This is to certify that the

dissertation entitled

Childhood Health and Nutritional Status in

Mporokoso District, Zambia

presented by

Darlington Chongo Mundende

has been accepted towards fulfillment
of the requirements for

PH.D. degree in Geography

J. M. Winter

Major professor

Date April 5, 1990

CHILDHOOD HEALTH AND NUTRITIONAL STATUS IN MPOROKOSO DISTRICT, ZAMBIA

By

Darlington Chongo Mundende

A DISSERTATION

Submitted to
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ABSTRACT

CHILDHOOD HEALTH AND NUTRITIONAL STATUS IN MPOROKOSO DISTRICT, ZAMBIA

BY

Darlington Chongo Mundende

The purpose of this study is to assess the health and nutritional status of children in two areas of Mporokoso District in Zambia by the use of anthropometric measurements of weight, mid-upper arm circumference, and height. The two study areas consist of a set of villages in the western part of the district and the other residential areas of Mporokoso Township, the district headquarters of the district, here referred to as Area 1 and Area 2, respectively.

Two surveys were carried out, the first one between August and October 1987, and the other between January and March 1988. Mothers or female guardians were asked questions regarding their demographic, nutritional, socioeconomic, and health conditions of their households. Also the weights, heights, and mid-upper arm circumferences of children under 15 years of age by April 1988 were taken. Respondents' weights, heights, and mid-upper arm circumferences were also taken.

Results indicate that the health and nutritional status of the children in Mporokoso District is similar to that of children in other Third World setting. The health

and nutritional conditions indicate a low level of socioeconomic situation in the study area. A preponderance of infectious and diarrheal diseases is one indicator.

Most respondents only visit health institutions when they or members of their household are ill. The use of health services for preventive care for children stops around the children's first birthday even if immunizations are not completed. Long distances are just a part of the problem.

Poor nutritional status is largely determined by insufficient food production, hence food shortage, large households but with few workers, and poor dietary patterns. But children did not lose weight during the two survey periods as was expected.

Nutritional status is found to be better in the urban area, or Area 2. Although some findings are not statistically significant urban children had higher anthropometric measurements than rural children. And generally, boys had higher values than girls.

Stepwise multiple regression analysis suggests that the children's ages, mothers' weights, distance to a health center, parents' educational levels, children's parity, number of workers, and household size are important determinants of nutritional status.

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DEDICATION

To my late father: Jackson Mwenya Mundende Chifuta,

And beloved Mother: Monica Lombe Mwenya:

For showing me the way;

Believing that I could walk it,

And supporting me all the way.

Daddy, I wish you were here

To see me at the end of it.

To our children:

Chongo, Mulenga Chonya, and Mwenya Chifuta

For allowing Daddy to leave them

For so long in order to travel this road.

Hoping you will never have to ask again:

"Daddy, where are you going this time?"

ACKNOWLEDGEMENTS

This study has been written with a lot of assistance and encouragement from many people and institutions. I do not think I can mention them all. Should they find themselves individually unacknowledged let them know that this part of acknowledgements is for them.

My greatest debt and thanks go to Professor John M. Hunter, the Chairperson of my Guidance Committee, for his patience, guidance, and untiring assistance since I came to East Lansing. Many thanks to other members of the Guidance Committee, namely: Drs. J. Allan Beegle (Professor Emeritus in Sociology), Bruce Wm. Pigozzi (Geography), and Robert N. Thomas (Geography), for their invaluable support and assistance from the very beginning of my program.

I gratefully thank the Population Council for providing the fellowship that not only made the field research possible, but also provided financial assistance for data analysis. Many thanks to the University of Zambia for awarding me a Special Research Fellowship that made this giant step possible. The Department of Geography here at Michigan State provided the computer time and money for the use of the mainframe.

Many thanks to my Research Assistants, namely, Messrs Alex Chikaka, Geoffrey Kamangala, Amon Kapembwa, and K.K. Mtonga, as well as Mrs. Christine Chibanga, who feared no rain, cold, or sunshine while on duty. Many thanks to all our respondents for their hospitality and assistance in providing answers to our many questions. Mr. and Mrs. Maynard Chanda deserve special mention for their assistance. May their children find some hope in the results of this study.

The Ministry of Health allowed this survey to be conducted at the time many research proposals were being turned down. I thank the Ethical and Research Committee, Director of Medical Services, Provincial (Northern) Medical Officer, Mporokoso District Medical Officer, and the staff at Chiwala Rural Health Center for their support.

This degree program has been a family effort. I do not know how to thank my beloved wife, Grace, for looking after the children while I was away. I greatly appreciate the children's patience as they stayed without a father for such a long time. Chongo, Mulenga, and Mwenya, thanks for being good children.

Many thanks to Mporokoso District leaders of the ruling United National Independence Party, beginning with the late District Governor, Mr. C. Chibanga, for their support. The village headmen in conjunction with the staff at Chiwala Rural Health Center made our life easier by contacting the people before we reached their villages.

Last, but not least, I would like to thank Dr. Raban Chanda and his wife, Jane, for correcting my Chibemba.

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LIST OF ABBREVIATIONS

ECA - Economic Commission for Africa

FAO - Food and Agriculture Organization

GRZ - Government of the Republic of Zambia

NCHS - National Center for Health Statistics

NFNC - National Food and Nutritional Commission

PEM - Protein Energy Malnutrition

RHC - Rural Health Center

UCI - Universal Child Immunization (campaign)

UNICEF - United Nations Children's Fund

WHO - World Health Organization

CHAPTER 1

INTRODUCTION

Purpose of the Study

All over the world people desire to live fuller and healthier lives that would enable them to perform well in their daily endeavors. They wish the same for their children. Nutritional status of the people by and large reflects and influences the socioeconomic development of a given country (FAO, 1974a). Unfortunately, in some developing countries malnutrition is, and continues to be, the single most important health problem (Latham, 1979).

The purpose of this study is to assess the health and nutritional status of children in two areas of Mporokoso District in Zambia, using the anthropometric measurements of height, weight, and mid-upper arm circumference. The study aims at identifying specific groups of children who are at risk of developing malnutrition, the most important determinants of the nutritional status, as well as the role of seasonality and the utilization of health services in the health and nutritional status of the children.

The study focuses on the areas surrounding two health institutions, namely: Chiwala Rural Health Center, and Mporokoso District Hospital, located in Mporokoso District

in Northern Province of Zambia. Several questions have been asked in this study. What are the most important variables in the health and nutritional status of the children in the two areas? Is nutritional status different between the two areas? What role does utilization of health services play in health status of the children? Do socioeconomic variables have a part in the determination of nutritional status? Are demographic variables important? Important variables include availability of and accessibility to food, types of food produced and consumed, education, source of livelihood, income, age, gender, number of children, and parity.

The study also aims at identifying the groups of people who are at risk of developing malnutrition in the two areas. The results will be used to make recommendations that could help the two communities in the District as well as other rural areas where similar conditions exist. The results should be beneficial to the health planners and health workers. Upon return to Zambia, I shall meet with the people in the research areas to relate some of the results so that they can learn about conditions and find solutions to some of the problems.

Nutritional Status and Malnutrition

Nutritional status has been defined as "The condition of the body resulting from the utilization of the essential nutrients available to the body" (Boerma, 1975:

145). Poor nutritional status is manifested in malnutrition. For a long time malnutrition has been looked at as a physiological state associated with a very limited view of causes and, hence, a restricted number of possible solutions. The last three decades have shown that the problem of malnutrition is a more complex issue than was previously thought.

Malnutrition is believed to be caused by deficiencies of specific nutrients, and particularly protein. It is a widely held view that poor nutrition is a result of ignorance, and that infectious diseases, though exacerbated by malnutrition, have been treated as a separate problem to be encountered by specifically designed programs. Recent studies show that (1) malnutrition is caused by several factors, many of which are linked to the conditions of inequality of resource distribution, of poverty, and of social discrimination; (2) that humans can adapt to a wide range of dietary situations, and it is only when the dietary limits are exceeded that malnutrition occurs, mainly in the socially and economically disadvantaged sections of the population; and (3) that most intervention programs such as production of special nutritious foodstuffs, special delivery systems, and projects to educate people about nutritional values of food, have not been very successful (Joy, 1978; Payne, 1985; Joy and Payne, 1975).

Malnutrition leads to smaller body sizes in human

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Malnutrition leads to smaller body sizes in human

beings. It reflects a response to diverse environmental conditions. But it is associated with permanent impairment of mental development, reduced work capacity, and higher morbidity and mortality. Stunting is both a waste of human resources and an indicator of undesirable environmental pressures (Ferro-Luzzi, 1984).

Determinants of nutritional status can be genetic or environmental. Environmental stressors include nutritional factors, higher exposure to risk behaviors like smoking during pregnancy, higher altitude hypoxia, and neurohumoral disturbances secondary to psychological deprivation, temperature, or climatic extremes. Furthermore, determinants can be direct or indirect. Direct determinants are those factors that disturb the nutritional status by metabolically affecting nutrient utilization. Food intake as well as infectious and parasitic diseases are direct determinants, although the relationship between food intake and disease is a complex issue. For instance, though infections have been intimately associated with adverse human growth, the precise nature of the interaction has not been defined. Complicating factors include the myriad interacting environmental factors, the variability of severity and duration of the disease in question, and the nature of the microbes (Ferro-Luzzi, 1984).

Infectious diseases interfere with the growth processes through nutritional disturbance. For instance,

an undernourished person is much more likely to succumb to an infectious disease than a well-nourished person. The impact of malnutrition on infection in Africa can be seen in the light of high fatality rates of such diseases as measles. Children with measles usually have poor nutritional status and low resistance. The simultaneous presence of both malnutrition and infection results in an interaction which has more serious consequences for the child than the additive effect of the two working independently. While infections make malnutrition worse, poor nutrition increases the severity of infectious diseases. This interaction is known as the synergistic effect (Latham, 1979).

Indirect determinants of poor nutritional status are many. They mainly fall within the broad groups of demographic factors (e.g., number of siblings in the home, household size, age at weaning, gender), socioeconomic factors (e.g., food expenditure, parental education, income, housing conditions), individual behavior (e.g., smoking, eating habits), and high altitude hypoxia. These factors have recently been advocated for study as the major factors in nutritional status determinants (Ferro-Luzzi, 1984; Levinson, 1974; Mata et al., 1977; Bairagi, 1980; Balderston et al, 1981; Baumgartner and Pollitt, 1983; Nabarro, 1984; Maletnlema, 1986; Pellett, 1983). The present study uses some of these indirect determinants.

Studies on the growth and development of children

identify the populations at risk of nutritional deficiency. Bad nutrition may lead to stunted or retarded growth. Other influences include low birthweight, weight of mother, height of mother, duration of breastfeeding, weaning practices, infections, death or absence of parent(s), and failure to gain weight early in life.

Why Anthropometric Measurements

This is a dietary outcome study which utilizes the anthropometric measurements of weight, height, and mid-upper arm circumference. As opposed to a dietary intake study, an outcome study is quick to conduct and is less expensive. The measurements have been found to be objective and simple (Jelliffe, 1966), especially in cases of children's nutritional status assessment (Seoane and Latham, 1971; Waterlow, 1976). The use of weight-for-age, height-for-age, weight-for-height, mid-upper arm circumference, and birthweights have been highly recommended by the World Health Organization (WHO, 1983). I have not used birthweight data because they did not exist at the time of survey.

Anthropometric measurements will be used because (1) using clinical signs in a study like this one is not practical in that no objectivity exists in diagnosing and interpreting clinical signs of malnutrition. The signs are not standardized and cannot be expressed quantitatively (Keller and Fillmore, 1983: 140); (2) although biochemical

indicators using blood and urine can be quantified (McLaren et al., 1967), biochemical evaluation is not practical in field studies in that sophisticated laboratory equipment and a large number of specimens are involved; and (3) anthropometric measurements are not only quantifiable, they are also practical for use in field studies. They produce reliable data (Keller and Fillmore, 1983).

The measurements of the Zambian subjects were compared to those of the National Center for Health Statistics (NCHS) system which has been used as the reference population. The NCHS system, an American standard, has been recommended by the WHO for international comparison purposes because it is based on a larger population sample than other systems. The NCHS growth charts were developed in 1976 in the United States (Hamill et al., 1979).

The Study Areas

Mporokoso is a civil district in Northern Province of Zambia. The District lies between 9° 10' and 10° 30' south of the Equator and 29° 0' and 31° 15' east of the Greenwich Meridian. The population is served by one hospital, Mporokoso District Hospital, one Township Clinic, and five rural health centers (RHCs) located at Chitoshi, Chiwala, Mukolwe, Mukupa Kaoma, and Shibwalya Kapila. In addition, local community health centers (CHCs)

have been established in several villages. They are run by community health workers that have been sponsored for training by the local villages in simple drug administration. These workers are paid by the communities involved.

Selection of the Study Areas

Two areas were purposely selected for study. Area 1 consists of the villages surrounding Chiwala Rural Health Center (RHC), while Area 2 comprises the formal residential areas of Mporokoso Township -- the district headquarters of Mporokoso District. Area 2 is more accessible than Area 1 in that it receives occasional (sometimes weekly) bus services from Kasama to Nsumbu on Lake Tanganyika and vice-versa. It is the only urbanized place in Mporokoso District. It has workers who receive salaries from formal employment. Area 1 receives fewer vehicles even though it lies on a major artery of the Kawambwa-Mporokoso road. Especially during the rainy season, Area 1 experiences more problems in securing transport to reach a hospital. However, once a month a government vehicle from Mporokoso District Hospital, goes to Chiwala to make drug deliveries. In particular, external accessibility to several goods produced outside the area is higher in Area 2 than in Area 1. One government shop serves the area.

I expect Area 2 to have better nutritional status

because, other things being equal, it is more accessible than Area 1. The people who live in Area 2 are in regular employment drawing monthly salaries and wages, whereas very few people do so in Area 1.

The people in Area 1 are not cattle-keeping; they mainly depend on hunting wild game for their meat. However, all the people are expected to keep chickens, and some even rear goats and sheep. Fish is the major source of animal protein, but I would expect people in Area 2 to have more access to fish because they live on an important first stop used to transport fish to the Copperbelt. Local fishing, in the nearby rivers and streams, should be another source of fish supplements in Area 1.

The two areas are different. Area 1 is inhabited by the Bemba-speaking people who practise the chitemene system of agriculture. This system depends on the lopping or felling of trees and bushes, collecting the dried branches in stacks, and burning the stacks prior to planting. Also, village gardening is practised in the immediate vicinity of a given village (Chapter 4). People in Area 2 depend on income obtained mainly from formal employment and, in certain cases, from petty trading activities.

Contributions of the Study

This study aims at contributing several things to research on nutrition. First, for some unknown reasons,

medical geographers seldom work in the field of nutrition. The study will contribute some work in this neglected field. Second, as a comparative study between two areas in a rural District, the study aims to identify determinants of nutritional status, and to reveal potential solutions to the problems. Third, the issue of utilization of the health centers is introduced in order to understand whether or not they are used for preventive or curative care, if they are used at all. The reasons for use or non-use of the services could be helpful to the Ministry of Health and the people concerned.

The use of geographic, socioeconomic, nutritional, and demographic variables in the study will lead to the understanding of the role of the variables in nutritional status in the study area. The study has important implications for both planners and people living in the study area. By knowing the extent of the problem, identifying the determinants of the problem, and understanding the use or non-use of government health services, appropriate measures to improve the health and nutritional status of the people can be applied.

The dissertation is divided into seven chapters. Chapter 1 introduces the purpose and objectives of this study, and briefly introduces the study areas. Chapter 2 contains the review of literature as well as the expectations and hypotheses. Chapter 3 has the methods and procedures that have been used in the study. Chapter 4

focuses on the study area, but specific emphasis is directed at food and dietary preferences of the people in the research area. Chapters 5 and 6 present and discuss the findings of the study. In Chapter 5 are discussed the health and nutritional status of the households while in Chapter 6 are discussed the health and nutritional status of the children. Chapter 7 gives the summary and conclusions of the study.

CHAPTER 2

REVIEW OF LITERATURE

Studies on the nutritional status of children abound in the world, although medical geographers' contributions to the literature are lacking. The purpose of this chapter is to review some of these studies that have particular relevance to the subject matter of this study. The studies that have been conducted in Zambia are reviewed separately in order to provide some particular emphasis to the Zambian health and nutritional status.

Birthweight

In a study of young children in the Gambia, McGregor et al. (1968) found that birthweights were on average lower during the wet season than in the dry season. During the first six months the weight gains of the low birthweight babies were similar to those of large babies. Though weight gains were higher for the Gambian than American children during the first three months, after 15 months of life the weight gains were identical between the two groups. Generally, the children grew poorly from six months to one and a half years of life, especially during the wet months. Males were taller than females.

Morley et al. (1968) identified low birthweight children in Nigeria. These children gained little weight and most of them were underweight at six months. Higher birthweight children maintained their weight even up to 9-12 months. If a child was of a low weight in the second half of the first year of life, he or she was probably to remain smaller than the other children and had a greater chance of dying. In all, nine factors were found to be important in affecting the growth of the child, namely: (1) maternal weight below 43.5 kg, (2) birth order greater than 7, (3) death of either parent or broken marriage, (4) deaths of more than four siblings, particularly deaths occurring between ages 1 and 12 months, (5) birthweights below 2.4 kg, (6) twinning, (7) failure to gain 0.5 kg a month in the first trimester or 0.25 kg a month in the second trimester of life, (8) breast infections in breast-feeding, and (9) episodes of measles, whooping cough, and severe or moderate diarrhea in the early months of life.

Food Consumption and Breast-feeding

Food consumption is important in understanding the nutritional status of a given population. In most cases, nutritional problems arise from food consumption, and particularly from nutrient intake. Persons who eat good quality food in right amounts, at regular times, are well nourished and healthy. Times of food deficits, food

surpluses, and food adequacies exist in African communities. Knowledge of food preparation, storage, the role of breast-feeding in the diets of infants, and feeding practices of young children have been studied.

In his study in Songea District of Tanzania, Robson (1974) found that the main sources of food were cassava, maize, rice, (mixed) beans, meat, milk, bananas, citrus and other fruits, as well as green leaves. Groundnuts, millet, and sorghum were also available. However, meat was occasionally consumed. Most households had no, or little, income. There was not enough land for every peasant farmer, and because of migrant labor practice, even the work previously done by men, like felling trees, was then done by women. The nutritional status and health of children were normal up to six months after which time both started to falter.

Breast-feeding is universal from birth to 4-5 months when thin porridge is gradually introduced in the Machakos area of Kenya (Steenbergen *et al*., 1978). Later, *ngima* (Swahili, *ugali*), a hard maize flour porridge is served. *Isyo*, whole maize in combination with whole beans or pigeon peas, is the most frequently served meal but which is normally withheld from children until after two years. In the Steenbergen *et al.* (1978) study most of the children (71%) were described as healthy and acceptably fed. The weights and heights of the children were also acceptable in all age groups, but a deviation from the

standard was noticed as the children grew.

Franklin et al. (1983) carried out a study in Kinshasa on infants and young children. Eighty percent of the children were under five years of age and over half of the mothers were currently breast-feeding at the time of the study. At age 23 months less than 10 percent of the children were breast-fed because the children were already eating solid food, were sick, mother was ill, pregnant, or had sore breast. Mothers living in an urban area used both bottle-feeding and breast-feeding simultaneously for various reasons including mother's absence for several hours during the day, insufficient milk or milk quality, and mother's illness. Over two-thirds of the children ate twice or less during the day, just as families did.

In a study of 107 Ugandan children, Goodall (1979) did not find any child below the age of six months with kwashiorkor. Most of the children with kwashiorkor were between ages 12 and 35 months. Breast-feeding was found to be responsible for the nonexistence of kwashiorkor in very young infants. Most of the children with kwashiorkor had been weaned before they developed the disease. Dietary histories revealed that protein intake was deficient at the time of weaning. In addition, most of the children with kwashiorkor came from one-parent families.

The critical stage at weaning poses a great risk for an infant's future growth and development. Most studies on weaning in Africa show that children receive decreasing

amounts of milk or none at all at weaning. Instead they are given diluted staple foods such as light porridge with no or with little protein supplement (Gershon, 1978; Mugwira, 1982; Richards, 1939).

Rearing of children by both parents is important in raising well-nourished and healthy children. Most studies carried out in Uganda show that many children from separate families or those that went to stay with their aunts, developed malnutrition. Children raised by their own mothers had better diets than those who were raised by relatives (Bennett and Stanfield, 1971). Similar findings have been reported in the Transkei of South Africa (Westcott and Stott 1977). In the latter study, poorest diets came from families that were not supported by the father. These families had little income to spend on food, and most of the children fell below the Boston third percentile.

In a study on infant feeding in Liberia, Jarosz (1985) found that children of younger mothers were breast-fed longer than children of older mothers. A negative correlation existed between the duration of breast-feeding and the mother's level of education, which in turn was related to mother's employment. Most urban mothers breast-fed their children less than three months whereas non-Monrovian mothers breast-fed their children for at least three months. Rural children were breast-fed at least 2.4 times longer than the children in Monrovia.

On the whole breast-feeding declined with increasing urbanization.

Salaried mothers introduced foods earlier and breast-fed their children for a shorter time period than non-salaried mothers. The food selection was based on the mothers' belief that it was good for the health and nutrition of their children, someone else recommended it to them, non-availability of the preferred product, and not enough milk from the breast. Analyzing the breastmilk supplements for nutritional requirements and appropriateness for the age, Jarosz (1985) found that 56 percent of the children were fed inappropriate replacement preparations.

The frequency of infant feeding differed among groups and was chiefly associated with time available for the child and with the socioeconomic circumstances of the family. Food diversity was greatest for the salaried mothers who tended to use formulas more than others.

Seasonal Hunger

Several studies now exist for Africa which indicate that seasons affect hunger and the nutritional status in varying degrees. Hunter (1967), using an annual farming activity cycle in relation to food supply and bodyweight in Nangodi (northeast Ghana), has shown that many people lost weight during the "hungry season". Precisely, 94% of active adults in the community lost weight. On average,

females lost 6.5% of their bodyweight and males 6.2%. More females (90%) lost 5% or more of their bodyweight than males (78%). Favored women, such as wives of chiefs and women with skill and capital, were better off than those who were not in similar positions. Stronger men were able to sustain themselves even during the hungry season.

Wilmsen (1978) studied the San of the Kalahari desert. The San had a variety of wild edible vegetables and meat. Their weights fluctuated from season to season. Maximum weight was obtained in June-August and minimum weight in December-January. The bush-food-dependent Zu averaged 4 kg less of bodyweight (42 kg) than those who relied on domestic foods (46 kg).

Loutan and Lamotte (1984) focused their attention on the Wadaabe herders of Niger. These are Bororo and Fulani people who keep cattle, sheep, and goats. They trade milk for various consumption goods, especially cereals (millet and sorghum). Milk and cereals are the basis of their diet, but sometimes milk is the only available food. The herders gained maximum weight during the rainy season. After the rains a sharp drop in weight occurred during the hot dry season (February to May). The average loss was 3.1 ± 2.1 kg for men and 2.4 ± 2.7 kg for women. Children gained weight from the end of the rains to the cold season (February) after which, like adults, lost weight.

Galvin (1985) looked at the nutritional status of the Turkana pastoralists of Kenya. Among her major findings

were that although weight increased with age, females were heavier than males until adulthood. Girls were heavier than adult women. The greatest gains of weight for children aged 2-13 years occurred between the dry season and the late dry season and between the wet and early dry seasons. Males showed the smallest total increase. The mean mid-upper arm circumferences increased with age, but those of girls were almost identical with those of adult men and women. However, the mean circumferences decreased among girls between the late dry season and the wet season, the period of large weight loss for both girls and women.

Although Cogill (1987) was not directly interested in the aspects of seasonality, he found that seasonality affected the growth rates of preschoolers. Increased rates in length, weight, and weight-for-age were associated with the period of reduced morbidity and increased food availability - the period following each of the two rainy seasons in Kenya.

In Uganda, seasonal hunger, though not very widespread, occur in adults and is usually associated with crop failure. However, adult starvation has been found to exist in all cereal eating areas during the hungry, dry season and in the initial planting season. This problem has been largely attributed to the efficiency or inefficiency of the traditional techniques of storing and preserving famine reserve foods (Bennett and Stanfield,

1971: 8-9).

Accessibility and Utilization of Health Services

Studies on health care service utilization are an important subject of the larger geographical literature on consumers' spatial behavior. The impact of spatial factors on health care behavior and their implications have been major themes in medical geographical research (Shannon and Dever, 1974; Gesler, 1984; Joseph and Phillips, 1984).

Location (availability) of health services is important because where they are locally absent, the population is compelled to make long trips to sources of care or choose to go without any care at all. Alternatively, the people may avail themselves of traditional health care. (It is not the intention of this study to deal with this important option but it is widely used in rural areas - Nchinda, 1977; Gesler, 1979a; Lasker, 1981; Stock, 1981; Slikkerveer, 1982; Ojanuga and Lefcowitz, 1982). Suffice it to say that traditional medicine is used widely by the educated and uneducated, young and old, rural and urban dwellers. Coupled with a general lack of transport, the location of health care is of critical importance in health care utilization in times of need (Joseph and Phillips, 1984). Bennett and Stanfield (1971: 7-8) state that in Uganda villages at greater distances from curative and preventive services as well as less active health education clubs had more underweight

children with mild protein energy malnutrition (PEM) than those with clubs and living near health services. Children who regularly attended the child welfare clinics had less PEM than the general outpatient clinic population.

Similarly, Westcott and Stott (1977) report that the mothers' record of attendance at the baby clinic was significantly associated with the adequacy of the diet prescribed by the mothers. However, a mere attendance at the clinic did not discernibly improve the mothers' tendency to feed their children adequately, but once the knowledge of good nutrition had been internalized, the incidence of malnutrition was reduced.

The distance between the patient and the facilities, costs of care, especially transport and treatment costs, waiting time, quality of services available, and the availability and utilization of traditional medicine are the major determinants of health care utilization in Africa. The rate of utilization of government health services has been found to decline sharply with distance in Africa (Gesler, 1979a, 1979b; Egunjobi, 1983; Stock, 1983; Okafor, 1984).

Okafor (1984) found that the majority of the respondents in Bendel State of Nigeria were prepared to walk only up to 8 km for health care in a day. Few people used the general hospitals because they were not served by direct roads and they maintained that they lived "far" from the facilities. Utilization rates were higher in

areas with well spaced general hospitals and where most of the population lived less than 8 km from the general hospital.

Other important determinants of utilization of health care services include costs of care and waiting time. Costs can either be travel costs or treatment costs. Patients avoid health units where they are made to wait for a long time before they are seen by a health staff, especially in areas with many health services. Similarly, high travel costs and treatment costs deter people from using particular health centers. In free health delivery systems such as Zambia's, patients mainly pay travel costs. However, in urban areas of Zambia, people are prepared to pay for the services rather than wait in long lines at the Government health facilities.

Gershon (1978), looking at a peri-urban area of Ghana, found that almost half of the mothers never took their children to a clinic for immunizations because they did not believe in preventive health measures. They only came to the clinic for cure. Some mothers had very little time to care for their children because they were busy working as traders. Those who took their children for curative care stopped going to the clinic at the first signs of recuperation. Some mothers prefered to use patented medicines and other medicines from traditional healers to going to the clinic. Part of the reason was to avoid the long waiting lines at the clinic.

Similar findings come from a study conducted in Botswana (Ulin, 1976). Preventive health services were not used by mothers. Even mothers who attended prenatal clinics normally did so in order to seek relief from illness or discomfort that coincided with pregnancy. In spite of the clinic being located in the village most babies were delivered at home. Moreover, most women avoided or neglected immunizations beyond one inoculation for fear that such inoculation would cause illness. Nonetheless, patients sought three kinds of health care, namely: the official government care, traditional care, and patent medicines. Infants were normally first taken to traditional healers before seeking help at a government clinic while older children were first taken to the official government clinic before trying traditional medicine. On the whole, diseases that were categorized as traditional were first taken to traditional healers.

Jarosz's study indicates that children's survival in Liberia was associated with increased mother's education, mainly because educated mothers were more health-conscious than non-educated mothers (Jarosz, 1985). They used preventive health services more than the non-educated mothers. The salaried group had 89 percent of its children vaccinated against specific diseases.

Income

The role of income in the determination of nutritional status has come into focus more sharply than probably other determinants. The obvious reasoning is that those people who have a higher income will generally spend more money on their food. Gershon's (1978) Accra study highlighted the plight of the urban poor. Most of the children that he looked at were from poor families where parents had little or no income, no marketable skills, and who mainly worked as laborers and watchmen -- in most cases on an on-and-off basis. The extent of malnutrition was enormous, especially the protein-energy kind - kwashiorkor. Families did not usually eat meat, and when they did children were in most cases excluded from such treats. The situation grew from bad to worse at the weaning stage. Forty to fifty percent of the children between 18 and 24 months were malnourished. Gershon (1978) argues that although the mothers were taught about nutritious, culturally acceptable, and locally available foods, prohibitive prices eliminated their use.

Cogill (1987) studied three groups of farmers in south-west Kenya -- the sugar cane farmers, new sugar cane farmers (new entrants), and non-sugar cane farmers -- in order to learn about the effects of the commercialization of agriculture on the nutritional status. Sugar farmers had large farm sizes. Among the many findings were that the introduction of sugar cane led to positive effects on

income (of course expected), better welfare, improved nutritional status, and reduced morbidity. However, the land under food production declined. Although the sugar farmers planted less land in food crops during the short rains, they used cash income to meet the shortfalls which the other two groups could not afford to do. Non-sugar farmers had more stunted and more wasted children than sugar farmers.

Cash income and education were the highest predictors for the use of maternity services in Botswana (Ulin, 1976). Also membership in a voluntary women's organization led to more use of the health services for both preventive and curative care. However, the number of the women in voluntary organizations was small. The amount of primary schooling that women had was positively associated with increased use of services for prenatal care, delivery of babies, and favorable opinions on immunizations. But as in other societies diseases considered to be traditional in nature went to traditional healers irrespective of the number of years a woman had spent in school.

Nutrition Studies on Zambia

Several studies have been conducted on diet and nutritional status in Zambia. The earliest works were conducted by Richards (1939) and a subsequent summary provided by May and McLelland (1970). The studies reviewed here are presented in chronological order of date

of publication. The review, though not exhaustive, brings out the salient features of the studies that have been conducted before in the country.

The earliest work on agriculture and diet on the Bemba was produced in 1939 (Richards, 1939). Focusing her attention on the Bemba land tenure system, socioeconomic changes, and the political and kinship structures, Richards concluded, among other things, that food shortages in Northern Province was partly due to outmigration of male labor to the mines. Seasonal food shortages during the hungry months of February, March, and April were noted. At this time women were busy in the fields and did not have enough time to devote to their families.

Howard (1966), interested in the new entrants (girls) to a secondary school, found that calorie intake from the homes they originated was generally low. Only 7 out of 38 girls reported to have intakes of over 2000 calories. However, no statistical difference was found in the means of scores between those who received more energy and those who did not, but the girls from homes with better diets scored better in class than the rest of the girls. In a further study of 64 girls who had indicated that they came from wage earning parents, Howard (1967) found that even these girls had anthropometric measurements that fell below the European standards. Fifty-four (or 84.4%) of the girls showed one or more clinical signs of malnutrition.

Girls were generally lacking protein, vitamin B, and vitamin A foods.

In a study of the mid-upper arm circumference on children in Kitwe, Blankhart (1969) noted that the children's circumferences increased with age. However, the time of onset of the accelerated increase was earlier in well-nourished children than in the malnourished children.

Fisher and Davison (1970) studied two groups of children in Luanshya's Mining Townships. The experimental group consisted of children who were known to have suffered from severe malnutrition when they were under two years old. The control group consisted of children who were known to have been well-nourished. The curves of the children fell below the standard curve. However, the curves for girls approached, and in the case of weight and arm circumference, actually crossed the standard curve. The control group compared favorably well with children from other races until they reached six months of life.

Most studies indicate a general low nutritional status for rural children, but the Zambezi study had mixed findings (Reid et al., 1971). For instance, although the means of the height, weight, and arm circumference measurements fell below the standards used, the authors noted a reduction in the standard weight for height for shorter children. Taller children were heavier than the standard. In addition, younger and shorter children were lighter than the standard population.

Children attending the Zambia Flying Doctor Service (ZFDS) clinics in rural areas of Zambia were studied by Barclay et al. (1972). Their anthropometric measurements were compared to findings from Lebanon and India. Although the Zambian figures fell below the standard with respect to head circumference, no malnutrition signs were noted. The children's measurements were comparable in the three societies.

A study in two adjacent areas was carried out in the west of Lusaka, namely: Matero and Mwaziona (Savage, 1972). Matero was an official residence while Mwaziona was not at the time of study. Twenty-four percent of the children in Matero were found to be underweight as compared to 28.5 percent in Mwaziona, but the difference was not statistically different. Most of the children that died were in their second year of life, and 50 percent of the 13-18 month children that died were underweight. In this age group alone 48 percent and 51 percent of the children were found to be underweight in Matero and Mwaziona, respectively. A large family size was found to be no overall disadvantage in as far as nutritional status was concerned. However, more children whose parents were divorced were underweight than were children whose parents were married. Children of better educated fathers had better nutritional status, and children of low income families, especially in Mwaziona, were worse off than the rest. Also the education of the mother was important in

determining the nutritional status of the children. For example, increasing education of the mother led to significant decrease in the number of underweight children, especially in cases where the mother had reached at least grade seven.

Nwosu (1973) found 446 of the 632 (or 71%) children he studied to be malnourished in Western Province. Of these 99 were children under five years of age, and 45 of whom were malnourished. Malnutrition was especially high in the lowest three graders.

Fisher (1976) suggests that a value of 15 cm or less of the mid-upper arm circumference for children from the age of 7 months in Zambia indicates a risk of malnutrition. This conclusion is based on measurements that she made on miners' children in Kitwe whose birthweights were known. The children were measured at 12 and 18 months. Breast-feeding was common from birth but its use dropped considerably by 18 months. Most children were lighter and thinner than expected for their age. Some were even stunted (32 out of 163). The mean monthly weight gains decreased after six months and even fell below the standard's.

In a clinical study, Khan and Gupta (1977) evaluated the nutritional status of 360 malnourished children admitted to the Department of Pediatrics and Child Health of the University Teaching Hospital. The majority of the children came from Lusaka, and mainly from low income

families and recent migrants to Lusaka. All had bodyweights below 80 percent of the normal standard weight-for-age with or without edema. The malnourished children consisted of 9.1 percent of the total admissions and 26 percent of the deaths. Maximum admissions occurred during the rainy season (November to March) - the time when personal hygiene is very low in peri-urban and slum areas of the city. Most of the children (65.2%) were aged between 13 and 24 months. The majority (69%) did not use the local clinics, only 30 percent used the services regularly. No child came from upper class parents, who obviously lived in good neighborhoods.

Nationwide studies on food (Food Consumption Survey - FCS) and nutrition (Nutrition Status Survey - NSS) were conducted in Zambia by the National Food and Nutrition Commission of the Republic of Zambia (NFNC), with the help of the Food and Agriculture Organization (FAO, 1974b). The FCS was carried out in all areas of Zambia while the NSS was a subsample of the people studied in the FCS. Children under five years of age were examined and their mothers questioned about the social and economic factors that described their family circumstances (1974b).

From the national surveys NFNC (1978) found that between 1969 and 1972 thirty percent of the children aged 0-5 years had protein-energy malnutrition, 68 percent anemia, 38 percent hypovitaminosis A, and 79 percent riboflavin. In Lusaka malnutrition in 1975 was the third

cause of deaths, and in 1976 the second cause in the University Teaching Hospital. In Chawama, a squatter compound in Lusaka, chronically undernourished children were found more in low income families, while acute malnutrition was found in higher income families (NFNC, 1978).

Wenlock (1980), summarizing the findings from the national study, indicates that the weaning period was associated with the greatest risk of nutritional deficiency and the youngest child was the most affected; the children of the Lunda, Bemba, and Lozi mothers were at greater risk for long term malnutrition than children of the Tonga and Nyanja-speaking mothers; malnutrition was more common among mothers with no education, who normally came from families of low income, poor housing, deficient water supplies, and limited access to medical facilities; shorter mothers had a higher risk of nutritional deficiency; and that occupation of the father, infections, and child mortality greatly influenced the nutritional status of the children.

The Economic Commission for Africa (ECA) and the Government of the Republic of Zambia (GRZ) conducted a joint survey on the interrelationships among infant and child mortality, socioeconomic factors, and fertility in Lusaka (an urban area) and Keembe (a rural area). The authors note that because of the problems of transport most people walked to health facilities. The services were

well provided in the two areas (ECA, 1982a). The majority of the women were satisfied with the services available to them. Nonetheless, those who were dissatisfied stated that the providers, especially nurses, were rough or rude to them, they did not treat well, and sometimes no drugs were available.

In their cross-sectional anthropometric study children in urban areas were found to be both taller and heavier than those in the rural area. The latter's weight was even more spread around the mean than the former's. About 25 percent of the children had first degree malnutrition, i.e., they fell below 90 percent of the mean weight for their age group taken as a percentage of the number of children in each age group. Children from high income families had better nutritional status. Growth retardation was especially noted in the first and second years of life. Children from poorer areas had thinner arms, especially those between 10 and 24 months of life (ECA 1982b).

Women in both Keembe and Lusaka indicated that they served starchy foods at breakfast. Meat, vegetables, and beverages were served more regularly in Lusaka than in Keembe. A typical lunch meal consisted of starch, vegetables, animal protein, and fruits, especially for families in Lusaka's high income families. For Lusaka, the authors suggest that the differences in food types consumed would be attributed to the quality and quantity

of the foodstuffs, given that malnutrition is so common. Supper or dinner meals were similar to lunch meals. Taboos on foodstuffs were common against certain types of food such as eggs, fish, pork, and game meat during pregnancy (ECA, 1982c: 13).

The nutrition studies carried out by the National Food and Nutrition Commission had other important findings (Kwofie, 1977; Kwofie, et al., 1983). The prevalence of malnutrition among children under five years of age varied from 46 percent in Southern Province to 60 percent or more in Northern and Luapula Provinces (Kwofie et al., 1983). Northern Province was not only underserved with health facilities, it also had some of the highest rates of fetal deaths, malnutrition, and anemia. This pattern of health status has been attributed to differences in per capita availability of food, per capita distribution of income, and the distribution of (and relative accessibility to) existing health services (Kwofie et al., 1983: 542). In addition, widespread malnutrition in pregnant women was held to be responsible for low birthweights, congenital malformations, as well as for increased maternal and perinatal mortality and morbidity.

Rao et al. (1981) studied the growth of children in Lusaka, an urban area. They found that the growth spurt for girls started at age 9 years, accelerated until age 15 when it substantially declined. For boys the growth spurt fell between 10 and 17 years. When compared to heights of

Ghanaian children in Accra and European standards they found that Zambian children were shorter than the Europeans but taller than the Ghanaian children.

Barber (1982) studied the records of mine hospital children between 1965 and 1975. 939 cases for the first year of life were extracted. He concluded that children doubled their weight by three months and weighed about three times as much by their first birthday. During the first six months children grew a little faster than the UK children. However, the rate of growth after six months fell below that of their UK counterparts.

Watts and Chintu (1983) reviewed 888 cases of children that were brought in dead to the department of pediatrics at the University Teaching Hospital in Lusaka over seven months in 1980-81. The majority of the children were under two years of age. Most children had been taken to at least one health institution. The doctor subjectively considered that at least half of the children died because of malnutrition, especially those from low income parents.

Ng'andu (1984) conducted his research at Keembe Primary School (rural area) and Northmead Primary School (urban area). Urban school children tended to be heavier and taller than their rural counterparts, although the differences were not significantly different. However, children at both schools fell below the World Health Organization's median reference standards for weight for

age and height-for-age. About 30 percent of the rural children fell below the 80% average weight-for-age and 20 percent of the urban children fell below this reference standard.

A more recent study reported in Moore and Vaughan (1987) conducted by the IRDP (Integrated Rural Development Program) and the NFNC (National Food and Nutrition Commission) indicates that seasonality has an effect on nutritional status of the children. Although the study does not conclude that commercialization causes malnutrition, the authors found that nutritional status of children declined with increases in maize production. However, the nutritional status improved after the harvests, especially for children of subsistence farmers in the Mpika-Chinsali area. This study hypothesized that women did not have enough time to adequately prepare for their children, especially weaning foods. Freund and Kalumba (1984) suggest the same situation where women failed to feed their children frequently during the busy months of the year.

Sharpe (forthcoming) has concluded that food consumption is generally low in Northern Province. Hence people have low energy intake. Low agricultural production is the key determinant of absolute food shortages which are reflected in low consumption. Increased food production does not necessarily lead to increased food availability among rural households.

Several nutrition clubs have been formed in the country, but most of them are very ineffective. The Chipata Nutrition Club is one of the most active clubs. It runs the Rehabilitation Center whose aims are (1) to rehabilitate malnourished children on low cost basis in terms of foods and staff, (2) to teach mothers, for three weeks, the use of appropriate foods, and (3) to induce them to use such foods when they return to their homes. Between 1974 and 1978 it received 253 children for rehabilitation. Of the 201 children that were monitored 41.8 percent were found to be acutely undernourished, especially those that were aged between one and a half and two and a half years. Sixty percent of the chronically undernourished were between 12 and 26 months. However, the percentage of undernourished children between the ages 15 and 26 months (Mulenga and Kanyangwa, n.d.).

The Present Study

Women in Zambia have always been responsible for the health and nutritional nourishment of the family. About 80 percent of the workload in health institutions of Zambia deal with maternal and child health. This workload includes deliveries, pregnancy disorders, childhood diseases, immunizations, health and nutrition education, and growth and development monitoring of the children (Brew-Graves, 1977). The Ministry of Health has a Department of Maternal and Child Health Services in order

to combat the tragic and unnecessary maternal, infant, and childhood morbidity and mortality. This is done through such services as antenatal and postnatal care, midwifery or delivery services, children's clinics, school health services, immunization programs, nutrition education, and family health education.

From the literature review one deduces that an average Zambian child is born with a satisfactory weight, except for those who are born underweight, and develops "normally" until the age of six months when the child begins to experience growth failure that lasts for about nine months. The child begins to grow again, but fails to catch up on lost growth (NFNC, n.d.)

At a recent conference (May 1989) in Lusaka, the capital city of Zambia, malnutrition was singled out as a major public health problem, by representatives of the Ministry of Health from all the nine provinces of Zambia. Malnutrition is a major cause of death among children aged 1 to 4 years, as it contributes 40 percent of the child mortality rate (Times of Zambia May 15, 1989). Some authors believe that malnutrition has been on the increase in Zambia since the mid-1980s because of inflation and hard economic conditions that exist in the country (GRZ/UNICEF, 1985). It is against such background that a study like this one can contribute to the understanding of the problem in one part of the country.

Expected Outcomes

Based on earlier studies that have been cited and others that have been conducted in several parts of the world, the following were the expected outcomes of the present study:

1. Subjects who lived near a given health center would use it more frequently than those who lived farther away.
2. Other things being equal, children who used health services more frequently should have had a better health and nutritional status than those who did not.
3. Children lost weight during the pre-harvest season, i.e., the rainy season.
4. Children of better educated parents would have better nutritional status than those of less educated or uneducated parents.
5. Children from relatively wealthy households were expected to have a better nutritional status than those from poorer households.
6. Households that received income from outside sources, e.g. from family members and relatives, to supplement their incomes, were expected to have a better nutritional status, than those who did not have supplemental income.
7. Children at the higher parities (parity is the number of children previously born alive to a woman), would have higher risks of nutritional deficiency than those at lower parities.

8. Large households would have lower nutritional status than smaller households.
9. Children at the weaning stage would have poorer or lower nutritional status than other children.
10. Because customs do not favor either boys or girls in the research area I did not expect to see any differences in the health and nutritional status of both genders.
11. I expected Area 2 to have a better nutritional status than Area 1, for all the expectations given above.

Hypotheses

1. H0: No significant difference exists in the nutritional status of children with respect to distance to a health center.
   H1: Nutritional status is higher for children living near a health center than for those living farther away.
2. H0: No significant difference exists in the utilization patterns of health services for any given distance.
   H1: Children living near a given health center use it more frequently than those who live farther away.
3. H0: No significant difference exists in weight during the preharvest and postharvest seasons.
   H1: Children lose weight during the preharvest season.
4. H0: No significant difference exists in the nutritional status of children of better educated parents and

children of less educated or uneducated parents.

H1: Children of better educated parents have a higher nutritional status than children of less educated or uneducated parents.

5. H0: No significant difference exists in nutritional status with respect to household income.

H1: Children from households with higher income will have a better nutritional status than those from households with smaller income.

6. H0: No significant difference exists in the nutritional status among the children with respect to outside sources of income.

H1: Children from households that have outside sources of income have a higher nutritional status than those who come from households that do not receive similar assistance.

7. H0: No significant difference exists in the nutritional status of children with respect to parity.

H1: Children at the highest parity have lower nutritional status than those at lower parities.

8. H0: No significant difference exists in the nutritional status of children with respect to household sizes.

H1: Children from smaller households have better nutritional status than those from larger households.

9. H0: No significant difference exists in the nutritional

status of children with respect to age.

H1: Children at the weaning stage have a lower nutritional status than other children.

10. H0: No significant difference exists in the nutritional status between boys and girls.

H1: Boys have a better nutritional status than girls.

11. H0: No significant difference exists in the nutritional status of children in Area 1 and those in Area 2.

H1: Children in Area 2 have a better nutritional status than those in Area 1.

CHAPTER 3

METHODS AND PROCEDURES

Introduction

This study utilizes field survey data that were collected over a period of nine months to assess the health and nutritional status of children in two areas of Mporokoso District. With the aid of a questionnaire information on the following subjects were obtained: the demographic situation of the household, socioeconomic indicators, foods eaten, anthropometry, utilization of health services, antenatal and neonatal care, as well as morbidity and mortality conditions in the households.

Data were collected during two time periods which have been respectively termed as the dry, postharvest season (phase 1 or period 1), between August and October 1987, and the wet, preharvest season or hungry season (phase 2 or period 2) between January and April 1988. The season of plenty falls in the cool and dry as well as in the hot and dry season while the hungry season comes in the hot and wet season between November and March. The data were collected between July 1987 and April 1988.

The data base for the research comprised of 196 households in the villages in the western part of

Mporokoso District, here referred to as Area 1 or the rural area (Bondo, Bweupe, Chikolwa, Chikwanda/John Chimbele, Chipenya/Kafwi, Chiwala, John Levi, Kapalange/Kasampa, Luka, Mukunsa, and Mwilwa), and 160 households in Mporokoso Township, referred to as Area 2 or the urban area. In the initial conceptualization of the study, villages were going to be randomly selected, just as households were going to be randomly selected. After carrying out an initial pilot project to test the validity of the questions, the idea of randomness was dropped because had the plan been implemented very few households would have been reached and also because some households had no children under fifteen years of age. A research such as this requires a large number of subjects. As a result all households with children under fifteen years of age within a village were visited. Visiting young children were excluded, irrespective of the length of stay.

Given that women in Zambia are the main custodians of health (they are largely responsible for the health of their household members) and "fire" (i.e., they are responsible for providing food), aspects which are fundamental to understanding the health and nutritional status of households, questions were directed to them. With the help of research assistants, mothers and/or female guardians of the children were interviewed. Sometimes men, who were usually husbands, attended the interviews. Men proved to be very helpful especially when

questions on specific birth dates of children were asked.

During the first phase, August to October 1987, time was spent getting acquainted with heads of the households and respondents while at the same time administering the questionnaire. At least an hour was spent administering the questionnaire and taking measurements. Phase 2 started in January and ended at the end of March 1988. During the second phase households that were visited in the first phase were revisited, a new follow-up questionnaire administered, and new measurements taken. Only measurements of the people that were measured during the first phase were recorded. For courtesy reasons measurements of children found in the household during phase 2 were taken. However, they were excluded from the coded data. Given that the second phase questionnaire was very short, only about 30 minutes on average, was spent administering it at each household. Phase 2 was also used to catch up on some information previously missed during phase 1. As was expected some families had moved away by the time we returned. This situation was especially true for Mporokoso Township. Sometimes we had to go to one household more than three times in order to get all the eligible children and respondents measured (Appendix A).

Demographic Information

The basic household information was obtained from mothers or/and female guardians of the children.

Demographic information on the names of people present, number, birthdates of children, names and relationships to the respondent (or husband) on all the rest of the household members was collected. Also collected were data on the marital status of the respondents. The respondent and children were given three digit code numbers that were used throughout the study. During the second survey changes in the household composition were noted, paying particular emphasis on migration, births, and deaths.

Information on the number and names of surviving children as well as on the deaths in the household was important for the study. Information on stillbirths and miscarriages was voluntarily given by the respondents. Because three of the four research assistants were men, questions on pregnancy were not included, although all visible pregnancies were recorded. That is, interviewers recorded that the respondent was pregnant only when they were sure that she was pregnant.

Socioeconomic Information

Respondents in Mporokoso Township (Area 2) and those who were working or had their husbands working were asked questions concerning monthly salaries or wages. How much income did they or/and their husband receive per month? Of that amount how much was spent on food? The question on income proved to be very problematic. For example, although some respondents readily supplied the information

on monthly income, they did not mention the amount they spent on food. Conversely, some respondents did not know the actual amount of money their husbands made, and as a result could only give the amount of money they received for food. However much I tried to straighten out this problem I could not go around it. Thus the amount given as income is either monthly income (gross or net), or income spent on food. Where both amounts were mentioned only the income spent on food was recorded for analysis.

For respondents in the villages it was not easy to estimate the amount of land cultivated by each household. It was also not easy to obtain information concerning income. Instead respondents were only asked if they received some money from relatives and friends staying elsewhere. Such income was used as a proxy for income for these people.

My initial interest in obtaining information on the type and number of livestock owned by the respondents and members of the household could not materialize partly because the only viable livestock kept were chickens. During the time of study chickens were dying because of an outbreak of a disease. Very few households kept sheep, goats, ducks, or rabbits.

Questions on maternal and paternal educational levels yielded two kinds of information. First, educational levels were determined in terms of no schooling, primary school education, and secondary school education. Second,

the specific highest grades that respondents and their husbands had reached were recorded. For some respondents the data on the highest level of their husband's education were hard to obtain in the absence of their husbands.

Respondents were also asked to supply information on occupations and on other jobs they had. The same questions were asked about their husbands.

In order to know the number of workers in the household respondents were asked to give the number of people that contributed to the upkeep of the household. For those respondents who received monthly income they were asked to mention other people, besides themselves and their husbands, who contributed to the upkeep of the household. This question was worded differently in the villages. In villages all the people above the age of 15 years were taken to be net contributors to the household's upkeep, although children less than 15 years contribute to household's upkeep.

Information on the presence or absence of a latrine, sources of water, and the number of rooms was solicited in order to know the type of housing situation that existed in the area. This information was somehow redundant in Area 2 because all the houses had piped water and brick or concrete block buildings, while in the rural villages most of the houses were constructed of wood and "kimberley" bricks and thatch. But the questions were left in order to see if any variations existed within the other aspect of

housing, namely number of rooms.

Agricultural Production

Questions on food production were directed to respondents in Area 1, i.e., respondents in the villages, who were asked to report all the crops that they had grown and harvested the previous agricultural season. Finger millet was the most important cereal, but it was difficult to know or estimate the exact number of 50 kg bags of millet that individual households had harvested and stored in a barn. However, groundnuts, beans, and maize were recorded.

Where possible or necessary the respondent took the interviewer to the field to see for himself the crops the family was growing. Multiple cropping was found to be the norm. Such obvious crops as cassava and maize were not usually included in the initial responses. During phase 2 we were forced to visit some people in their gardens because they spent the whole day, from dawn to dusk, scaring away animals and birds from eating their crops.

Reproductive History and Behavior

As is indicated above respondents were asked questions on the birthdates of their children. Also they were asked to supply information on their use or non-use of clinics and hospitals during their previous pregnancies. They were further asked whether or not they

had attended antenatal clinics, if any of the children was born in a health center or hospital, and if they attended under-five clinics. The use of under-five clinics was explored by on-the-spot check on cards. Respondents were asked to produce the under-five clinic cards for their children. On these cards are written the names and sex of children, their birthdates, weights, and records of their immunization histories. Also recorded are the names of the parents and usual place of residence, as well as other helpful nutritional information such as when to begin giving the baby supplementary food, what to do when the baby needs extra care, and names of other brothers and sisters.

Respondents were asked to provide information on their breast-feeding behavior. Did they breast-feed their babies? For how long? When did they wean their children? When did they introduce other foods beside breastmilk? What foods did they use to wean their children?

Morbidity and Mortality

Data on the use or non-use of the health services was also solicited with respect to specific visits to the clinics or hospitals for medical or/and health reasons. Respondents were asked about whether or not they had visited a health center (either a clinic or hospital) in the previous twelve months prior to the interview. Memory lapse could be suspected here, but the idea behind such a

long time was to determine if respondents used the services regularly or not. The respondent gave the illnesses from which the members of the household had suffered. During the second phase questions on those who had visited a health post during the intersurvey period were asked. Also respondents were asked to mention the number one health problem in the area.

In as far as mortality was concerned respondents were asked during phase two to supply the names of the children they had lost through death. The ages at which they died were recorded. To reduce the stress on the family reasons for the deaths were not solicited. Some respondents had experienced deaths during the interim period.

Diet and Food

As this is an outcome study the amount of calories, proteins, and fats that were eaten were not measured. However, respondents were asked to report the usual number of meals they ate and what actually constituted those meals. I should emphasize that meal in this area is used in a special way in that it refers to food known as ubwali or nshima (see Chapter 4). For example, tea with or without bread is not a meal, just like rice without nshima, is not a meal. But as will be apparent people in Area 2 (Mporokoso Township) considered these types of foods to comprise meals as well.

Respondents supplied information on the number of

days in a week that they ate specific types of food, such as chicken, meat, and fish products. Days in a week were chosen because the frequency of eating some of these foods was very low. Given that people in this part of the country do not keep animals they depend on game or wild meat. The problem at the time of the survey was that poaching was rife in this area, and the government representatives were apprehending anybody they found eating game meat. So the question asking for information on meat usually was looked at suspiciously by the respondents. They needed great assurance that all responses were confidential. However, some people gave their answers very easily and without harboring any fears.

Instead of asking respondents to recall the types of foods they ate the last 24 hours, they were asked to simply recall those they ate the previous evening. This question was asked because variations in foods eaten in a day did not seem to be much. In most cases the food eaten at lunch time was the same or similar to that eaten at supper time. Some respondents had difficulty remembering the foods they had eaten the previous night, even if they were asked about it in the morning the following day. They had to be helped by their children and husbands in order for them to remember all the foodstuffs they have had.

Respondents were also requested to give an opinion on what they considered to be the number one nutrition problem in the area.

Anthropometric Measurements and Nutritional Status

Anthropometric measurements were conducted for every child under fifteen years of age and respondent in the household in order to assess their nutritional status variation during the two time periods. Height, weight, and mid-upper arm circumference measurements were taken. For respondents their heights were taken only once during the first phase.

Data Collection Method

Two rigid rulers were used to measure the height of the subjects to the nearest .5cm as they stood on a flat surface, without shoes, and in most cases against a wall or door. For children under two years of age their lengths were taken while lying down on an infant/baby scale. In all situations only light clothing was permitted. Sunbeam bathroom scales were used to take weight measurements for children over two years of age, while the infant/baby scale was used for those under two years, with the children lying down (supine length of crown-to-heel) rather than sitting down. The respondents assisted in restraining difficult children. The scales were constantly calibrated to zero. Mid-upper arm circumferences were measured with a Helvetica cloth tape to the nearest .5cm.

The ages of the children were obtained from the respondents themselves, some who readily supplied the dates, and others who needed some help either from their

husbands or older children. Most of the dates were verified from the health center under five clinic cards. When it was clear that the respondent did not know the birthdate of the child and was guessing she was requested to produce an under five clinic card. If she did not have one, assistance was sought from her husband if he was around, or from older children. In most cases she was asked the question again, to verify the date, at some other time. Usually she produced the same date. To avoid being too meticulous on this issue some respondents were only requested to give the month and year or only year their children were born. In many households the respondents had the birth dates of their children recorded in a notebook that was carefully stored somewhere. They gave the interviewer the records, which were then transferred to the questionnaire. Where applicable, the records included the dates on which some children had died. Getting the dates on which some of the respondents were born was the hardest business during the interviews. Of course some of them did not know when they were born and using familiar events such as the beginning or end of the Second World War did not help at all. In general, getting birth dates for their own children was easier than obtaining those for the children of relatives that they were keeping.

Data Coding and Cleaning

Data coding and cleaning were carried out by the author. Coding was conducted in the field for phase 1 between November 1987 and January 1988. During the coding process an immediate on-the-spot check was instituted to verify a date, measurement, or any other particular information that looked anomalous. Data were coded continuously during the second phase, from January to April 1988.

Data were entered on the floppy diskettes in East Lansing at Michigan State University in the months of May and June 1988. Data cleaning followed immediately but I was interrupted for a month and a half when I went for a family emergency in Zambia in July 1988. In all, coding and cleaning took about four months.

Data Analysis

Nutritional Procedures

1. Weight-for-height index. The weight-for-height index (WH) was used to evaluate whether or not the weight and growth of the subjects was appropriate, i.e., if the weight was appropriate for height. The index is expressed as:

$$WH = (W / SW) * 100 \quad (1)$$

where:

W = weight of the subject.

SW = weight of reference standard of the

same height.

2. Body mass index. The body mass index (BMI) is a ratio that indicates the appropriate weight for height. It has the advantage in that it does not employ a standard or recommended bodyweight. It is usually expressed as:

$$BMI = W / H2 \quad (2)$$

where:

W = actual weight in kilograms.

H = actual height in meters

2 = exponential power.

3. Weight-for-age. The weight-for-age index (WA) was used to evaluate if the weight of the children was appropriate for age. The index has been recommended for use in children under the age of five where acute malnutrition, i.e. malnutrition of relatively short duration exists. The index is expressed as:

$$WA = (W / SW) * 100 \quad (3)$$

W = weight of the subject

SW = weight of reference subject of the same age.

4. Height-for-age. Linear growth was measured by the height-for-age index (HA). Stunted and normal growth was identified through this index. It indicates the relationship between the observed height and expected height for specific age and gender. It is expressed as:

$$HA = (H / SH) * 100 \quad (4)$$

where:

H = height of subject.

SH = height of normal subject of same age.

Statistical Procedures

An SPSS-X computer program was used to determine mean weight, mean height, and mean mid-upper arm circumference for each age and sex group for the two time periods. In addition to nutritional measurements other food and nonfood confounding variables that have been recognized to influence nutritional status were examined. Thus, the influence of demographic, socioeconomic, food types, and geographic factors have been measured through appropriate student-t tests and multiple regression analysis.

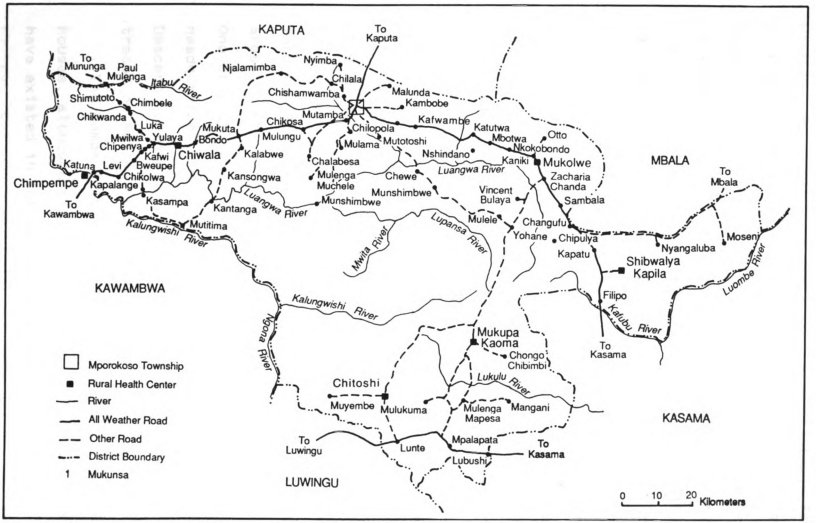
CHAPTER 4

FOOD AND DIETARY PREFERENCES IN THE STUDY AREA

Introduction

Mporokoso District is a civil district of Northern Province of Zambia, lying between 9° 10' and 10° 30' south of the Equator and between 29° 0' and 31° 15' east of the Greenwich Meridian. It is bounded in the north by a common border with Kaputa District, in the south with Luwingu, in the south-east with Kasama District, in the east with Mbala District, and in the west with Kawambwa District (Figure 4.1). All boundaries are natural following watersheds, escarpments, ridges, rivers, or streams. The principal rivers are the Lufubu, which forms part of the eastern boundary and the Kalungwishi in the western boundary. Numerous small streams exist. The purpose of this chapter is to introduce the study area by looking at the people and their environment as background information in the explanation of the health and nutritional status of their children.

Given that Mporokoso is just one of the seven districts in the Province, and that it is largely inhabited by the Bemba or Chibemba-speaking people who practise similar kind of agriculture and live in similar



Source: Compiled from 1:250,000 Maps SC-36-5 (MPOROKOSO), SC-35-8 (KAWAMBWA), SC-35-12 (LUWINGU), AND SC-36-9 (KASAMA).

Figure 4.1 Mporokoso District

environments, this chapter will be general in context. However, the people in Area 2 are not exclusively from Northern Province, and some of them are not Bemba. They come from all over the country, and are in Area 2 mainly because of their being employed in Mporokoso Township. They do not engage in agriculture for their livelihood because they or/and their spouses are employed in the formal sector.

The Bemba have been the largest and most highly organized ethnic group in Northern Province (Richards, 1939:15). They are an offshoot of the great Luba Empire of Zaire who invaded the present territory either at the end of the seventeenth century or early eighteenth century. Their headquarters are at Chitimukulu Village near Kasama. They had expanded in all directions as far as Lake Bangweulu in the west and southwesterly directions, into Lungu, Tabwa, and Mambwe territories in the north, and into the Bisa territory in the south. In all the conquered areas chiefs were appointed to rule and obtain tributes. One of these chiefs was Chief Mumpolokoso whose headquarters are at Chishamwamba near Mporokoso Township. Descent, clan affiliation, and succession to office are traced on matrilineal lineage.

The Bemba live in small communities of about 30 to 50 houses, although bigger villages exist and are known to have existed in the past. Previously, each village was a kinship unit under the rule of a headman who was appointed

by the chief and to whom he was responsible. Nowadays, the communities do not necessarily comprise a kinship unit as migration, village regrouping, and marriage outside the kinship groups have brought many clan units together. Thus, the village changes in composition from time to time and sometimes from site to site, but shifting from one site to another is a rare occurrence these days. Instead, fields or gardens are changed from site to site. The settlements are scattered all over the region. Recently, people have started living in homestead settlements - they leave the villages to settle in smaller family communities composed of husband, wife or wives, and children.

Physical Environment and Rainfall

The grain of Zambia, and Mporokoso District, is north-east/south-west with a fairly strong north-south system. A brief look at any map of Northern Province indicates that most rivers, streams, and ridges follow this pattern in close approximation. The geology of Mporokoso District is comparatively simple. The area is a plateau. Sedimentary rocks of the plateau series, i.e. felspathic sandstones, quartzites, conglomerates, and shales dominate the plateau and much of the lower lying areas. The most commonly encountered rocks are the quartzites and coarse arkose sandstone (Bands, n.d.).

Rainfall is high in Northern Province, exceeding 1,200mm per annum. The rains start at the end of October

or early in November while other areas in the country are still dry. The research area gets not only the first rain but also is the last to receive the latter rain. The maximum temperatures are experienced during the months of December and/or January. Usually there occurs a temporary break of rainfall, locally known as icilala, at the end of January. The rains stop at the end of March or in April. Rainfall in May is not unusual in Mporokoso District. The timing of the rainfall may not be appropriate for agriculture (Richards, 1939:33). The people depend entirely on this rainfall for their agriculture during which time they produce only one set of crops. Harvest is done from April to July. But these are the same months during which new gardens are prepared. Because of heavy rainfall the soils are heavily leached and have, as a result, little natural fertility.

Agriculture

The Bemba are an agricultural people who are also fond of hunting and fishing. In addition to their cultivated crops they depend on wild fruits and plants for food. They are not a pastoral people although a few individuals keep goats, sheep, and even cattle. Keeping these animals is, however, an exception rather than the norm.

The Bemba have been "traditional" shifting cultivators using the system known as the Northern

Chitemene system. This system of agriculture depends on clearing a fresh strip of bush by clearing the undergrowth and pollarding the trees, collecting the branches in one big stack, and then burning the stack. The ash provides the needed nutrients while the fire kills both pests and weeds. In heavily-leached soils this is a sound practice. After burning the stacks seeds are then broadcast and sown. In the later years the gardens are dug up into mounds for other crops. Once the gardens lose their fertility, the peasant farmer abandons that area so that regrowth of the trees is ensured. The fallow period depends on the time for arboreal regrowth. These days continuous cultivation rarely exceeds three years because of soil infertility (Shultz, 1976). As the soil loses its fertility another site is chosen and the cycle begins. Previously this type of agriculture meant people had to shift from one area to another in search of virgin lands to clear. Nowadays, only gardens move, making people to move farther and farther away from the village in order to reach their respective fields or gardens.

Finger millet (Eleusine corecana), locally known as amale is the main staple crop. It is a coarse tufted grass that grows about one meter high bearing fine grain that grows on five or six radiating finger-like spikes. Other important crops include Kaffir corn, amasaka, and cassava (Manihot utilissima), locally known as kalundwe. However, the latter two have been of recent origin, and cassava has

been more successfully adopted than Kaffir corn. Cassava is grown more like a security food rather than as the main food as millet is. Maize (Zea mays) or invanje has not been successfully adopted although nowadays more people grow it not only for green cobs but for the markets as well.

Gardens around the villages are the norm rather than the exception. In these gardens are planted maize, cassava, sweet potatoes (Ipomea batats) or ifyumbu, and all sorts of vegetables.

Material Culture

The Bemba have had a simple material culture consisting of four items, namely: (1) a wedge-shaped axe blade called isembe (pl. amasembe). This is usually a locally forged implement fixed in a wooden shaft that is used for clearing the bush, cutting poles for fencing, building huts, houses, and furniture, constructing canoes, fashioning logs into drums, stools, and mortars, and doing several other jobs; (2) a hoe, ulukasu (pl. inkasu) used for cultivation. These are long handle hoes previously bought from the Lungu and other ethnic groups. Now they are either forged locally or bought from commercial shops. Another important implement is (3) a spear, ifumo (pl. amafumo) which is forged locally, and was used in war, hunting and fishing expeditions, and protection against wild animals; and (4) a bow, ubuta (pl. amata) formerly

used in war and hunting. It is now an important heirloom in many families.

The material culture described above shows a simple culture that existed up to the late 1940s. It is now more complex than that as more and more people have been involved in acquiring wealth than they used to previously. For instance, people now have capital like bicycles, sewing machines, and the like.

Richards (1939:33) believes that no organized system of exchange or barter existed among the Bemba or with other groups of people. Previously, marriage contracts and most other kinship obligations were fulfilled by giving service, and not goods. Nowadays the situation depends on the parties involved. Some parents require dowry (money) for their daughters, while others may require service or/and goods from their would-be in-laws. Compared to other ethnic groups the Bemba do not demand a lot of money or goods for their daughters.

The Bemba Diet

The Bemba are well-endowed with a variety of foods. Cereals, roots, pulses, vegetables, fish, and meat are abundant, although this abundance may only be for part of the year, except for meat which is more scarce. Nonetheless, the Bemba diet lacks milk and milk products. As will be shown later only one season of cultivation annually exists and the people mainly rely on one staple,

namely finger millet, but cassava is also widely used. As a result hunger months and months of plenty can be expected to exist.

The people are familiar with hunger months and food months. Two months in a Bemba year depict this realization. The month of March locally known as Kutumpu mutumpula nshinde suggests that during this time food is scarce and most food reserves are depleted. People anxiously wait for crops to ripen and look for the harvest season that begins in April. The month of April is known as Shinde bulale na mucipe, meaning that people have food to eat such that they can even throw some away or have a lot of leftovers.

During the hunger months which fall during the rainy season, November to March, meals are reduced from two to one in a day, and beer brewing is slowed down. However, extreme cases of hunger are rare (Richards, 1939:35-36). During the hunger months people depend on less nutritive foods such as edible gourds, pumpkins, mushrooms, and caterpillars.

Composition of the Diet

Cereals.

The Bemba diet is mainly composed of one cereal food, namely: finger millet (Eleusine corecana), locally known as amale. The grains are ground or milled into flour from which a variety of foods is made. The most important

meal is called ubwali, a thick porridge that is eaten with other foods including meat, fish, and vegetables. Other foods made from finger millet include porridge, a thin gruel known as umusunga. After some special treatment millet flour is made into beer, ubwalwa, or a sweet drink called umunkoyo. The people depend almost entirely on the amount of millet they get, and the seasonal variations of hunger and plenty could be attributed to the absence or abundance of this important cereal crop.

Kaffir corns (Sorghum spp.) are also grown in the area but not to the same extent as finger millet. In fact, only a few individuals do so and on a very limited scale. Local varieties of the sorghums include amasaka, sonkwe, and kancebele. Ubwali, beer, and porridge are also made from sorghum flour.

Maize (Zea mays) or invanje is also grown as another important cereal these days. It is the second most important crop for some households next to cassava, which is next in line to finger millet. Previously maize was only used for eating as green maize boiled or roasted on the cob. Its flour was used to make porridge. Nowadays, maize flour, known as mealie meal, is used to make ubwali, porridge, beer, and samp. Green maize is eaten as before, green on the cob when it is either boiled or roasted. For people in Area 2 mealie meal is their main flour used in their ubwali. When they talk of the absence of flour, they refer to maize flour.

Bulrush millet (Pennisetum typhoideum), locally known as ububele, is a rare millet grown in isolated and smaller stumps in very few instances. It is ground into flour and subsequently made into ubwali. Very few households in the area cultivate bulrush millet.

Root Crops.

Cassava (Manihot utilissima), or kalundwe, is the next most important food crop in the Bemba diet after finger millet. Most of it is used for making ubwali. It is also eaten as a snack when it is boiled or roasted and then eaten in chunks with or without roasted groundnuts. The leaves of the cassava plant when stewed form a vegetable dish called katapa. Groundnut sauce is sometimes added. Traditionally since its adoption cassava has been used as a security crop, eaten when the millet grain harvest has been bad. Nowadays it forms the number one food crop in some households.

Sweet potatoes (Ipomea batats), or ifyumbu, are usually eaten alone either as roasted or boiled potatoes. Sometimes groundnut sauce is added. Potatoes can be dried and eaten later as insemwa.

Livingstone potatoes (Coleus esculentus), or umumbu, are also grown. They are eaten alone, usually boiled but they can be eaten raw as well. However, Livingstone potatoes are not as common as sweet potatoes.

Pulses.

Next to millet and cassava the next most valuable foodstuffs are the pulses, especially groundnuts, a variety of beans, ground beans, cow peas, and European peas. All these are good sources of protein and fat, particularly groundnuts.

Groundnuts (Arachis hypogea), known as imbalala, are the most important pulse crop. They are eaten alone either as fresh nuts or heated, boiled, fried, or pounded. They are eaten as relish in a variety of ways. They form an important part of other relishes when they are used as a sauce called intwilo. They are ground and cooked into a cake called icinkonko. A few people still extract oil from them, but such people are very few and isolated.

Beans (Phaseoulus spp.), locally known as cilemba, is another important pulse used as relish. It is eaten as boiled fresh pods, fresh or dried seeds that are stewed to form a puree. Its leaves are eaten as relish called cimpapila or cinkamba. Fresh bean leaves form an important source of relish in the rainy season while dry leaves are used during the postharvest season. Groundnut sauce is added to leaves to make a very delicious dish.

Ground beans (Voandzeia subterranea), or intoyo, are eaten either fresh or dry. They are boiled or roasted with or without salt. They too can be cooked with water to form a relish. It is common to see groundnuts and ground beans interspaced in one field. Ground beans are an important

crop among Chibemba-speaking peoples.

Cow peas (Vigna unguiculata), ilanda, are the other important pulses after groundnuts and beans, although in most cases they are not stored in greater quantities than ground beans. Fresh or dried leaves are stewed as relish with groundnut sauce while the seeds themselves are cooked and eaten as relish.

European peas (Pisum sativum), intongwe, are either stewed or pounded into a cake or cooked and then eaten with ubwali. They too can be cooked in pod or treated as relish when they are boiled in water.

Cucurbits.

A variety of cucurbits exist, the most common being pumpkins (Cucurbita spp.). They are locally known as ifipushi (sing. icipushi), and are usually eaten alone or as part of relish. Fresh or dried pumpkin leaves form an important relish called cibwabwa, a common dish during the months of January, February, and March.

Other important cucurbits are (1) edible gourds (Lagenaria sp.) , or imyungu (sing. umungu) which are boiled and eaten alone, sometimes together with pumpkins, (2) cucumbers or ifibimbi (Cucumis sativus), (sing. icibimbi). These are normally eaten raw, and (3) amankolobwe, the smallest cucumbers which when boiled form a hot drink. But they are also cooked with locally made soda or groundnut sauce as relish.

Animal Protein.

The Bemba are not a pastoral people although a few individuals keep goats and sheep -- and even cattle in certain conditions. Tsetse flies have limited the domestication of animals. Chickens are also reared. However, domestic animals, known as ifitekwa, are not kept for their meat per se. They are used to provide meat at a ceremony such as a wedding, or to obtain money to meet an urgent need such as sending a child to school. It is common to give them away as a gift to an important person. Thus, animal protein mainly comes from game meat, usually of buck, deer, wild pig, guinea fowls, quails, and wild pigeons. The meat (inama) is generally referred to as relish (umunani). Meat is prepared in a variety of ways including stewing, roasting, and frying.

Chickens (inkoko) are the most numerous. Each household is expected to keep chickens but they do not often eat them. A chicken is a symbol of honor. As a result it provides relish for most important functions in addition to meat. Visitors that do not taste a chicken even if they eat 'meat' everyday of their stay do not feel welcome or important.

Fish (isabi) is another important source of protein, especially in villages around big rivers. It is highly valued and is prepared in a variety of ways just like game meat. Apart from the small fish called kapenta and cisense, fish is just as scarce as meat in the study area.

This scarcity was expected because (1) fish is normally caught when the waters of the rivers flood the banks or when they recede between December and May; and (2) the Government temporarily closes lakes Tanganyika and Mweru to fishing till March in order to allow fish to spawn and grow before fishing is allowed again.

Another important source of protein in the study area are a variety of caterpillars. The most important are cipumi, mumpa, impambata, imiyongolo, and utubambe. Flying ants (inkate), locusts (makanta), and birds are important in the Bemba diet.

Other foods.

A variety of wild spinaches, generally known as umusalu are collected and eaten as relish. Among the most common are pupwe, pimpa, kapalala, and cinsanki. The fresh or dried leaves are stewed with groundnut sauce and with locally made soda (ifishikisa). Wild orchids, cikanda, and mushrooms, ubowa, form an important part of diet. Mushrooms are especially important from December to February. On the whole these foodstuffs are not as nutritious, in terms of nutritive value, as those already mentioned. However, they are abundant during the times the people need them most, the hungry season.

Wild plums, imfungo, (Anisophyllea sp.), loquots (Uapaca kirkiana), - amasuku, amapangwa, insokolobe, and the other similar species of fruits, and impundu

(Parinarium mobola) are important wild fruits. These fruits are eaten raw or made into their respective drinks. They are however, limited to the months of September to November.

Other important fruits are the cultivated ones, which include oranges, guavas, lemons, pineapples, bananas, and mangoes. These fruits are seasonal and are out of stock for much of the time. However, they are not harvested at the same time. For instance, mangoes are eaten in December-January, guavas around February and March, oranges around May to August. Potentially, the area could have fruits all year round with proper planning. Similarly, cabbage, tomatoes, onions, spinach, kale, and rape are also grown. Like fruits they are not grown at a large scale. In fact they are left to few individuals who get some money from selling these crops.

Food Storage

Millet is stored in granaries called amatala (sing. ubutala). The grain is first dried in the sun and in the head and then stored. Millet could be stored for over a year but these days few people manage to have supplies that could last that long. In most cases, such millet, called comba, is used for brewing beer rather than for making ubwali.

Groundnuts are stored in whatever amounts because they are considered an important part of the diet. Small

bins (ututala, sing. akatala) are usually built to store groundnuts. In many villages during the time of research groundnut bins were not common. Instead people used sacks or bags which they hid in their homes. The main reason for this change of behavior was that some people had some of their groundnuts stolen from the bins while they were asleep or away visiting relatives.

Beans is another important crop stored in bags or sacks. Other crops are also stored but in smaller quantities. However, each household tries to store as much of each crop as it could manage, some for seed for the next growing season, but mostly for food during the rest of the year.

Seasonal Variations of Food Availability

The Bemba calendar year is noticeable in terms of food availability. Harvest time falls between April and August. During this time millet, groundnuts, pulses, and vegetables are harvested and stored. Also at this time game meat and beer are plentiful. Fish may be plentiful also. At the same time new chitemene gardens are made. During the late dry season, October and November, it has been reckoned that some people may have low or no green vegetables in their reserves (Richards, 1939). This situation did not seem to exist during the time of study. It was obvious, however, by February that few people had preserved green vegetables for food. But at that time they

had started eating fresh vegetables.

At the beginning of the rainy season certain changes in the diet occur among most of the people. Millet stocks are low for most of them. As the season progresses the stocks are depleted. At this time many people may depend on the environment to supply mushrooms. Also edible gourds, pumpkins, and maize cobs become the main foodstuffs for some people.

The Bemba Meal

A complete meal consists of a thick porridge called ubwali and relish known as umunani. Ubwali is made from ground or milled flour made from millet, cassava, and/or maize. Usually a combination of these is used. The flour is poured into boiling water, stirred to make a consistent stiff mixture, which is then kneaded and patted to make a smooth lump. It is then served on plates. To eat this food people usually sit around it and tear off bits using their hands. The rolled balls are then dipped into relish and eaten.

Umunani is composed of vegetables, meat, and/or fish. It is usually a liquid stew prepared in a variety of ways. In most cases the amount of ubwali prepared is determined by the amount of relish available. Umunani makes swallowing ubwali much easier and gives it taste. Usually only one or two types of relish are provided at each meal. Life sustenance requires both ubwali and umunani in terms

of their nutritive values. But as has been mentioned before umunani may specifically refer to meat consumed in the household. Sometimes nicknames are invented in order to confuse the people who may be interested in reporting those involved to government officials.

According to the Bemba ubwali and its associated relish are the real food. Other foodstuffs are simply additions and snacks eaten after or before the meal, and during the hungry months. It is not unusual to hear a couple relating the story of its visit to a certain place in such terms, "We had a wonderful time together with so-and-so. They gave us tea with bread in the morning. At noon they gave us rice with meat. In the evening we ate Irish potatoes with meat or chicken. In between these times we had several things like drinks and biscuits. However, we did not eat food." All this statement amounts to is that they were not given ubwali for their main meal. And this aspect seems to be common in most African countries (Jarosz, 1985).

The Bemba do not have ritual restrictions on diet. Their taboos have no particular bearing with regard to gender or particular time of life. However, abstentions from particular foodstuffs exist where a traditional healer may ask the patient to abstain from eating certain foodstuffs (government medical and health personnel do the same thing) or in situations where a given individual associates eating of certain foodstuffs with ill luck

experienced in the past. Certain Christian beliefs make some people not to partake of certain foodstuffs.

Infant Feeding

Infant feeding is a wide practice among the Bemba. Babies are breastfed whenever they want to, especially when they cry - day or night. Mothers used to breast-feed their children for two to three years (Richards, 1939: 67). Also babies are carried about the village on their elder sisters' or mothers' backs. As babies grow older relatives can have a chance to look after them too, especially the grandparents.

In the past sexual abstinence was the norm while a child was breast-feeding. In certain cases coitus interruptus was allowed but the couple that had another pregnancy before its child was successfully weaned was chided. Especially if the child became ill or died, the parents were charged as being responsible for the child's illness or death (Richards, 1939:67). Probably this was one major reason polygamy was common.

Richards (1939:68-69) suggests that although the Bemba encouraged their nursing mothers to eat food in order to have milk for the baby, they never thought of breastmilk as food. This belief made them begin to give their children water from an early part of life and a thin gruel (porridge), umusunga, from the age of two weeks. By three or four months the children were used to eating

porridge, and by eight months they were given ubwali in small lumps to eat on their own. Richards (1939) noted that people used to eat only once a day, after they came from their gardens, which was usually late in the day. When food became scarce children were fed less frequently than when food was plentiful. From personal experience and research findings families ate in the morning before they went out to their gardens. This means that they had at least two meals in a day.

Health Care Delivery

The Government of Zambia offers free curative and preventive health care, although discussions and pronouncements about beginning to charge for certain services have been going on for some time now. Several categories of health care services exist. At the highest level are hospitals. At the lower levels are urban clinics, rural health centers, leprosaria, and the Zambia Flying Doctor Service. Also existing are mission operated hospitals that have been traditionally located in rural areas, and traditional healers and doctors. I will confine myself to the government services.

Government services are centered around large hospitals which offer curative and preventive care. Hospitals are mainly located in cities and towns including district centers. Three types of hospital exist, namely: the central, general, and district hospitals, excluding

the University Teaching Hospital in Lusaka. Some hospitals offer specialized treatment such as the Arthur Davison Children's Hospital in Ndola, the Chainama Hills Hospital for the mentally sick in Lusaka, and several leprosaria for rehabilitating lepers.

Urban clinics are mainly referral centers for large hospitals. They are located in main residential areas of urban areas. For one to be attended to at a given hospital, one has to produce a referral letter from a clinic. Although this situation is not enforced strictly, it was instituted in order to reduce the workload in hospitals and as a measure to avoid possible underutilization of certain services offered by the government.

Rural health centers are what their name implies, large clinics in rural areas. Most rural health centers have in-patient facilities such as beds and cots. Two types of rural health centers exist -- those with at least 16 beds and cots and have an annual average out-patient attendance of at least 10,000 new cases. Very few rural health centers qualify in this category because most of them have only four to six beds. The other RHCs have fewer beds and cots.

Since 1981 the government has been encouraging villages to organize themselves into community health centers. Villages do individually or collectively choose one or two persons for training in administering simple

and more common drugs. After training these community health workers live and work amongst the people that nominated them, and who support them financially or materially.

The Government has established maternal and child health (MCH) clinics in all the health centers, i.e., hospitals and clinics. In the MCH programs the health and nutritional status needs of the mother and child are emphasized. Free antenatal, postnatal, and under-five services are given to mothers. Also lessons on the importance of utilizing health services for preventive health care are given.

After delivering the baby mothers are encouraged to take their children to under-five clinics in order to monitor the growth and health status of the children. An under-five clinical card is issued when the mother visits the clinic after delivery. On this card is recorded information concerning the parents' names, their place of residence, date of birth of the child, and all the records of immunization are recorded there.

Mporokoso District is served by one hospital, namely: Mporokoso District Hospital (which also caters for Kaputa District); and rural health centers located at Chitoshi, Chiwala, Mukolwe, Mukupa Kaoma, and Shibwalya Kapila (Figure 4.1). In addition, there exists an urban clinic in Mporokoso Township, and several community health centers scattered all over the district. At the time of the survey

49 community health centers were very active. Mporokoso District Hospital is headed by the District Medical Officer. The hospital has 70 beds and 20 cots. Chiwala Rural Health Center is headed by the Clinical Officer. It has 6 beds. The Mporokoso Township Clinic does not have in-patient facilities. Figure 4.2 shows a detailed map of the research area.

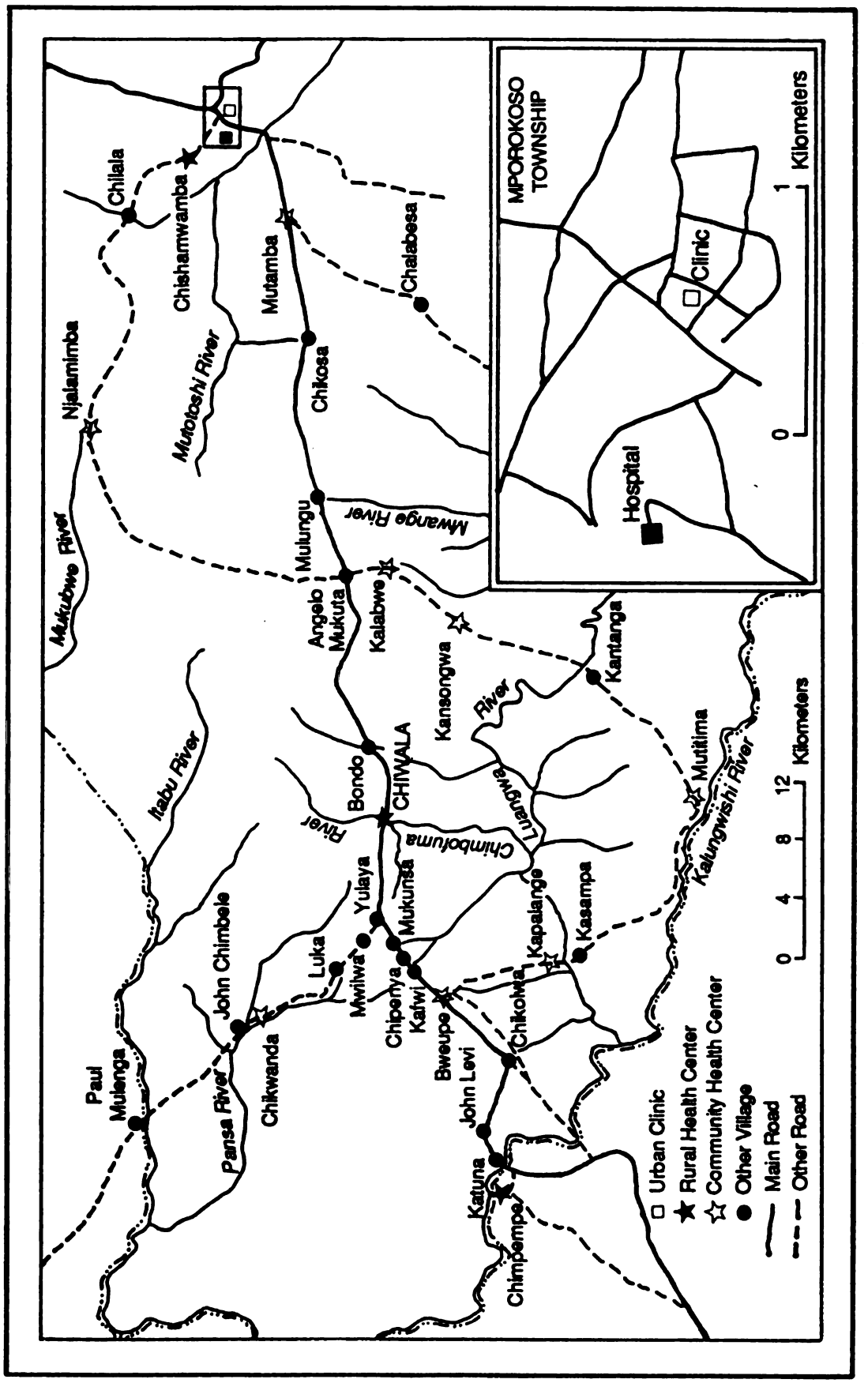


Figure 4.2 The Study Area

CHAPTER 5

HEALTH AND NUTRITIONAL STATUS OF THE HOUSEHOLDS

Introduction

In this chapter findings of the study on demographic and economic characteristics of the respondents, food types and diet, and health care behavior of the households are presented and discussed.

The Demographic Situation of the Households

The total sample consisted of 356 women, 196 from the villages and 160 from the Township. During the second survey, however, only 308 respondents were interviewed as has been explained in Chapter 3 - 182 from the villages and 126 from the Township.

Marital Status:

Of the 196 women in Area 1, 166 (or 84.7 percent) were married, 10 (or 5.1 percent) were not married, 11 (or 5.6 percent) were widowed, while 9 (or 4.6 percent) were divorced. All the women in Area 2 were married. Overall, 91.6 percent of the respondents were married, 2.8 percent single, 3.1 percent widowed, and 2.5 percent divorced. Though still practised, polygamy was not very prevalent as

only 15.1 percent of the respondents were in polygamous unions (Table 5.1).

Table 5.1. Marital Status of Respondents by Rural and Urban Residence

Marital Status	Rural Cases	Rural %	Urban Cases	Urban %	Total Cases	Total %
Single	10	5.1	0	0.0	10	2.8
Married	166	84.7	160	100.0	326	91.6
Widowed	11	5.6	0	0.0	11	3.1
Divorced	9	4.6	0	0.0	9	2.5
TOTAL	196	100.0	160	100.0	356	100.0

The mean age for all the respondents was 31.8 years. The rural women were slightly older (mean age = 33.0 years) than their urban counterparts (mean age = 30.6 years). Rural women had slightly more children (mean = 4.8 children) than urban women (mean = 4.2 children). However, urban households were larger (6.9 persons per household) than rural households (6.0 persons per household). These statistics imply that the kinship system is widely practised in the area because on average, urban respondents have fewer children of their own than rural respondents. Both rural (2.9 years) and urban women (2.8 years) had similar birth intervals between the last two births. From the findings one can state that on average women had their firstborn child when they were 19 years of age (Table 5.2).

Table 5.2. Mean Values for Selected Demographic Indicators

Indicator	Rural		Urban		Total	
	Cases	Mean	Cases	Mean	Cases	Mean
Age Of Mother*	183	33.0	160	30.6	343	31.8
Children	196	4.8	160	4.2	356	4.5
Household Size	196	6.0	160	6.9	356	6.5
Birth Interval**	167	2.9	127	2.8	294	2.8
Firstborn***	187	19.1	156	18.9	343	19.0

*Age in years
**Birth interval in years
***Age of mother at her first child

Social and Economic Situation of the Households

Educational Status

Most women had some formal education. Rural women had mainly primary school education. Of the 185 rural women that indicated a level of education, 139 or 75.1 percent stated that they had some primary school education. Those who had no schooling and those with secondary school education were equally divided (12.4 percent each). The majority of urban women had some primary school education (58.0 percent) and over a third had some secondary school education (36.7 percent) (Table 5.3).

Table 5.3. Educational Levels of Respondents

Educational Level	Rural Cases	Rural %	Urban Cases	Urban %	Total Cases	Total %
No Schooling	23	12.4	8	5.3	31	9.3
Primary School	139	75.1	87	58.0	226	67.4
Secondary School	23	12.4	55	36.7	78	23.3
TOTAL	185	100.0	150	100.0	335	67.4

When means of the highest grade reached by the respondent were computed, results indicate that the rural women had mainly reached grade 5 whereas urban women had reached grade 7. Thus, for the whole sample over two-thirds (67.4 percent) of the respondents had some primary school education, 23.3 percent some secondary school education, and 9.3 percent had never had any formal

education.

Excluding the 27 women who had no husband in the rural area, results show that husbands were more educated than the respondents (Table 5.4). For example, only 12.4 percent of the rural women had some secondary school education compared to 30.9 percent of the men. Similarly, of the 145 men whose educational level was known in the urban area about 62 percent had some secondary school education as compared to 36.7 percent of the women. On the whole, less than a quarter of the women had some secondary school education as compared to almost 50 percent of the men. As was expected, urban men were more educated than rural men. There were twice as many men in the urban area (61.9 percent) as there were in the rural area (30.9

Table 5.4. Husband's Level of Education

Educational Level	Rural		Urban		Total	
	Cases	%	Cases	%	Cases	%
No Schooling	6	3.7	0	0.0	6	2.0
Primary School	79	48.8	46	31.7	125	40.7
Secondary School	50	30.9	99	61.9	149	48.5
No Husband	27	16.7	0	0.0	27	8.8
TOTAL	162	100.0	145	100.0	307	100.0

percent) with some secondary school education. Only 31.7 percent of the men in the urban area had some primary school education as compared to 48.8 percent in the rural

area. Two percent of the men in Area 1 had no formal schooling. No respondent in the urban area indicated that her husband had no formal education.

Occupational Status:

The educational status depicted above is reflected in the occupational characteristics of the respondents. The majority of the women (86.0 percent) were housewives - 83.2 percent of the rural women and 89.4 percent of the urban women were housewives. The remainder of the respondents were either teachers and nurses in the urban sample or teachers and single parents in the rural area. However, some respondents were involved in other activities that brought in income such as selling at the market place, brewing and selling local beer, baking, and making pots and water containers (Table 5.5). For men, the situation was different. With the exception of the rural

Table 5.5. Other Jobs Performed for Cash by Respondents

Job	Rural		Urban		Total	
	Cases	%	Cases	%	Cases	%
Marketeering	0	0.0	17	10.6	17	5.4
Beer Brewing	51	26.0	6	3.7	57	18.3
Sewing & Knitting	8	4.1	15	9.4	23	7.4
Baking & Pottery	4	2.0	6	3.7	10	3.2
None	133	67.9	116	72.5	249	65.7
TOTAL	196	100.0	160	100.0	356	100.0

area where some men were involved in such activities as fishing, basket-making, blacksmithing, and carpentry, most urban men did nothing else apart from their regular work. A few were involved in growing vegetables.

Nutritional Situation of the Households

Food Types Cultivated and Eaten

Respondents in villages were asked to mention the foods they usually grow during the rainy season, and the ones they actually planted and harvested in the 1986/87 growing season. The food crops that were frequently mentioned were, namely: millet, cassava, beans, groundnuts, various forms of cucurbits, maize, groundnut beans, peas, and various types of vegetables. They also collected wild edible mushrooms, fruits, and caterpillars.

They were asked to mention the foods they had eaten the previous evening (the night before the interview) the foods they normally ate at breakfast, and those they usually ate at lunch time or supper. Their answers were later categorized into proteins, carbohydrates, fats, and oils. Little fat and oil, other than the one obtained from using groundnuts, were found to be used. The main dish consisted of ubwali and a variety of relish dishes. Given that ubwali was eaten at almost every meal, only the types of relish that went with it are given here.

Most women (65.3 percent) in the rural area stated that they did not have breakfast in the mornings compared

to only 10.6 percent of the urban women. This meant that most rural children, as well as others went to school or work hungry. On the whole carbohydrate foods and beverages were the main items consumed at breakfast. These included sweet potatoes, porridge with or without sugar added, cassava, rice whenever available, and even ubwali in some households. These households represented 40 percent of the whole sample (33.2 percent rural and 48.1 percent urban). Beverages, mainly tea, coffee, chocolate, and cocoa drinks, usually hot drinks, were taken especially in the urban area (Table 5.6).

Table 5.6. Food Types Eaten at Breakfast

Food Type	Rural Cases	Rural %	Urban Cases	Urban %	Total Cases	Total %
No Breakfast	128	65.3	17	10.6	145	40.7
Carbohydrates	65	33.2	77	48.1	142	39.9
Carbohydrates & Some Protein	0	0.0	6	3.4	6	1.7
Beverages	3	1.5	60	37.5	63	17.7
TOTAL	160	100.0	160	100.0	356	100.0

Lunch or supper mainly consisted of ubwali and relish. The only item that changed was the relish, say from fish at lunch to vegetables at supper time. Usually two meals were served each day, although during the rainy season only one meal per day was served in most households. Although lunch and supper are mentioned here

some households in the rural areas ate theirs early in the morning before they went to work and later in the afternoon after they returned from work. Most respondents indicated that they usually served some protein and vegetables at their meals. Of the 356 respondents, 71.1 percent indicated that usually at lunch or supper they had some meat, fish, or vegetable relish in which groundnut sauce was added. Over a quarter of the respondents stated that their main relish was composed mainly of vegetables (Table 5.7).

Table 5.7. Food Types Eaten at Lunch and Supper

Food Type	Rural Cases	Rural %	Urban Cases	Urban %	Total Cases	Total %
Vegetables	60	30.6	43	26.9	103	28.9
Vegetables & Protein	136	69.4	117	73.1	253	71.1
TOTAL	196	100.0	160	100.0	356	100.0

It is worth emphasizing that people usually ate game meat because they were not cattle-keeping herders, and very few people kept goats and sheep. The main source of protein was fish, of which two types were dominant. These were small fish called kapenta and cisense, respectively. These fish were not caught locally and had to be bought either from Mporokoso Township market or from local and traveling traders who bought them in bulk either from

other traders or at the sources on Lakes Mweru or Tanganyika. Those who lived near the big rivers in the area, namely Luangwa and Kalungwishi, had local catches of fish from these rivers which they sometimes sold to neighboring villages for cash or in exchange for human labor in their gardens.

The food types tended to reflect seasons. At some particular times kapenta and cisense were not that plentiful as the government restricted their fishing in order to make them spawn and grow. So during the rainy season up to March very little kapenta and cisense was sold in the area. Luckily for the people this was the time that local rivers swole with fish which was caught locally.

Seasonality also affected diets in some specific ways. For example, when respondents were asked to mention the foods they had eaten the previous nights during the two interviews a marked difference in the food types was noted. For example, fish and beans, an important source of protein in the area, were consumed more in the dry season. Vegetables formed an important part of both rural and urban households (Table 5.8).

A somewhat different picture was noted during the second visit in the rainy season. Fish, meat, and beans were consumed less frequently in the rural households as was previously recorded during the first visit. On the other hand, urban households tended to consume more meat, fish,

Table 5.8. Foods Eaten Previous Evening - Phase 1

Food Type	Rural Cases	Rural %	Urban Cases	Urban %	Total Cases	Total %
Meat-Chicken	23	11.7	14	8.7	37	10.4
Fish	58	29.6	40	25.0	98	27.5
Vegetables	47	24.0	24	15.0	71	19.9
Vegetables & Some Protein	14	7.1	65	40.6	79	22.2
Beans	40	20.4	11	6.9	51	14.3
Relish with Groundnuts	12	6.1	4	2.5	16	4.5
Other	2	1.0	2	1.2	4	1.1
TOTAL	196	100.0	160	100.0	356	100.0

and vegetables mixed with some groundnuts than they did during the dry season. During the second visit rural households depended on vegetables, and mainly of three types: wild mushrooms, pumpkin leaves, and in March beans leaves. Almost every household that indicated they had vegetables had one or more of the mentioned relishes. Vegetables treated with groundnut sauce was a rare delicacy as most of the seeds had been planted (Table 5.9).

Table 5.9. Foods Eaten Previous Evening - Phase 2

Food Type	Rural Cases	Rural %	Urban Cases	Urban %	Total Cases	Total %
Meat-Chicken	11	5.6	38	30.2	49	15.9
Fish	14	7.1	48	38.1	62	20.1
Vegetables	101	51.5	24	19.0	125	40.6
Vegetables & Some Protein	20	10.2	6	4.8	26	8.4
Beans	32	16.3	9	7.1	41	13.3
Other	4	2.0	1	0.8	5	1.6
TOTAL	182	100.0	126	100.0	308	100.0

During the first survey respondents were asked to mention the number of times they ate meat or fish in a week. Results indicate that few households, in both areas 1 and 2, ate these products regularly. Almost 90 percent of the respondents in Area 2 stated that they ate meat very infrequently or rarely. Only a very small fraction said they ate meat either very often (at least four days a

week) or often (at least once but less than four times a week). Similarly, the majority of the respondents in Area 1 stated that they ate meat very rarely. Only about 15 percent of the rural women ate meat either very often or often (Table 5.10).

Table 5.10. Frequency of Eating Meat Per Week

Frequency	Rural		Urban		Total	
	Cases	%	Cases	%	Cases	%
Very Often	8	4.1	3	1.9	11	3.1
Often	25	12.8	14	8.7	39	11.0
Rare	78	39.8	77	48.1	155	43.5
Very Infrequently	85	43.4	66	41.2	151	42.4
TOTAL	196	100.0	160	100.0	356	100.0

Fish is eaten more frequently than meat. Over half of the respondents stated that they either ate fish very often or often. Especially, the urban sample indicated more frequent use of fish than the rural sample. However, the situation differed among and between villages. For example, respondents at Kapalange reported that they used fish as their main relish. When they complained that they had no relish, they usually meant that they did not have fresh fish. No respondents in the urban area claimed not to have fish very infrequently (Table 5.11).

Though people kept chickens they rarely ate them. The main protein relish for the people were beans. Rural

Table 5.11. Frequency of Eating Fish Per Week

Frequency	Rural		Urban		Total	
	Cases	%	Cases	%	Cases	%
Very Often	34	17.3	56	35.0	90	25.3
Often	39	19.9	73	45.6	112	31.5
Rare	69	35.2	31	19.4	100	28.1
Very Infrequently	54	27.6	0	0.0	54	15.4
TOTAL	196	100.0	160	100.0	160	100.0

respondents stated that they ate beans at least three days in a week. Urban respondents, however, did not eat beans as frequently as the rural respondents.

Respondents were asked to mention what they considered to be the number one nutritional problem in the area. Most respondents indicated that lack of sufficient and alternative animal protein was the number one nutritional problem (29.5 percent). Especially this percentage was largely composed of the rural area respondents. The urban sample found the shortages of mealie meal, from which ubwali was made to be the major nutritional problem (17.5 percent). Especially a general lack of a variety of relish dishes and that of mealie meal was the major problem for the urban sample. Some respondents found insufficient food production to be the main problem (Table 5.12). Rural respondents also

Table 5.12. Number One Nutritional Problem in the Area

Problem	Rural		Urban		Total	
	Cases	%	Cases	%	Cases	%
Inadequate Protein	77	39.3	14	11.1	91	29.5
Lack of Variety	19	9.7	20	15.9	39	12.7
Mealie Meal Shortage	16	8.2	22	17.5	38	12.3
Meal and Relish	9	4.6	46	36.5	55	17.9
Lack of Essentials	18	9.2	9	7.1	27	8.8
Insufficient Food Production	4	2.0	9	7.1	13	4.2
Animals Eating Crops	10	5.1	0	0.0	10	3.2
No Problem	29	14.8	6	4.8	35	11.4
TOTAL	182	100.0	126	100.0	308	100.0

indicated that such animals as pigs and monkeys made agriculture and life difficult for them because these animals were eating their crops. A general lack and shortage of essential commodities such as salt, cooking oil, and commercial vegetables such as cabbage, rape, and kale were among the major problems mentioned.

Breast-Feeding and Weaning

In this section results concerning breast-feeding practices as well as antenatal and postnatal behavior of parents are presented.

Breast-feeding is very common in the research area. All respondents who have had their own children stated that they breast-fed their babies. It was difficult to obtain the average length of time they breast-fed each child, so instead those respondents with more than one child were asked to state the number of months they breast-fed their last child. Those who were currently breast-feeding were asked to state the length of time they would take to breast-feed their currently nursing child. The mean time women breast-fed their children was 1.5 years for the rural area and 1.6 years for the urban area. Supplemental foods were introduced when the baby was 4.7 months in the rural area and 4.5 months for the urban area.

Answers by the respondents who were breast-feeding on the length of time it took them to wean the last child and

when they were thinking of weaning their current baby were compared together. One hundred and forty-one respondents (78 in Area 1 and 63 in Area 2) were included in this category. Over half of these respondents (54.6 percent) indicated that they were going to breast-feed their children the same number of months they did the other child. About a third of the respondents were thinking of breast-feeding their babies longer than they had done for the last one. The answers did not differ greatly between the rural and urban areas, although the urban sample, surprisingly, indicated that they were going to breast-feed their children longer periods than they did previously (Table 5.13). Only 9 percent of the respondents were undecided.

Table 5.13. Length of Breast-feeding Currently Breast-feeding Child (Compared to length of Breast-feeding Last Child)

Length of Time	Rural Cases	Rural %	Urban Cases	Urban %	Total Cases	Total %
Same	45	57.7	32	50.8	77	54.6
Longer	22	28.2	22	34.9	44	31.2
Shorter	4	5.1	3	4.8	7	5.0
Undecided	7	9.0	6	9.5	13	9.2
TOTAL	78	100.0	63	100.0	141	100.0

Asked why they breast-fed their children the number of months they had indicated most respondents did not give

a specific answer. Efforts to elicit specific answers were unfruitful in most cases. The most popular answer was that "The child was big enough." Over 75 percent of the respondents gave this answer -- 75.5 percent in the rural area and 80.6 percent in the urban area. This answer can be interpreted in several ways. First, the answer can mean that the child is "big enough" such that strict parental guidance is not necessary (Table 5.14). Second, other members of the household unit, and especially other children, could now look after the child without the

Table 5.14. Reasons for Weaning the Last Child the Stated Period of Time

Reason	Rural		Urban		Total	
	Cases	%	Cases	%	Cases	%
Big Enough	148	75.5	129	80.6	277	77.8
Right Time	10	5.1	3	1.9	11	3.9
Pregnant	7	3.6	3	1.9	10	2.8
Baby Difficult	3	1.5	3	1.9	6	1.7
Other	5	2.6	7	4.4	12	3.4
No Experience	23	11.7	15	9.4	38	10.7
TOTAL	196	100.0	160	100.0	356	100.0

parents worrying much about him or her. Third, the child is big enough so that efforts to have another child could resume. A combination of these answers is another possibility.

Asked to elaborate further on this issue most mothers indicated that the nurses in the hospitals and clinics

advised them to wean their children around one and a half years. In certain cases the respondent became pregnant. The category the "Baby became difficult" included instances when the child started to bite the mother or when it became embarrassing to breast-feed a "grown-up baby" -- around two years of age (Table 5.14).

Utilization of Health Services

Of the 196 rural women, 148 (or 75.5 percent) had taken the children they were staying with to a health center for treatment during the previous twelve months. Similarly 131 (or 81.9 percent) out of 160 respondents in the urban area had done so also. The main problems that prompted respondents to take the children for treatment are given in Table 5.15.

Table 5.15. Health Problems Children were Taken to a Health Facility

Problem	Rural		Urban		Total	
	Cases	%	Cases	%	Cases	%
URTI	27	18.2	28	21.4	55	19.7
GE	35	23.6	19	14.5	54	19.4
URTI + GE	24	16.2	22	16.8	46	16.5
Fever	23	15.5	21	16.0	44	15.8
Malaria	7	4.7	22	16.8	29	10.4
Other	32	21.6	19	14.5	51	18.3
TOTAL	148	100.0	131	100.0	279	100.0

URTI = Upper respiratory infections.
GE = Gastroenteritic problems.

Other than malaria and fever the majority of the children suffered from upper respiratory infections (URTI - 19.7 percent), mainly coughing, sneezing, and colds; and gastroenteritis (GE - 19.4 percent), mainly diarrhea, dysentery, nausea, headaches, vomiting, and general abdominal pains. A combination of both upper respiratory infections and gastroenteritis produced many patients, (16.5 percent). Slightly fewer urban women (14.5 percent) took their children for gastroenteritic problems than rural women (23.6 percent). More urban women (16.8 percent) took their children for malaria treatment than rural women (4.7 percent).

Those respondents who did not go to a health center and yet had sick children at home gave several reasons for their behavior. Most of the answers hinged on the consideration that the problem was not too serious to warrant taking the children to the hospital, especially for those who lived far away from a health facility. They could not take the children for treatment because they themselves were ill at the time the children fell sick. Some used patented drugs bought from the shops. They knew that their children would not be given any "stronger medicine" than they themselves could administer at home. Some respondents used herbs and other traditional medicines. A small proportion indicated that they used drugs administered by local community health workers.

During the second round of the survey respondents

were asked whether or not they had visited a health facility during the inter-survey period. Of the 182 rural respondents 128, or 70.3 percent, had visited a health facility. Also 115 (or 91.3 percent) of the urban respondents had gone to a health facility. Reasons related to children included taking the latter for treatment (18.5 percent of the respondents), taking them to under-fives clinics (11.0 percent), and visiting the sick relatives (13.9 percent). Some respondents had visited the facility for antenatal clinics as they were expecting another child (Table 5.16).

Table 5.16. Reasons for Going to a Health Center during the Inter-Survey Period

Reason	Rural		Urban		Total	
	Cases	%	Cases	%	Cases	%
Sick children	21	10.7	36	28.6	57	18.5
Self/Husband	49	25.0	34	27.0	83	27.0
Under-Five Clinics	28	14.3	6	4.8	34	11.0
Visit Sick	19	9.7	24	19.0	43	13.9
Antenatal Clinics	10	5.1	5	4.0	15	4.9
Others	1	.5	10	7.9	11	3.6
Never Went	54	27.5	11	8.7	65	21.1
TOTAL	182	100.0	126	100.0	308	100.0

The rise in the use of the rural under-five clinics was partly due to a "harsh measure" taken by the rural health center staff that could "chasticize" the parent of a child that came for cure for a problem that could have been

avoided through immunizations or simple health education. This measure "forced" parents to take their children to under-fives clinics. The staff came to learn about the problem during Phase 1 of the survey.

More urban women (28.6 percent) took their children to the hospital or urban clinic for treatment than rural women (10.7 percent). Probing the reasons why they did not go to a health facility for service, most rural women stated that it was difficult for them to go given the distances that separated their villages and Chiwala Rural Health Center. The average distance to Chiwala RHC was 10.4 kilometers. To take three young children to the clinic in a place without public transport was a difficult thing to do. Those in the urban area were lucky in that they were only .3 km away from the Township Clinic and .7 km away from the hospital. Apparently, many rural respondents did not frequently use the local community health posts as manned by community health workers (CHWs).

A complicating factor arose because of the Universal Child Immunization (UCI) program that was being implemented by Mporokoso District Hospital, through the staff at Chiwala Rural Health Center. In this program the staff members were each week visiting selected posts among the villages in order to administer immunizations and inoculations. In as far as people were concerned this service was enough for their children, and as a result they did not take their children for weighing and other

lessons at Chiwala RHC. The problem, however, was that during those UCI visits no anthropometric measurements were taken. These were taken only at Chiwala. Most of the mothers felt that the UCI visits were enough. <u>According to them, except for inoculations, one does not take healthy children to a clinic in case they themselves fall ill.</u>

Respondents were asked to mention what they thought to be the number one health problem in the area. A combination of both upper respiratory infections and gastroenteritic disorders was considered the number one health problem by over a third of the rural respondents. The remainder of the respondents were equally divided mentioning gastroenteritic disorders (12.6 percent), gastroenteritic disorders and malaria (12.6 percent), fever and headache (12.1 percent), and malaria and upper respiratory infections (11.0 percent) as the major health problems (Table 5.17).

Table 5.17. Number One Health Problem in the Area

Problem	Rural		Urban		Total	
	Cases	%	Cases	%	Cases	%
URTI + GE	68	37.4	7	5.5	75	21.1
GE	23	12.6	7	5.5	30	8.4
GE + Malaria	23	12.6	55	43.0	78	21.9
Fever + Headache	22	12.1	3	2.3	25	7.0
Malaria + Cough	20	11.0	27	21.1	47	13.2
URTI	15	8.2	11	8.6	26	7.3
TOTAL	171	93.9	110	68.8	281	78.9

Discussion

Most children came from stable homes, i.e., where both husband and wife were present. Other things being equal, this was a support team in which most of the aspirations of the children were met. The average household, around four-five persons, indicated that the households themselves were not very big given that the number of children, especially in the rural area surpassed the household sizes. Sending children to live with relatives was still a common practice in the area as was indicated by the large urban household size when compared to number of own children.

Most children came from households where both the mother and father had had some schooling. When the level of education and residence were isolated the urban area seemed to do better than the rural area in terms anthropometric measurements. I think that one of the main reasons for this difference was that women in the urban area had a lot of advantages over those in rural areas especially with regard to sanitation and general hygiene conditions. They lived in permanent housing structures, used piped water within their homes, and had income to use for their daily needs. Also in the urban area women did not work in fields as their rural counterparts, although this statement cannot be applied to all the urban women because some had their own fields in which they grew crops just as the women in the villages.

Like in any other developing country, most of the households suffer from both upper respiratory infections and gastroenteritic disorders. The preponderance mention of these problems could not be surprising especially for the rural women who have to work and live in the fields for most of their lives while taking their children with them, and also because of the lack of potable water. People depend on rivers for their domestic water. Although the yards around the houses and the surrounding areas are kept clean, the water drawn from streams or rivers is used for all domestic purposes. For most households, drinking water is never boiled. Those who boil it do so once in a while.

Although the impact of infections and parasitic diseases on malnutrition cannot be inferred from the results of this study, it is safe to assume that they play a major role in weakening the children's immune systems and worsening the nutritional and health status. In Zambia as a whole infections such as malaria contribute 7.3 percent of the causes of death associated with malnutrition. Respiratory diseases and gastroenteritis each contribute 10.6 percent of deaths associated with malnutrition (Times of Zambia, May 15, 1989).

To a large extent, communicable diseases reflect poor economic status of the general population and the general level of development of a given area. Mporokoso District is one of the remotest and poorest rural areas in the

country. Despite these misgivings about the area people are receptive to new ideas, especially as they come from the health staff. For instance, educating people about the advantages of oral rehydration salts has picked up in the area for children suffering from diarrhea, according to the health staff.

Utilizing government health services is not an easy task for rural women in a place without public or even private transport. In order to get to Chiwala Rural Health Center the women have to walk long distances. Moreover, they usually have more than two young children to take to the under-five clinics. When they do so they have to leave their fields and gardens unattended for the time they will spend at the clinic. The actual service itself may only take two hours, allowing for waiting time. The women have however, to walk back to their villages most of the afternoon. Some women in far away places have to miss two days' work in order to attend the service. This is why the Universal Child Immunization campaigns are popular because the clinical staff do the traveling.

Several things were noted during the survey which are not reflected in the results. First, due to the problems outlined above, very few mothers took their children to Chiwala Rural Health Center for inoculations and immunizations after the basic ones were given, namely BCG, polio, whooping cough, tetanus, and diphtheria. Some people did not even finish these courses. Thus, in some

rural villages, the measles immunizations due at 18 months were not given to the majority of the children who as a result suffered devastating consequences. For instance, during the survey measles broke out in the area and deaths were experienced in two villages. In one village two children survived and were taken to Chiwala Rural Health Center for treatment and convalescing. For the two weeks those children were at the clinic no mother dared take her sick child there for either treatment or under-five clinic for fear of contracting measles - even if the child was actually protected. For that period of time only adults and older children could be seen at the clinic. But who could blame the mothers?

Second, most women found it burdensome to take healthy children to Chiwala Rural Health Center simply to weigh them after all the immunizations were given. Long distances were simply part of the problem. Two other problems surfaced during the surveys, namely: the general apathy by some mothers who did not care much about taking their children either for treatment or under-five clinics, and also a general lack of drugs at the clinic during certain periods.

Third, the United Nations Children's Fund (UNICEF) have instituted the Universal Child Immunization (UCI) campaign in the area through which they want to give all eligible children the much-needed immunizations. The goodness with this campaign is that it is the clinical and

hospital staff that travel to given villages in order to administer the immunizations. The problem is that the campaign is simply for giving the children immunizations. No weighing scales or measuring tapes are taken. In as far as the mothers are concerned this service is more than they could bargain for because it occurs in their own village or somewhere close by. They find going to Chiwala to weigh their children burdensome and a waste of time. So for most of them the growth of their children is not monitored beyond the initial immunizations.

Fourth, some mothers were discouraged to take their children to Chiwala Rural Health Center to avoid the stigma that normally accompanied those women whose children were losing or not gaining weight. During the first six months of life, even up to one year, mothers are encouraged to take their children to the health center because their children do gain weight. But when mothers realize that their children stop growing or start losing weight they stop taking them to the under-five clinics -- one of the places they could get advice. After realizing that this was the situation for some mothers, a meeting was arranged with the clinical staff so that the problem could be discussed and minimized. Reluctantly the clinical officer established a general rule that in order for a child to be treated the mother or guardian should produce evidence that the child attends under-five clinics for those children below the age of five. Although not

quantified the number of mothers attending under-five clinics increased during the survey period.

Last, shortages of essential drugs make some respondents not to go to the health centers. One respondent asked, "What good does it do for me if I go to the hospital and the only medicine they give me is Panadol? I have Panadol in my home, and I can effectively administer it to my children." Thus, some parents wait a couple of days, weeks, or even months before they can take their sick to the hospital.

From the survey women mainly used the health services for curative care. Even women in the urban area did not differ much from the rural women when it came to taking their children for preventive care. Although urban women were more readily able to finish immunizations than rural women, they usually went to the clinic or hospital for curative care rather than for preventive care, less so than rural women did. Surprisingly urban women were more educated than rural women and should have known better the advantages of preventive health care. Health education, and probably a similar stipulation requiring attendance of under-five clinics for all the children under the age of five years could be instituted in Mporokoso Township as well. The hardship this stipulation may bring about cannot be imagined, but parents should know their inescapable duties in their children's health.

The greatest challenge for a health professional in

the research area still remains how to encourage parents to use health services for preventive care (or for curative purposes soon after they notice signs and symptoms that their children may be suffering from an illness). As one health official said, "People simply come here (Mporokoso District Hospital) to die because by the time they come they are too weak to respond to our medication." And the trouble with this situation is that if people note that those who go to the hospital do not come back alive, they themselves are reluctant to go there for treatment.

Breast-feeding is widely practised in Mporokoso District. Both rural and urban women breast-fed their children for about one and a half years after which time they weaned them. This was an excellent practice because in this area animal milk products were nonexistent for reasons given above. Infant formulas were, first, nonexistent in the shops, and second, when available too dear for the ordinary person to afford. Thus the only milk product that children got was breastmilk. Previously, mothers who attended under five clinics were supplied with milk freely by the government. This was one incentive that made many mothers go there. However, economic difficulties have made it imperative for the government to suspend this practice. Only special cases are supplied with milk products. The deaths that were associated with powdered milk in the late 1970s and early 1980s throughout the

developing countries scared everybody about giving powdered milk to people they never knew were going to make a good solution. The use of cups and spoons, instead of bottles and nipples, is being encouraged in the research area by the Mporokoso Nutrition Group and Kapumo Farm Institute.

During the interviews about length of time of breast-feeding I came to suspect some answers. Some respondents obviously were not telling the whole truth about the exact amount of time they weaned their previous child. Part of the reason seemed to be that they did not remember when they had done so. However, it also appeared that they were just giving the answers I was expecting to obtain. I suspected that many mothers knew when they weaned their children but were simply reluctant to give out the answer. For example, one and one half years is the time mothers are encouraged to wean their children by the health staff. So even if the mother had not actually weaned her child at the time she specified, it was easier for her to mention 18 months.

By 6 months most, if not all, the children have been started on supplementary foods. The main constitution of these foodstuffs is carbohydrates - porridge made from cassava or millet. Supplementary foods are given earlier in life and by one year of age children are usually ready to eat on their own with the other members of the family.

Weaning takes place gradually with more adult food

added to the menu each time between the time porridge, or umusunga, is introduced and the time ubwali is actually served. The ultimate goal is to make the child eat on its own the foods adults eat. At the health centers mothers are encouraged to prepare porridge in which groundnuts are used in order to provide some of the much-needed proteins.

Interesting answers were obtained when the respondents were asked to itemize the foods they used to wean their children. Most respondents indicated that they used porridge, a few used fruits such as bananas and and oranges. Others used sweet potatoes, rice, and the foods available to adults. In other words whatever the adults in the household ate, that they gave to their children.

The greatest danger of weaning occurred to children who were immediately weaned as a result of another pregnancy or sudden illness or death of a mother. Some children fell sick and could not suck any more. These children were at risk of developing protein-energy malnutrition, locally known as ulunse. Some health officials felt this was one of their greatest challenges - dealing with sudden weaning, especially as a result of another pregnancy. In general some health officials found weaning foods to be lacking in variety. It must be a traumatic experience for some children. A baby who is excessively indulged (given milk on demand, carried on mother's back all day, sleeps in her arms or by her side all night, and is breast-fed for a long time) finds

himself or herself suddenly weaned, must, of necessity, suffer from dejection.

The Bemba diet is simple as has been discussed already (Chapter 4). Results confirm earlier studies that the main dish is made of ubwali and one or two relish dishes. Fish and vegetables are the main foods eaten. As for game meat consumption no truth ever came out. Probably no truth will ever come out. People are not allowed to eat game meat and nobody tells anybody else, even in confidence, whether or not one is having game meat for relish.

At the Kapumo Farm Institute nutrition workshop participants stated that both kwashiorkor and marasmus do exist in the district. Though not common, their prevalence was still unknown. Incredibly for 1987 only 17 cases came to the District Hospital as suffering from the severe forms of malnutrition. Other figures were not available. The greatest advantage people have in the area is their relative proximity to the sources of fish.

Green vegetables are in abundant supplies especially during the rainy season. The problem lies in their preservation. The following crops produce leaves that are eaten fresh or dried and stored for future use: beans, pumpkins, edible gourds, black eye peas, and sweet potatoes. Cassava leaves are also eaten when picked fresh. (They are not dried or stored.) An insufficient storage of these relishes means a very lean rainy season and spells

hunger for the affected households.

Discussions with the elders in the villages revealed that they felt that hunger was more widespread then, and especially in some households than it used to be. The reasons for this assertion were, first, fields for cultivation have grown smaller and farther away from the villages. Second, the soils around the villages have grown infertile such that village agriculture is not as widely practised as it used to be. In this regard, gardens are not as extensive and as productive as before. Third, such animals as monkeys and wild pigs eat peoples crops. Thus, people spend some of their most valuable time trying to drive away these marauding animals instead of concentrating on making new fields. This was a localized problem, however, as in some villages these animals have been eliminated or scared off to other places. Fourth, insufficient food production seems to be of recent origin. Some people have even taken to stealing as a way of surviving. Some elders intimated that theft never occurred before. If a person was hungry he or she could go into someone else's garden and get something to eat, but not to carry home. "These days people have gone in other people's gardens and dug up cassava. This was unthinkable ten to twelve years ago. Nowadays, people can even come up in your bedroom and steal anything they want, including groundnuts," they stated. Some attributed this kind of behavior to the present mix of people in the villages.

Previously, clans stayed together, but with "village regrouping exercises" people from different areas and backgrounds have come to live together.

CHAPTER 6

CHILDHOOD HEALTH AND NUTRITIONAL STATUS

Introduction

This chapter, divided into four sections, presents and analyzes the results on children. The first section presents the results on the whole sample. The second section compares the two areas. The third section looks at the determinants of the observed patterns. The last section discusses the results presented in the chapter.

The Total Sample

One thousand, one hundred and four children from 356 households constituted the whole sample. Of these children 557 or 50.5 percent were boys and 547 or 49.5 percent girls. According to the statistics compiled at Chiwala Rural Health Center 568 children from the villages represent 12.35 percent of the entire population of 4,598 in the Chiwala Rural Health Center catchment area in Area 1 (Chiwala Rural Health Center, Health Assistant's file). The 536 children in Mporokoso Township represent 9 percent of the entire urban population (5973) in Area 2 (CSO, 1985: Table 1.1). Of the 568 children in Area 1 62.68 percent (or 356) were under the age of five years. The

rest were at least five years old but less than fifteen years by the end of the second survey. The total number of children under fifteen could not be obtained for the two respective areas. The following section gives the information on the socioeconomic conditions under which the children lived during the time of the survey.

Only 18 or 1.6 percent of the children came from households whose mothers were not asked about their formal education. Just slightly over two-thirds of the children (68.1 percent) had mothers with some primary school education, and about 20 percent with some secondary school education. Ten percent of the children had mothers who had no formal education or those who considered their brief encounter with the formal educational system to be insignificant (Table 6.1). Generally, the fathers were better educated than mothers. For instance, whereas 69 percent of the children had mothers with some primary school and only 21 percent with secondary school education, 47 percent had fathers with primary and 44

Table 6.1. Educational Levels of Parents

Educational Level	Mother		Father	
	Cases	%	Cases	%
No Schooling	110	10.1	25	2.3
Primary	752	69.2	506	46.9
Secondary	224	20.6	475	44.1
No Father	0	0.0	72	6.7

percent with some secondary school education. Only 2.3 percent of the children had fathers who had no formal education.

The majority, 88.4 percent, of the children had mothers who were only housewives. Very few children came from households where mothers were in formal employment, mainly as educators (teachers) or nurses. About 6 percent of the children came from single-parent households where the mother was the head of the household.

The mean age of the children was 6.67 years while the mean parity for the 986 children was 3.97. Thus 118 were children of relatives whom the respondents were keeping. When the sample was broken down into age groups the following pattern emerged. Fifty-eight or 5.3 percent were infants, 377 or 34.1 percent were 1-4 year olds, 366 or 33.2 percent were between 5 and 10 years, while 303 or 27.4 percent were older than 9.999 years but younger than 15 years by the end of the second survey.

In Chapter 5 the results on the frequency of eating meat and fish in the households were presented. What did those results mean in terms of the nutrition of the children? The data show that only 142 children ate meat either often or very frequently -- (34 children or 3.1 percent ate meat very often while 108 children or 9.8 percent ate it often). Over 85 percent of the children ate meat very rarely or occasionally. The results did not differ markedly between Areas 1 and 2. For example, about

83 percent and 90 percent of the respondents in Areas 1 and 2, respectively, ate meat rarely or very infrequently. An almost equal proportion, 44 percent for Area 1 and 43 percent for Area 2 ate meat very rarely (Table 6.2).

Table 6.2. Frequency of Eating Meat per Week (Children)

Frequency	Rural		Urban		Total	
	Cases	%	Cases	%	Cases	%
Very Often	24	4.2	10	1.9	34	3.1
Often	69	12.1	39	7.3	108	9.8
Rare	223	39.3	258	48.1	481	43.6
Very Infrequently	252	44.4	229	42.7	481	43.6
Total	568	100.0	536	100.0	1104	100.0

The situation was better off with fish consumption (Table 6.3). On the whole about 60 percent of the children had fish either very often or often, especially in the urban area. For instance, whereas 80 percent of the urban children had fish either very often or often, only 37 percent of the rural children had fish at the same

Table 6.3. Frequency of Eating Fish per Week (Children)

Frequency	Rural		Urban		Total	
	Cases	%	Cases	%	Cases	%
Very Often	95	16.7	193	36.0	288	26.1
Often	115	20.2	242	45.1	357	32.3
Rarely	180	31.7	101	18.8	281	25.2
Very Infrequently	178	31.3	0	0	178	16.1
Total	568	100.0	536	100.0	1104	100.1

frequency. On the other hand, 60 percent of the rural children ate fish very infrequently or rarely, but only 19 percent in the urban area.

Anthropometric Measurements

Comparison With the American Population

The children from the study areas were very short people when compared with the NCHS growth charts. Height for weight data were extracted in order to calculate the mean height-for-weight and height-for-age values. Only 87 cases (or 8 percent) of the 1,104 children had equal or higher anthropometric values as the NCHS reference population standards. Of the remaining children 158 or 14.3 percent of the entire sample could not be used because they fell under the age of two.

Weight-for-Age

All the mean weight-for-age values for male children fell under the 5th percentile of the NCHS standards for both time periods. Given that the weight increased between the two survey periods, the weight-for-age values increased also, sometimes reaching but not surpassing the values for the 5th percentile of the standards.

Similarly, the mean values for female children fell below or at the 5th percentile of the NCHS charts during the first survey. During the second survey the girls' values were between the 5th and 10th percentiles for those

aged 10 years or less. Those aged more than 10 years had smaller values than the 5th percentile even during the second survey period.

The interpretation of these observations is that the average child in the research area is smaller than 95 of every 100 United States boys or girls between the ages of 2 and 15 years.

Height-for-Age

Concerning the mean height-for-age values both girls and boys fell below the 5th percentile of the NCHS values. These results imply that on average the surveyed children were shorter or smaller, than 95 or more of every 100 U.S. children of the respective gender between 2 and 15 years of age.

Young Children

The data were further disaggregated into three month periods in order to compare the length and weight of young children to those of the NCHS.

Males. The weight of children increased during the second period, and can be noted in all the following figures. Figure 6.1 shows that rural boys were shorter and weighed less than the reference population. Only boys aged less than 15 months had their values even reach the 5th percentile.

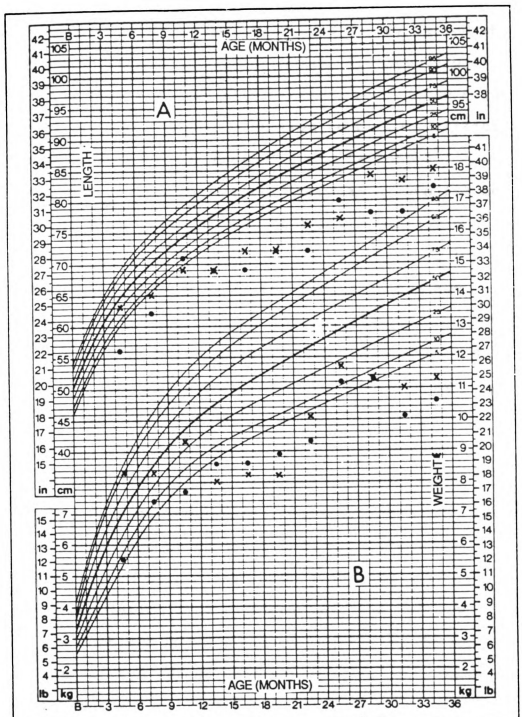


Figure 6.1 Mean Weights and Lengths for Rural Boys Relative to the NCHS Reference Population

The situation was slightly better off for the urban children, especially during the second survey period when some of their weight-for-age or height-for-age values reached the 10th and even 25th percentiles (Figure 6.2). On the whole, the situation appeared to be more critical for children between the ages Of 12 to 24 months.

The role of location is reflected in Figure 6.3 and Figure 6.4. Urban boys were in most cases heavier and taller than rural boys. However, when compared to the American standards both still fell short of the 5th percentile of the NCHS charts, although during the second survey period boys gained some weight, such that some respective weight-for-age and height-for-age values reached the 25th percentile.

Females. When compared to rural boys weight-for-age values were better off for rural girls. Their values reached the 25th during the first year of life, and above the 10th percentile after their second birthday (Figure 6.5). However, rural girls were still shorter than the reference population. The situation was similar with urban girls, although the urban girls had better weight-for-age and height-for-age values than the rural girls, their weight-for-age values were mostly between the 5th and 25th percentiles during the first period, and between the 10th and 25th percentiles during the second survey period (Figure 6.6).

An interesting situation is noted in Figures 6.7 and

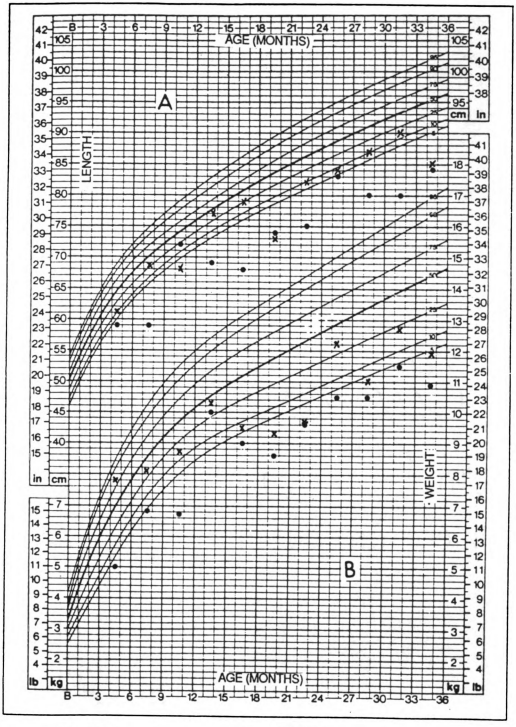


Figure 6.2 Mean Weights and Lengths for Urban Boys Relative to the NCHS Reference Population

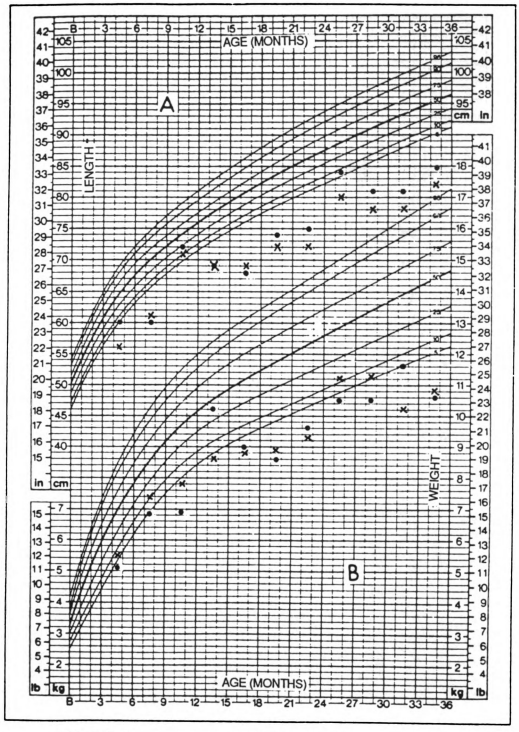
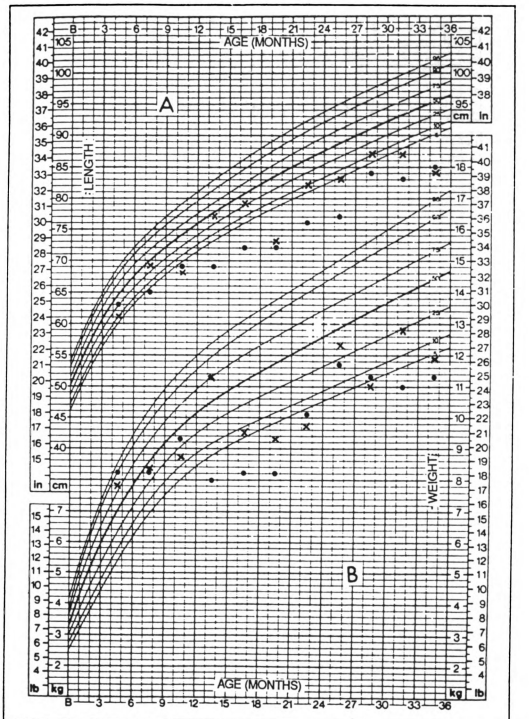


Figure 6.3 Mean Weights and Lengths for Boys During the First Survey Period Relative to the NCHS Reference Population



• Rural Boys × Urban Boys

Figure 6.4 Mean Weights and Lengths for Boys During the Second Survey Period Relative to the NCHS Reference Population

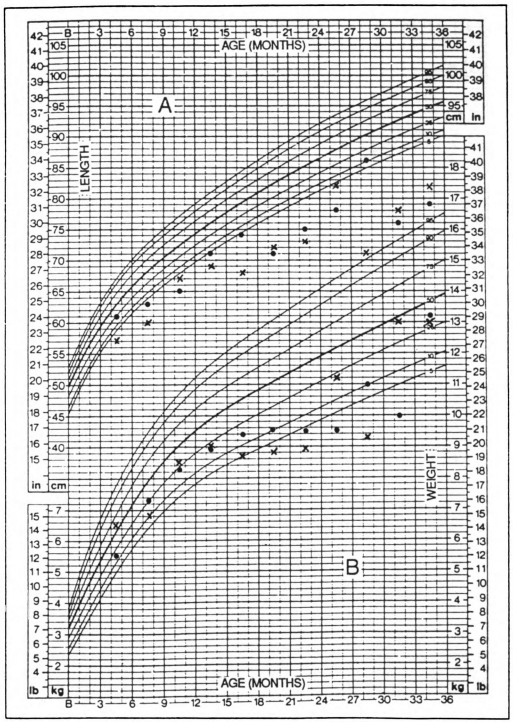
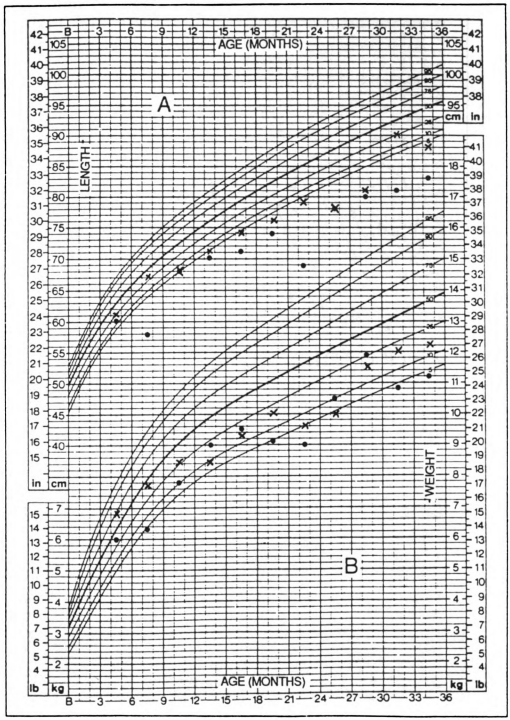
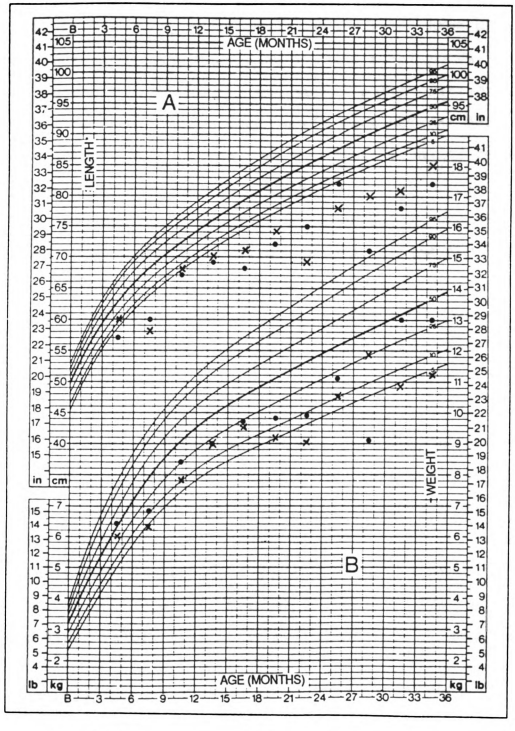


Figure 6.5 Mean Weights and Lengths for Rural Girls Relative to the NCHS Reference Population



• Period 1 x Period 2

Figure 6.6 Mean Weights and Lengths for Urban Girls Relative to the NCHS Reference Population



• Rural Girls × Urban Girls

Figure 6.7 Mean Weights and Lengths for Girls Relative to the NCHS Reference Population During the First Survey Period

6.8. For example, rural girls were heavier than urban girls for most age groups during the first survey period (Figure 6.7). But during the second survey period the opposite took place - urban girls were heavier for most age groups. Most of their weight-for-age values fell between the 5th and 25th percentiles.

Concerning height-for-age urban girls were taller than rural girls for most age groups. Unlike was the case for weight-for-age, the girls were very short. Almost all of the values fell below the 5th percentile (see Figure 6.7 and Figure 6.8 - top part) of the NCHS reference population.

Comparison Within and Between One-Year Age Groups

Because the sample population was found to have smaller anthropometric values when compared to the American population, the values of boys and girls were simply compared together without reference to the NCHS population. Thus, the discussion that follows compares the obtained values without refering to the NCHS charts.

Weight-for-Age

Anthropometric measurements yielded interesting, but in no large measure, unpredictable results. When children were grouped into one-year age groups the following results were obtained. Figures 6.9 and 6.10 present the weights of boys in the two respective areas during the two

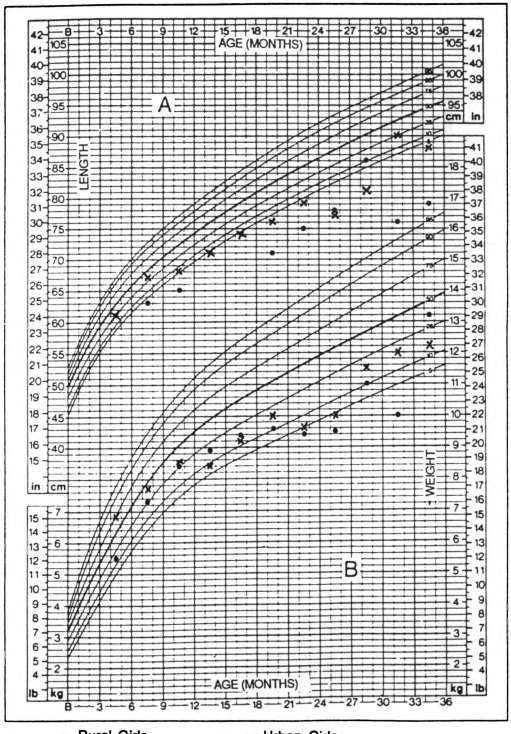


Figure 6.8 Mean Weights and Lengths for Girls Relative to the NCHS Reference Population During the Second Survey Period

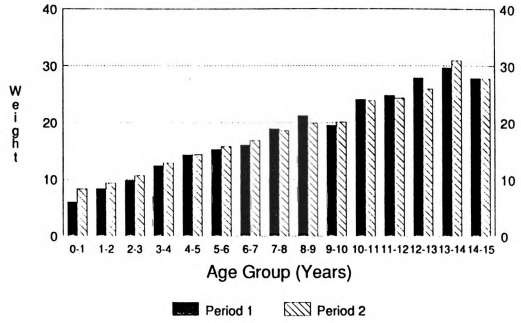


Figure 6.9 Rural Male Weight (in kg)

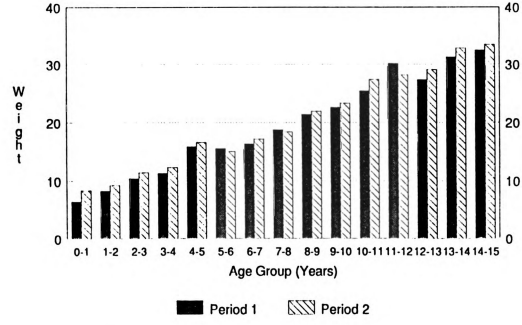


Figure 6.10 Urban Male Weight (in kg)

survey periods. Figure 6.9 indicates that some minor weight loss was experienced for older age groups in the rural area. On the other hand, only age groups 5-6, 7-8, and 11-12 years in the urban children experienced weight loss (Figure 6.10). Figures 6.9 to 6.32 are made from values presented in Appendix B1 to Appendix B6.

In almost all cases, and at most different age groups, rural male children were lighter than urban children (Figure 6.11 and Figure 6.12), especially older boys, from age 8 years and onwards. Before then the mean weight of rural and urban boys were identical, except for age group 4-5 when the urban boys are heavier than rural boys during the first survey period (Figure 6.11), and age group 1-2 years during the second survey period (Figure 6.12).

The situation for girls was similar to that of the boys (Figure 6.13 and Figure 6.14), but with some notable differences. For example, the weight of rural girls rose with age between the two survey periods until age group 11-12 years when the weight declined (Figure 6.13). The situation for urban girls was similar to that of rural girls (Figure 6.14). In all situations weight gain was very minimal between the ages of 3 and 10 years.

Figure 6.15 and Figure 6.16 show the differences between rural and urban girls. The first noticeable difference is that rural girls were heavier than urban girls during the first three years of life, although

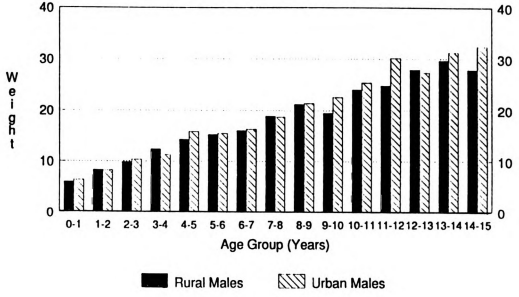


Figure 6.11 Male Weight (in kg)
During Survey Period 1

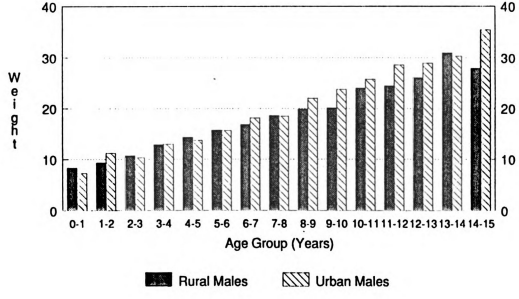


Figure 6.12 Male Weight (in kg)
During Survey Period 2

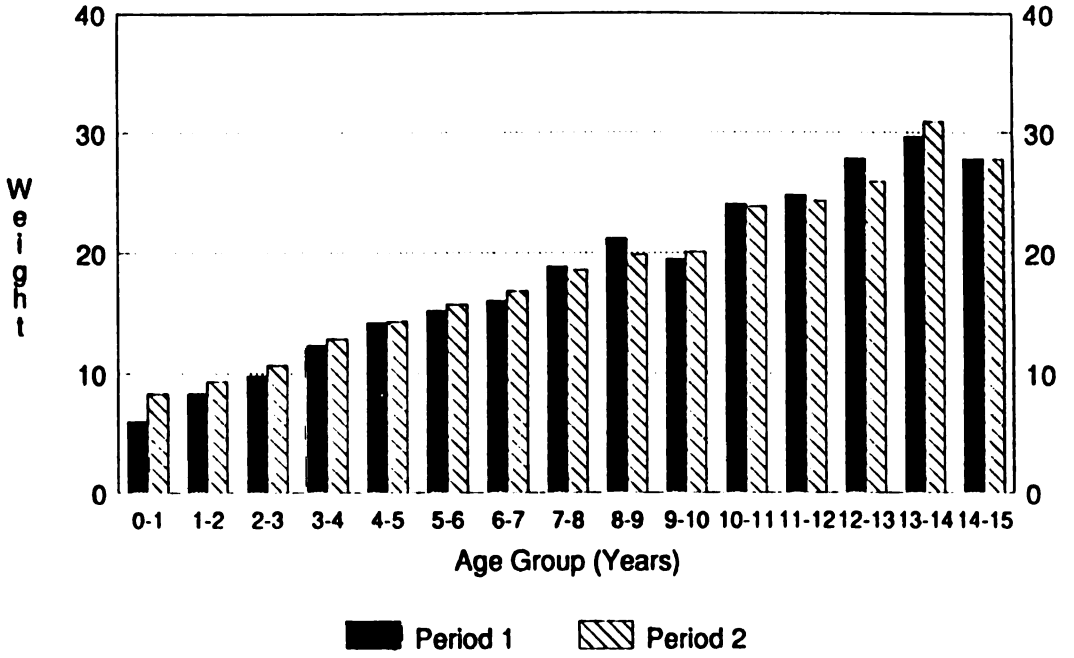


Figure 6.13 Rural Female Weight (in kg)

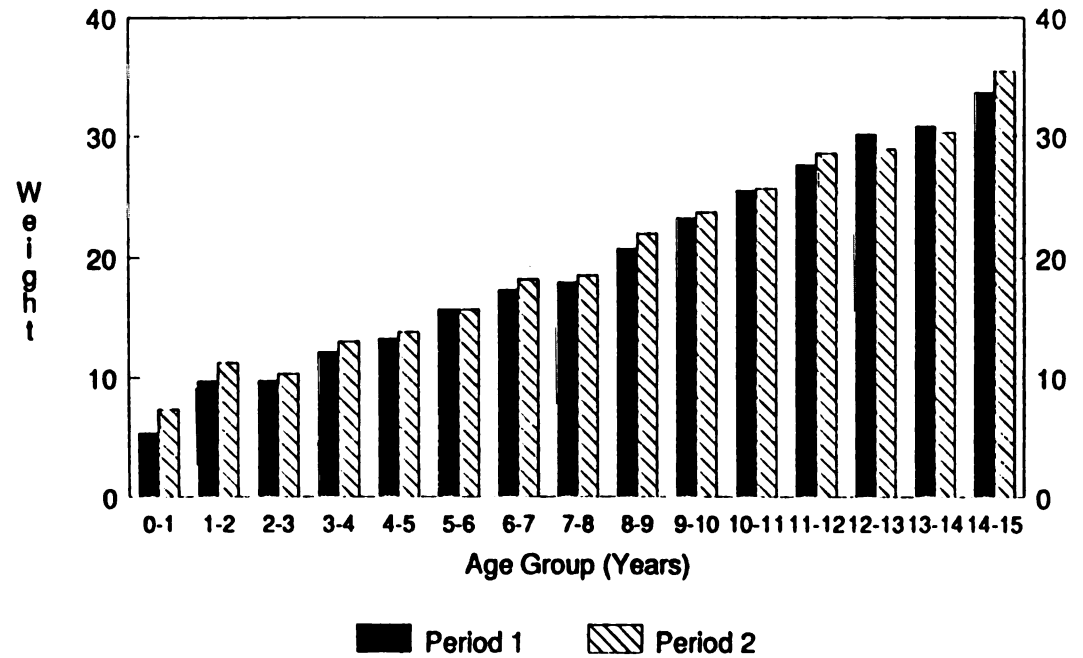


Figure 6.14 Urban Female Weight (in kg)

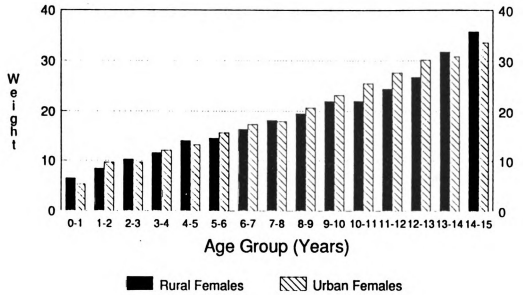


Figure 6.15 Female Weight (in kg)
During Survey Period 1

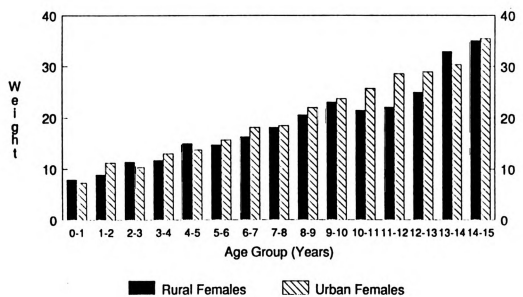


Figure 6.16 Female Weight (in kg)
During Survey Period 2

during the second year urban girls were heavier. Second, the mean weight difference between ages 8 and 14 was especially large between the two groups, and particularly in the second survey period.

One interesting and surprising finding from this research is that the weight of children increased between the two survey periods - it was expected to decline. However, as has been demonstrated in the preceeding figures, some age groups, especially the older age groups above 8 years of life actually lost weight in the rural area. Also age groups between 4 and 8 years show little growth, an indication of growth retardation. The biggest increases were for children under three years of life. The mean weight for urban girls increased from 19.7 kg to 20.3 kg and from 16.9 kg to 17.2 kg for rural girls. The figures further suggest that in certain instances the mean weight dropped for girls aged 11 years or older between the two survey periods.

From Table 6.4 we note that on the whole boys were heavier than girls for most age groups. Nonetheless the girls were heavier than boys for both time periods in the age group 1-2 years. Also there were other age groups in which girls were heavier than boys, especially girls aged older than 11 years.

Table 6.4. Weight (in kg) of Children by Age Group and Gender*

Age Group	Survey Period 1 Males	Survey Period 1 Females	Survey Period 2 Males	Survey Period 2 Females
0- 1	6.18 (1.334,33)	6.11 (1.202,25)	8.34 (1.072,30)	7.68 (1.629,23)
1- 2	8.29 (1.865,46)	8.71 (4.176,54)	9.30 (2.014,42)	9.39 (4.588,47)
2- 3	10.07 (1.932,53)	9.97 (2.505,48)	11.01 (2.064,48)	10.87 (2.735,38)
3- 4	11.87 (2.411,44)	11.81 (2.128,38)	12.61 (2.635,42)	12.31 (2.409,36)
4- 5	14.92 (4.195,49)	13.70 (4.461,45)	15.24 (4.523,44)	14.52 (4.630,43)
5- 6	15.32 (2.729,50)	14.98 (3.523,33)	15.38 (3.759,44)	15.10 (3.759,29)
6- 7	16.13 (2.852,37)	16.77 (2.946,43)	16.99 (2.805,33)	17.16 (3.105,40)
7- 8	18.78 (2.923,33)	17.97 (2.883,35)	18.50 (3.365,29)	18.32 (2.931,33)
8- 9	21.27 (4.490,32)	20.14 (3.063,33)	20.68 (3.935,28)	20.94 (3.466,31)
9-10	21.43 (3.850,30)	22.61 (3.578,40)	22.02 (4.148,27)	23.38 (3.569,36)
10-11	24.73 (5.090,30)	23.84 (4.439,32)	25.52 (5.893,28)	23.46 (4.087,25)
11-12	27.57 (6.503,27)	26.75 (5.276,26)	25.91 (4.844,22)	27.07 (6.060,22)
12-13	27.60 (4.334,42)	28.25 (4.506,38)	27.25 (4.668,36)	26.52 (5.178,32)
13-14	30.35 (6.671,29)	31.29 (6.807,31)	31.82 (6.359,28)	31.63 (8.178,27)
14-15	30.52 (6.533,22)	34.60 (7.774,26)	30.90 (6.967,20)	35.27 (8.368,24)

*Values in parentheses are, respectively, the standard deviation and number of cases for each age group.

Mid-Upper Arm Circumference

Results show that in general the mid-upper arm circumference increased for boys during the second survey period (Figure 6.17 and Figure 6.18). Although the differences can be considered to be minor in most cases, the general trend was that boys had bigger arm circumferences during the second survey period than they did during the first survey period. As was the case with the results on weight rural boys between the ages of 7 and 11 years had lower arm circumferences in the second survey period (Figure 6.17). The urban boys had consistently bigger arm circumferences during the second survey period than they had in the first (Figure 6.18).

Generally, urban boys had bigger arm circumferences than rural boys (Figure 6.19 and Figure 6.20). Particularly during the second survey all age groups, except 6-7, in the urban area had higher values than the rural area. As with weight the biggest differences were experienced in very young (less than 3 years) and older (10 years and above) boys, respectively.

The mean arm circumferences for girls increased during the two survey periods, although the differences between the two periods could not be considered large in most instances (Figure 6.21 and Figure 6.22). During the first three years of life the increases were noticeable. Figure 6.22 shows that urban girls, 10 years or older, actually had lower mean mid-upper arm circumference during

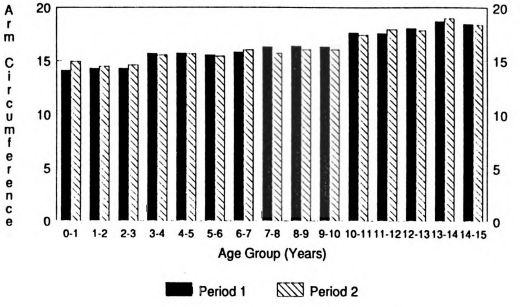


Figure 6.17 Rural Male Arm Circumference (in cms)

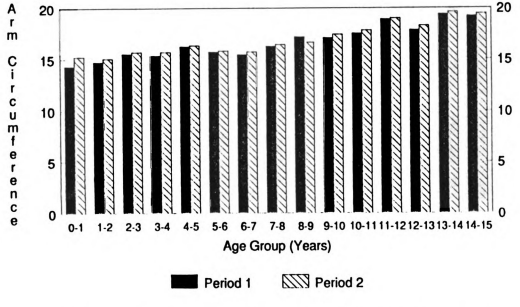


Figure 6.18 Urban Male Arm Circumference (in cms)

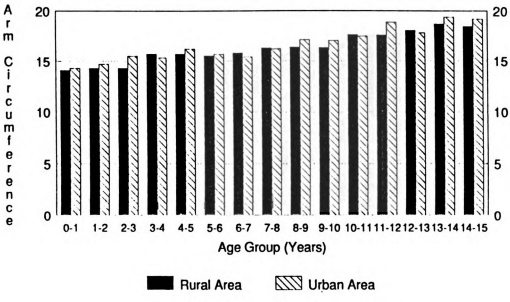


Figure 6.19. Male Arm Circumference (in cms) During Survey Period 1

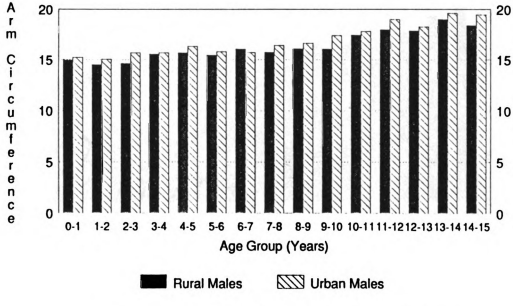


Figure 6.20. Male Arm Circumference (in cms) During Survey Period 2

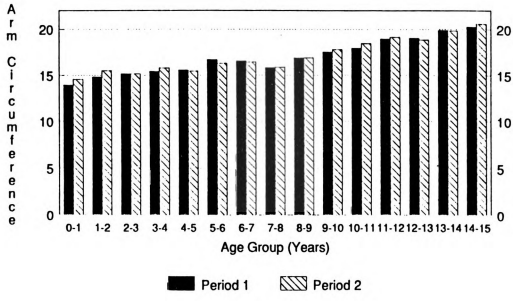


Figure 6.21. Rural Female Arm Circumference (in cms)

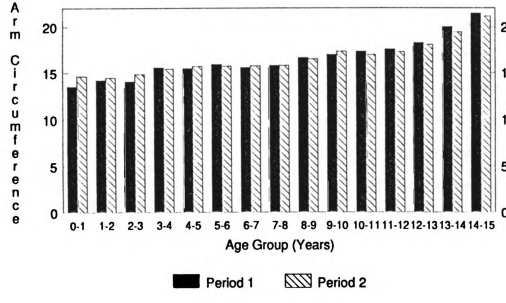


Figure 6.22. Urban Female Arm Circumference (in cms)

the second survey period than they did in the first.

Results further indicate that rural girls had higher mean mid-upper arm circumferences than urban girls (Figure 6.23 and Figure 6.24), except for age group 14-15 years when urban girls had bigger arm circumferences. This situation was completely different with that of the urban boys whose values were consistently higher than those of rural boys. It appears then that seasonality favored urban boys than it did urban girls.

Male children had a higher mean mid-upper arm circumference than female children. The mean mid-upper arm circumference for boys was 16.44 cms as compared to 17.11 cms in Area 2. The respective values for phase 2 were 16.10 cms and 16.13 cms.

The situation painted above could be an oversimplification of the issues involved in that although male mid-upper arm circumference was higher than that of females, usually arm circumferences of several age groups were higher for girls than they were for boys from age 5 years onwards (Table 6.5). But as has been indicated above, the differences were minimal in certain cases.

Height-for-Age

Figure 6.25 and Figure 6.26 give the mean heights of rural and urban male children respectively. As was expected the height of the children increased with age during the survey periods. Higher increments were observed

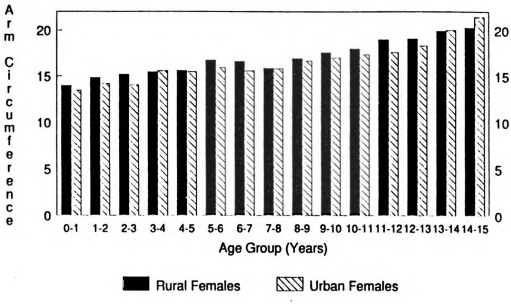


Figure 6.23. Female Arm Circumference (in cms) During Survey Period 1

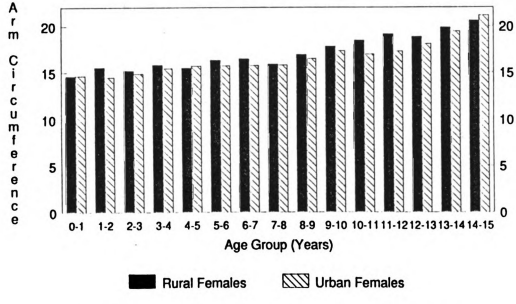


Figure 6.24. Female Arm Circumference (in cms) During Survey Period 2

Table 6.5. Mid-Upper Arm Circumference (in cms) of Children By Age Group and Gender*

Age Group	Survey Period 1		Survey Period 2	
	Males	Females	Males	Females
0- 1	14.15 (1.064,33)	13.60 (1.652,25)	15.07 (1.194,30)	14.61 (1.288,23)
1- 2	14.52 (1.443,46)	14.34 (1.610,54)	14.80 (1.288,42)	14.71 (1.614,47)
2- 3	14.88 (1.412,53)	14.58 (1.811,48)	15.09 (1.386,48)	15.00 (1.648,38)
3- 4	15.53 (1.579,44)	15.47 (1.230,38)	15.61 (1.359,42)	15.63 (1.317,36)
4- 5	15.92 (1.249,49)	15.48 (1.544,45)	15.93 (1.362,44)	15.63 (1.578,43)
5- 6	15.60 (1.165,50)	16.26 (1.404,33)	15.61 (1.405,44)	15.98 (1.385,29)
6- 7	15.61 (1.072,37)	16.06 (1.301,43)	15.86 (1.040,33)	16.09 (1.260,40)
7- 8	16.28 (1.160,33)	15.79 (1.365,35)	16.03 (1.069,29)	15.85 (1.389,33)
8- 9	16.70 (1.396,32)	16.78 (1.359,33)	16.29 (1.384,28)	16.71 (1.263,31)
9-10	16.78 (1.040,30)	17.26 (1.367,40)	16.86 (1.374,27)	17.60 (1.383,36)
10-11	17.57 (1.756,30)	17.65 (1.410,32)	17.61 (1.718,28)	17.70 (1.507,25)
11-12	18.23 (1.903,27)	18.56 (1.857,26)	18.39 (2.799,22)	18.73 (2.256,22)
12-13	17.95 (1.517,42)	18.62 (1.531,38)	18.03 (1.673,36)	18.41 (1.634,32)
13-14	19.00 (2.121,29)	19.94 (1.792,31)	19.27 (2.106,28)	19.65 (1.890,27)
14-15	18.89 (1.414,22)	20.79 (2.196,26)	18.98 (1.736,20)	20.83 (2.135,24)

*Values in parentheses are the respective standard deviation and number of cases for each age group.

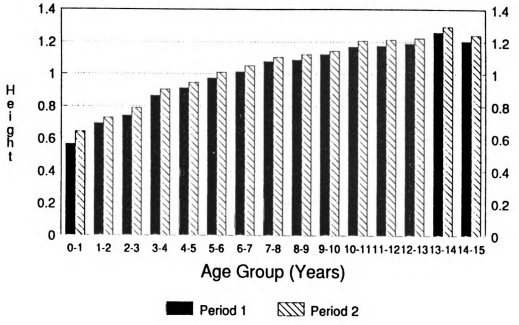


Figure 6.25 Rural Male Height (in m)

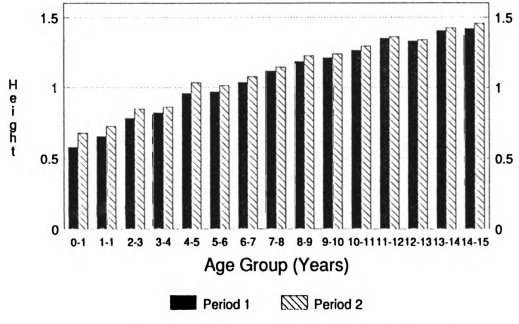


Figure 6.26 Urban Male Height (in m)

for children less than three years old.

Urban boys were taller than rural boys (Figure 6.27 and Figure 6.28). The differences were larger for older age groups. It is interesting to note that rural boys less than two years old were taller than urban boys during the first survey period. Height differences were minimal between the ages 4 and 8 years during both time periods.

Similarly, the girls increased in height with age. The increment in height is not as great as it was for either weight or arm circumference. Unlike the measurements of weight and mid-upper arm circumference the values during the second survey were always equal to or higher than those during the first survey (Figure 6.29 and Figure 6.30).

Figure 6.31 and Figure 6.32 show the differences between the rural and urban girls. Generally, the values are not very different between rural and urban girls before the age of six years. Urban girls were taller than the rural girls after the age of six years.

As was the case with weight, urban boys and girls were taller than rural children in most of the age groups, especially at older age groups. Thus, on the whole, urban children were generally heavier and taller than rural children (Table 6.6).

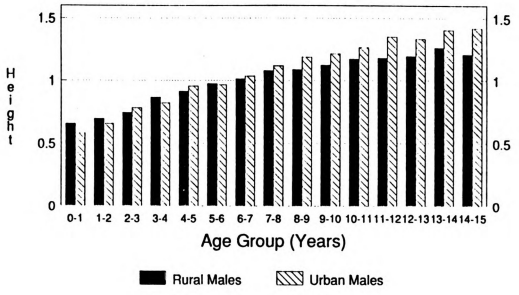


Figure 6.27 Male Height (in m)
During Survey Period 1

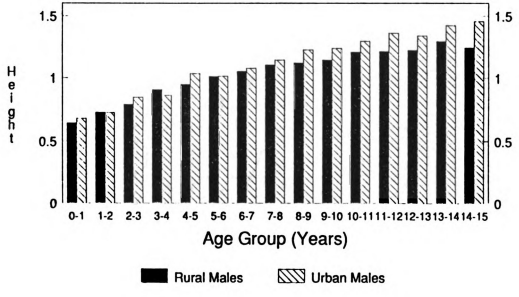


Figure 6.28 Male Height (in m)
During Survey Period 2

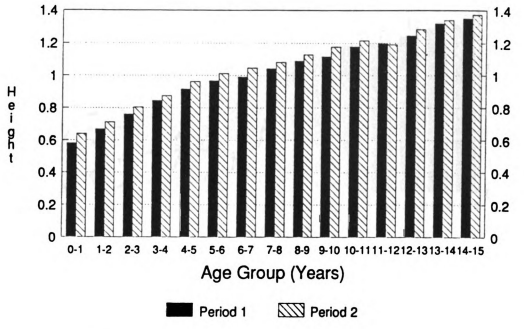


Figure 6.29 Rural Female Height (in m)

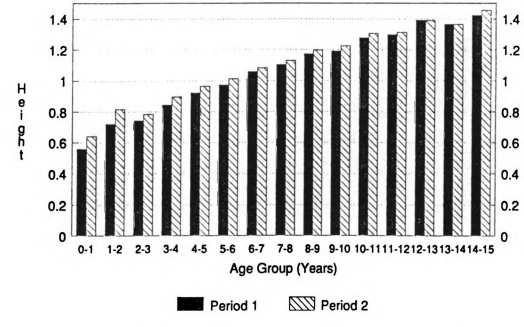


Figure 6.30 Urban Female Height (in m)

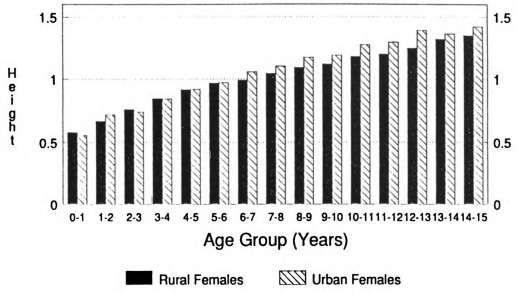


Figure 6.31 Female Height (in m)
During Survey Period 1

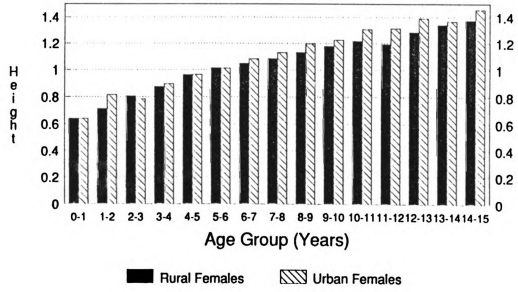


Figure 6.32 Female Height (in m)
During Survey Period 2

Table 6.6. Height (in m) of Children by Age Group and Gender*

Age Group	Survey Period 1 Males	Survey Period 1 Females	Survey Period 2 Males	Survey Period 2 Females
0- 1	.570 (.057,33)	.573 (.064,25)	.658 (.052,30)	.640 (.042,23)
1- 2	.669 (.089,46)	.682 (.137,54)	.727 (.078,42)	.736 (.137,47)
2- 3	.761 (.089,52)	.750 (.069,48)	.815 (.084,48)	.795 (.075,38)
3- 4	.845 (.092,44)	.843 (.074,38)	.885 (.084,42)	.885 (.083,36)
4- 5	.931 (.111,49)	.916 (.112,45)	.973 (.122,44)	.962 (.110,43)
5- 6	.969 (.092,49)	.969 (.103,33)	1.011 (.103,44)	1.013 (.096,28)
6- 7	1.024 (.088,37)	1.024 (.111,43)	1.064 (.078,33)	1.063 (.080,40)
7- 8	1.092 (.086,33)	1.077 (.095,35)	1.123 (.089,29)	1.110 (.087,32)
8- 9	1.128 (.125,32)	1.133 (.095,33)	1.160 (.116,27)	1.164 (.089,31)
9-10	1.178 (.082,30)	1.155 (.129,40)	1.200 (.093,27)	1.202 (.121,36)
10-11	1.216 (.139,30)	1.230 (.092,32)	1.249 (.120,28)	1.259 (.077,25)
11-12	1.266 (.149,27)	1.270 (.135,26)	1.275 (.124,22)	1.286 (.122,22)
12-13	1.253 (.150,42)	1.310 (.142,38)	1.270 (.135,35)	1.327 (.127,32)
13-14	1.324 (.143,29)	1.342 (.142,31)	1.355 (.140,28)	1.352 (.133,27)
14-15	1.330 (.161,22)	1.389 (.169,26)	1.361 (.164,20)	1.417 (.164,24)

* Values in parentheses are respective standard deviations and number of cases for each age group.

Body Mass Index

The body mass index (BMI) is understood to be (weight (in kg)/height (in m)2), i.e. it is calculated by dividing weight (in kilograms) by height squared (in meters). It is used to measure obesity, excess body fat that frequently results in significant health impairments of health (Burton et al., 1985: 157). The BMI is a useful descriptive measure (independent of height) and useful evaluative measure when compared to BMI levels at desirable and other weights.

I could not find specific BMI standards for children. I have therefore simply used the values for adults aged between 25 and 30 years. BMI values above 26.9 for women and 27.2 for men are considered to indicate overweight conditions for individuals concerned. Ideal indices for men and women are 22.4 and 22.7 respectively. Almost all the children in the research area were found to have desirable weight for height as their indices fell below or around the desirable weight standards.

Clinical Records

Each child in Zambia is given an under-five clinic card. Like all growth curve charts the card has two lines against which the growth of the child is monitored. The card is based on the Harvard system of nutritional assessment. Children whose records fall between the curves are said to be on the road to health, especially if their

particular curve is not dropping. A child's curve above the upper curve may cause concern. However, a child's curve below the lower curve causes concern for both the parents and health professionals.

To check weight-for-age records at Chiwala Rural Health Center entries of new attendances and reattendances were consulted between January and June 1987 (Chiwala RHC, 1987). Attendances had dropped between the time the health center was opened in May 1986 and June 1987, the initial time of survey for this study.

The staff at health centers are required to record whether or not a given child increased in weight, had not declined between two successive visits to the health increased in weight (static), or if the weight actually declined. The staff also note if the weight falls above the upper curve, between the two curves, or below the lower curve. The tallies are converted into percentages and sent to the national Ministry of Health headquarters in Lusaka through the district and provincial headquarters.

The clinical records indicate that, for the most part, the majority of the children were gaining weight (Table 6.7). A few remained static, and some were actually losing weight. Most of the children whose weight did not increase were between the ages of 12 and 23 months. A few more who lost weight were between the ages of 24 and 59 months. Most of the children that lost weight lost it

Table 6.7. Growth Patterns of Children Attending Chiwala Rural Health Center, January - June 1987

Age Group	% Growing						% Static						% Losing Weight					
	J	F	M	A	M	J	J	F	M	A	M	J	J	F	M	A	M	J
0-11	78	57	82	88	85	89	16	7	9	7	8	9	7	36	9	5	8	2
12-23	74	36	45	67	25	68	6	18	13	8	50	3	21	45	42	25	25	29
24-59	71	33	73	67	60	50	6	0	20	17	20	0	24	67	7	17	20	50
Total	74	46	66	81	76	80	11	11	12	9	13	7	14	43	21	10	10	13

between the months of January and March.

This may be a misleading way to look at the children's growth. The tallies are made simply in relation to the last visit. However, they are indicative of the conditions in the research area. Over 50 percent of the children fell below the lower curve. These were the children at risk of developing malnutrition. But the values also reflect the role of seasonality (Table 6.8). For example, before April very few children were between the two curves, but after March most of them were.

Testing the Hypotheses

The data were subjected to grouped and paired t-tests. The following section focuses on the results of the tests, starting with the grouped tests. The null hypothesis is rejected when the PROB-value is less than 0.05, and accepted when the PROB-value is equal to or greater than 0.05. The reason for these decisions is that when the PROB-value approaches 1 the belief in the null hypothesis increases while a PROB-value that approaches 0 diminishes the belief in the null hypothesis (Barber, 1988: 274).

Significant differences were found to exist between Areas 1 and 2 for the anthropometric measurements of weight, arm circumference, and height. All the PROB-values were 0.000 (t-values in parentheses) for WEIGHT1 (-3.44), WEIGHT2 (-3.96), ARM1 (-4.53), ARM2 (-5.06), HEIGHT1

Table 6.8. Position of Children in Growth Patterns, January - June 1987

Age Group	% Above Upper Line						% Between Curve Lines						% Below Lower Lines					
	J	F	M	A	M	J	J	F	M	A	M	J	J	F	M	A	M	J
0-11	10	7	16	27	24	29	67	80	54	63	62	58	22	13	30	10	14	13
12-23	9	0	0	15	0	0	35	50	50	69	100	79	56	50	50	15	0	21
24-59	0	0	0	0	0	0	53	17	60	50	60	100	47	87	40	50	40	0
Total	8	3	8	23	20	18	56	62	53	63	65	66	36	34	39	14	15	16

(-5.51), and HEIGHT2 (-5.22). In each of these cases the null hypothesis that no significant difference occurred in the anthropometric measurement between the two research areas was rejected and the alternate hypothesis accepted that Area 2 was better off than Area 1.

The results are mixed for the differences between boys and girls. The null hypotheses that no significant differences existed between boys and girls were rejected for ARM1 (PROB-value = 0.03, t-value = 1.88) and ARM2 (PROB-value = 0.03, t-value = 1.89). In this regard, significant differences were found to exist between boys and girls in the mid-upper arm circumferences. The null hypotheses were not rejected for weight and height. It was concluded that no significant differences existed between boys and girls for WEIGHT1 (PROB-value = .16, t-value = .99), WEIGHT2 (PROB-value = 0.19, t-value = .88), HEIGHT1 (PROB-value = .12, t-value = 1.16), and HEIGHT2 (PROB-value = .12, t-value = 1.18). These results explain to some extent the observation made already that at certain age groups girls were taller and heavier than boys.

The anthropometric measurements of children who were kept by their guardians at the time of the survey were compared to those of other children who were not being kept by their own mothers. All the PROB-values for weight, mid-upper arm circumference, and height were 0.00. We therefore rejected the null hypothesis that no significant

difference existed between the two groups, and concluded that children who were looked after by their own mothers-cum-parents had a better nutritional status than those children who were looked after by relatives. The following were the t-values, namely: -64.41 for WEIGHT1, -64.03 for WEIGHT2, -238.80 for ARM1, -234.57 for ARM2, -121.94 for HEIGHT1, and -127.27 for HEIGHT2.

The education category was reorganized such that those children from households whose mothers had declared no formal education or simply did not answer the question on formal education were put into one group. The rest of the children were put into another group. The mothers' levels of education produced mixed results. The null hypotheses that no significant differences existed between the anthropometric measurements of the two groups were rejected for WEIGHT1 (PROB-value = 0.000, t-value = 2.63), WEIGHT2 (PROB-value = 0.03, t-value = 2.16), ARM1 (PROB-value = 0.01, t-value = 2.35), and ARM2 (PROB-value = 0.04, t-value = 1.82). We concluded that children of educated mothers had better nutritional status, viz weight and mid-upper arm circumference, than those from noneducated mothers. However, no significant differences were found for HEIGHT1 (PROB-value = 0.06, t-value = 1.57) and HEIGHT2 (PROB-value = 0.06, t-value = 1.55).

Similarly, the father's level of educational level produced mixed findings. For example, only for WEIGHT1 (PROB-value = 0.03, t-value = -1.12) and ARM1 (PROB-value

= 0.04, t-value = -1.80) were significant differences found to exist. Therefore, the null hypothesis that no significant difference existed between the father's level of education in each case was rejected. On the other hand, for WEIGHT2 (PROB-value = 0.29, t-value = -0.56) ARM2 (PROB-value = 0.08, t-value = -1.36), HEIGHT1 (PROB-value = 0.14, t-value = -1.07), and HEIGHT2 (PROB-value = 0.12, t-value = -1.16) no significant differences were found. These were unexpected findings. Perhaps one reason for these results is that the educational levels of the fathers were not very different for most of the households as compared to those of respondents (mothers). For example, many fathers had secondary school education.

The role of seasonality was tested on weight, mid-upper arm circumference, and height, through the use of paired t-tests. In all the cases the null hypotheses were rejected because the PROB-values were less than 0.05, namely: PROB-value = 0.04 and t-value = -0.53 for weight, PROB-value = 0.00 and t-value = -0.04 for height, and PROB-value = 0.02 and t-value = -0.14 for mid-upper arm circumference.

As has been indicated above, on average, children gained weight during the study period. This has been an unexpected finding. This unexpected finding might exist because the people in the villages especially might have developed strategies to cope with the situation during the rainy season. Various food types are stored specifically

for the rainy season, although in certain cases the stored foods are not enough to last them the entire rainy season. Moreover, certain foodstuffs are extensively and intensively used during the hungry months such as mangoes in December, mushrooms in January and February, as well as pumpkins and other edible gourds in February and March which tend to cushion most people from losing weight. The only problem with these food types is that they are very low in nutritive values.

Respondents in the Township are also affected by the changes in the surrounding villages. It is common for them to have small vegetable gardens at the back of their houses. However, for much of the vegetables most of the households depend on the marketable foodstuffs that villagers bring for sale. In fact, the Township people are very susceptible to the fluctuations in the marketable crops and foodstuffs. During the time of research one could only see very few vegetables on sale during certain months.

In a way an increase in the weight of children could be expected given that in growing children weight is supposed to increase unless the health and nutritional situations in the households deteriorate so much to critically undermine the children's growth patterns. The same situation is the case for mid-upper arm circumference and height. With regard to height six months is not that long a time to see overwhelming growth taking place.

How could this situation possibly be explained? Although it is intuitively sound to assume that rural areas are worse off than urban areas, in a small rural place like Mporokoso District, not many people have as high incomes as those living in bigger towns such as Lusaka.

To a large extent, urban households depend on the villagers who provide daily needs in terms of foods. For those in rural areas they have their own pieces of land on which they grow what they need. During the interviews respondents were asked to mention what they regarded to be the number one nutritional problem. For those who answered that they did not "see" any problem, a typical answer was: "We have our own piece of land from which we grow what we eat. Unless we experience a drought or something like that, we do not think there exists a problem."

Unlike in some urban areas where a variety of foodstuffs are consumed at one sitting (the situation which is fast disappearing because of the high cost of living), this situation was rarely observed in the study areas. But Area 2 seemed to have more variety, and especially more protein foods than Area 1. And some villages were better off than others in this respect as well.

Pearson Correlation Coefficients

In order to examine how variables correlated with each other, the Pearson Product Moment Correlation matrix was generated using the SPSS-X package. The matrix on 20 variables was generated for the entire sample for the two separate areas. The interest here was on learning the relationships between the anthropometric variables of weight and height and the others. The list of variables that were included in the matrix is presented in Table 6.9 while Table 6.10 presents the correlation coefficients. Only values of 0.6 or greater and -6.0 or lower were taken to be of great importance in their association with other variables.

We note that all the anthropometric measures of weight, height, and mid-upper arm circumference were positively and highly correlated with each other (Table 6.10). The situation was true with other variables, namely WEIGHT2, HEIGHT1, and HEIGHT2, except for the individual correlation coefficients. With the exception of MAGE and PAGE whose correlation coefficients were at least 0.20 the rest of the variables had coefficients bordering around zero - indicating that no correlation exists between the variables of interest and the three anthropometric variables (Table 6.10).

Table 6.9. Description of the Variables Used in Product Moment Pearson Correlation and in Stepwise Multiple Regression Analysis

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Dependent

WEIGHT1 - Weight of the child in kilograms during phase 1
WEIGHT2 - Weight of the child in kilograms during phase 2
ARM1 - Mid-upper arm circumference in centimeters during phase 1
ARM2 - Mid-upper arm circumference in centimeters during phase 2
HEIGHT1 - Height of the child in meters during phase 1
HEIGHT2 - Height of the child in meters during phase 2

Independent
AGE - Age of the child in years.
MAGE - Mothers age in years.
PAGE - Fathers age in years.
PARITY - Order of birth of the child.
HSIZE - Number of people in the household.
DENSITY - Number of persons per room.
WORKERS - Number of people working in the household. (For villages anyone over 15 years of age was considered a worker.)
MOHEIGHT - Mother's height in meters.
MOWEIGT1 - Mother's weight in kilograms during phase 1.
MOWEIGT2 - Mother's weight in kilograms during phase 2.
EDMOTHER - Years of formal education of mother.
EDFATHER - Years of formal education of father.
DISTANCE - Distance to nearest clinic in kilometers.
DISTANCH - Distance to Mporokoso District Hospital in kilometers.

Table 6.10. Pearson Correlation Coefficients

Variable	Area 1				Area 2			
	WEIGHT1	WEIGHT2	HEIGHT1	HEIGHT2	WEIGHT1	WEIGHT2	HEIGHT1	HEIGHT2
Age	.889	.861	.869	.876	.890	.872	.921	.917
MAge	.401	.389	.341	.372	.226	.209	.251	.219
PAge	.347	.342	.302	.329	.247	.250	.228	.230
PARITY	-.049	-.044	-.060	-.077	-.097	-.095	-.058	-.076
HSIZE	.197	.235	.232	.248	.142	.148	.193	.181
DENSITY	-.043	-.002	-.000	.008	.087	.083	.132	.132
WORKERS	.084	.122	.030	.059	-.010	-.015	-.002	-.008
WEIGHT1	1.000	.949	.869	.883	1.000	.980	.931	.933
WEIGHT2	.949	1.000	.848	.865	.980	1.000	.916	.922
ARM1	.829	.772	.752	.749	.855	.843	.779	.774
ARM2	.807	.819	.663	.677	.815	.834	.717	.730
HEIGHT1	.869	.848	1.000	.983	.931	.916	1.000	.991
HEIGHT2	.883	.865	.983	1.000	.933	.922	.991	1.000
MOHEIGHT	.003	.018	.061	.050	.036	.011	.035	.011
MOWEIGT1	.083	.100	.069	.093	.107	.091	.086	.060
MOWEIGT2	.079	.116	.088	.127	.083	.102	.062	.068
EDMOTHER	-.095	-.056	-.036	-.024	-.091	-.089	-.100	-.103
EDFATHER	-.066	-.056	-.012	-.016	-.014	-.003	-.028	-.020
DISTANCE	-.102	-.109	-.026	-.034	-.090	-.117	-.093	-.117
DISTANCH	-.109	-.108	-.075	-.072	-.067	-.095	-.116	-.134

Stepwise Multiple Regression Analysis

In order to find out the determinants of some of the anthropometric measurements, which in turn are indicators of nutritional status, a stepwise multiple regression analysis was performed on the data. In multiple regression analysis the variables that have the greatest influence are entered first. The process continues until no more variables can be entered. In this study, WEIGHT1, WEIGHT2, ARM1, ARM2, HEIGHT1, and HEIGHT2 were the dependent variables and the rest of the variables independent variables. Acceptance levels for the variables were set at a = 0.05. Analysis is carried out on both the total area and separate research areas. The t-statistic values are given in parenthesis below the variables.

For WEIGHT1 the following equation was obtained:

$$\underset{\text{(3.559)}}{5.58(\text{CONSTANT})} + \underset{\text{(58.235)}}{1.86(\text{AGE})} + \underset{\text{(3.855)}}{.06(\text{MOWEIGT1})} - \underset{\text{(-3.447)}}{.39(\text{DENSITY})} + e$$

The equation above indicates that for WEIGHT1, or the weight of children during the first visit, their respective ages, the mothers' weight during the first visit, and the household density were important determinants of their weights. Of great importance was the result that whereas age and mother's weight affected the weights of the children positively, density affected them negatively. One interpretation of this finding is that the

higher the value of the household density, the smaller the weight of the children was. But the higher the child's age and the mother's weight were the bigger the child's weight was.

The second equation was obtained for WEIGHT2, the children's weight during the second phase of the survey. The age of the child, mother's weight during the second phase, distance to Mporokoso District Hospital, the mother's level of education, and the density of the household had important bearing on the weight of the children during the second phase of the study. DISTANCH had a negative influence on weight during the second survey period and none during the first. The following equation was obtained:

$$\underset{}{\text{WEIGHT2}} = \underset{(2.293)}{2.44(\text{CONSTANT})} + \underset{(52.100)}{1.80(\text{AGE})} + \underset{(4.208)}{.07(\text{MOWEIGT2})}$$

$$- \underset{(-2.538)}{.01(\text{DISTANCH})} + \underset{(2.202)}{.11(\text{EDMOTHER})} + e$$

The third equation was obtained for ARM1, the mid-upper arm circumference during the first visit. As was the case with the first two equations, the age of the child, mother's weight during the first visit, parity, and distance to Mporokoso District Hospital, were the major determinants of the children's mid-upper arm circumference. However, these variables could only explain 54 percent of the determinants as measured by adjusted R^2. The following equation was obtained:

$$\underset{(34.854)}{12.13(\text{CONSTANT})} + \underset{(30.240)}{.37(\text{AGE})} + \underset{(6.341)}{.04(\text{MOWEIGT1})}$$

$$- \underset{(-4.023)}{.04(\text{PARITY})} - \underset{(2.114)}{003(\text{DISTANCH})} + e$$

ARM2 had similar results as all the variables above with the additional variables of WORKERS and EDFATHER. PARITY and DISTANCH had negative effects.

$$\underset{(29.396)}{12.05(\text{CONSTANT})} + \underset{(27.399)}{.35(\text{AGE})} + \underset{(5.666)}{.04(\text{MOWEIGT1})}$$

$$- \underset{(-3.761)}{.01(\text{DISTANCH})} - \underset{(-3.387)}{.04(\text{PARITY})} + \underset{(3.027)}{.14(\text{WORKERS})}$$

$$+ \underset{(2.242)}{.04(\text{EDFATHER})} + e$$

The combined important role of distance was brought out more in HEIGHT1. The age of the child, distance to the nearest clinic, distance to Mporokoso District Hospital, mother's weight during the second survey period, and the father's level of education were found to be important determinants. However, though DISTANCH had a negative effect, as was expected, DISTANCE had a positive influence. These are contradictory and difficult findings to explain.

$$\underset{(19.283)}{.57(\text{CONSTANT})} + \underset{(58.941)}{.06(\text{AGE})} - \underset{(-7.476)}{.002(\text{DISTANCH})}$$

$$+ \underset{(6.048)}{.01(\text{DISTANCE})} + \underset{(2.746)}{.001(\text{MOWEIGT2})} + \underset{(2.517)}{.004(\text{EDFATHER})} + e$$

As for HEIGHT2 the following equation was obtained:

$$\text{HEIGHT2} = \underset{(22.175)}{.60(\text{CONSTANT})} + \underset{(61.561)}{.05(\text{AGE})} - \underset{(-6.716)}{.001(\text{DISTANCH})}$$

$$+ \underset{(-6.716)}{.004(\text{DISTANCE})} + \underset{(4.771)}{.004(\text{EDFATHER})} + e$$

These were the same variables that were significant for HEIGHT1, and they explained about 81 percent of the children's heights during the second phase of the survey.

The two study areas were treated separately for multiple regression analysis in order to see if the two areas behaved differently. What particular variables were important for each area? The stepwise multiple regression analysis yielded the following results. The results are presented one after the other to make it easy to compare the results of the two areas.

For WEIGHT1 two variables for both Area 1 and Area 2 were entered into the equation, namely: AGE and DENSITY for Area 1 and AGE and PARITY for Area 2. The adjusted R^2 for Area 1 was .79105 and that of Area 2 .78368. Thus:

$$\text{WEIGHT1} = \underset{(2.249)}{6.34(\text{CONSTANT})} + \underset{(41.859)}{1.81(\text{AGE})} - \underset{(-2.206)}{.30(\text{DENSITY})} + e$$

(AREA 1)

$$\text{WEIGHT1} = \underset{(14.795)}{6.13(\text{CONSTANT})} + \underset{(38.707)}{1.87(\text{AGE})} - \underset{(-2.481)}{.10(\text{PARITY})} + e$$

(AREA 2)

For WEIGHT2 only AGE and PAGE were entered for Area 1 and AGE and DENSITY for Area 2. Whereas PAGE had a positive influence, DENSITY had a negative one. The following equations were obtained:

$$\underset{\quad(12.117)}{\text{WEIGHT2} = 5.95(\text{CONSTANT})} + \underset{\quad(36.005)}{1.68(\text{AGE})} + \underset{\quad(2.034)}{.02(\text{PAGE})} + e$$

(AREA 1)

$$\underset{\quad(10.793)}{\text{WEIGHT2} = 8.01(\text{CONSTANT})} + \underset{\quad(37.385)}{1.92(\text{AGE})} - \underset{\quad(-2.523)}{1.01(\text{DENSITY})} + e$$

(AREA 2)

The adjusted R^2 value for Area 1 was .74592 and .76448 for Area 2.

The mid-upper arm circumferences had one more variable significant for Area 1 than for Area 2. Apart from AGE the rest of the variables were different for each area. For instance, the mother's age and household size were significant for Area 1, whereas household density was important for Area 2. The amount of variance explained was relatively small compared to the values already given for the equations above. The adjusted R^2 for Area 1 was .52581 and .51655 for Area 2, respectively. The following equations were obtained:

$$\underset{\quad(49.041)}{\text{ARM1} = 13.56(\text{CONSTANT})} + \underset{\quad(21.594)}{.39(\text{AGE})} - \underset{\quad(-2.219)}{.012(\text{MAGE})} + \underset{\quad(2.078)}{.06(\text{HSIZE})}$$

$$+ e \qquad \text{(AREA 1)}$$

$$\underset{\quad(10.793)}{\text{ARM1} = 8.01(\text{CONSTANT})} + \underset{\quad(37.385)}{1.92(\text{AGE})} - \underset{\quad(-2.523)}{1.01(\text{DENSITY})} + e$$

(AREA 2)

An interesting situation occurred for HSIZE in the mid-upper arm circumference measurements. Whereas the sign for HSIZE was positive for Area 1 it was negative for Area

2. One possible explanation here could be that whereas in the rural areas almost everybody contributes to the upkeep of the household, only one or two individuals (those in formal employment) did so in urban areas. But such a statement could be an oversimplification of the situation even in an urban setting. Women, and housewives in particular, do more work than they are given credit. Apart from using the limited budget to adequately cater for their families, some are engaged in other activities such as trading or even small scale gardening in order to supplement their husbands' income. The adjusted R^2 was .47465 for Area 1 and .49010 for Area 2.

$$\underset{}{\text{ARM2}} = \underset{(56.775)}{13.37(\text{CONSTANT})} + \underset{(19.140)}{.35(\text{AGE})} + \underset{(2.878)}{.09(\text{HSIZE})} + e \quad \text{(AREA 1)}$$

$$\underset{}{\text{ARM2}} = \underset{(54.400)}{15.33(\text{CONSTANT})} + \underset{(20.776)}{.39(\text{AGE})} - \underset{(-4.108)}{.14(\text{HSIZE})} + e \quad \text{(AREA 2)}$$

For Area 1 the age of the child, number of workers, and household size were important in determining the height of the child. For Area 2 the age of the child and its parity were the important variables. The adjusted R^2 was .74485 for Area 1 and .83813 for Area 2. Thus:

$$\underset{}{\text{HEIGHT1}} = \underset{(35.050)}{.64(\text{CONSTANT})} + \underset{(35.472)}{.05(\text{AGE})} - \underset{(-3.097)}{.01(\text{WORKERS})} + \underset{(2.498)}{.01(\text{HSIZE})} + e \quad \text{(AREA 1)}$$

$$\underset{}{\text{HEIGHT1}} = \underset{(59.711)}{.65(\text{CONSTANT})} + \underset{(46.061)}{.06(\text{AGE})} - \underset{(-2.083)}{.002(\text{PARITY})} + e \quad \text{(AREA 2)}$$

The basic differences in the two equations above are that WORKERS and HSIZE were only entered in the equation for Area 1 and PARITY for Area 2 only. The respective adjusted R^2 values were .74483 for Area 1 and .83813 for Area 2.

As for HEIGHT2 only two variables were entered for each area, namely AGE and WORKERS for Area 1 and AGE and PARITY for Area 2. Both WORKERS and PARITY had negative influences. This negative effect is unexpected in Area 1 because, ceteris paribus, more workers in a rural environment means more hands to work, and thus, more food to eat. But may be this negative effect is suggestive of other factors not considered in the equation , such as accessibility to food by the children, their health status, and infections. The equations for HEIGHT2 were as follows:

$$\underset{}{\text{HEIGHT2}} = \underset{(55.947)}{.72(\text{CONSTANT})} + \underset{(39.064)}{.05(\text{AGE})} - \underset{(-2.143)}{.01(\text{WORKERS})} + e \qquad \text{(AREA 1)}$$

$$\underset{}{\text{HEIGHT2}} = \underset{(70.196)}{.72(\text{CONSTANT})} + \underset{(46.712)}{.06(\text{AGE})} + \underset{(-2.128)}{.002(\text{PARITY})} + e \qquad \text{(AREA 2)}$$

Discussion

The greatest surprise of the results was that the role of seasonality did not come out as expected, namely that the anthropometric measurements that were supposed to

decline in fact increased between the two survey periods. The seasonal differences were significant at PROB-value = 0.05. As has been discussed already, the children in the rural area had almost half of their age groups either static or the anthropometric measurements declining between the two time periods. Reasons for these increases have been suggested to include first, people's experience through which they preserve some of their foods for the hungry season. Although for most households the reserves are depleted by the end of January, some people have their stock last even for another year. One unhealthy trend though has been the increased use of millet for beer brewing rather than for food consumption. Some households have more than enough millet at the end of the harvest. After selling some much of the remainder is used to brew beer. This is not a bad thing to do in itself. The only bad thing about it is that they do not leave some for themselves for use during the rainy season. Second, mothers who spent most of their time in the gardens and drinking beer had little time to attend to the many chores at home. Their time was finely tied to too many activities. Children were left to eat at the same time as adults or were left with older children who looked after them.

In school and at home usually older girls are instructed to cook for their fellow siblings. Though this is not a bad alternative in itself, in times of general

food shortages and scarcities such arrangements are shelved; and children have to eat at the same time as adults, usually once a day.

Gardens for the rural people have grown smaller and more fragmented than ever before. Travel time to and from these gardens has increased. Most people have to spend at least an hour to reach their nearest field. Moreover soil fertility around the villages has declined. Where once flourished nice and neat gardens now display the large elephant grass and other weeds. People have to travel long distances to the gardens. And the longer people have to travel to work the less time they spend at home to prepare nutritious and regular meals for their households. Children, especially smaller children, may be at higher risk.

In general, in all the three anthropometric measurements Area 2 had higher values than Area 1 in both time periods. Children in Area 2 were taller, heavier, and had larger middle upper arm circumferences than children in Area 1. The differences were statistically significant We conclude that children in Area 2 had a better health and nutritional status than those in Area 1. Also, although on the whole girls were taller than boys (but village boys were heavier and taller than village girls), no statistical differences were found.

The trends just outlined make me to ask the following questions: Does living in an urban or rural area make a

difference? It seems it does? Why should living in a place make a difference? What determines health and nutritional status in these two areas?

Children from Area 2 came from households that had a regular source of income with which they purchased the items they wanted. Their main problem was the nonavailability of a specific item that they wanted to buy. However, this study has failed to ascertain the amount of money spent on food. Obviously those respondents who were given more money by their husbands should have spent a little more on food than those who were given little. Other things being equal most of the money given to the wives was spent on food.

Area 2 had other advantages over Area 1. For example, the hospital and health clinic were within easy reach than Chiwala Rural Health Center was for most rural respondents. Also, the general sanitary conditions were better off in Mporokoso Township than they were in the villages. For example, piped water, which was drawn from their own houses, was better off than the water people had to draw from rivers and streams. Moreover, urban respondents were more educated than rural women. And from multiple regression analysis the education and weight of mothers were strong indicators of the anthropometric measurements.

Multiple regression analysis of weight, height, and mid-upper arm circumference for the entire sample revealed

that the children's ages, their mothers' weight, parents' level of education, distance to a health service, their parity, number of workers, and household density were critical determinants of the health and nutritional status of the children. AGE, MOWEIGT1, MOWEIGT2, EDMOTHER, EDFATHER, and DISTANCE produced positive values, whereas DENSITY, DISTANCH, and PARITY had negative values. This means that overcrowding conditions, fewer workers, and long distances to the hospital affected the health and nutritional status of children negatively. The level of education of the parents and the weight of the mothers were important factors as well. Usually more variables were entered for the dependent variable HEIGHT1. The age of the children, their fathers' level of education, distance to a health facility, and the mother's weight affected the children's nutritional status.

Multiple regression analysis of weight, height, and mid-upper arm circumference for the two study areas revealed that the children's ages, their mothers' weight, parents' age, household size, number of workers, and household density were of critical importance in determining nutritional status. AGE, HSIZE, PAGE, and MOWEIGT2 produced positive values whereas MAGE, DENSITY, and WORKERS had negative values. It is not clear why the mother's age had a negative influence.

For Area 2 the age of the child, its parity, household density, and household size were important

determinants of the nutritional status. But HSIZE, WORKERS, and PARITY had negative effects. These variables suggest that in an environment with limited resources, and where only a few people work, large households lead to poor health and nutritional status. Overcrowding affected the health and nutritional status of children negatively.

As for height the age of the child, its parity, household size, and number of workers were significant factors. The role of WORKERS, PARITY, and HSIZE is interesting because they all have a negative effect. However, PARITY has a positive influence in Area 2. This apparent anomaly could be linked to the fewer number of own children respondents in the urban area had. WORKERS in the rural area was taken to be all the adults in a household, where an adult was an individual 15 years or older at the time of the interview. In the urban area only people who earned some income, and were contributing to the upkeep of the household, were considered to be workers; and most households had only one worker. In the rural area many households had more than one worker. The variable is related to DENSITY. This is a difficult result to explain. One way to interpret WORKERS as affecting height negatively is to suggest that the higher the number of older people in the household, the less the children are going to have adequate food, and hence the lower their nutritional status. The only disturbing factor here is that in terms of nutritional status, height deficiencies

can only be noted after a long time.

The influence of distance on the utilization of health services was readily established from the questions that respondents were asked concerning the number of times they had visited a health facility. As was mentioned in Chapter 4 three health facilities are located in the research areas, namely: Mporokoso District Hospital, Mporokoso Township Clinic, and Chiwala Rural Health Center. All the respondents at John Levi mentioned that they attended the Chimpempe Rural Health Center, located in Kawambwa District. Technically they were supposed to use Chiwala RHC because they were located in its catchment area. Using a health center in another catchment area is not a problem in Zambia because the services are free. The patient only has to bear the travel cost.

Respondents in Area 2 were in close proximity to either the Township Clinic or the District Hospital. On average the respondents in Area 2 were only .3 km away from the clinic and .7 km away from the hospital. On the other hand, respondents in villages were on average 10 km away from their nearest clinic, and 66 km away from the hospital.

Figure 6.33 shows an inverse relationship in the use of health services and distance in Area 1 (the curve is fitted by eye). An anomalous situation occurred at the distance of 24 kilometers from Chiwala RHC. I think that this situation arose as a result of the respondents at

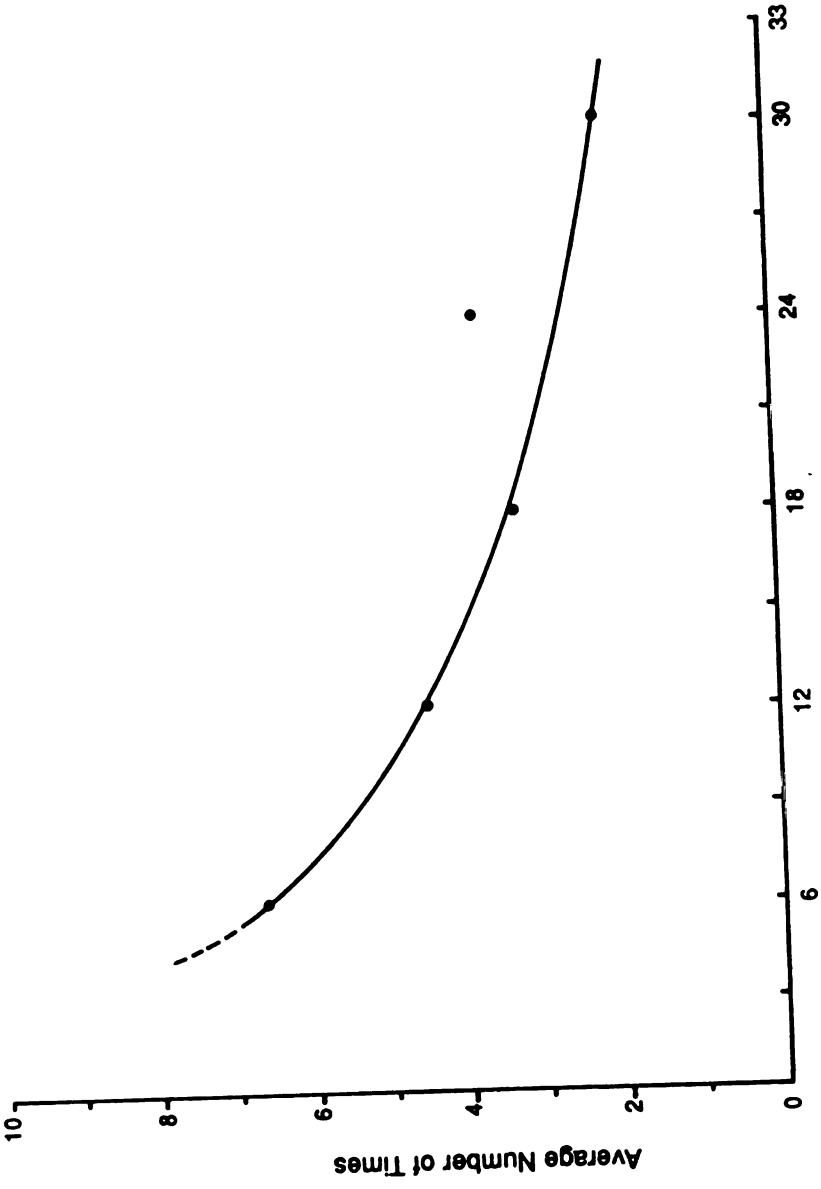

Figure 6.33 Use of Rural Health Centers in Area 1

Chikolwa who might have reported to have gone to Chiwala, when they in fact went to Chimpempe RHC. Except for those aged 50 years or more rural respondents used the services more frequently than urban respondents. Respondents living near a health facility indicated that they had used it more times than those who lived far away. This situation was expected. This negative relationship was not as clear cut in Area 2 as it was in Area 1 mainly because of the short distances involved in the former.

Distances were divided into .5 km increments for Area 2 and 3 km for Area 1. Only three subgroups were generated for Area 2. In the urban area on average respondents who lived less than .5 km and those living between 1.5 and 2 km used a health facility 6 times. Those who lived between .5 and 1.0 km used it about 7 times. More people, as has been established in Chapter 5, used the services for curative care more than they did for preventive care.

Use of health services by the age group of respondents indicate that, on the whole, the urban respondents used the services more for each age group except for those aged 30-34 and 50+ years (Table 6.11). Obviously close proximity to health services had a major influence on this pattern. Older respondents and younger respondents used the services less frequently). For example, women in their thirties and early forties used the services more times than those younger or older. Although more frequent use of the services may indicate

Table 6.11. Use of Health Services by Age Group of Respondents (Average Number of Times)

Age Group	Area 1	Area 2
Less than 20	3.00	4.67
20-24	5.35	6.52
25-29	4.18	5.29
30-34	7.68	6.69
35-39	3.85	7.20
40-44	7.46	9.79
45-49	5.07	5.71
50+	5.57	3.00

that "older" women had more children that they took ill to health facility, less frequent use of the services for those aged above their mid-forties indicate that distance considerations are involved.

A Suggested Model

From this study a model can be developed to highlight the health and nutritional status of the children in the area. Food shortage, dietary patterns, and infections are the three elements that this research has found to be critical (Figure 6.34).

Poor nutritional status is seen as emanating from three basic causes: food shortage, large households with fewer workers, and poor dietary patterns. Food shortage is a function of low food production and low or limited food storage. Where production is low and not enough is kept for the hungry season, the nutritional status of the children is necessarily poor. Low food production in the rural area is also a function of poor soils. In the research area a lot of rainfall leads to increased leaching, and ultimately, poor soils. Moreover, as land to clear in the nearby surrounding areas grows smaller and smaller people are forced to walk long distances to more fertile areas. Low food production is also a function of fewer workers and many people to feed.

The parity of children is an important factor in the determination of nutritional status. It appears that small

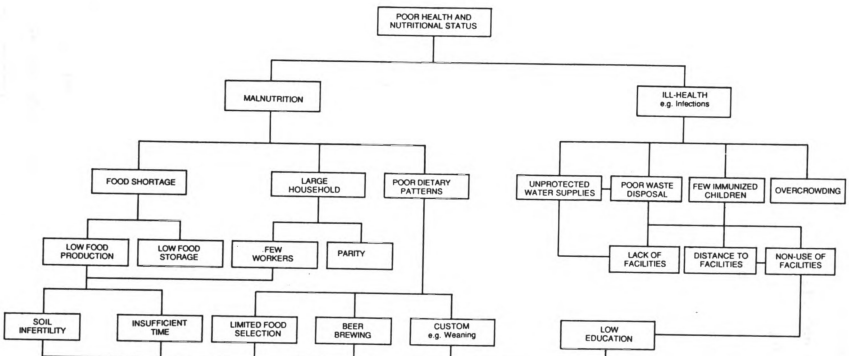

Figure 6.34 Explaining Poor Health and Nutritional Status

children in large households tend to suffer adversely, especially where fewer workers exist. One reason could be that children and adults usually eat together, and at the same time. Whereas infants are fed at their demand, those who have been weaned and older children, have to wait for the rest of the family members in order to eat together. This situation was especially practised in the rainy season when food reserves were low.

One may argue that it is not food shortage _per se_ that leads to poor nutritional status in the research area. A lot of foodstuffs exist to which people avail themselves. Instead poor dietary patterns could be blamed. In the area food selection is very limited. It is _nshima_ (and usually one form of relish at one setting) in the morning, _nshima_ at lunch time, and _nshima_ at supper time. A variety of relishes at one setting would complement and supplement each other in terms of nutrients. Some people may argue that given insufficient food production where is the extra food going to come from? The answer to this question lies in the people themselves. Varieties of food exist and the people know what to do with them as snacks. Probably what they need to be helped with are ways they can make those available foods become daily or more regular foods.

It has been a frustrating experience at Chiwala Rural Health Center where demonstration plots are organized for mothers. Mothers attending health and nutrition lessons

are given a hands-on practical experience on how to grow local crops, and even such exotic vegetables as cabbage and rape. The frustration comes when the crops are not only stolen but they are uprooted both branch and root by some unscrupulous and selfish individuals.

Another dietary pattern that is now pervasive in the area, and especially in the rural areas is that of beer brewing and drinking. Times have changed from when beer was drunk for social reasons to times when it is brewed for monetary reasons. This is not a bad reason in itself as people need cash for various household needs. However, most of the much needed millet is used in beer brewing. It was interesting to note that although some people would have sufficient millet to take them into the second harvest season they used all of it on beer brewing, and they instead had to buy from other people at a later time. Millet is a more nutritious grain, albeit its color and taste sometimes. When it is used for beer brewing, less nutritious cassava is used instead. Moreover, some parents spent too much time on beer brewing and drinking, neglecting their families.

Another dietary practise that works to the detriment of the child is sudden weaning. As has been explained already some children are weaned too quickly as a result of another pregnancy. Although this may not be a bad idea in itself, the trauma that follows may not be explained given that the child's milk supply is cut off immediately

and is substituted with other foods especially carbohydrates and water. This situation must be hard for a baby who has just been feeding at will.

Ill-health as a result of infections is a function of several factors. In terms of the present research illhealth is said to be caused or exacerbated by unprotected water supplies, poor waste disposals, few immunized children against deadly but preventable diseases, and overcrowded living conditions. The fact that many children suffer from diarrheal diseases and from upper respiratory infections indicates that the environment, especially in the rural areas, is still highly susceptible to communicable diseases. Overcrowding simply makes the situation worse, as any disease spreads very fast among the population at risk.

Added to these factors are the availability of health services in the area. Mporokoso Township is well endowed with the hospital and the clinic, and everybody is within walking distance to the facility. On the other hand people living far away from Chiwala Rural Health Center find it difficult to use the services offered because of long distances. A clear negative influence between the distance to a health facility and its use has been noted in the study. Many mothers stated that it was difficult to carry three small children to Chiwala RHC on their backs and shoulders for such meetings as weighing classes. When the children became sick all efforts were made to take them for care.

CHAPTER 7

CONCLUSIONS

Introduction

This chapter is divided into three sections. The first section contains the main findings, or summary, of this study. The second section looks back at the expected outcomes in light of the findings. The last section gives some suggestions (or recommendations) on what can be done to alleviate some of the problems that have been identified in this study.

Summary and Reflection

Most respondents (91.6 percent) were married. All the urban respondents were married. Few respondents were in polygamous unions. Rural women were slightly older (33.0 years) than urban respondents (30.6 years). Rural women had slightly more children (4.8 children) than urban women (4.2 children). But urban households had slightly more persons per household (6.9) than rural households (6.0).

Most respondents had some formal education, with rural women having mainly primary school education. Husbands had slightly more years of formal education than the respondents in most households. Because most of the

respondents were housewives, only a few were employed in the formal sector of employment - mainly as educators and nurses. However, a third of the respondents were also involved in other income-generating activities such as brewing and selling local beer, sewing and knitting, and baking. Rural women formed the bulk of the agricultural workforce in the household - cultivating, weeding, harvesting, and transporting the produce from the fields to the villages. Whereas urban men did not engage in any other activity that generated extra income other than their main and only occupation, rural men were engaged in such activities as fishing, basketmaking, carpentry, and blacksmithing.

People in Area 1 grew most of the foodstuffs they ate. Millet, cassava, and maize (recent addition) were the chief crops from which ubwali or nshima was made. Ubwali was in turn eaten with a variety of relish composed of wild game meat, fish, and a variety of vegetables. Seasonality affected the availability of and accessibility to certain foods. Most of the food crops were depleted in the rainy season because most of the seeds had been sown. During this time most people depended on less nutritious crops such as mushrooms.

Breast-feeding was commonly practised in the area. Most mothers weaned their children at one and one half years. Supplementary foods began to be administered when the children reached 5 months of life, the recommended

time by the health staff. Children were weaned when mothers felt that their children were big enough, when they found themselves in crisis situations such as when they or their children fell ill, when the mothers became pregnant, or at the time health staff recommended the children could be weaned without inflicting a lot of suffering on the children.

The health and nutritional conditions that have been highlighted in this study indicate low levels of socioeconomic conditions that exist in the region. A preponderance of infections and diarrheal diseases was one indicator, afflicting many children. The endemicity of malaria paused a major health problem. As one health officer put it, "The presence of malaria is intriguing to me. One does not see a lot of mosquitoes here, but look at the number of children suffering from plasmodiasis and malaria!" More research can be established to study this apparent paradox and perplexing phenomenon.

Parents took their children to health clinics for a variety of reasons, but particularly for curative treatment. Though respondents visited under-five clinics, most stopped to go before their children finished the courses of immunizations. Some of the major reasons being the non-availability of transport in the area and long distances that deter many respondents to take their children to preventive care. Of course the problem associated with the Universal Child Immunization (UCI)

campaigns was highly appreciated by the people.

The research suggests that children between the ages of 12 and 36 months appeared to be at greater risk of developing malnutrition. Most of the children that lost weight were aged between 12 and 24 months.

Most urban and working rural respondents, including those whose husbands were employed in formal employment, complained about the nonavailability of maize flour. I think that these people can work on adapting to eating ubwali made from cassava or/and millet. However, with the establishment of a regular bus service in the area, some of these problems could be minimized or eliminated because it could lead those workers to bring in mealie meal from outside the area.

Rural people could actually capitalize on this demand and grow more maize for mealie meal. The problem could continue to exist because of the non-availability of local mills. People still depend on mortar and board and grinding stones to make the much-needed flour. With the use of only simple implements such as hoes and axes very little can be accomplished in terms of increased food production. The present exorbitant prices of fertilizers do not help the situation either because very few people can afford to buy even one bag, and yet they need more.

The children in the research area were very small, had smaller bodyweights, and thinner mid-upper arm circumferences than the NCHS reference population. For

most of the indices and age groups the children's values fell below the 5th percentile.

Expected Outcomes Revisited

This study confirms the idea that people who lived near a health facility were more likely to it use more frequently than those who lived far away. Moreover, the use was geared more to curative than preventive service. How could people be motivated to use the given services? What can be done to make them search for cure immediately a problem develops?

Children did not lose weight during the hungry or rainy season as they were expected to. In all situations, and in both areas, children in fact gained weight between the inter-survey period. Given that many crops had just started to ripen at the end of the field survey, one could not expect children to lose weight. Was this situation an anomaly? Was the year unusual? I do not have answers to these questions myself.

The levels of education of the parents has been found to be very important in the children's health and nutritional status. This is not a surprising finding given that education normally goes hand in hand with knowledge on what to do given the children's physical health and nutritional status. At school and at home girls were taught ways of providing nutritious meals and providing for their families. Educated mothers internalized

instructions much faster than and adapted to new situations better than those who never had any formal schooling.

It is with much regret that the role of income has not been tested in this research. As has been explained already, not one type of income was obtained from the respondents. So it was difficult to analyze such kind of data. Similarly it was difficult to evaluate the role of external income in supplementing household income. In most cases outside help came in form of material goods. Where money was concerned most of it came for specific needs such as school fees or money with which to buy school books or uniforms.

The size of a household has been found to affect the health and nutritional status of children in two particular ways. First, large households tended to have children with smaller anthropometric measurements than small households, particularly in households where few workers were found. Second, household density has a negative influence on both health and nutritional status.

Children at higher parities tended to have lower nutritional status than children at lower parities. Probably this result indicated the problem mothers have when they have many children. Close parental guidance is lost and in many instances siblings have to look after other siblings. Particularly in situations where the mother has a lot of things to do in a given day, meeting

nutritional needs of every child is not an easy task.

Better health and nutritional status was associated with higher anthropometric values of weight, height, and mid-upper arm circumference. Children in Mporokoso Township had a better nutritional and health status than those in Area 1. The results were statistically significant. No significant differences were found between boys and girls in weight and height.

The Suggested Explanation

The model suggested in this study can be found to be too simplistic by some people. But others may find it too restrictive and inadequate in explaining the complex issues of health and nutritional status. I think that the model is suggestive of the most important factors that have been identified as major factors in the health and nutritional status of children in the area.

The advantage with it is that it is simple enough. If I were to do further research I would go to pains to obtain some representative information on income. Also I would welcome and include the assistance of a pediatrician or family physician in the research team. Furthermore, specific focus on one of the nutritional problems, say kwashiorkor or vitaminosis A could provide more information on the nature of the problem.

Demographic and socioeconomic factors, distance to a health center, and nutrition have been found to be

important. From the results children between the ages of 12 and 24 months are at greater risk of ill-health and malnutrition. This is the time they are weaned and the time they need more supplemental food. Greater care should be taken for these children. Mothers should be helped to understand this information.

Recommendations

Zambia uses a clinic card, based on the Harvard system, on which is charted the weight-for-age for children from birth to five years. Why is it that only one chart is used for both boys and girls? Is it not important that these genders have their own separate charts? As is common knowledge boys and girls grow at different rates. In addition to seeing separate charts for boys and girls I would like the age limit extended to at least 10 years. Furthermore, weight-for-height and height-for-age charts need to be developed. Using the NCHS charts would not be advisable for the children in the research area, but how do the other children elsewhere in Zambia compare with the NCHS charts? This study calls for further research.

It appears that women, especially those living in the villages, went to antenatal or postnatal clinics for fear that if they did not do so, they would be denied treatment in future. They were thus willing to travel to Chiwala at their own discomfort and great energy expense. Within limits this problem can be avoided. For example, the

present UCI visits to selected villages can be combined with weight measurements, by allowing the staff from Chiwala RHC to take portable scales. Also community health workers can be trained to take anthropometric measurements. Such a measure may prove to be cheap in the long run, and will also ensure constant monitoring of the children's growth. The major problem lies in the initial cost that has to be born by the government in supplying the necessary equipment.

At the workshop on nutrition at Kapumo Farm Institute in Mporokoso, participants from four Government and Party departments resolved to do their best in disseminating nutrition education information in the district. I feel that such education should not be limited to mothers. Involving fathers in nutrition clinics could enhance the program. This suggestion may meet opposition from men because traditionally they are not supposed to cook. However, sometimes diets were dictated by men. As one man put it, "You come here asking women questions concerning our families. If I had wanted, I should have not allowed my wife to participate in the survey. In as far as foods are concerned, my wife cooks whatever I provide for the day in terms of relish." I am certain that this was not an isolated case. Men should not only come to the wife's assistance at critical moments - when the child is too sick and warrants going to the hospital for immediate treatment. They ought to be involved at all stages in the

development of their child's health and nutrition.

Members of staff at the health centers can encourage the use of services by being courteous to their patrons, and in assisting them to understand the growth patterns of their children. A child whose growth becomes inconsistent can be provided with appropriate information. Understanding the proper use of the clinical card is important for the health staff. Rather than become angry at people who do not come for regular preventive care classes, the people should be helped to understand why the visits are necessary.

A Final Note

Since the time this research was conducted food items have become extremely expensive for most families because the Zambian Government removed subsidies on all the food items. What this new situation may imply on the health and nutritional status of the people in Zambia in general, and in rural areas in particular, has yet to be seen. One thing for sure is that things may be more difficult for urban workers than for those in rural areas.

If I were to extend this research I would involve other health professionals, such as pediatricians, nurses, and nutritionists. Also a narrow focus on an aspect of nutrition, say kwashiorkor, could prove more helpful to the people involved. Obviously, the people's food production system has changed over time involving long

distances to their fields. The use of clinics should be looked at, and their implications for health and nutritional status evaluated more than has been done here.

BIBLIOGRAPHY

BIBLIOGRAPHY

Abraham, S. (1979) Weight by Height and Age for Adults 18-74 Years. Vital and Health Statistics. Series 11. National Health Survey No. 208. DHEW Publ. No. (PHS) 79-1656. Hyattsville, MD.: National Center for Health Statistics.

Allan, W. (1945) African Land Usage. Rhodes-Livingstone Journal 3: 13-20.

Armer, M. and R. Youtz (1971) Formal Education and Individual Modernity in an African Society. American Journal of Sociology 76: 604-626.

Bailey, K.V. (1975) Manual on Public Health Nutrition. Geneva: World Health Organization Afr/Nut/79.

Bairagi, R. (1980) Is Income the Only Constraint on Child Nutrition in Bangladesh? Bulletin of the World Health Organization 58(56): 767-772.

Balderston, J.B. and A. Wilson (1981) Malnourished Children of the Rural Poor. The Web of Food, Health, Education, Fertility, and Agricultural Production. Boston: Auburn House Publishing Company.

Bands, D.P. Compiler (no date) Management Book for Mporokoso District. Kitwe: Northern Rhodesia Forest Department.

Barber, C.R. (1982) Weight and Weight Gain in the First Year of Life of Zambian Infants. Medical Journal of Zambia 16(2): 23-27.

Barber, G.M. (1988) Elementary Statistics for Geographers. New York: The Guilford Press.

Barclay, R. D. Goldin, and A.J.H. Stephens (1972) A Survey of "Well" Children under 5 in the Zambian Rural Areas. Medical Journal of Zambia 6(6): 180-185.

Baumgartner, R.N. and E. Pollitt (1983) The Bacon Chow Study: Analyses of the Effects of Infectious Illness on Growth of Infants. Nutrition Research 3(1): 9-21.

Benefice, E., S. Chavassus-Agnes, and H. Barral (1984) Nutritional Situation and Seasonal Variations for Pastoralist Populations of the Sahel (Senegalese Ferlo). Ecology of Food and Nutrition 14: 229-247.

Bengoa, J.M. (1969) Clinical and Socio-economic Aspects of PCM, Presentation of the Data on the Prevalence of PCM. In: S. Berlin (ed.) Protein-Calorie Malnutrition. New York: Avon.

Bennett, F.J., and J.P. Stanfield (1971) The Pattern of Malnutrition in Uganda. Journal of Tropical Pediatrics and Environmental Child Health 17(1): 5-10.

Benyoussef, A. and F. Wessen (1974) Utilization of Health Services in Developing Countries - Tunisia. Social Science and Medicine 8(5): 287-304.

Berg, A. (1973) The Nutrition Factor. Washington, D.C.: Brookings Institute.

Blankhart, D.M. (1969) The Arm Circumference as a Public Health Index of Protein-calorie Malnutrition of Early Childhood. Journal of Tropical Pediatrics 15(4): 205-208.

Boerma, A.H. (1975) The 30 Years' War Against World Hunger. Proceedings of the Nutritional Society 34: 145.

Brew-Graves, S.H. (1977) Maternal and Child Health Services in Zambia. Lusaka: National Food and Nutrition Commission.

Burgess, H.J.L., A. Burgess, and E.F. Wheeler (1973) Results and Appraisal of a Nutrition Survey in Malawi. Tropical and Geographical Medicine 25(4): 372-380.

Burton, B.T., W.R. Foster, J. Hirsch, and T.B. Van Itallie (1985) Health Implications of Obesity: An NIH Consensus Development Conference. International Journal of Obesity 9(3): 155-169.

Chen L.C., A.K.M.A. Chowdhury, and S.L. Huffman (1980) Anthropometric Assessment of Energy-protein Malnutrition and Subsequent Risk of Mortality among Preschool Age Children. American Journal of Clinical Nutrition 33: 1836-1845.

Church, M.A. (1971) Educational Methods, Cultural Characteristics and Nutrition Rehabilitation: Experience in a Kampala Unit. Journal of Tropical Pediatrics and Environmental Health 17(1): 43-60.

Cogill, B. (1987) The Effects on Income, Health, and Nutritional Status in Increasing Agricultural Commercialization in South-west Kenya. Ph. D. Dissertation. Ithaca: Cornell University.

CSO (Central Statistical Office) 1985 1980 Census of Population and Housing, Volume 1, General Population and Migration Tables. Lusaka: Central Statistical Office.

ECA (Economic Commission for Africa) (1982a) Availability and Use of Medical Facilities in Zambia. Paper Presented at the Feedback Seminar on Joint ECA/GRZ Survey on Interrelationships among Infant and Childhood Mortality, Socio-economic Factors and Fertility in Zambia. Kabwe, Zambia.

ECA (1982b) Body Weight, Height and Nutrition of Zambian Children under Five Years of Age. Paper Presented at the Feedback Seminar on Joint ECA/GRZ Survey on Interrelationships among Infant and Childhood Mortality, Socio-economic Factors and Fertility in Zambia. Kabwe, Zambia.

ECA (1982c) Food and Feeding Patterns and Habits in Zambia. Paper Presented at the Feedback Seminar on Joint ECA/GRZ Survey on Interrelationships among Infant and Childhood Mortality, Socio-economic Factors and Fertility in Zambia. Kabwe, Zambia.

Egunjobi, L. (1983) Factors Influencing Choice of Hospitals: A Case Study of the Northern Part of Oyo State, Nigeria. Social Science and Medicine 17(9): 585-589.

FAO (Food and Agriculture Organization) (1974a) Handbook on Human Nutritional Requirements. Rome: Food and Agriculture Organization.

FAO (1974b) National Food and Nutrition Programme, Zambia: Report on Project Results, Conclusions and Recommendations. Rome: Food and Agriculture Organization, ESN:DP/ZAM/69/512.

FAO (1982) Integrating Nutrition into Agricultural and Rural Development Projects, A Manual. Rome: Food and Agriculture Organization.

Ferro-Luzzi, A. (1984) Environment and Physical Growth, pp. 168-198. In: C. Susanne ed. Genetic and Environmental Factors during the Growth Period. New York and London: Plenum Press.

Fisher, M.M. (1976) Growth of Zambian Children. Transactions of the Royal Society of Tropical Medicine and Hygiene 70(5/6): 426-432.

Fisher, M. and W. Davison (1970) Growth Curves for Some Zambian School Children. Journal of Tropical Pediatrics 16(3): 103-111.

Franklin, R.R., W.E Bertrand, N.B. Mock, K. Nkamany, and A. McGraw (1983) Feeding Patterns of Infants and Young Children in Kinshasa, Zaire. Journal of Tropical Pediatrics 29(5): 255-259.

Freund, P.J. and K. Kalumba (1984) Maternal Health and Child Survival Rates in Rural Zambia: A Comparative Community Study. Medical Journal of Zambia 18(2): 12-16.

Frisancho, A.R. (1981) New Norms of Upper Limb Fat and Muscle Areas of Assessment of Nutritional Status. American Journal of Clinical Nutrition 34: 2540-2545.

Galvin, K. (1985) Food Procurement, Diet, Activities and Nutrition of Ngisonyoka, Turkana Pastoralists in an Ecological and Social Context. Ph. D. Dissertation, Binghamton: State University of New York at Binghamton.

Gershon, J. (1978) Sociocultural Factors Contributing to Protein-calorie Malnutrition among Pre-school Children in Accra, Ghana. Ph. D. Dissertation: Berkeley: University of California at Berkeley.

Geisler, G.G., B.B. Keller, and P. Chuzu (1985) The Needs of Rural Women in Northern Province: Analysis and Recommendations. Lusaka: Government Printer.

Gesler, W.M. (1979a) Illness and Health Practitioner Use in Calabar, Nigeria. Social Science and Medicine 13D(1): 23-30.

Gesler, W.M. (1979b) Barriers between People and Health Care Practitioners in Calabar, Nigeria. Southern Geographer XIX(1): 27-41.

Gesler, W.M. (1984) Health Care in Developing Countries. Washington, D.C.: Association of American Geographers.

Goldin, D. and R. Barclay (1972) Heights and Weights of Schoolchildren in Rural Areas of Zambia. Medical Journal of Zambia 6(1): 11-14.

Goodall, J. (1979) A Social Score for Kwashiorkor: Explaining the Look in the Child's Eye. Developmental Medicine and Child Neurology 21(3): 374-384.

GRZ/UNICEF (Government of the Republic of Zambia/United Nations Children Fund) (1986) Situational Analysis of Children and Women in Zambia. Lusaka: Government Printer.

Habicht, J-P., R. Martorell, C. Yarbrough, R.M. Malina, and R.E. Klein (1974) Height and Weight Standards of Preschool Children: How Relevant Are Ethnic Differences in Growth Potential? Lancet i: 611-615.

Habicht, J-P., C. Yarbrough, and R. Martorell (1979) Anthropometric Field Methods: Criteria for Selection, pp. 365-387. In: Jelliffe, D.B. and E.F.P Jelliffe (eds.) Human Nutrition: Nutrition and Growth. New York: Plenum Press.

Hamill P.V.V., T.A. Drizd, C.L. Johnson, R.B. Reed, A.F. Roche, and W.M. Moore (1979) Physical Growth: National Center for Health Statistics Percentiles. American Journal of Clinical Nutrition 32: 607-629.

Harris, D.R. ed. (1980) Human Ecology in Savanna Environments. New York: Academic Press.

Haug, R. (1983) Agricultural Crops and Cultivation Methods in the Northern Province of Zambia. Oslo: International Development Programs, Agricultural University of Norway.

Hoselitz, B.F. (1961) Tradition and Economic Growth, pp. 83-113. In: R. Braibanti and J.J. Spengler (eds.) Tradition, Values and Socio-economic Development. Durham: Duke University Press.

Howard, J.K. (1966) Calorie Intake and Intelligence: A Study among Bantu Schoolchildren. Central African Journal of Medicine 12(4): 63-64.

Howard, J.K. (1967) An Inquiry into the Nutritional Status of a Representative Group of Schoolgirls in Northern Zambia. East African Medical Journal 44(1): 9-10.

Huffman, S.L. (1984) Determinants of Breastfeeding in Developing Countries: Overview of Policy Implications. Studies in Family Planning. 15: 170-183.

Hunter, J.M. (1967) Seasonal Hunger in a Part of the West African Savanna: A Survey of Bodyweights in Nangodi, North East Ghana. Transactions of the Institute of

British Geographers 41: 167-185.

Jarosz, L.A. (1985) The Nutritional Implications of Changing Sociocultural Patterns of Infant Feeding in the Republic of Liberia. Ph. D. Dissertation. Minneapolis: University of Minnesota.

Jelliffe, D.B. (1966) The Assessment of the Nutritional Status of the Community. Geneva: World Health Organization Monograph Series No. 53.

Jelliffe, D.B. and E.F.P. Jelliffe (1984) Nutrition Assessment at Village Level. Journal of Tropical Pediatrics 30(6): 290-292.

Jenkins, C.L., A.K. Orr-Ewing, and P.F. Heywood (1984) Cultural Aspects of Early Childhood Growth and Nutrition among the Amele of Lowland Papua New Guinea. Ecology of Food and Nutrition 14(4): 261-275.

Johnston, B.F. and R. Martorell (1977) Interrelationships among Nutrition, Health, Population, and Development. Food Research Institute Studies XVI(2): 1-9.

Joseph, A.E. and D.R. Phillips (1984) Accessibility and Utilization: Geographical Perspectives on Health Care Delivery. London: Harper and Row.

Joy, J.L. (1978) Nutrition Planning: The State of the Art. Rome: Food and Agriculture Organization.

Joy, J.L. and P.R. Payne (1975) Nutrition and National Development Planning. Food and Nutrition 1: 2-17.

Keller, W. (1983) Choice Indicators of Nutritional Status, pp. 101-113. In: B. Schurch ed. Evaluation of Nutrition Education in Third World Communities. Bern: Hans Huber Publishers.

Keller, W. and C.M. Fillmore (1983) Prevalence of Protein-energy Malnutrition. World Health Statistics Quarterly 36(2): 129-167.

Khan, A.A. and B.M. Gupta (1977) Social and Economic Factors in Malnourished Children around Lusaka, Zambia. Tropical and Geographical Medicine 29(3): 283-287.

Kwofie, K.M. (1977) Patterns of Food Consumption in Rural Zambia. Lusaka: National Food and Nutrition Commission.

Kwofie, K.M. (1979) Integrating Nutrition Considerations into the Development of Zambia. Lusaka: National Food and Nutrition Commission.

Kwofie, K.M., E. Brew-Graves, and G.H. Adika (1983) Malnutrition and Pregnancy Wastage in Zambia. Social Science and Medicine 17(9): 539-543.

Lasker, J.N. (1981) Choosing among Therapies: Illness Behavior in the Ivory Coast. Social Science and Medicine 15A(2): 157-168.

Latham, M.C. (1979) Human Nutrition in Tropical Africa: A Textbook for Health Workers, 2nd ed. Rome: Food and Agriculture Organization.

Learmonth, A.T.A. (1978) Patterns of Disease and Hunger: A Study in Medical Geography. Newton Abbott: David and Charles.

Lerner, D. (1958) The Passing of Traditional Society: Modernizing the Middle East. Glencoe: Free Press.

Levinson, F.J. (1974) Morinda: An Economic Analysis of Malnutrition among Young Children in Rural India. Cambridge, Mass.: Cornell-MIT International Nutrition Policy Series.

Loutan, L. and J-M. Lamotte (1984) Seasonal Variations in Nutrition among a Group of Nomadic Pastoralists in Niger. Lancet i(8383): 945-947.

Maclean, C.M.U. (1966) Hospitals or Healers? An Attitude Survey in Ibadan. Human Organization 25: 131-139.

Maletnlema, T.N. (1986) The Problem of Food and Nutrition in Africa. World Review of Nutrition and Dietetics 47: 30-79.

Martorell, R. (1982) Nutrition and Health Status Indicators: Suggestions for Surveys of the Standard of Living in Developing Countries. Living Standards Measurement Study Working Paper No. 13. Washington, D.C.: World Bank.

Mata, L., R.A. Kromal, J.J. Urrutia, and B. Garcia (1977) Effect of Infection on Food Intake and Nutritional State: Perspectives as Viewed from the Village. American Journal of Clinical Nutrition 30(8): 1215-1227.

May, J.M. and D.L. McLelland (1970) The Ecology of Malnutrition in Eastern Africa and Four Countries of

Western Africa. New York: Hafner Publishing Company.

May, J.M. (1974) The Geography of Nutrition, pp. 32-45. In: J.M. Hunter (ed.) The Geography of Health and Disease. Chapel Hill, N.C.: University of North Carolina at Chapel Hill.

McGregor, I.A., A.K. Rahman, B. Thompson, W.Z. Billewicz, and A.M. Thomson (1968) The Growth of Young Children in a Gambian Village. Transactions of the Royal Society of Tropical Medicine and Hygiene 62(3): 341-352.

McLaren, D.S., P.L. Pellett, and W.W.C. Read (1967) A Simple Scoring System for Classifying the Severe Forms of Protein-calorie Malnutrition of Early Childhood. Lancet i: 533-535.

Mellor, J.W. (1973) Nutrition and Economic Growth, pp. 70-73. In: A. Berg, N.S. Scrimshaw, and D. Call (eds.) Nutrition, National Development and Planning. Cambridge, Mass.: Massachusetts Institute of Technology.

Miller, D.S. and J. Rivers (1972) Seasonal Variations in Food Intake in Two Ethiopian Villages. Proceedings of Nutrition Society. 31: 32A-33A.

Moore, H. and M. Vaughan (1987) Cutting Down Trees: Women, Nutrition and Agricultural Change in the Northern Province of Zambia, 1920-1986. African Affairs 86(345): 523-540.

Morley, D., J. Bicknell, and M. Woodland (1968) Factors Influencing the Growth and Nutritional Status of Infants and Young Children in a Nigerian Village. Transactions of the Royal Society of Tropical Medicine and Hygiene 62(2): 164-195.

Mugwira, P. (1982) An Assessment of Maternal Nutrition in a District in Zimbabwe and a Proposal for Creating Nutrition Awareness. Ph. D. Dissertation. Knoxville: University of Tennessee.

Mulenga, R.C. and J.K. Kanyangwa (no date) An Evaluation of Data Collection System and Nutrition Status of Infants and Young Children in Chipata Rehabilitation Center. Lusaka: National Food and Nutrition Commission.

Nabarro, D. (1984) Social, Economic, Health and Environmental Determinants of Nutritional Status. Food and Nutrition Bulletin 6(1): 18-32.

Nchinda, T.C. (1977) A Household Study of Illness Prevalence and Health Care Preference in a Rural District of Cameroon. International Journal of Epidemiology 6(3): 235-241.

Newman, J.L. (1980) Dietary Behavior and Protein-energy-malnutrition in Africa South of the Sahara: Some Themes for Medical Geography, pp. 77-92. In: M. Meade (ed.) Conceptual and Methodological Issues in Medical Geography. Chapel Hill, N.C.: University of North Carolina at Chapel Hill.

NFNC (National Food and Nutrition Commission) (1978) Better Food, Better Health, Better Today and Tomorrow: Zambia's Children. Lusaka: National Food and Nutrition Commission.

NFNC (no date) Anthropometric Measurements on the Population in North, East and Central Provinces and the Region of Ndola Rural, Zambia. Lusaka: National Food and Nutrition Commission.

Ng'andu, N.H. (1984) Growth of Urban and Rural Children in Zambia (A Limited Study). Medical Journal of Zambia 18(3): 30-35.

Nwosu, G.C. (1973) Nutritional Status Survey in Western Province of Zambia. Central African Journal of Medicine 19(8): 178-179.

Ojanuga, D.N. and M.J. Lefcowitz (1982) Typology of Health Care Consumers in Nigeria. Social Science and Medicine 16: 1649-1652.

Okafor, F.C. (1984) Accessibility to General Hospitals in Rural Bendel State, Nigeria. Social Science and Medicine 18(8): 661-666.

Okafor, S.I. (1982) The Case of Medical Facilities in Nigeria. Social Science and Medicine 16: 1971-1972.

Oomen, H.A.P.C., A.A.J. Jansen, and W.T. Mannetje (1979) Machakos Project Studies. Agents Affecting Health of Mother and Child in a Rural Area of Kenya. XIV Growth of Rural Preschool Children. Three Distinct Periods of Growth. Tropical and Geographical Medicine 31(3): 421-439.

Pagezy, H. (1982) Seasonal Hunger, as Experienced by the Oto and the Twa of a Ntomba Village in the Equatorial Forest (Lake Tumba, Zaire). Ecology of Food and Nutrition 12(2): 139-153.

Payne, P.R. (1985) The Nature of Malnutrition, pp. 1-19. In: M. Biswas and P. Pinstrup-Andersen eds. Nutrition and Development. Oxford: Oxford University Press.

Pellett, P.L. (1983) Commentary: Changing Concepts on World Malnutrition. Ecology of Food and Nutrition 13(1): 115-125.

Rao, U.K.G., M. Kartzarski, L. Mehta, and K. Brady (1981) Growth of Zambian Children. Medical Journal of Zambia 15(3): 87-91.

Reid, B.D., T.E. Reid, and G. Ullstrop (1971) The Health of the Zambezi Schoolchild. Medical Journal of Zambia 5(2): 61-69.

Reinhardt, M.C. and E. Lauber (1971) Maternal Diet, Breast Feeding and Infants' Growth. Journal of Tropical Pediatrics 27: 229-235.

Richards, A.I. (1939) Land, Labour and Diet in Northern Rhodesia. London: Oxford University Press.

Ritchie, J.F. (1944) The African as Grown-up Nursling. Rhodes-Livingstone Journal 1: 55-60.

Robson, J.R.K. (1974) The Ecology of Malnutrition in a Rural Community in Tanzania. Ecology of Food and Nutrition 3(1): 61-72.

Savage, F.M.A. (1972) The Effect of Town Life on Child Health: A Study from Matero and Mwaziona, Lusaka. Lusaka: National Food and Nutrition Commission.

Seoane, N. and M.C. Latham (1971) Nutritional Anthropometry in the Identification of Malnutrition in Children. Journal of Tropical Pediatrics and Environmental Child Health 17: 98-104.

Shannon, G.W. and G.E.A. Dever (1974) Health Care Delivery: Spatial Perspectives. New York: McGraw-Hill.

Sharpe, B. (forthcoming) Nutrition and Commercialization of Agriculture: From Subsistence to Poverty in Northern Province. In: A.P. Wood et al. (eds.) The Dynamics of Agricultural Policy and Reform in Zambia. Ames: Iowa State University Press.

Shultz, J. (1976) Land Use in Zambia. Munchen, Welt-Vorum Verlag.: Afrika-studien.

Simson, H. (1985) Zambia: A Country Study. Uppsala: Scandinavian Institute of African Studies.

Slikkerveer, L.J. (1982) Rural Health Development in Ethiopia. Problems of Utilization of Traditional Healers. Social Science and Medicine 16: 1859-1872.

Sorre, M. (1962) The Geography of Diet, pp. 445-456. In: P.L. Wagner and M.W. Mikesell (eds.) Readings in Cultural Geography. Chicago: University of Chicago Press.

Spence, L. (1984) Rotavirus, pp. 565-571. In: K.S. Warren and A.A.F. Mahmoud (eds.) Tropical and Geographical Medicine. New York: McGraw-Hill Book Company.

Srikantia, S.G. (1982) Protein Energy Malnutrition (PEM) in Children, pp. 197-207. In: A. Neuberger and T.H. Jukes (eds.) Human Nutrition: Current Issues and Controversies. Lancaster: MTP Press Limited.

Steenbergen, W.M., J.A. Kusin, A.M. Voorhoeve, and A.A.J. Jansen (1978) Machakos Project Studies. Agents Affecting Health of Mother and Child in a Rural Area of Kenya. IX. Food Intake, Feeding Habits and Nutritional State of the Akamba Infant and Toddler. Tropical and Geographical Medicine 30(4): 505-522.

Stephenson, L.S. et al. (1983) A Comparison of Growth Standards: Similarities between NCHS, Harvard, Denver and Privileged African Children and Differences with Kenyan Rural Children. Ithaca: Cornell University Press.

Stock, R. (1983) Distance and the Utilization of Health Facilities in Rural Nigeria. Social science and Medicine 17(9): 563-570.

Times of Zambia. Malnutrition Cited As Worst Killer. May 15, 1989.

Times of Zambia. Child Death Rate Rises. July 22, 1989.

Ulin, P.R. (1976) Utilization of Maternal and Child Health Resources in Rural Botswana. Ph. D. Dissertation. Amherst: University of Massachusetts.

Valverde, V., H. Delgado, R. Martorell, J.M. Belizan, V. Mejia-Pivaral, and R.E. Klein (1982) Seasonality and Nutritional Status: A Review of Findings from Developed and Developing Countries. Archivos Latinoamericanos de Nutricion 32(3): 521-540.

Vogel, L.C. ed. (1974) Health and Disease in Kenya. Nairobi: East African Literature Bureau.

Waterlow, J.C. (1976) Classification and Definition of Protein-energy Malnutrition, pp. 530-555. In: G.H. Beaton and J.M. Bengoa eds. Nutrition in Preventive Medicine. Geneva: World Health Organization Monograph Series No. 62.

Watts, T. and C. Chintu (1983) Child Deaths in Lusaka. Medical Journal of Zambia 17(2): 39-45.

Wenlock, R.W. (1970) Nutrition Status Survey: Preliminary Biochemical Data from Northern Province, Zambia. Lusaka: National Food and Nutrition Commission.

Wenlock, R.W. (1980) Nutritional Risk and the Family Environment in Zambia. Ecology of Food and Nutrition 10(1): 79-86.

Westcott, G.M. and R.A.P. Stott (1977) The Extent and Causes of Malnutrition in Children in the Tsolo District of Transkei. South African Medical Journal 52 (24): 963-968.

WHO (World Health Organization) (1976) Methodology of Nutritional Surveillance. Geneva: World Health Organization Technical Report Series No. 593.

WHO (1978) A Growth Chart for International Use in Maternal and Child Health Care. Geneva: World Health Organization.

WHO (1983) Measuring Change in Nutritional Status. Geneva: World Health Organization.

Wilmsen, E.N. (1978) Seasonal Effects of Dietary Intake on Kalahari San. Federation Proceedings 37(1): 65-72.

Winterbottom, J.M. (1945) The Ecology of Man and Plants in Northern Rhodesia. Rhodes-Livingstone Journal 3: 33-44.

APPENDICES

APPENDIX A1. QUESTIONNAIRE FOR ROUND ONE: AUGUST TO OCTOBER 1987

UBUMI NE MILILE MU NCENDE SHA MUMISHI MU ZAMBIA
HEALTH AND NUTRITIONAL STATUS IN RURAL ZAMBIA

IFIPUSHO FYA MUKU WAKUBALILAPO
ROUND ONE QUESTIONNAIRE

MUKWAI NDI MWANA WE SUKULU. NINKWATA AMEPUSHO YAMOYAMO AYAKUMWIPUSHA PA MULANDU WA MIKALILE YENU. AMEPUSHO AYA YAKUNGAFWILISHA MUKUSAMBILILA KWANDI. NANGULA NDELEMBA AMASHINA YA BANTU NDEIPUSHA AYA MEPUSHO, AYA MASHINA NSHAKAYABOMFYE NANGU UKUYATWALA NANGU KUMO. AMASHINA YALENGAFWILISHAFYE UKUMONA IMPENDWA YA BANTU NDEIPUSHA. AMASUKO YENU YABE AYACINE NE CISHINKA.

MADAM, I AM A STUDENT WHO HAS QUESTIONS TO ASK YOU ABOUT YOUR LIVELIHOOD. THESE QUESTIONS ARE TO ASSIST ME IN MY STUDIES. ALTHOUGH I AM WRITING DOWN NAMES OF PEOPLE I WILL NOT USE THESE NAMES FOR ANY OTHER PURPOSES APART FROM KNOWING THE NUMBER OF PEOPLE. SO, LET YOUR ANSWERS BE TRUTHFUL AND SINCERE.

ISHINA LYA MUSHI:.....
NAME OF THE VILLAGE

INAMBALA YA NG'ANDA:..... CODE YA NG'ANDA.....
HOUSE NUMBER HOUSE CODE

UBUSHIKU BWE LELO:.....
TODAY'S DATE

UBUSHIKU BWAKUPITULUKAMO:.....
DATE OF INSPECTION

1.1 Bushe mukwai nimwe bani ishina?.....
Madam, what is your name?

1.2 Bushikunshi mwafyelwepo? MWESHI..... UMWAKA.....
What is your date of birth? MONTH YEAR

1.3 Cifulonshi mwafyalilweko? UMUSHI/UMUSUMBA*.....
What is your place of birth? VILLAGE/TOWN*

DISTRICT/PROVINCE.....

*Bakepusha. Ngatabafyalilwe mumushi uno nangu muno Township bepusheni amepusho aya ayakonkapo. Nga bafyalilwe mumushi nangu mu Township kabiyeni ku cipusho 2.1

*Interviewer. If the respondent was not born in this village or Township ask her the following questions, otherwise go to question 2.1.

1.4 Bushe e kucifulo mwafumine ilyo mwaishile muno mushi/Township? EE:.....(Q1.6) IYOO:.....

Is that the place you left when you came to live in this village/Township? YES:..... (Q1.6) NO:.....

1.5 Nikumushinshi nangu musumbanshi mwafumine ilyo mwaishile mukwikala muno mushi nangu muno Township?
.....

From what village or town did you come?.....

1.6 Mulandunshi mwaishile mukwikala muno mushi/Township?
.....

Why did you come to live in this village/Township?...
.....

1.7 Mwakanshi mwakukile muli uno mushi/Township?.....
In what year did you move to this village/Township?

2.1 Bushe mwalyupwa? EE:..... IYOO:.....(Q2.6)
Are you married? YES NO

2.2 Bushe abenamwenu nibani ishina?.....
What is your husband's name?

2.3 Bushe abenamwenu bafyalilwe muli uno mushi/Township?
Was your husband born in this village/Township?

EE:..... IYOO:.....
YES NO

2.4 Bushe mwaupwa ku mpali? EE:..... IYOO:.....(Q2.8)

Does your husband have more than one wife?
YES:..... NO:.....(Q2.8)

2.5 Ukubikapo naimwe bene, abenamwenu bakwata abakashi banga?.....
Including yourself, how many wives has your husband?

2.6 Bushe mwalitala amupwapo? EE:..... IYOO:.....(Q2.8)
Have you ever been married? YES NO

2.7 Bushe (1) Balifwa?.....
Is he (1) Dead?

Bushe (2) Mwalilekana?.....
Are you (2) Divorced?

Bushe (3) Muleikala palepale pali ino nshita?.....
Are you (3) Separated?

2.8 Bushe mwakwata abana abakuifyalila banga?.....
How many children of your own do you have?

2.9 Mukwai njebeniko amashina yabo, ubushiku bafyelwepo, elyo kabili nga baume atemwa banakashi.

Kindly give me the names of your children, their dates of birth, and their sex.

ISHINA NAME	UBUSHIKU BWAKUFYALWA DATE OF BIRTH			MWAUME/MWANAKASHI MALE/FEMALE
	UBUSHIKU DAY	UMWESHI MONTH	UMWAKA YEAR	

2.10 Pali aba bana mwalumbula, nibani abo mucili muleikala nabo?

Who among the children you have mentioned are still living with you?

ISHINA NAME	ISHINA NAME

2.11 Mpeniko amashina ya bantu abalupwa ne fibusa abo mulesunga panshita ino. Munjebeko inshiku bafyelwepo, ifyo muli nabo, elyo nokunjeba nga baume nangu banakashi.

Kindly give me the names of relatives and friends who are living with you. Also give me their dates of birth, the relationship between you and each of them, and their sex.

ISHINA NAME	UBUSHIKU BAFYELWEPO DATE OF BIRTH	IFYO MULI NABO RELATIONSHIP	BAUME/ MALE/ BANAKASHI/ FEMALE

3.1 Bushe mwapelele mwi mukusambilila kwenu?.....
What is the highest level of your education?

*Bakepusha. Moneni Q2.1. Ngacakuti balyupwa bepusheni icipusho ici cakonkapo. Nga tabaupwa kabiyeni pa cipusho 4.1.

*Interviewer. Refer to Q2.1. If the respondent is married ask her the following question, otherwise go to Q4.1.

3.2 Nga abenamwenu bapelele mwi mukusambilila kwabo?.....

What is the highest level of education of your husband?.....

4.1 Nincitonshi mubomba?.....
What is your occupation?

4.2 Bushe nincito ya malipilo pa mweshi? EE:.....
IYOO:..... (Q4.4)

Do you receive a monthly wage or salary? YES:.....
NO:..... (Q4.4)

4.3 Bushe mupoka indalama shinga pa mweshi?.....
What is your monthly income?

4.4 Bushe mwalitala amubombapo incito ya malipilo mu myeshi ikumi naibili iyi yapita? EE:... IYOO:...(Q4.6)

During the past twelve months, did you ever work in some formal employment? YES:..... NO:..... Q4.6)

4.5 Nincitonshi, kabili malipilonshi mwapokele?.....
What was your occupation and what was your income?

4.6 Bushe kwaliba incito nashimbi isho mubomba?
EE:..... IYOO:.....(Q4.8)

Do you do other jobs besides the one you have mentioned? YES:..... NO:.....(Q4.8)

4.7 Nincitonshi?.....
What other jobs do you do?

*Bakepusha. Ngabakasuka balyupwa bepusheni amepusho aya ayakonkapo. Ngatabaupwa kabiyeni ku Q4.12.

*Interviewer. If the respondent is married ask her the following questions. If she is not married go to Q4.12.

4.8 Bushe incito ibomba abenamwenu nincitonshi?.....
What is the occupation of your husband?

4.9 Bushe bapoka indalama shinga pa mweshi?.....
What is his monthly salary?

4.10 Bushe incito shimbi isho babomba nincitonshi?.....
What other jobs does he do?

4.11 Bushe mung'anda namukwatapo bambi abamwafwilisha ku ncito shenu isha mumabala nangu incito shamalipilo? Mumpeko impendwa yabo.....

Who else in the household assists you in your work? Please give me the number of such people.....

Bakepusha. Ipusheni amepusho ayakonkapo ku bantu bekala muncende shamumishi. Aba mu Mporokoso Township mwibepushako aya mepusho. Bena kabiyeni pa cipusho calenga 5.1.

Interviewer. Ask the following questions to respondents in villages only. For respondents in Mporokoso Township go to Q5.1.

4.12 Bushe amabala ayo mulimamo kuti yaba shani ubukulu nga mwayabikile pamo?.....

How big would be your field if you put all your fields together?..... .

4.13 Kwalepa shani ubutali kwi bala lyapalamisha muno mushi?.....
How far is your nearest field from this village?

4.14 Kwalepa shani kwi bala lyatalukisha ukufuma mumushi?.....
How far is your farthest field from this village?

4.15 Nibani abamwafwilisha mukubomba incito shenu?.....
Who helps you in your work?

5.1 Bushe ing'anda yaba ne miputule inga?.....
How many rooms does this house have?

5.2 Bushe paliba icimbusu? EE:..... IYOO:.....
Is there a latrine/toilet? YES NO

5.3 Bushe mutapakwi amenshi yakwipikila na yakunwa?.....
What is the source of your domestic water?

5.4 Bushe kwalepa shani uko kwine ukufuma pano ng'anda?...
How far is that source from this house?

5.5 Bushe mulepikako amenshi yakunwa? EE:..... IYOO:.....
Do you boil your drinking water? YES NO

5.6 Mukwai mpeniko amashina elyo ne mpendwa yafitekwa fintu mwakwata pa ng'anda.

Kindly give me the names and number of livestock you have in this household.

ISHINA NAME	IMPENDWA NUMBER	ISHINA NAME	IMPENDWA NUMBER

Bakepusha. Nga balikwata abana abakuifyalila (Q2.8), bepusheni amepusho ayakonkapo. Nga tabakwata abana abakuifyalila kabiyeni ku Q7.1.

Interviewer. Refer to Q2.8. If the respondent has her own children, ask her the following question. If she does not have children of her own, go to Q7.1

6.1 Bushe mulaya nangu mwaleya ku kiliniki ilyo muli nangu ilyo mwaleba pa bukulu? EE:..... IYOO:.....(Q6.3)

Do you or did you attend antenatal clinics when pregnant? YES:..... NO:..... (Q6.3)

6.2 Pa bana benu bonse, nibani bafyalilwe ku kiliniki nangu ku cipatala?.....
.....

Who among the children was/were born at a clinic or hospital?.....
.....

6.3 Bushe mulonsha nangu mwaleonsha abana benu ibele?
EE:..... IYOO:.....(Q7.1)

Do you or did you breast-feed your child or children?
YES:..... NO:.....(Q7.1)

6.4 Myeshi inga mwaonseshe umwana uwakushalikisha?.....
For how many months did you breast-feed the last child?

Nga baleonsha panshita ino: Bushe mukamonsha imyeshi inga uyu mwana ali pa mubili?.....

If currently breast-feeding: For how many months will you breast-feed this baby?.....

6.5 Akwete imyeshi inga ilyo mwatendeke ukumupela ifyakulya fimbi ifyakucila pe bele?.....

How many months was your last baby when you started to give him or her supplemental foods other than breast milk?.....

6.6 Mulandunshi mwalekele ukumonsha?.....
.....

Why did you stop to breast-feed him or her?.....
.....

Nga baleonsha panshita ino: Mulandunshi mukalekela ukumonsesha pa myeshi iyo mwalumbula?.....
.....

If currently breast-feeding: Why will you stop breast-feeding this child at the age you have mentioned?.....
.....

6.7 Bushe filyonshi ifyo mupela nangu mwalepela abana musumuna nangu mwalesumuna kwi bele?.....
.....

What foodstuffs do you give or did you give to the children you wean or weaned?.....
.....

Bakepusha. Aya mepusho mwiipushako abantu abekala mu Township. Bena muye ku cipusho calenga 8.1.

Interviewer. Ask the following questions only to residents in villages. For respondents in the Township go to Q8.1.

7.1 Bushe filyonshi nangu filimwanshi mwalimine uyu mwaka wapita ifyo mwasombwele uno mwaka?.....
.....

What crops did you grow last season that you harvested this year?.....
.....

7.2 Bushe mifuko inga iyakufina 50 kilogram iyo mwasombwele ukufuma mufilyo mwalimine?

How many 50 kilogram bags of particular crops did you harvest?

ICILYO CROP	IMIFUKO BAGS	ICILYO CROP	IMIFUKO BAGS

7.3 Mifuko inga mwashitishapo nangu mukashitishapo pa filyo fine ifi?

How many bags have you sold or will sell from your harvest?

ICILYO CROP	IMIFUKO BAGS	ICILYO CROP	IMIFUKO BAGS

7.4 Mulandunshi mwashitishishe nangu mukashitishisha ifyo filyo?.....
.....

Why did you or will you sell those foodstuffs?.....
.....

7.5 Bushe ukufuma mu Kabengele Kanono, mwatala amushitapo ifyakulya? EE:..... IYOO:.....(Q8.1)

From January this year, have you ever bought any foodstuffs? YES:..... NO:.....(Q8.1)

7.6 Fyakulyanshi mwashitile kabili nikuli bani mwashitile ifyo fine filyo?.....
.....

What foodstuffs did you buy and from whom?.....
.....

8.1 Bushe mulya ifyakulya imiku inga mubushiku bumo?.....
How many times a day do you eat your meals?

8.2 Ninshitanshi mulya ifyo filyo?.....
At what particular times of the day do you eat those meals?

8.3 Fyakulyanshi mulya ulucelo ilyo tamulaya ku milimo nangu ilyo abana besukulu tabalaya ku sukulu?.....
.....

What foodstuffs do you eat at breakfast?.....
.....

8.4 Nondolweleniko ifilyo mulya akasuba (akasuba pa kati ka mutwe) nangu ilyo mwabwela ku milimo, elyo ne filyo mulya icungulo.....
.....

Kindly tell me the foods you eat at lunch time (or when you come from your fields), and the foods you eat at supper.....
.....

8.5 Bushe umunani wa cilemba, inyangu, ne ntongwe, mulya inshiku shinga mumulungu umo?.....

How many days a week do you eat beans, peas, and other pulses?.....
.....

8.6 Ngo munani wa nkoko na mani mulya imiku inga mumulungu umo?.....
How many times a week do you poultry products?

8.7 Bushe umunani wa nama mulya imiku inga mumulungu umo?.....
How many times a week do you eat meat?

8.8 Nge sabi mulya imiku inga mumulungu umo?.....
How many times a week do you eat fish?

8.9 Fyakulyanshi mwalile mailo icungulo?.....
.....

What foodstuffs did you eat last evening?.....
.....

9.1 Bushe mulatwala nangu mwaletwala abana ku kiliniki nangu ku cipatala ilyo bacili abanono ku Under-five Clinic? EE:..... IYOO:.....(Q9.3)

Do you or did you take children to Under-five clinics when they are/were young? YES:..... NO:.....(9.3)

Bakepusha. Nga muli abana abanono pokeni amakati yabo nokumona amalwele bacingililwako. Elyo kabili mumone nga balatwala abana babo ku cipimo.

Interviewer. If there are children in the household request for their Under-five clinic cards. Check for immunization records and whether or not the respondent takes them for weight monitoring.

9.2 Mukwai mpeniko amakati ya bana abanono pakuti mmone amalwele bacingililwako.

Kindly give me the children's Under-five clinic cards so that I can check their immunization records.

ISHINA NAME	ALICINGILILWA VACCINATED AGAINST	ISHINA NAME	ALICINGILILWA VACCINATED AGAINST

Bakepusha. Kabiyeni ku cipusho calenga 9.4.

Interviewer. Go to question 9.4.

9.3 Mulandunshi mushitwalila nangu ico mushaletwalila abana ku Under-five clinic?.....
.....

Why don't you or did you not take the children to Under-five clinics?.....
.....

9.4 Mumyeshi ikumi na ibili iyi yapita, bushe mwalitalile mwatwala umwana nangu abana ku kiliniki nangu ku cipatala kukundapwa? EE:..... IYOO:.....(Q9.8)

During the past twelve months, did you ever take your child or children to a clinic or hospital for treatment? YES:..... NO:.....(Q9.8)

9.5 Miku inga intu mwaile ku kiliniki nangu ku cipatala mukutwala umwana nangu abana mukundapwa?.....

How many times did you go to that clinic or hospital to take a sick child or children for treatment?.....

9.6 Ni ku kilinikinshi nangu cipatalanshi mwaile?.....
.....

To which clinic or hospital did you go?.....
.....

9.7 Alelwalanshi nangu balelwalanshi?.....
.....

What problem or problems did they have?.....
.....

9.8 Pa myeshi yonse iyi ikumi na ibili, bushe tamwali umwana umulwele mung'anda? EMO ALI:.. TAMWALI:.(Q9.10)

During the past twelve months, did you not have a child or children that fell sick in the household? THERE WERE SOME:..... THERE WAS NONE:.....(Q9.10)

9.9 Mulandunshi mushamutwalile nangu mushabatwalile ku kiliniki nangu ku cipatala?.....
.....

Why did you not take them to a clinic or hospital?...
.....

9.10 Nga abana balwala mucita shani pakucefyanyako nangu ukupwisha amalwele?.....
.....

What do you do to eliminate or reduce the disease burden when a child falls ill?.....
.....

9.11 Pa myeshi ikumi limo naibili iyi yapita, nibani aba mung'anda bambi abaile ku kiliniki nangu ku cipatala, kabili macushonshi yabatweleko?.....
.....
.....

During the past twelve months, who else was ill in the household and went to a clinic or hospital? From what problem were they suffering?.....
.....
.....

10.1 Bushe balupwa lwenu ne fibusa mwakwata abekala ku ncende shimbi balamutuminako indalama nangu ubwafwilisho ubuli bonse? EE:..... IYOO:.....

Do relatives and friends that live elsewhere send you money or any other form of assistance? YES:... NO:...

10.2 Bushe mwalikwata incinga pa ng'anda? EE:... IYOO:...
Do you own a bicycle? YES NO

Mukwai ndefwaya ukupima abana bonse abashilafika imyaka yakufyalwa ikumi limo na isano. Bonse abali pano ng'anda (abo mwikala nabo, te batandashi iyoo) ndebapima mumusango umo wine. Elyo naimwe bene ndemupima.*

Madam, I would like to measure all the children who are not yet fifteen years years old. I just want to measure those children who stay with you (and not visitors). Also I will take your measurements too.*

*Bakepusha. Shininkisheni ifyo abana mwalapima niabo abali ne myaka yakufyalwa abashilati bakumanye ikumi limo na isano. Moneni pa mepusho Q2.9 na Q2.10. Mwilaba kupima na bakasuka wa mepusho.

*Interviewer. Make sure that you take measurements for all the children under fifteen years of age. Check for them under questions Q2.9 and Q2.10. Remember to take measurements of the respondent as well.

ISHINA NAME	UBUTALI HEIGHT/LENGTH	UKUFINA WEIGHT	UKUBOKO CIRCUMFERENCE

MUKWAI NATASHA NGANSHI PA BWAFWO BUNTU MWAMPELA. NDI NOKUBWELA KABILI, NOMBA NKABAFYE NA MEPUSHO AYANONO AYAKUMWIPUSHA.

THANK YOU SO MUCH FOR YOUR KIND ASSISTANCE IN ANSWERING MY QUESTIONS. I WILL BE BACK AGAIN BUT WITH VERY FEW QUESTIONS TO ASK YOU.

APPENDIX A2. QUESTIONNAIRE FOR ROUND TWO: JANUARY TO MARCH 1988

UBUMI NE MILILE MU NCENDE SHA MUMISHI MU ZAMBIA
HEALTH AND NUTRITIONAL STATUS IN RURAL ZAMBIA

IFIPUSHO FYA MUKU WACIBILI
ROUND TWO QUESTIONNAIRE

ISHINA LYA MUSHI:..... INAMBALA YA NG'ANDA.....
NAME OF VILLAGE HOUSE NUMBER

CODE YA NG'ANDA:..... AMACODE YA BANTU:.....
HOUSE CODE SUBJECTS' CODES

UBUSHIKU BWE LELO:..... UBUSHIKU BWAKUPITULUKAMO
TODAY'S DATE DATE OF INSPECTION:.....

ISHINA LYA BAKASUKA WA MEPUSHO:.....
RESPONDENT'S NAME

1.0 Bakasuka wa mepusho (1) Bafyalilwe, (2) Tabafyalilwe (Q1.3) muli uno mushi/muno Township.

The respondent was (1) Born, (2) Not Born (Q1.3) in this Village/Township.

1.1 Bushe mwatala amwikalako ku ncende shimbi ukucila pa mwaka umo? EE:..... IYOO:.....(Q1.3)

Have you ever lived elsewhere for more than a year?
YES:..... NO:.....(Q1.3)

1.2 Nikwi mwaikele ukucila pa mwaka umo?.....
Where did you live for more than one year?

1.3 Ngacakuti kwali ukusala ukwakwikala mucalofye conse ica Zambia, niku cifulonshi mwingatemwa ukwikala, kabili mulandunshi mwingatemenwa ukwikala uko kwine?.....
.....

If you could choose where to live in Zambia, where would you like to live and why?.....
.....

2.0 Bakasuka (1) Baupwa, (2)Tabaupwa (Q3.0) ku mpali.

The respondent is married (1) In a Polygamous, (2) Monogamous (Q3.0) marriage.

2.1 Bushe mulalila pamo na bakashi banenu nabana babo?
EE:..... IYOO:.....

Do you usually eat together with the other wife (wives) and her/their children? YES:..... NO:.....

2.2 Bushe mulabombela pamo nabakashi banenu imilimo ya pa ng'anda? EE:..... IYOO:.....

Do you work together with the other wife (wives) in your household jobs? YES:..... NO:.....

3.0 Bakasuka (1) Balilandile (Q3.2), (2) Tabalandile umo abalume bapelele mukusambilila kwabo.

The respondent has (1) Already (Q3.2), (2) Not Yet provided information on the level of education of her husband.

3.1 Bushe abenamwenu bapelele mwi mukusambilila kwabo?.....

What is the highest educational level of your husband?
.....

3.2 Bushe abenamwenu bafyelwe mu mweshi na mwakanshi?.....
In which month and year was your husband born?

4.0 Bakasuka (1) Bekala (Q4.2), (2) Tabekala mu Mporokoso Township.

The respondent (1) Lives (Q4.2), (2) Does Not live in Mporokoso Township.

4.1 Filyonshi mulimine uno mwaka?.....
.....

What crops have you sown/planted this farming season?
.....
.....

4.2 Bushe fyakulyanshi mwalile mailo icungulo?.....
.....

What particular foodstuffs did you eat last evening?..
.....

5.1 Ukufuma apo twamutandalile mu September nangu October, bushe mwatala amuyako ku kiliniki nangu ku cipatala? EE:..... IYOO:.....(Q5.4)

Since we visited you in September or October, have you ever gone to a clinic or hospital? YES:..... NO:.....(Q5.4)

5.2 Mwaile ku kilinikinshi nangu cipatalanshi?.....
To which clinic or hospital did you go?

5.3 Cinshi mwaile mukucitako?.....
What did you go there for?

5.4 Bushe kuliko bamo abalwele mung'anda pa nshita ino? EE:..... IYOO:..... (Q5.6)

Are there some people currently sick in your household? YES:..... NO:.....(Q5.6)

5.5 Bulwelenshi nangu malwelenshi yalebacusha?.....
What are they suffering from?

5.6 Bushe mukumona kwenu, bucushinshi ubwa bumi ubo abantu abengi baculako kuno ncende ya Zambia?.....

What do you see as the number one health problem in this area of Zambia?.....

6.0 Bushe mwatala amulufyapo umwana (uwafwa)? EE:..... IYOO:..... (Q7.1)

Have you ever experienced a death of a child in your family? YES:..... NO:..... (Q7.1)

6.1 Ali nangu bali ne myaka inga ilyo afwile/bafwile?.....
.....

How old was the child/were the children when he or she/they died?.....

7.1 Mukumona kwenu, bushe ubwafya ubukalamba ubwa milile kuno ncende ya Zambia bwafyanshi?.....
.....

What, in your opinion, is the number one nutritional problem in this area of Zambia?.....
.....

7.2 Ngacakuti mwalisalile impendwa yabana mwingatemwa ukukwata, bushe kuti yaba ni mpendwanshi?.....

If you were given a chance to choose the number of children you would like to have, what number could that be?.....

7.3 Cinshi mwalumbwila iyo mpendwa?.....
.....

Why have you chosen that number?.....
.....

8.0 Bakasuka (1) Balilandile (E MPELA YA MEPUSHO), (2) Tabalandile indalama shipoka abalume babo pa mweshi.

The respondent (1) Provided (END OF INTERVIEW), (2) Did Not provide information on husband's income.

8.1 Bushe abenamwenu bapoka indalama shinga pa mweshi?.....
What is your husband's monthly salary?

Mukwai ndefwaya ukupima abana balya bapiminwe lilya twaishile pa muku wakubalilapo. Naimwe bene ndemupima.

Madam, I would like at this time to take measurements of the same people we measured last time we were here. I will take your measurements also.

ISHINA NAME	UBUTALI HEIGHT	UKUFINA WEIGHT	UKUBOKO CIRCUMFERENCE

NATASHA NGANSHI PA BWAFWO BWENU!

THANK YOU SO MUCH FOR YOUR KIND ASSISTANCE!

Appendix B1. Male Weights (in kg) by Age Group and Area*

Age Group	Rural Boys Period 1	Rural Boys Period 2	Urban Boys Period 1	Urban Boys Period 2
0- 1	5.97 (1.324,18)	8.32 (1.313,17)	6.42 (1.349,15)	8.38 (.691,13)
1- 2	8.31 (1.740,19)	9.33 (2.498,18)	8.27 (1.981,27)	9.27 (1.617,24)
2- 3	9.79 (2.272,26)	10.67 (2.173,26)	10.35 (1.528,27)	11.42 (1.897,22)
3- 4	12.32 (2.544,25)	12.85 (3.215,24)	11.27 (2.145,19)	12.28 (1.602,18)
4- 5	14.21 (2.912,27)	14.31 (3.108,26)	15.79 (5.318,22)	16.58 (5.857,18)
5- 6	15.18 (3.099,25)	15.73 (4.621,22)	15.46 (2.358,25)	15.02 (2.706,22)
6- 7	15.97 (3.061,18)	16.81 (2.720,16)	16.28 (2.715,19)	17.15 (2.957,17)
7- 8	18.83 (3.399,19)	18.56 (3.851,16)	18.71 (2.242,14)	18.42 (2.805,13)
8- 9	21.17 (5.294,18)	19.85 (3.778,17)	21.39 (3.375,14)	21.96 (4.003,11)
9-10	19.46 (3.387,11)	20.09 (3.506,11)	22.58 (3.705,19)	23.34 (4.126,16)
10-11	24.07 (5.189,15)	23.90 (5.100,15)	25.40 (5.079,15)	27.39 (6.384,13)
11-12	24.81 (5.202,13)	24.35 (4.930,13)	30.14 (6.695,14)	28.17 (3.929, 9)
12-13	27.83 (4.345,23)	25.95 (3.837,21)	27.32 (4.423,19)	29.07 (5.233,15)
13-14	29.63 (7.658,16)	30.93 (7.438,15)	31.23 (5.384,13)	32.85 (4.930,13)
14-15	27.78 (7.886, 9)	27.78 (7.807, 9)	32.42 (4.864,13)	33.46 (5.246,11)
MEAN	17.30 (8.08,282)	17.56 (7.61,266)	18.17 (8.74,275)	18.81 (8.73,235)

*Values in parentheses are standard deviations and number of cases in each respective age group.

Appendix B2. Male Mid-upper Arm Circumferences (in cms) by Age Group and Area*

Age Group	Rural Boys		Urban Boys	
	Period 1	Period 2	Period 1	Period 2
0- 1	14.06 (.906,18)	14.94 (1.391,17)	14.27 (1.252,15)	15.23 (.904,13)
1- 2	14.26 (1.695,19)	14.47 (1.440,18)	14.70 (1.237,27)	15.04 (1.132,24)
2- 3	14.25 (1.313,26)	14.60 (1.357,26)	15.49 (1.241,27)	15.68 (1.201,22)
3- 4	15.68 (1.773,25)	15.54 (1.474,24)	15.34 (1.302,19)	15.69 (1.226,18)
4- 5	15.69 (1.257,27)	15.65 (1.164,26)	16.21 (1.203,22)	16.33 (1.553,18)
5- 6	15.52 (1.212,25)	15.43 (1.498,22)	15.68 (1.135,25)	15.80 (1.315,22)
6- 7	15.81 (1.238,18)	16.03 (1.218,16)	15.43 (.882,19)	15.71 (.849,17)
7- 8	16.32 (1.346,19)	15.72 (1.183,16)	16.23 (.895,14)	16.42 (.787,13)
8- 9	16.36 (1.443,18)	16.06 (1.435,17)	17.14 (1.247,14)	16.64 (1.286,11)
9-10	16.32 (.783,11)	16.05 (1.150,11)	17.05 (1.092,19)	17.42 (1.254,16)
10-11	17.63 (1.866,15)	17.43 (1.802,15)	17.50 (1.701,15)	17.81 (1.665,13)
11-12	17.58 (1.134,13)	17.96 (1.587,13)	18.89 (2.272,14)	19.00 (4.008, 9)
12-13	18.04 (1.558,23)	17.86 (1.831,21)	17.83 (1.500,19)	18.27 (1.450,15)
13-14	18.69 (2.330,16)	18.97 (2.394,15)	19.39 (1.850,13)	19.62 (1.746,13)
14-15	18.44 (1.211, 9)	18.39 (1.900, 9)	19.19 (1.508,13)	19.46 (1.508,11)
MEAN	16.10 (2.00,282)	16.13 (1.99,266)	16.44 (1.98,275)	16.66 (2.02,235)

*Values in parentheses are the standard deviations and number of cases for each respective age group.

Appendix B3. Male Heights (in m) by Age Group and Area*

Age Group	Rural Boys		Urban Boys	
	Period 1	Period 2	Period 1	Period 2
0- 1	.563 (.055,18)	.641 (.042,17)	.578 (.061,15)	.679 (.058,13)
1- 2	.691 (.086,19)	.727 (.087,18)	.654 (.089,27)	.727 (.072,24)
2- 3	.740 (.081,25)	.789 (.088,26)	.781 (.094,27)	.847 (.069,22)
3- 4	.864 (.101,25)	.904 (.092,24)	.820 (.074,19)	.861 (.067,18)
4- 5	.912 (.103,27)	.946 (.109,26)	.955 (.119,22)	1.011 (.131,18)
5- 6	.973 (.105,24)	1.009 (.121,22)	.966 (.079,25)	1.013 (.084,22)
6- 7	1.012 (.077,18)	1.051 (.070,16)	1.034 (.099,19)	1.077 (.084,17)
7- 8	1.076 (.101,19)	1.104 (.105,16)	1.115 (.057,14)	1.145 (.063,13)
8- 9	1.085 (.146,18)	1.120 (.121,17)	1.184 (.057,14)	1.227 (.072,10)
9-10	1.120 (.094,11)	1.143 (.107,11)	1.211 (.052,19)	1.240 (.057,16)
10-11	1.168 (.165,15)	1.207 (.134,15)	1.264 (.091,15)	1.297 (.082,13)
11-12	1.175 (.105,13)	1.214 (.093,13)	1.350 (.134,14)	1.363 (.112, 9)
12-13	1.189 (.142,23)	1.223 (.138,21)	1.332 (.123,19)	1.341 (.098,14)
13-14	1.258 (.147,16)	1.295 (.150,15)	1.405 (.086,13)	1.425 (.087,13)
14-15	1.202 (.184, 9)	1.242 (.177, 9)	1.419 (.044,13)	1.457 (.058,11)
MEAN	.975 (.23,280)	1.012 (.22,266)	1.029 (.27,275)	1.067 (.25,233)

*Values in parentheses are the standard deviations and number of cases for each respective age group.

Appendix B4. Female Weights (in kg) by Age Group and Area*

Age Group	Rural Girls Period1	Rural Girls Period 2	Urban Girls Period 1	Urban Girls Period 2
0- 1	6.43 (1.067,18)	7.85 (1.877,16)	5.30 (1.215, 7)	7.30 (.816, 7)
1- 2	8.35 (1.786,39)	8.84 (1.730,36)	9.65 (7.486,15)	11.21 (9.034,11)
2- 3	10.24 (3.094,24)	11.35 (3.281,20)	9.70 (1.760,24)	10.33 (1.914,18)
3- 4	11.52 (2.138,18)	11.64 (2.484,18)	12.07 (2.139,20)	12.97 (2.199,18)
4- 5	13.95 (5.197,30)	14.90 (5.284,29)	13.19 (2.487,15)	13.75 (2.861,14)
5- 6	14.47 (4.337,18)	14.66 (4.194,16)	15.60 (2.189,15)	15.65 (3.224,13)
6- 7	16.24 (3.145,21)	16.25 (3.543,21)	17.28 (2.718,22)	18.16 (2.218,19)
7- 8	18.07 (1.900,14)	18.08 (1.956,13)	17.90 (3.431,21)	18.48 (3.462,20)
8- 9	19.47 (3.248,15)	20.50 (3.803,15)	20.69 (2.870,18)	21.34 (3.187,16)
9-10	21.95 (4.048,19)	23.00 (3.853,17)	23.21 (3.068,21)	23.71 (3.364,19)
10-11	21.97 (3.957,15)	21.42 (3.763,13)	25.50 (4.272,17)	25.67 (3.285,12)
11-12	24.43 (2.699, 7)	22.00 (2.550, 5)	27.61 (5.776,19)	28.56 (6.015,17)
12-13	26.71 (3.608,21)	24.87 (4.675,19)	30.15 (4.876,17)	28.92 (5.090,13)
13-14	31.73 (4.818,15)	32.86 (6.443,14)	30.81 (8.400,16)	30.31 (9.812,13)
14-15	35.75 (6.864,12)	35.05 (6.358,11)	33.61 (8.607,14)	35.46 (10.022,13)
MEAN	16.93 (8.66,286)	17.22 (8.37,263)	19.69 (9.05,261)	20.27 (9.04,223)

*Values in parentheses are the standard deviations and number of cases, respectively.

Appendix B5. Female Mid-upper Arm Circumference (in cms) by Age Group and Area

Age Group	Rural Girls		Urban Girls	
	Period 1	Period 2	Period 1	Period 2
0- 1	13.47 (1.567,18)	14.63 (1.348,16)	13.93 (1.946, 7)	14.57 (1.239, 7)
1- 2	14.17 (1.420,39)	14.47 (1.454,36)	14.80 (2.007,15)	15.50 (1.924,11)
2- 3	14.02 (1.839,24)	14.85 (1.663,20)	15.13 (1.637,24)	15.17 (1.663,18)
3- 4	15.56 (1.199,18)	15.44 (1.247,18)	15.40 (1.284,20)	15.81 (1.395,18)
4- 5	15.45 (1.719,30)	15.71 (1.724,29)	15.55 (1.167,15)	15.46 (1.263,14)
5- 6	15.89 (1.568,18)	15.72 (1.183,16)	16.70 (1.066,15)	16.31 (1.588,13)
6- 7	15.55 (1.071,21)	15.76 (1.347,21)	16.55 (1.336,22)	16.45 (1.079,19)
7- 8	15.79 (1.104,14)	15.81 (1.032,13)	15.80 (1.541,21)	15.88 (1.605,20)
8- 9	16.63 (1.302,15)	16.50 (1.035,15)	16.86 (1.433,18)	16.91 (1.452,16)
9-10	16.97 (1.429,19)	17.35 (1.260,17)	17.52 (1.286,21)	17.82 (1.483,19)
10-11	17.33 (1.448,15)	17.00 (1.414,13)	17.93 (1.357,17)	18.46 (1.252,12)
11-12	17.57 (1.170, 7)	17.30 (1.304, 5)	18.92 (1.953,19)	19.15 (2.330,17)
12-13	18.29 (1.496,21)	18.11 (1.496,19)	19.03 (1.515,17)	18.85 (1.784,13)
13-14	20.00 (1.452,15)	19.46 (1.985,14)	19.88 (2.110,16)	19.85 (1.842,13)
14-15	21.42 (2.512,12)	21.14 (2.367,11)	20.25 (1.805,14)	20.58 (1.977,13)
MEAN	16.10 (2.48,286)	16.25 (2.22,263)	16.98 (2.31,261)	17.11 (2.33,223)

Values in parentheses are the standard deviations and number of cases, respectively.

Appendix B6. Female Heights (in m) by Age Group and Area*

Age Group	Rural Girls Period 1	Rural Girls Period 2	Urban Girls Period 1	Urban Girls Period 2
0- 1	.579 (.066,18)	.639 (.042,16)	.557 (.059, 7)	.641 (.045, 7)
1- 2	.667 (.070,39)	.712 (.057,36)	.719 (.235,15)	.816 (.257,11)
2- 3	.759 (.077,24)	.804 (.089,20)	.741 (.060,24)	.784 (.056,18)
3- 4	.843 (.070,18)	.874 (.077,18)	.843 (.080,20)	.895 (.090,18)
4- 5	.914 (.127,30)	.961 (.122,29)	.920 (.077,15)	.964 (.082,14)
5- 6	.966 (.117,18)	1.012 (.115,15)	.971 (.087,15)	1.013 (.073,13)
6- 7	.990 (.120,21)	1.046 (.091,21)	1.057 (.093,22)	1.082 (.063,19)
7- 8	1.041 (.104,14)	1.082 (.097,13)	1.101 (.083,21)	1.129 (.076,19)
8- 9	1.088 (.098,15)	1.129 (.089,15)	1.171 (.075,18)	1.197 (.077,16)
9-10	1.116 (.136,19)	1.177 (.123,17)	1.190 (.114,21)	1.225 (.118,19)
10-11	1.177 (.096,15)	1.215 (.070,13)	1.277 (.058,17)	1.306 (.055,12)
11-12	1.197 (.179, 7)	1.192 (.123, 5)	1.297 (.109,19)	1.313 (.110,17)
12-13	1.245 (.127,21)	1.283 (.113,19)	1.391 (.119,17)	1.390 (.122,13)
13-14	1.319 (.130,15)	1.339 (.125,14)	1.364 (.153,16)	1.365 (.145,13)
14-15	1.349 (.163,12)	1.372 (.153,11)	1.422 (.172,14)	1.455 (.169,13)
MEAN	.964 (.25,286)	1.006 (.24,262)	1.080 (.26,261)	1.115 (.24,222)

*Values in parentheses are the standard deviations and number of cases, respectively.