur premier anniversaire? (c'est-à-dire avant le mois de naissance de l'année suivant) _____

30. Combien sont-ils morts après l'âge d'un an? _____

31. Combien d'enfants vivants avez-vous actuellement? _____

SI TOUS SES ENFANTS SONT ENCORE EN VIE, COCHER "NE S'APPLIQUE PA A SON CAS" A LA QUESTION NO 32 ET PASSER A LA QUESTION NO 33

32. Quelles sont selon vous, les causes du décès de vos enfants qui sont nés vivants et qui sont morts par la suite?

causes de décès

âge au moment du décès

- | | | |
|------------|-----------------------------------|-------|
| (1) _____ | maladie diarrhéique | _____ |
| (2) _____ | rougeole | _____ |
| (3) _____ | infection des voies respiratoires | _____ |
| (4) _____ | sorcellerie | _____ |
| (5) _____ | malnutrition | _____ |
| (6) _____ | infection des yeux | _____ |
| (7) _____ | fièvre | _____ |
| (8) _____ | blessures | _____ |
| (9) _____ | infirmités | _____ |
| (10) _____ | mort subite | _____ |
| (11) _____ | cause inconnue (je ne sais pas) | _____ |
| (12) _____ | ne s'applique pas à son cas | _____ |
| (13) _____ | autre (à préciser) | _____ |

33. Où avez-vous mis au monde (NOM DE L'ENFANT)

- (1) _____ à domicile
- (2) _____ chez une accoucheuse traditionnelle
- (3) _____ dans une clinique
- (4) _____ à l'hôpital (ou)? _____
- (5) _____ tout autre endroit (à préciser) _____

34. Qui vous a assisté lors de l'accouchement?

- (1) _____ sâge femme
- (2) _____ médecin
- (3) _____ parent ou ami
- (4) _____ belle-mère
- (5) _____ mes coépouses
- (6) _____ accoucheuse traditionnelle autre que votre belle-mère
- (7) _____ autre (à préciser) _____

35. SI L'ENFANT EST NE DANS UN HOPITAL OU UNE CLINIQUE, POSER LA QUESTION SUIVANTE:

Combien l'enfant a-t-il pesé à sa naissance? _____

SI L'ENFANT EST NE AILLEURS QUE DANS UN HOPITAL OU UNE CLINIQUE, POSER LA QUESTION SUIVANTE:

L'enfant était-il "léger" à sa naissance?

- (1) _____ non (2) _____ oui (3) _____ je ne sais pas

D. PARLONS MAINTENANT DES TYPES D'ALIMENTS QUE VOUS MANGIEZ OU QUE VOUS NE MANGIEZ PAS QUANT VOUS ETIEZ ENCEINTE DE (NOM DE L'ENFANT) AINSI QUE DES RAISONS JUSTIFIANT CHAQUE CAS.

36. Quels aliments mangiez-vous de plus quand vous étiez enceinte de (NOM DE L'ENFANT)?

Aucun _____

ALIMENTS	POURQUOI LES MANGIEZ-VOUS

37. Quels aliments ne mangiez-vous pas quand vous étiez enceinte de (NOM DE L'ENFANT)?

Aucun _____

ALIMENTS	POURQUOI LES MANGIEZ-VOUS?

SI LA REPONSE AUX QUESTIONS NO 36 OU 37 EST "AUCUN", PASSER A LA QUESTION NO 39.

38. Qui vous a appris le plus de choses sur les aliments à consommer ou à éviter pendant la grossesse (NE PAS LIRE LA LISTE. COCHER TOUTES LES REPONSES CONVENABLES).

- | | |
|--|--------------------------------|
| (1) _____ ma mère | (9) _____ radio |
| (2) _____ ma grand-mère | (10) _____ télévision |
| (3) _____ les aînés | (11) _____ médecin |
| (4) _____ ma belle-mère | (12) _____ une amie |
| (5) _____ mon mari | (13) _____ un enseignant |
| (6) _____ ma propre expérience | (14) _____ mes coépouses |
| (7) _____ autres membres de la famille | (15) _____ autres (à préciser) |
| (8) _____ agent de santé | _____ |

39. Quels aliments mangiez-vous de plus quand vous donniez le sein à (NOM DE L'ENFANT)?

Aucun _____

ALIMENTS	POURQUOI LES MANGIEZ-VOUS?

40. Quels aliments ne mangiez-vous pas quand vous donniez le sein à (NOM DE L'ENFANT)?

Aucun _____

ALIMENTS	POURQUOI LES EVITIEZ-VOUS

SI LA REPONSE AUX QUESTIONS 39 OU 40 EST "AUCUN", PASSER A LA QUESTION 42.

41. Qui vous a appris le plus de choses sur les aliments à consommer ou à éviter quand vous donniez le sein à (NOM DE L'ENFANT)? (NE PAS LIRE LA LISTE. COCHER TOUTES LES REPONSES CONVENABLES).

- | | |
|--|--------------------------------|
| (1) _____ ma mère | (9) _____ radio |
| (2) _____ ma grand-mère | (10) _____ télévision |
| (3) _____ les aînés | (11) _____ médecin |
| (4) _____ ma belle-mère | (12) _____ une amie |
| (5) _____ mon mari | (13) _____ un enseignant |
| (6) _____ ma propre expérience | (14) _____ mes coépouses |
| (7) _____ autres membres de la famille | (15) _____ autres (à préciser) |
| (8) _____ agent de santé | _____ |

42. Quand avez-vous commencé à donner le sein à (NOM DE L'ENFANT)? (NE PAS ENUMERER LES EVENTUELLES REPONSES)

- (1) _____ quelques heures après la naissance
 (2) _____ un jour plus tard
 (3) _____ deux jours plus tard
 (4) _____ trois jours plus tard
 (5) _____ n'a pas allaité l'enfant au sein

43. Pourquoi avez-vous choisi de commencer à ce moment?

- (1) _____ pour nettoyer d'abord l'estomac de l'enfant
- (2) _____ le premier lait est très important pour l'enfant
- (3) _____ le lait ne coulait pas au début
- (4) _____ pour nettoyer d'abord l'estomac de l'enfant avec des herbes
- (5) _____ le premier lait n'est pas bon pour l'enfant: (DEMANDE POURQUOI?)
 - _____ il provoque la diarrhée chez l'enfant
 - _____ il donne des crampes d'estomac à l'enfant
 - _____ il constipe l'enfant
 - _____ il donne la jaunisse à l'enfant à cause de la couleur
- (6) _____ autres (à préciser) _____

44. SI LA MERE A ATTENDU UN OU PLUSIEURS JOURS, POSER LA QUESTION SUIVANT:

Que donniez-vous à l'enfant pendant ces (un, deux, ou trois jours)?

- (1) _____ herbes
 - (2) _____ coca cola
 - (3) _____ eau
 - (4) _____ eau sucré
 - (5) _____ autres (à préciser) _____
- à donner ces choses à l'enfant*

45. Qui vous a appris ~~ces choses-là~~? (NE PAS LIRE LA LISTE. COCHER TOUTES LES REPONSES CONVENABLES).

- | | |
|--|--------------------------------|
| (1) _____ ma mère | (9) _____ radio |
| (2) _____ ma grand-mère | (10) _____ télévision |
| (3) _____ les aînés | (11) _____ médecin |
| (4) _____ ma belle-mère | (12) _____ une amie |
| (5) _____ mon mari | (13) _____ un enseignant |
| (6) _____ ma propre expérience | (14) _____ mes coépouses |
| (7) _____ autres membres de la famille | (15) _____ autres (à préciser) |
| (8) _____ agent de sante | _____ |

46. A quel âge avez-vous donné le bibéron à votre enfant pour la première fois?

_____ jours _____ semaines _____ mois
_____ n'a jamais donné le bibéron

SI LA REPONSE C'EST "JAMAIS", PASSER A LA QUESTION NO 48.

47. Avez-vous fait subir un quelconque traitement à l'eau avant de la mettre dans le bibéron?

- (1) _____ non (2) _____ oui

SI OUI, DEMANDER "QU'AVEZ FAUT?"

- (1) _____ rien
- (2) _____ filtré
- (3) _____ fait bouillir
- (4) _____ autre (à préciser) _____

48. Quel est le premier aliment courant que vous avez donné à (NOM DE L'ENFANT)? Comment avez-vous préparé?

ALIMENT

FORME

- | | |
|------------------------------------|------------------------------------|
| (1) _____ Manioc | (1) _____ écrasé/pile |
| (2) _____ macabo | (2) _____ pré-maché |
| (3) _____ mais | (3) _____ bouillie |
| (4) _____ autre (à préciser) _____ | (4) _____ autre (à préciser) _____ |

49. Quel âge avait (NOM DE L'ENFANT) lorsque vous lui avez donné cet aliment?

_____ semaine _____ mois

50. Pourquoi avez-vous choisi de donner à (NOM DE L'ENFANT) cet aliment comme première nourriture ?

- (1) _____ ma mere ou m'a dit
- (2) _____ c'est donné par la plupart des gens
- (3) _____ c'est mou/facile à avaler
- (4) _____ c'est bon /nourrissant
- (5) _____ sans raison
- (6) _____ autre (à préciser) _____
- (7) _____ Je ne sais pas

51. Pourquoi avez-vous commencé à donner cet aliment à cet âge?

- (1) _____ il m'a été conseillé de le faire
- (2) _____ le bébé pleurait beaucoup
- (3) _____ le moment était venu pour l'enfant de manger des aliments solides
- (4) _____ autre (à préciser) _____
- (5) _____ Je ne sais pas

52. Combien de fois par jour avez-vous donné cet aliment pendant les trois premiers jours?

- (1) _____ premier jour
- (2) _____ deuxième jour
- (3) _____ troisième jour

53. Deviez-vous préparer fraîchement l'aliment chaque fois que vous le donniez à l'enfant?

(1) _____ non (2) _____ oui
SI NON, PASSER A LA QUESTION NO 54

54. Pourquoi prépariez-vous fraîchement l'aliment chaque fois?
PUIS PASSER A LA QUESTION NO 55

(1) _____ ma mere ma dit
(2) _____ peut se garter
(3) _____ microbes ou germes ou salites
(3) _____ sans raison, je ne sais pas
(4) _____ autre (a preciser) _____

55. Pour celles qui donnent les restes: où conserviez-vous l'aliment jusqu'au moment de le redonner à l'enfant?
(CONTENANT ET LIEU)

CONTENANT

LIEU

(1) _____ assiete (1) _____, sur le plancher
(2) _____ marmite (2) _____ étage
(3) _____ boite (3) _____ armoire
(4) _____ thermos (4) _____ réfrigérateur
(5) _____ autre (à préciser) (5) _____ autre (à préciser)

56. Pendant combien de temps les restes étaient-ils conservés?

(1) _____ jusqu'au lendemain
(2) _____ 1 journée
(3) _____ 1/2 journée

57. Quels autres aliments avez-vous donné à l'enfant par la suite?
(DANS L'ORDRE)

ALIMENTS	AGE	NOMBE DE FOIS PAR JOUR	PREPARATION (1) écrasé (2) pile (3) pré-maché (4) bouillie (5) aliments habituel mais rendu mou

58. A quel [^]âge votre enfant à commencer à manger les mêmes aliments que le reste de la famille?
 _____ mois _____ année
59. A Quel [^]âge avez-vous cessé complètement de donner le sein à (NOM DE L'ENFANT)?
 _____ mois _____ année
60. Pourquoi avez-vous décidé de sevrer à cet âge?
 (NE PAS LIRE LA LISTE)
- (1) _____ il mangeait bien (mieux)
 - (2) _____ il se portait mieux que tous les autres
 - (3) _____ le lait ne coulait plus suffisamment de mon sein
 - (4) _____ l'enfant refusait lui-même de prendre le sein
 - (5) _____ j'étais enceinte
 - (6) _____ je ne me sens pas bien depuis que j'ai mis cet enfant au monde
 - (7) _____ je n'avais pas assez de temps pour être toujours à ses côtés
 - (8) _____ je devais le laisser à la maison pour me rendre aux champs
 - (9) _____ c'est l'âge normal pour sevrer
 - (10) _____ mon mari a décidé
 - (11) _____ moi-même a décidé
 - (12) _____ ma belle-mère a décidé
 - (13) _____ ma mère a décidé
 - (14) _____ autre (à préciser) _____
61. Comment avez-vous procédé pour supprimer le sein à (NOM DE L'ENFANT)? NE PAS LIRE LA LISTE
- (1) _____ j'ai enduit les bouts de sein d'une substance au goût amer
 - (2) _____ j'ai éloigné l'enfant (chez un parent, chez sa grand-mère, dans une chambre à part)
 - (3) _____ cacher les mamelons
 - (4) _____ donner l'alcool à l'enfant pour le faire dormir
 - (5) _____ donner autres liquides quand l'enfant veut têter
 - (6) _____ autre (à préciser) _____
62. Lorsque vous avez sévré complètement l'enfant, quels autres changements avez-vous introduits dans son régime alimentaire
- (1) _____ donné les vitamines
 - (2) _____ donné les oeufs
 - (3) _____ donné les légumes verts
 - (4) _____ les écorce
 - (5) _____ augmenté la quantité de nourriture
 - (6) _____ aucun
 - (7) _____ autre (à préciser) _____

63. Quel aliment considérez-vous comme le meilleur pour la croissance de votre enfant?

64. Citez d'autres aliments utiles à la croissance de votre enfant?
(1) _____
(2) _____
(3) _____
65. Quel aliment considérez-vous comme le pire ou le plus dangereux pour la croissance de votre enfant?

66. Citez d'autres aliments que vous jugez mauvais pour votre enfant
(1) _____
(2) _____
(3) _____
67. Quelles personnes s'occupent des divers besoins de (NOM DE L'ENFANT), depuis sa naissance? (LIRE CHAQUE ACTIVITY)

ATIVITE	MOI	ENFANT PLUS AGE	MA SOEUR	MA NIECE	MA MERE	AUTRE
DONNER A MANGER						
LAVER ET LANGER						
SOIGNER EN CAS DE MALADIE						
APPRENDRE LES BONNES MANIERES						
JOUER AVEC LUI						

68. Combien de fois avez-vous joué avec votre hier? _____

E. PARLONS MAINTENANT DES TYPES DE MALADIE QUI ONT AFFECTE LA SANTE DE (NOM DE L'ENFANT) ET DE MANIERE DONT VOUS LES AVEZ TRAITEES.

69. Que faites-vous lorsque vos enfants souffrent des maladies suivantes?
(EXAMINER LES MALADIES L'UNE APRES L'AUTRE)

	☐ Aucun	☐ Aucun	☐ Aucun
	Diarrhée	Infections des voies respiratoires	Fièvre
Où conduisez-vous l'enfant			
Quels médicaments			
Meilleur aliment			
Plus mauvais aliment			

70. A qui demandez-vous conseil lorsque _____ tombe malade?

(NE PAS LIRE LA LISTE. COCHER UNE SEULE REPONSE).

- | | |
|---|---|
| (1) ☐ ma mère | (9) ☐ radio |
| (2) ☐ ma grand-mère | (10) ☐ télévision |
| (3) ☐ les aînés | (11) ☐ médecin |
| (4) ☐ ma belle-mère | (12) ☐ une amie |
| (5) ☐ mon mari | (13) ☐ un enseignant |
| (6) ☐ ma propre expérience | (14) ☐ mes coépouses |
| (7) ☐ autres membres de la famille | (15) ☐ autres (à préciser) |
| (8) ☐ agent de santé | |

71. Combien de fois avez-vous amené (NOM DE L'ENFANT), aux endroits ci-après l'année dernière (LIRE CHAQUE ENDROIT)

- (1) ☐ chez le guérisseur traditionnel
 (2) ☐ au centre de santé
 (3) ☐ à l'hôpital
 (4) ☐ à la pharmacie

- (5) _____ chez le médecin privé
72. Combien de temps faut-il en moyenne pour aller de votre domicile jusqu'au lieu où vous conduisez habituellement votre enfant lorsqu'il est malade?(IL S'AGIT DU LIEU OÙ L'ENFANT EST CONDUIT LE PLUS SOUVENT)

_____ heures _____ minutes

73. Pendant combien de jours cet enfant a-t-il fait la diarrhée au cours des deux dernières semaines?

_____ jours _____ aucun

SI AUCUN PASSER A LA QUESTION NO 76

74. Combien de selles liquides faisait-il par jours? _____
Je ne sais pas _____

75. Qui a contribué le plus à vous apprendre comment garder les enfants en bonne santé?

- | | |
|--|--------------------------------|
| (1) _____ ma mère | (9) _____ radio |
| (2) _____ ma grand-mère | (10) _____ télévision |
| (3) _____ les aînés | (11) _____ médecin |
| (4) _____ ma belle-mère | (12) _____ une amie |
| (5) _____ mon mari | (13) _____ un enseignant |
| (6) _____ ma propre expérience | (14) _____ mes coépouses |
| (7) _____ autres membres de la famille | (15) _____ autres (à préciser) |
| (8) _____ agent de santé | _____ |

76. A quels moments lavez-vous vos mains habituellement?
(NE PAS LIRE LA LISTE, MAIS PROCEDER PAR L'INVESTIGATION)

- (1) _____ première chose au réveil le matin
(2) _____ chaque fois que je me prépare à faire la cuisine
(3) _____ avant de manger
(4) _____ après avoir manger
(5) _____ avant de donner à manger à l'enfant
(6) _____ première chose lorsque je reviens des champs
(7) _____ chaque fois que je finis d'utiliser les toilettes
(8) _____ chaque fois que je finis de nettoyer l'enfant quand il se souille
(9) _____ après le travail dans les champs
(10) _____ après avoir donné à manger aux animaux
(11) _____ quand je touch tout objet sale
(12) _____ autres(à préciser) _____

77. Utilisez-vous autre chose en dehors de l'eau quand vous vous lavez les mains?

(2) _____ oui (1) _____ non

SI OUI, QU'UTILISEZ-VOUS?

- (1) ☐ savon
- (2) ☐ brosse
- (3) ☐ éponge
- (4) ☐ autre (à préciser) _____

78. Lorsque les bébés et les petits enfants font caca à l'intérieur de la maison comment enlevez-vous les excréments?
(NE PAS LIRE LES REPONSES)

- (1) ☐ n'enlève pas
- (2) ☐ en utilisant des feuilles de plantes
- (3) ☐ en utilisant du papier
- (4) ☐ en laissant les chiens et les cochons les manger
- (5) ☐ en les recouvrant d'une couche de terre
- (6) ☐ à l'aide d'une houe et de tout autre outil tranchant
- (7) ☐ autres (à préciser) _____

79. Où jetez-vous ces excréments?

- (1) ☐ derrière la maison
- (2) ☐ rigole
- (3) ☐ porcherie
- (4) ☐ fosse
- (5) ☐ W.C.
- (6) ☐ autre (à préciser) _____

80. Si les enfants font caca dans la cour, comment enlevez-vous les excréments?
(NE PAS LIRE LES REPONSES)

- (1) ☐ n'enlève pas
- (2) ☐ en utilisant des feuilles de plantes
- (3) ☐ en utilisant du papier
- (4) ☐ en laissant les chiens et les cochons les manger
- (5) ☐ en les recouvrant d'une couche de terre
- (6) ☐ à l'aide d'une houe et de tout autre outil tranchant
- (7) ☐ autres (à préciser) _____

81. Lorsque vous balayez l'intérieur, la cour ou les alentours de la maison, où jetez-vous les ordures?

- (1) ☐ derrière la maison
- (2) ☐ rigole
- (3) ☐ porcherie
- (4) ☐ fosse
- (5) ☐ W.C.
- (6) ☐ autre (à préciser) _____

82. Ou puissez-vous de l'eau que vous buvez?

- (1)___ rivière ,ruisseau, lac
- (2)___ eau de pluie
- (3)___ source
- (4)___ puits
- (5)___ la fontaine publique
- (6)___ robinet interne
- (7)___ autre (à préciser)_____

83. Quels types de toilettes possédez-vous?

- (1)___ brousse (pas de toilettes)
- (2)___ W.C. au sol nu
- (3)___ W.C. au sol cimenté
- (4)___ toilettes intérieurs
- (5)___ autre (à préciser)_____

84. Combien de fois vous êtes-vous lavé pendant les deux dernières semaines?_____

85. Combien de fois avez-vous lavé (NOM DE L'ENFANT) pendant les deux dernières semaines? _____

86. En quelle matière est fait le sol de votre maison?
DEMANDER, SI L'ON N'EST PAS ADMIS A L'INTERIEUR; SI OUI,
OBSERVER SOI-MEME

- (1)___ terre
- (2)___ bois
- (3)___ beton/cemente
- (4)___ autre, (à préciser)

VOIR SI LE PLANCHER EST (1)___en mauvais etat (2)___en bon etat
(1)___sale (2)___ propre

87. En quelles matières sont faits les murs de la maison?

- (1)___ paille
- (2)___ bambou
- (3)___ bambou et terre batteu
- (4)___ briques en terre
- (5)___ planche
- (6)___ parpaings
- (7)___ cailloue
- (8)___ autre (à préciser)_____

VOIR SI LES MURS SONT (1)___en mauvais etat (2)___en bon etat

88. En quelles matières est fait le toit?

- (1) _____ natte
(2) _____ paille
(3) _____ toles
(4) _____ autre (à préciser) _____

VOIR SI LE TOIT EST (1) _____ en mauvais etat (2) _____ en bon etat

89. Combien de temps avez-vous mis hier pour accomplir les activités suivantes?

Pour le temps mis:

1 = très peu de temps (30 minutes)

2 = peu de temps (1 à 2 heures)

3 = demi-journée (du matin jusqu'à midi ou de midi jusqu'au soir)

4 = journée entière

LIRE CHAQUE ACTIVITE

ACTIVITE	TEMPS MIS	QUI A AIDE	EN COMPAGNIE DE L'ENFANT	ELLE NE LE FAIT PAS
Travaux champêtres				
Travaux ménagers				
Préparation des aliments				
Ramassage du bois				
Soins à l'enfant				
Puisage de l'eau				
Repos		=====		
sommeil		=====		

90. Au cours de la dernière semaine, à quels autres endroits vous êtes-vous rendue en emmenant l'enfant avec vous?

Pour le temps mis:

1 = très peu de temps (30 minutes)

2 = peu de temps (1 à 2 heures)

3 = demi-journée (du matin jusqu'à midi ou de midi jusqu'au soir)

4 = journée entière

LIRE CHAQUE ENDROIT

ENDROITS	NOMBRE DE FOIS PAR SEMAINE	TEMPS MIS	EN COMPAGNIE DE L'ENFANT	N'Y EST PAS ALLEE
Vente emportée				
Marché				
Boutiques				
Reunions				
Cérémonies de deuil				
Visites aux amis				

91. A qui laissez-vous l'enfant régulièrement quand vous sortez?

- (1) _____ l'aîné de mes enfants _____ âge _____ sexe
 (2) _____ ma nièce _____ âge
 (3) _____ mon mari
 (4) _____ ma belle-mère
 (5) _____ ma mère
 (6) _____ ma grand-mère
 (7) _____ un voisin
 (8) _____ jamais

92. A quel âge avez-vous commencé à confier cet enfant à des tierces personnes pendant vos absences? _____ âge (en mois)

93. Pendant combien de temps le laissez-vous ainsi à cette période-là? _____ heures _____ jours

94. Pendant combien de temps le laissez-vous maintenant?
 _____ heures _____ jours _____ semaines

95. Qui est-ce qui donne à manger à (NOM DE L'ENFANT)?
NE LIRE PAS LA LISTE

- (1) _____ il mange tout seul
- (2) _____ moi-même
- (3) _____ un autre adulte
- (4) _____ des enfants plus âgés
- (5) _____ autres (à préciser) _____

96. A l'aide de quoi vous lui donnez à manger ou il mange?

- (1) _____ avec la main
- (2) _____ avec une cuillère
- (3) _____ les deux

97. A quel âge a-t-il commencé à manger tout seul?

_____ mois _____ année _____ il ne mange pas tout seul

98. Parvient-il habituellement à finir toute la quantité de nourriture qui lui est servie?

- (1) _____ non
- (2) _____ oui

Si non, que faites-vous des restes?

(NE PAS LIRE LA LISTE, MAIS PROCEDER PAR L'INVESTIGATION)

- (1) _____ le reste est couvert et gardé pour lui être servi plus tard
- (2) _____ le reste est jeté aux animaux
- (3) _____ je l'oblige à manger le reste
- (4) _____ je ne sais pas parce que je ne suis pas toujours présente lorsqu'il mange
- (5) _____ le reste est donné aux autres enfants
- (6) _____ je mange moi-même
- (7) _____ autre (à préciser) _____

99. Que souhaiteriez-vous de l'avenir de cet enfant?

100. Quels moyens de locomotion utilisez-vous pour se déplacer?
(NE PAS LIRE LA LISTE)

- (1) _____ marche à pied
- (2) _____ âne, cheval
- (3) _____ vélo
- (4) _____ motocyclette
- (5) _____ camionnette
- (6) _____ véhicule de transport en commun
- (7) _____ voiture familial
- (8) _____ autre (à préciser) _____

101. Est-ce que vous possédez?

LIRE LA LISTE, COCHER PLUSIEUR REPONSES S'IL Y A LIEU

- (1)___ aucun (4)___ la radio
(2)___ la machine à coudre (5)___ le téléviseur
(3)___ la magnétophone

102. Quels programmes aimez-vous suivre à la radio (NE PAS LIRE LISTE, COCHER PLUSIEURS REPONSES S'IL Y A LIEU)

- (1)___ agriculture (5)___ Cameroon midi
(2)___ santé (6)___ musique
(3)___ divertissement (7)___ aucun
(4)___ emission des femmes (8)___ autre (à préciser)

103. Appartenez-vous à ?

LIRE LA LISTE, COCHER PLUSIEUR REPONSES S'IL Y A LIEU

- (1)___ un groupe religieux
(2)___ une tontine
(3)___ un groupe de femmes
(4)___ un groupe de danse traditionnelle
(5)___ un cooperative
(6)___ aucun
(7)___ autre (à préciser)_____

104. Quel est le problem le plus difficile que vous rencontrez en élevant cet enfant?

105. Etes-vous contente de votre vie?

- (1)___ non
(2)___ oui

106. Comment votre mari vous traite-t-il?

- (1)___ je ne sais pas
(2)___ pas bien
(3)___ bien
(4)___ très bien
(5)___ mari presant
(6)___ je ne suis pas mariée

107. Est-ce que votre mari vous aide?

- (1) _____ en matière alimentaire
- (2) _____ en matière de soins aux enfants
- (3) _____ en matière de travaux champêtres
- (4) _____ en matière de scolarité
- (5) _____ en matière de santé/soins médicaux
- (6) _____ en matière d'équipement de la maison
- (7) _____ mari présent
- (8) _____ je ne suis pas mariée

Heure à laquelle se termine l'interview _____

NOM DE L'ENFANT _____

DATE DE NAISSANCE _____

DATE DE L'INTERVIEW _____

SEX _____

POIDS _____

TAILLE _____