THE EPIDEMIOLOGY OF MALNUTRITION IN YOUNG CHILDREN IN KAMNAROK MOSOP, BARINGO DISTRICT

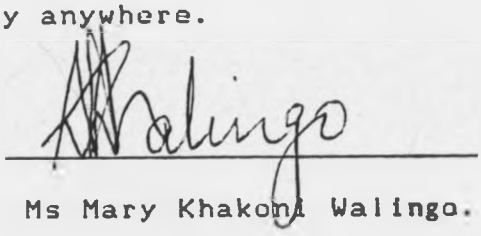
BY

MARY KHAKONI WALINGO.

A thesis submitted in part fulfilment of the Degree of Master of Science in Applied Human Nutrition at the University of Nairobi.

DECLARATION

I Mary Khakoni Walingo declare that this thesis is my original work and has not been presented in any other university anywhere.



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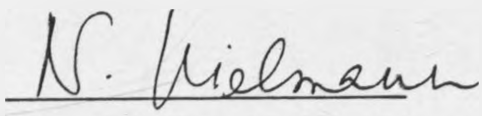
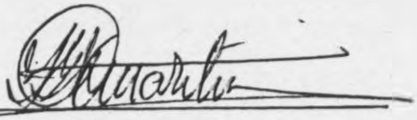
(a) 

Ms Nandita Kielmann.
Lecturer,
Unit of Applied Human Nutrition,
University of Nairobi.

(b) 

Dr G.K Maritim.
Head, Unit of Applied Nutrition,
University of Nairobi.

DEDICATION

To my parents Rosa and Abraham for their dedication to my education.

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I want to thank all those who made it possible for me to complete this work. Great appreciation goes to GTZ for sponsoring my education and also to IDRC for sponsoring the research activities.

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DEFINITION.

(a) *Family*: A group of people living together who are related by blood, marriage, and/or adoption.

(b) *Household*: A group of people within a family living and eating together.

(c) *Preschool child*: A child between 6-40 months of age. This is an index child.

(d) *Area of study*: Kamnarok Mosop location of Kabartonjo Division, Baringo District, Rift Valley Province.

(e) *Dependency ratio*:

$$= \frac{\text{pop. below 15 yrs+pop. above 65yrs}}{\text{pop. between 15-45 yrs}}$$

(f) *Average household size*:

$$= \frac{\text{Total pop. under study}}{\text{Total households under study}}$$

(g) *Ecology*: For the purpose of this study, it is the study of children's nutritional status in relation to their environment.

(h) *Etiology*: For the purpose of this study, it is an inquiry into the causes of malnutrition amongst children aged between 6-40 months.

(i) *Kiosk*: For the purpose of this study, it is a small retail shop where food items are sold.

(j) *Ugali*: For the purpose of this study, it is a dish made from flour and water served with vegetables and/or meat stew.

(k) *Githeri*: For the purpose of this study, it is a dish made from a mixture of maize and beans.

ABBREVIATION

CBS: Central Bureau of Statistics.

CDC: Centre for Disease Control Programme.

NCHS: National Centre for Health Statistics.

SD: Standard Deviation.

ABSTRACT

A cross-sectional survey was set up to establish the prevalence of protein-energy malnutrition and to identify its probable determinants in Kamnarok Mosop, Kabartonjo Division in Baringo District. The survey sought to establish a relationship between socioeconomic status, water availability, individual child morbidity experience, time spent by mothers doing household chores, and nutritional status of preschool children. The subjects of the study were children aged between 6-40 months. Their mothers were the respondents who provided relevant information about their children and household amenities.

To determine prevalence of protein-energy malnutrition of preschool children anthropometric measurements of each child were obtained. These measurements included determination of the precise age, height, and weight of an individual child. Using weight-for-age as an indicator of prevalence, the obtained measurements were entered on a Centre for Disease Control (CDC) programme and compared with the National Centre for Health Science (NCHS) reference population for each sex. All children

whose weights were less than -2 Standard Deviations (-2SD) of the standard weight-for-age of the reference population were considered undernourished.

About 18.4% of the total study children fell in this group. Variables which showed associations with a child's nutritional status were the age and sex of a child, number of pregnancies of the mother, childhood morbidity, total household income, and total time spent by the mother on household chores. However, no conclusive statements could be made concerning the determinants of malnutrition amongst the variables considered. Though the above variables showed associations with nutritional status, they had very low correlation coefficients. There is need for further research to identify other factors that may have had an influence on the nutritional status.

Organization of women into groups through which literacy campaigns and nutrition education can be chanelled, establishment of income generating activities to exploit maternal skills and reduction of household chores to make more time available for child care recommended for the improvement of nutritional status.

CHAPTER ONE

1.0 INTRODUCTION

1.1 STATEMENT OF THE PROBLEM

Great efforts have been made towards the improvement of children's nutritional and health status. This is evident from the numerous etiological studies conducted in many parts of the world. Studies have shown that etiological determinants of malnutrition vary from region to region due to ecological diversity and tribal/ethnic background. Existing information is usually given in terms of national averages. Information on both nutrition and health desegregated by area is largely lacking. In view of the above it would be more valid if studies concentrated on each separate region as data from one area cannot be used to describe situations and problems in another area, or for generalizations about Kenya as a whole.

Baringo District has the highest prevalence of wasting in children (6.4%), with a malnutrition prevalence rate of 19% (CBS 1983). Evaluation of The Baringo Arid and Semi Arid Project has been carried out in the lower areas of the District and the results indicate a high prevalence of malnutrition (21-29%) in children living in the

various parts of the Baringo Arid and Semi Arid Project area. In this survey a number of pastoralist families living in the semi-arid zone identify water as the top priority among other basic needs (Kwame M. Kwofie 1984).

Kamnarok Mosop (in the Tugen hills) Baringo District was chosen as the study site for an investigation of the prevalence and causes of protein-energy malnutrition amongst children aged 6-40 months. The Tugen were originally pastoralist. They have settled down to farming where climatic conditions are favorable. Few studies have been carried out on the Tugen population of Kenya. Having worked in this area for a year the principal investigator noticed many cases of malnutrition, but was unable to find any documentation of its prevalence. This study was therefore carried out to establish the prevalence of protein-energy malnutrition and to identify its probable determinants amongst children 6-40 months of age.

A cross-sectional survey was carried out to determine the prevalence of preschool malnutrition in this area, followed by an in-depth study of the population to establish factors leading to this condition at household level. The study was

carried out in two phases. Phase 1 entailed anthropometric measurements and collection of demographic information. Phase 2 involved administration of the questionnaire through interview technique to collect information on selected variables such as age, sex, health status, socioeconomic and housing conditions. The whole survey was carried out between December 1988 and May 1989.

1.2 Objectives

1.2.1 To determine the prevalence of preschool child malnutrition in Kabartonjo Division, Baringo District.

1.2.2 To determine effects of household characteristics such as household size, sex differences, age of a child on prevalence of malnutrition.

1.2.3 To determine effects of socioeconomic factors such as income, education, occupation and land size on prevalence of of preschool malnutrition.

1.2.4 To determine the relationship between household accessibility to water, maternal time devoted to household chores and

nutritional status.

1.3 Hypotheses.

1.3.1. There is an association between socioeconomic status of a household, especially income of the head of the household and the nutritional status of its preschool children.

1.3.2. Size of landholding of a household is not associated with nutritional status of its preschool children.

1.3.3. Time spent by the mother on household chores is associated with nutritional status of preschool children.

1.4 Benefits of the study.

The purpose of the study was to establish a baseline for further research in the same area, and for comparison purposes with other areas. It will also provide policy planners with information about the child 'at risk' of developing malnutrition. Projects with a limited budget aimed at the improvement of health and nutritional status of the preschool children can be more effective if determinants of their nutritional and health status are known.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction.

Protein-energy malnutrition was defined by World Health Organization as a range of pathological conditions arising from coincident lack, in varying proportions of protein and calories, occurring most frequently in infants and young children and commonly associated with infections (Alleyne et al, 1977). In general usage the term protein-energy malnutrition (PEM) encompasses a spectrum of syndromes ranging from simple growth failure to pure and mixed syndromes of kwashiorkor, marasmus and marasmus-kwashiorkor.

2.1.1 Malnutrition and poverty.

Poverty as a primary cause of malnutrition underlies other causal factors (Taylor, C.E, 1976). Poverty is widespread at a higher magnitude in the third world countries. These countries have high birth and fertility rates compared to death rates. Child population is increasing and the absolute number of children with severe clinical forms of malnutrition is likely to continue to increase (Solomons, N.W., 1985). The social consequences of poverty are manifested in

high death rates and low standards of living.

2.1.2 Malnutrition and infection.

The mechanisms by which infection worsens nutritional status include reduction of appetite; a tendency for solid foods to be withdrawn, increased metabolic losses of nitrogen and decreased nitrogen absorption when infection involves the gastrointestinal tract. Several longitudinal studies have confirmed that children who are thin by anthropometric criteria have an increased likelihood of death (Scrimshaw, N. S 1975).

The most important infections in developing countries include diarrhea, acute respiratory infection and measles. These alone account for 75% deaths in Asia, Latin America and Africa (Ekholm, E. 1976). Malnutrition increases susceptibility to infection (Taylor,C. Kielmann, A. and Desweemer, C. 1979). Studies have shown that malnutrition lowers immune competence thus increasing susceptibility to infections. These in turn results in a poor nutritional status, increased mortality and deaths (Kielmann, A. McCord, C. 1978).

2.2 Etiological determinants of malnutrition.

2.2.1 Water supply.

Few studies have related nutritional status to the availability of water, especially few have considered the nature of the source of water and the distance to the source. The International Drinking Water Supply Decade of the UN and the Water Supply and Sanitation Plan of the Alma Ata Platform on 'Health for All' were based on the assumption that investments in water supply and sanitation would improve health (Isely, B. R. 1983).

Hughes (1980) while reviewing forty three studies of varying quality concluded that projects which emphasized quantities of water were more frequently able to demonstrate improvement in diarrheal morbidity than those that emphasized only improved water quality. An accepted minimum per capita of water a day necessary for health benefits appears to be 20 to 30 litres. A number of studies are beginning to suggest nutritional benefits from improvements in water supply and/or sanitation with possible beneficial effects in terms of diminished morbidity, savings in maternal time and energy and improved food production (Isely, B. R 1983).

In rural Bolivia, an investigation by Anderson (1981) on the effects of potable water on health and nutrition revealed a predominance of stunting in children. Stunting was more pronounced at higher than at lower altitudes. Dietary analysis revealed lower caloric and protein content at higher altitudes. Gastroenteritis was more frequent at lower altitudes. Another study carried out in St Lucia, West Indies, to determine the relationship between environmental sanitation and nutritional status of infants observed that weights and heights of children improved in areas with households that had taps and latrines (Henry, F. 1981).

In Africa, few studies of this nature have been done. One investigator compared Nigerian children from villages with scanty unprotected open well water with those from copious protected open well water. The results showed a greater weight-for-age and height-for-age in children from villages with copious protected water (Tomkins, A.M. 1978). Greater quantities of available water with beneficial effects on personal hygiene and food cleanliness offer a plausible explanation for the results.

In Kenya an evaluation of the Baringo Arid and Semi Arid Project revealed that, to the Baringo people,

limited amount of water was a major constraint affecting both human life and livestock. People have to walk long distances in search of water. The findings of this evaluation demonstrate that the degree of deprivation, as measured by the proportion of households with undernourished children, is quite high particularly among households with least access to water for irrigation as well as for human and animal consumption (Kwofie, K. M. 1984).

It is evident from existing literature that water supply is a critical factor in household hygiene and health status of its members. This has a further impact on the nutritional status of children in a household. More studies need to be carried out to determine the effect of water supply on nutritional status.

2.2.2 Maternal Time Availability.

The ability of a mother to look after her children as she would like is influenced to a large extent by the viability of her family as an economic unit. This viability is primarily determined by the availability of resources that lead to production and/or income for the family. It may also be affected by general economic conditions during

particular times of the year. In problematic situations economically constrained mothers will be faced with a limited number of options and choosing the right one may be difficult, especially a choice between using time for economically productive work or for child care and other domestic activities (Nabarro, D. 1981).

Generally women are responsible for food production and child feeding within the household (Holmboe-Ottesen, G. et al 1988). Women's participation in food production may be important in relation to the nutritional situation in the household: her food production may augment the availability within the household, as well as supplementing family income. Furthermore, a greater involvement in income generating activities often allow women more say in how to spend the income. There is evidence from many societies that when women control cash income they generally, spend more on food than do men (Tinker, I. 1979; Guyer, J. 1980; Tripp, R. 1982; Katona-Apte, J. 1983).

Contrary to the above, a heavy workload for women which is often the case when women are participating in food production, may negatively affect the nutritional status of children. This negative effect has been related to insufficient

time for the women to perform food related activities within the household, especially preparation and cooking, child care and child feeding (Popkin, B. et al 1976; Carloni, A. 1984; FAO, 1979; Holmboe-Ottesen, G. 1986).

Research dealing with women's work and the household food and nutrition situation is scanty (Holmboe-Ottesen, G. et al 1986). However, some studies have been conducted in Africa. One such study was carried out in the Gambia, basically on infant feeding and child care. The results showed that children unfortunate enough to reach the weaning stage at the beginning of the crop growing season were usually weaned abruptly, and would be typically left with a younger sibling or an elderly person in the family, especially if the mother's rice fields were far off. These children demonstrated a higher infection rate, a greater degree of weight faltering, and a greater mortality rate than those who passed through the crop growing season at the breast (Thompson,B. et al 1967).

In North East Zaire, Vis et al (1981) found that children whose mothers traveled great distances to fields not only had children with the highest infection rates, earlier weight faltering and earlier mortality but the mothers themselves had

the least weight gain in pregnancy, the smallest newborns and the smallest volumes of breast milk. Other important variables were season, parity and maternal infection.

By extrapolation, these same consequences for the nutritional status of preschool children could result from long distances to water sources coinciding with critical times of the cycle of pregnancy, lactation, child growth and development (Isely, R. B. 1981). Few studies have concentrated on the effect of maternal work load on the nutritional status of her children. Existing literature seems to suggest that a heavy maternal work load has a negative effect on the nutritional status of her children.

2.2.3 Land use.

Lack of land is an important risk factor in the etiology of malnutrition in third world countries. This could be attributed to the fact that land is used for the production of food crops for the household. Numerous studies carried out seem to agree that non-ownership of land is an important risk factor for malnutrition, but there is no general consensus that land size is correlated with malnutrition.

In India, Kielmann et al (1978) looked into weight-for-age as an index of risk of death in children. The results showed that children from landless families tended to suffer from more malnutrition and had increased mortality than those from landholding families. A separate investigation carried out in the same region found that parents of well nourished children tended to be landholding farmers (Kielmann, N. et al 1976).

One investigator sought to establish relationships between growth in young children in Bangladesh and socioeconomic status, food intake and morbidity. Land size was used as an indicator of wealth. The results showed that children from low socioeconomic status consumed less food and also experienced long episodes of diarrhea compared with their counterparts from higher socioeconomic groups (Becker, S. 1986). In the same region, Bhuiya et el (1985) found a better nutritional status of boys and girls in the larger land owner families. This was seen as a reflection of the positive impact of resource availability.

Some investigators looked at characteristics and determinants of child nutritional status in Nepal. A significant positive association was found between landholding and all measures of nutritional

status (Martorell, R. et al 1984). In the same region, another investigator found that children from small farmer households experienced a higher prevalence of wasting when compared to children from large farm households. These children also experienced a higher prevalence of stunting (Nabarro, D. 1981).

In Guatemala, Valverde et el (1977) found that the risk of having children with moderate malnutrition was significantly higher in farming families owning less than one and a half hectares than in families who had access to more than three and a half hectares. In this study quality of the soil and water availability were not considered.

Other studies failed to demonstrate any relationship between the amount of land owned and nutritional status. One such study was carried out in South Brazil. The results failed to show an association between the amount of land owned by the family and malnutrition (Victoria, C. et al 1986).

In Haiti, a study was carried out to identify socioeconomic, educational and health factors influencing growth of rural children. The results failed to show any effect between land owned by a family and growth of children as measured by weight-for-age and height-for-age. Although land

access was not significant, however being able to feed the family on the land was highly significant (Smith, M. F. et al 1982).

In Kenya several studies have examined land ownership as a socioeconomic variable. In this country the landless poor are seen as a nutritionally deficient group (Republic of Kenya Dev. plan 1979-83).

In Machakos District, an investigation by the Integrated Development Program found a strong correlation between nutritional status and size of land holding per capita. Stunting was high in children from families with less than a quarter of a hectare of land. This relationship was maintained when land holding was standardized by household size (FAO, 1984). In Siaya District, Kaseje et al (1983) found that the amount of land owned the previous year did not influence current nutritional status significantly. This was attributed to the fact that drought conditions had prevailed during the previous year, hence size of land or land holding as such did not provide any nutritional advantages.

Some researchers looked at child malnutrition among socioeconomic classes of rural Kenya as defined by

province, occupation, head of household and size of land holding. The investigators combined data from nationwide nutrition surveys so that national generalizations could be made. They found that land varied greatly in economic value, according to differences in soil fertility, rainfall, location and use of agricultural inputs (fertilizer, technology). As such any relationship between land size, household income and prevalence of malnutrition was not likely to be uniform in all areas (Haaga, J. et al 1986). The prevalence of malnutrition was high in children from households of landless agricultural workers and small holders as compared to children from households with large farms.

There seems to be a lack of consensus as to whether land size and land ownership is associated with child malnutrition. This may be because according to differences in soil fertility, rainfall, location and use of agricultural inputs, land varies greatly in economic value from one area to another.

2.2.4 Occupation.

From studies conducted in various parts of the world, it is apparent that land ownership and occupation are related. While land owners feed

their families on the land, the landless rely on other forms of employment.

In Costa Rica, Rawson et al (1981) demonstrated a high prevalence of malnutrition defined by weight-for-age among children of laborers and farmers owning less than 3.5 acres (1.4 hectares). Prevalence of malnutrition was low in children from families owning larger farms (Rawson, I. G. et al 1976). Another study in the same region showed a low prevalence of malnutrition which was only marginally higher in children of laborers as compared to children of farmers (Cervantes, S. et al 1981).

In four rural Guatemalan villages, other investigators looked into the relationship between occupation and nutritional status of two- and three-year old children. Families were divided into three occupational groups; salaried agricultural workers, farmers, and skilled workers/merchants. There was a tendency for children of skilled workers and merchants to have the lowest prevalence of moderate malnutrition as compared to other categories (Valverde, V. et al 1977).

In rural Bolivia, one investigator divided families into two occupational groups; merchant-professional

families, and farmers. Children from merchant-professional families were found to be significantly taller, heavier and fatter than children from farming families (Stinson, S. 1983). In Haiti, occupation related variables such as number of occupations and number of days spent away from home while working were statistically compared with household characteristic variables, household size and presence of a father in the household. The results showed no association between nutritional status and parental occupation (Smith, M. F et al 1982).

In Zaria, Northern Nigeria, a combined hospital and community study of childhood malnutrition was carried out. Good nutritional status of children was significantly associated with parental occupations in trading, mechanical and clerical work, while poor nutritional status was significantly more common in children of farmers and herdsmen. No association between nutritional status and father's occupation was seen in the more homogenous village survey group (Cherian, B. et al 1984). In the village survey group, there was little variation, if any, in parental occupation.

In peri-urban Zimbabwe, relationships between nutritional status of children and several

dimensions of socioeconomic status were investigated during the rainy season. Parents were categorized as semi-skilled laborers, skilled laborers, civil servants, and managers or professionals. Children of semi-skilled laborers had the highest prevalence of malnutrition of all the categories (Mazur, R. et al 1988).

In Kenya, one study examined child malnutrition among strata population as defined by occupation of heads of household. The results of this study showed a high prevalence of malnutrition (stunting) in rural non-agricultural households as compared to households that could be categorized as professional and households that are midway between small and large land holders (Haaga, J. et al 1986).

From the literature gathered, there is an association between occupation of heads of households and child nutritional status. This could be true because of the great variation in the nature of occupations amongst the study population. This may not be true, however, in a more homogeneous village population as demonstrated by Cherian (1985) in Nigeria.

2.2.5 Income.

The way income of a household affects nutritional status of its children depends on who controls income in the household and how he or she ranks priorities. Several studies have attempted to correlate cash income of a family and nutritional status of children. One such study was carried out in Jordan. A case-control design was used where hospital cases were compared with a control group. The results revealed that the cases were from families with low income (Hijaz, S. S, 1974). In Mexico the same study design as above was used but children were matched at birth for gestational age, total body length and body weight. The results showed no significant association between family income and malnutrition (Cravioto, J. et al 1967).

In Punjab, India, the Narangwal study demonstrated significantly lower monthly income in families with underweight children regardless of caste (Kielmann, N. et al 1976). In Dharwad, India, another study showed a significant relationship between nutritional status and income level (Rao, M. 1987). Characteristics and determinants of child nutritional status were examined in two districts in Terai, Nepal. It was found that household income was positively and significantly associated with

all parameters of malnutrition (Martorell, R. et al 1984).

In Colombia, some investigators found a low prevalence of malnutrition in higher income groups. In respect to nutritional status of children, family income made a difference at every level (Wray, J.D. et al 1969). In the same region, Cravioto et al (1974) observed that higher weight gain children tended to be from families with higher per capita income.

Risk factors for malnutrition with consideration of the role of social and environmental variables was examined in Brazil. The investigators found a strong correlation between nutritional status and father's income and education (Victoria, C. G. et al 1986). A year later in the same region another study looked at the influence of economic deterioration on the nutritional status of children. No adverse anthropometric effects were observed (Gross, R, et al 1987).

It is evident that income of a household, or of the head of a household, is not always associated with the nutritional status of its children.

2.2.6 Demographic Variables.

Several studies that have looked at demographic variables have found a significant association between these variables and child nutritional status. However, other studies have failed to demonstrate any association between demographic variables and child nutritional status.

2.2.6.1 Family size.

In Haiti, a study found a significant association between household size and nutritional status. This association was no longer significant when economic measures were included in the analysis. This suggests that in larger households there are more people available to grow food or to earn money for food (Smith, M. F. 1983). A significant association was found between the father living in the house and the child's height-for-age indicating some long term benefit to the child living with his nuclear family (Ballweg, 1972; Rawson, et al 1973; Smith, et al 1983).

A statistically significant association was found between birth order, family size and malnutrition in Columbia. There was a high prevalence of malnutrition in children who were fifth born or below. There was no association between birth

interval and malnutrition (Wray, J.D. et al 1969).

In their findings, Sanjur et al (1970) demonstrated that high parity and large family size were important determinants in the quality of infant feeding (Sanjur, D. et al (1970). At a later date in the same area, Cravioto et al (1974) failed to demonstrate any significant difference between the malnourished and control groups with regard to family size.

In India, one study failed to show a statistically significant association between birth order, family size and malnutrition. However the investigators observed that the malnourished children tended to have more siblings (Kielmann, N. et al 1976). In the same region, another study failed to demonstrate any significant association between nutritional status, birth order and family size (Rao, M. 1987).

In the Philippines, an investigator found an association between nutritional status and family size (Balderrama-Guzman, V. 1973). In Bangladesh, Bhuiya et al (1985) found a negative effect of household size on nutritional status of boys and girls. He explained it as being due to scarcity of resources modified by the effect of ownership of

property.

Not much information was found to this effect in Africa. In Zaria, a study failed to show an association between family size and nutritional status in both well and malnourished groups (Cherian, A. et al 1984).

In Murang'a, Kenya, investigators observed that the number of young children under five years present in the household influenced their nutritional status. The effect was strong if such children were born in poor households consisting of young parents (Hoorweg, J. et al 1983).

2.2.6.2 Parental education.

Parental education has been widely perceived as a risk factor in the causation of malnutrition. Some studies have found associations while other studies have not found any associations between nutritional status and parental level of education.

In Brazil, one study demonstrated an association between mother's education and the nutritional status of her children (Victoria, C. G. 1986). In Columbia, when mothers were grouped into literate and illiterate categories a highly significant positive association was found between

education and nutritional status (Wray, J. et al 1969).

In Mexico, education was among the factors associated with malnutrition. Sanjur found a consistent positive association between maternal education and infant feeding practices (Sanjur, D. et al 1970). However, in the same region another study failed to demonstrate an association between education variables and malnutrition (Cravioto, J. et al 1967). In Costa Rica, educational level of neither parent was significantly associated with nutritional status (Rawson, I. G. 1976).

In India, a study observed a positive relationship between maternal education and malnutrition (Rao, M. 1987). Education was found to have a positive effect only on male children in Bangladesh. When fathers education was considered, a positive effect was demonstrated with both boys and girls (Becker, S. 1986).

2.2.7 Anthropometric Findings in Kenya.

A number of nutritional surveys have been carried out in Kenya. In a 1977 Central Bureau Statistics (CBS) nationwide nutrition survey in Central Province, of the 225 children between 12-48 months age surveyed, 31% were less than 90% height-

for-age, and 33% were less than 90% weight-for-height (Hoorweg, et al). In Coast Province, in a 1976 report of a survey of 62 Orma children (0-60 months old) in Hola District, 80% were reported to have a weight-for-height less than 90% Harvard standard (CBS 1979). This survey showed that girls were more likely to be malnourished than boys.

In 1978-79 a nutrition survey among children between 6-60 months of age indicated stunting (height-for-age) in 58% of the children, especially those in rural areas. This was greatest in the Coast and Nyanza Province. In the Rift Valley rural group, 10.8% of children aged between 6-60 months had weights less than the fifth percentile of the reference weight-for-height. In terms of low weight-for-height, the Rift Valley rural group children ranked fourth after Coast rural (13.7%), Coast urban (12.9%) and Eastern rural (11.4%) respectively. There were more wasted boys than girls and wasting was highest in the age group 12-23 months, an age when a child is likely to be given an inadequate diet, and at which diseases are more prevalent (CBS 1980).

With respect to weight-for-age in the Rift Valley rural group 45% of the children had weights less than the fifth percentile of the reference weight-

for-age and this ranked fourth after Nyanza rural (53.8%), Eastern rural (47.3%) and Western rural (53.8%). The proportion of stunted children in the 6-11 months age group was less than in the 12-23 and 24-47 months age groups in both rural and urban samples. The lower proportion of stunting in the 48-60 months age group could be attributed to either 'catch-up' growth or to death related malnutrition (CBS 1980).

In Eastern Province, baseline anthropometric data from 186 children 12-72 months old indicated a high prevalence of protein-energy malnutrition; mean weight-for-age was 79% of Harvard standard, and mean height-for-age 92%. Only 15% were above 90% weight-for-age (Stephenson, L. S et al). Among children aged 6-12 months weight-for-age averaged 86% Harvard standard. Among children older than 12 months, weight-for-age did not show further deterioration but catch up growth was recorded (Van Steenbergen, W. M et al 1980).

In the Third Rural Child Nutrition survey 1982, an investigation of selected factors affecting nutrition was carried out. Concerning household amenities, the results showed a prevalence rate for stunting of 21% in households with sewage-facilities and 28% in those without sewage

facilities in the wet season, and 18% in the dry season in households without sewage facilities.

Concerning water, the results showed a prevalence rate for stunting of 26% and 25% in those households who drew water from the borehole/well and river/spring respectively in the wet season. During the dry season the corresponding percentages were 28% and 24% respectively. Stunting prevalence was high in households which traveled 2km (29%) to fetch their water. No difference was observed in stunting prevalence between those who traveled 3km and those who traveled over 4km to a source of water. There were greater differences in childhood stunting rates when maternal education was considered; those with no education had rates of 29% compared with 23% in the group with class 1-4 education and 5-8 education. The group which had the lowest prevalence rate, 16%, had form 1-6 education. Children of mothers having some post secondary education however had an unanticipatedly higher prevalence of stunting (33%).

There seems to be a lack of clarity between parity and nutrition. Some of the factors involved include the physiological factors of the mother, family socioeconomic status, which may change with age of the mother, and the number of other children

presently living in the household in terms of their economic activity on one hand and their consumption of food on the other.

2.3 Summary.

It is evident therefore that determinants of P.E.M vary with ecological diversity due to a myriad of factors. Immediate causes for the individual child, on the other hand, are more readily identified, and are more similar to those in the developing world. An examination of these is essentially limited to the identification of reasons for decreased food intake, decreased food utilization, and, or, increased food expenditure (Kielmann, et al 1976).

2.4 Gaps in knowledge.

Even though a large body of knowledge is available on etiological determinants of P.E.M in rural societies the world over, qualitative and quantitative effects of these factors are neither uniform in all situations, nor can extrapolations be made from these areas where information is available to other regions. While people suffering from under nutrition are usually poor, not all the poor are undernourished, neither are all the rich

well-nourished. An intricate interaction of the factors, largely dependent on a particular situation or area, is usually responsible for the manifest result. Thus it is necessary to investigate causative factors in detail before planning an intervention program for a specific area. This study aspires to fill gaps in knowledge by clarifying the role of ecological factors related to the current nutritional situation in Baringo, Kabartonjo Division.

CHAPTER THREE

3.0 BACKGROUND REPORT.

3.1 Geographic Location and Climatic Conditions.

Kabartonjo Division is surrounded by the Tugen Hills, and the lowland area (Kerio valley). It covers an area of 1,692 square kilometers. Its altitude range from 900m to 2,300m above sea level. There are two rainfall seasons: long rains which occur during March to May, and the short rains during October to December. The total annual rainfall received, however, varies from 800mm in the valley to 1,500mm in the hills.

3.2 Population and Infrastucture.

The Division has a total population of 60,000 people as projected in 1988 by an agricultural survey of 7,800 households. It covers an area of 1,692 square kilometers. It has a total number of 15 operational dispensaries and one health centre.

The Divisional Headquarter is connected to the District Headquarter by a tarmac road. The other parts of the Division can be reached through all weather roads. Because of its rugged topography, some parts of the area cannot be reached by vehicles.

3.3 Administration.

The Division is made up of two ecological zones; Upper zone and Lower zone. The Lower zone comprises four locations; Kamnarok Soi, Saimo Soi, Ngorora and Kaboske. Administration by location is through the Subchiefs who are under the jurisdiction of the chief. The Lower zone covers 3/4 of the total area of the Division and its population has been projected to be 33,000 people in 1988.

The Upper zone consists of two locations; Kamnarok Mosop and Saimo Mosop. Each location is under the administration of a Subchief. The Upper covers about 1/4 of the total area of the division. The population of the area has been projected to be 27,000 in 1988.

These two zones compose the Kabartonjo Division which is administered by a District Officer.

3.4 Agriculture.

Although the Division has considerable agricultural and economic diversity, there is not much arable land. This is due to drastic weather conditions and the rugged terrain.

3.4.1 The Lower Zone.

Various activities are carried out in this area where there is irrigation. Livestock farming is practiced with goats, sheep and zebu cattle being kept. A wide range of crops is grown. Cotton is the main cash crop in areas covered by the Kerio Valley Development Authority. Various types of fruits, maize and onions are also grown under irrigation. Drought resistant crops such as millet and sorghum are grown in areas where there is no irrigation. A game reserve under the Ministry of Tourism has also been established in this area around lake Kamnarok.

3.4.2 The Upper Zone.

The upper zone consists of forests, bushland with a potential for forestry and extensive agriculture. There are no irrigation projects in this area. Grown here are coffee, pyrethrum, maize, beans, millet/sorghum and horticultural products. The livelihood of the people is therefore diverse. Subsistence and cash crop farming are practiced. Livestock farming is also practiced although goats, sheep and zebu cattle are also kept. Agriculture is mostly unmechanized because of the topography. There are families who earn their living from

occupations other than farming, for example, small business, regular employment and casual labor. The common type of business practiced is shopkeeping, running a kiosk/hotel and selling vegetables to name a few. The type of casual labor is also varied; working for someone else, working in a government office or working in a cooperative society.

Afforestation is a major activity carried out on government owned land with the aim of protecting water catchment areas and indigenous forests among others. Timber production is a major activity in such areas. This provides employment to the local people.

3.5 The Study Site.

Kamnarok Mosop has a projected population of 12000 (1988 agricultural survey). It has a total of 9551.3 hectares, with 2000 households. Households live on land acquired through inheritance or individuals may purchase land.

The topography of Kamnarok Mosop is varied. There are hills in a large part of the area. This is a part of the Tugen Hills which is covered by rocks in certain areas. The other area of the

location is fairly flat land covered by shrubs and rocks. This has a marked effect on the nature of agriculture practiced in the different areas. Given the topography of the area, agricultural mechanization and water availability are both problems.

3.6 Culture.

Like every society the Tugen society has its own norms and every member is expected by the society to carry out certain activities depending on age and sex. The man is the head of a household. He clears the land for digging and goes with the boys to look for pasture during the dry season. The woman is concerned with all household chores like meal preparation and child care, but she also digs the farmland. Girls do the same chores as the mother, the small ones often looking after their younger siblings. Boys herd livestock and seek other pasture land in the dry periods. They also protect their village and livestock from intruders. These roles are changing with modernization.

The diet of the Tugen is composed of ugali made from a mixture of millet and sorghum. Maize meal ugali is a recent introduction though it is now

becoming the main staple. Children are fed on milk, porridge, maize/beans and ugali. Ugali is eaten with traditional vegetables or meat and sometimes milk. Blood was a common dish in the past.

Like any African society the Tugen woman was restricted by custom from eating particular foods. Pregnant or lactating mothers were not allowed to eat meat from an animal that had died of sickness or from unknown causes. Society allowed them to eat game meat. Milk was prohibited during pregnancy. They were allowed to eat ugali and vegetables, and honey mixed with water which was kept in a special gourd that no other person was allowed to handle. Women were not supposed to handle the man's milk gourd, or eat the heart and tongue of a goat.

A married woman stays with her husband and children in the husband's home. Should the husband die the woman stays in that home as long as she does not remarry. If she divorces she goes back to her parents home but in most cases she is not given a warm welcome. Inheritance is patrilineal.

The Tugen people were pastoralist and also nomads. They have settled down to farming where climatic conditions have allowed them to do so. In this society age group and membership of the extended family constitutes an important

source of identity for the individual.

CHAPTER FOUR

4.0 METHODOLOGY.

4.1 Summary.

A cross sectional survey with a descriptive component was carried out to establish the prevalence and causes of protein-energy-malnutrition in Kamnarok Mosop area of Baringo District, Kenya. Children between 6-40 months of age were the target group of the study.

4.2 The study Design.

The study was carried out using a cross sectional design. All households with children between 6-40 months (300) of age were identified for the study. The age group of 6-40 months of age was chosen for the etiological study given that malnutrition problems are more prevalent in children 6-36 months. The age group 6-40 months was chosen to allow for an indication that malnutrition was falling off around three years.

Numerous studies, for example Balderrama-Guzman, V. (1973), have demonstrated that children between 1-3 years have the highest prevalence of malnutrition.

4.3 Sampling Procedure.

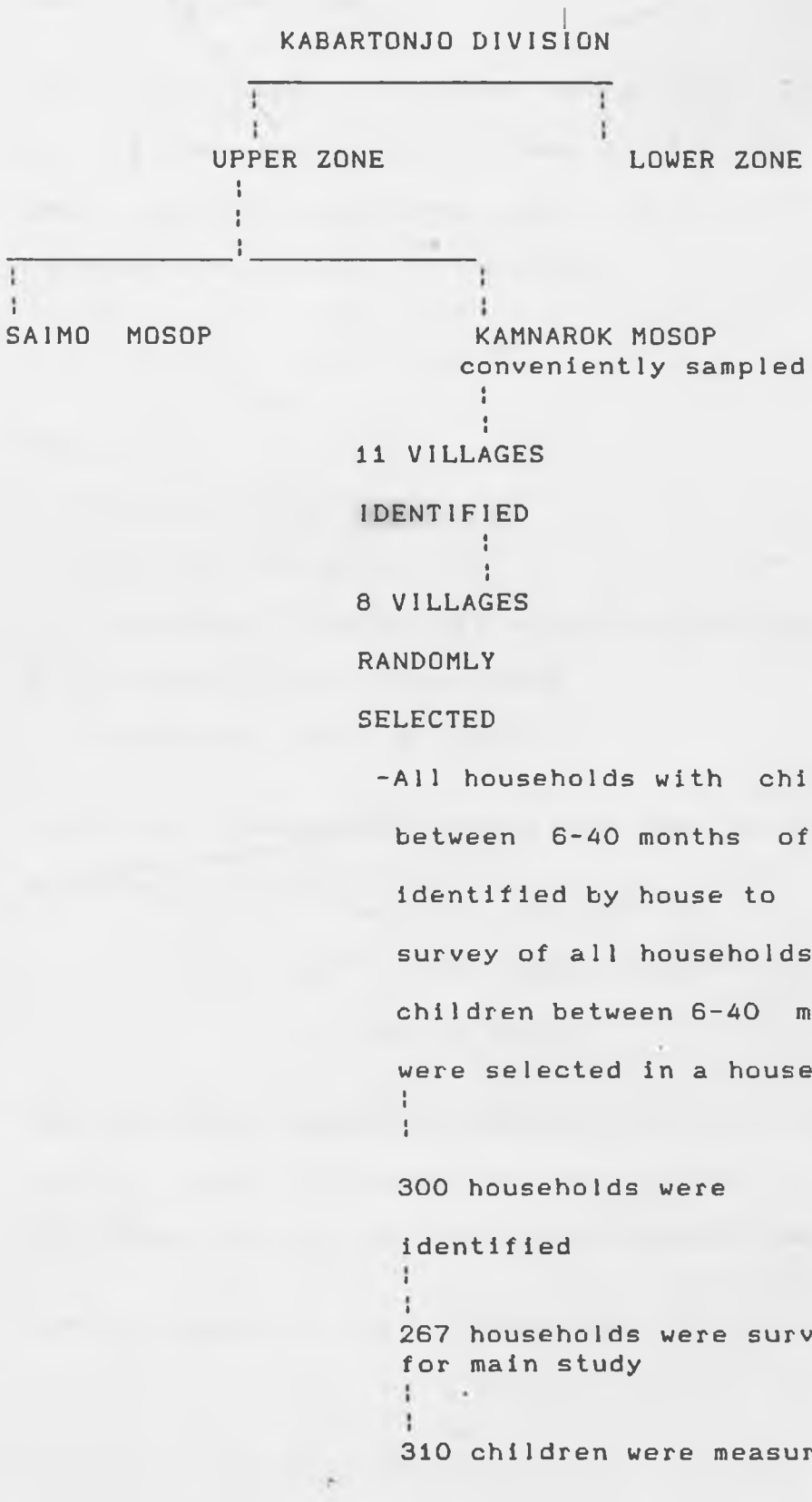
Kabartonjo Division Centre was the starting point.

The Lower zone was omitted from the study because an evaluation study of the Impact of the Water Project had covered part of the area. Of the two locations in the upper zone Kamnarok Mosop was selected as the study area due to its accessibility given the available resources in terms of time and finances.

With a view to ease of accessibility a representative sample of eleven villages was identified. Out of these villages a random sample of eight villages was selected for the purposes of the study. All households with children between 6-40 months of age were included in the study sample.

All selected households were to be visited on prearranged days. This procedure was subsequently abandoned since respondents failed to appear if they knew enumerators were coming to their homes. In most cases female guardians were selected as the respondents. Since most of the respondents were not able to speak kiswahili fluently, Tugen research assistants from the same area were recruited. They were trained in methods of data collection for a period of two weeks prior to the actual survey. Interviews were conducted in the local vernacular. See Figure 4.1 for the sampling procedure.

Figure 4.1 Sampling Procedure.



4.4 Sample Size.

Sample size was calculated using the Baringo District malnutrition prevalence rate of 19% (CBS 1980). The following formula was used to arrive at the sample size used for the study.

$$n = z^2(pq)/d^2$$

Where;

n = Required sample size,

z = Level of certainty,

p = Percentage of malnutrition in Baringo District,

q = Percentage not malnourished,

d = Acceptable range of error.

Using this formula, the sample size was calculated as shown;

$$n = 1.96^2 \ (0.19 \times 0.81) / \ 0.05^2$$

$$n = 236 \text{ Children.}$$

Out of the 20 households identified for the pilot survey, only 12 households were covered. A non-participation rate was calculated as shown below;

Non-participation rate = 8/12 x 100

= 40% (0.4).

Therefore the total sample size was expected to be

330 children i.e 236 + (236 x 0.4).

Estimating that the average number of children less than 5 years per household is 1.5 (Nairobi City Commission, Urban II, 1985; Redeemed Gospel Church, 1985) the total number of households to be sampled was calculated as follows;

$$\frac{330}{1.5} = 220 \text{ households.}$$

Since the study was limited to children between 6-40 months of age, the number of households under study was raised from 220 to 300 in order to come up with an adequate sample size.

4.5 Training of the Interviewers.

Potential interviewers were recruited with the help of the area Chief and the Ministry of Social Services field workers. A total of 15 mothers were identified as potential interviewers since it was felt that these mothers would create a good rapport with the mothers to be interviewed as they were of the same age, sex and came from the same area. These mothers were given a language test for the purpose of selecting a better group for training. Ten mothers qualified for training and were trained in methods of data collection for a period of one

week and subsequently given a qualifying test. The mothers (5 mothers) who qualified were further trained for another week in methods of data collection. Therefore the total training period for those who eventually qualified was two weeks. These mothers had secondary education and some had qualified for training in various colleges.

During the training period, the research questionnaire was used to enable mother interviewers to fully comprehend what was expected of their work. Each question was studied separately and discussed in detail to determine its comprehensibility and acceptability from the maternal view point. Where the question was not understood by the trainees, an explanation was given and if the question still posed problems of comprehension, the trainees gave suggestions as to how the question should be framed. These suggestions were adopted or rejected after each question had been thoroughly scrutinized by the group of trainees.

4.6 Pilot Survey.

The research questionnaire was translated into Tugen by a teacher from Ossen Secondary School. The translated script was then given to a teacher from

Moi Secondary School, Kabartonjo for translation back into English. Where there were differences in translation the two translators consulted to find a solution. A 'trial' mother who was able to speak both English and Tugen was identified and interviewed using the two translated scripts at different times to ensure that there were no mistakes. Corrections were then made. The accepted script was tested on ten households to check for acceptability of the questions and any other problems. For example it was found that most people did not like to be asked directly about deaths hence changes were made. These 'test' households were then purposely excluded from both the pilot and the main study.

A pilot survey was later carried out in the Lower zone on twenty households since this area was not included in the study sample. During the pilot survey the enumerator skills were evaluated and feedback was given. The suitability of the questionnaire was also tested and further changes were made where necessary. The results of the pilot survey were discussed with the advisor at the University of Nairobi and further corrections and changes were made.

4.7 Data Collection Procedure.

In the first phase of the study a census survey was carried out of all selected households to establish the total population under study. This was followed by an anthropometric survey where all children within the specified age range in a household were measured. This survey was carried out by the principal investigator and a nurse from the Health Centre. Weight was taken using a salter scale while height was measured using a length board. A child health card or any other document of age was used to verify the age of each child.

In the second phase of the study a detailed questionnaire was administered to female guardians of chosen children on selected variables such as household characteristics, socioeconomic status of a household, availability of water and time spent by the mother performing various household chores, quality of the house and crowding within that particular house, twenty-four hour recall diet survey, and seven day morbidity experience of selected children. Mothers or female guardians of selected children were chosen as the respondents since it was felt that they would be in a better position to provide information on these variables than would any other person.

4.8.4 Questionnaire.

A detailed questionnaire was administered to mothers for the measurement of probable etiological determinants of malnutrition. (See Appendix Three).

4.9 Data Analysis

Anthropometric data was entered on the CDC program. The questionnaire data was entered on the dBase III Plus. A statistical program, SPSS, was used for data analysis. Household information was matched with the anthropometric information to identify factors associated with nutritional status. Frequency and cross-tabulation information concerning all household data was carried out followed by correlation of household data with anthropometric information. Finally, multiple regression of factors that correlated with nutritional status was carried out.

CHAPTER FIVE

5.0 RESEARCH IMPLEMENTATION.

5.1 Research Permit and Tour of the Area.

A research permit was acquired from the Office of the President in December 1988. No complications were encountered in the process though the signatories were out of the country at the time so we had to wait for a while.

A trip was made to the District of study where the District Commissioner was contacted. The purpose of the study was explained to him and consent in the form of a letter was received. At the Divisional Headquarters the purpose of the study was further explained to the Division Officer. He gave suggestions as to what areas would be of high priority for the study, and explained some general points including agricultural activities carried out in the area. He requested the Chief and Assistant Chiefs of the area to give as much assistance as they could towards the success of the study.

With the help of the Division Officer of Kabartonjo and the Ministry of Social Services field workers, a tour of the whole area was made. A decision as to

what areas would be studied was made with a view to ease of accessibility, time available to carry out the study and finance. Since Kamnarok Mosop was chosen the Assistant Chief of the area was contacted. He defined the boundaries of his area and any other information he was asked concerning his area.

The Subchief organized a baraza where the principal investigator and her team were introduced to the people. The investigator explained the purpose of the study in simple terms to the people. Their assistance and cooperation was requested.

5.2 Recruitment of the Enumerators.

Recruitment of possible enumerators was discussed with the Subchief and the Social Services field workers. With their help 15 mothers were identified, who underwent training and tests. At the end of the two-week training period only five mothers were selected as enumerators.

5.3 Mapping of the area.

The area was mapped out with the help of the social workers in charge of the area. All households with children under five years were initially identified and then only those households with children

between 6-40 months of age were chosen. These households were numbered with the consent of the head of the household. A total of 400 households were identified though only 300 households met the selection criteria.

5.4 Problems Encountered.

5.4.1 Accessibility.

Kamnarok Mosop is composed of the Tugen hills giving it a rugged terrain. Accessibility to most parts of this area is therefore difficult. Thus movement within the area required a lot of time hence lengthening the total survey time. The situation was made worse with the coming of the rains (March-May).

5.4.2. Language

Almost all the study population are Tugen and most of them are not fluent in Kiswahili. The investigator therefore relied fully on enumerators for the most part of each interview.

5.4.3. Turnover Among Enumerators.

Towards the end of the study some of the enumerators left for college while others got

permanent jobs. It was therefore not possible to cover all the households initially selected. At the end of the study it was possible to collect complete information on 267 households. When the remaining 33 households were visited, there was no apparent difference with the households already studied.

5.4.4. Financial Constraints.

Procuring research funds from the university was an extremely long procedure requiring a lot of time. This also increased the total study time.

CHAPTER SIX

6.0 RESULTS.

6.1 Summary.

The objective of the study was to determine the prevalence of protein-energy malnutrition and identify its probable determinants among children aged between 6-40 months in Kamnarok Mosop Location. The results presented in this chapter are based on data collected on 267 households. Data on 33 households was incomplete and was excluded from the final analysis.

6.2 Household characteristics.

6.2.1 *Population composition by age and sex.*

Table 6.1 shows population distribution by age and sex. The study population was 1,653 people and about 50% of them were male and 50%. Overall sex distribution was equal as seen from the male to female ratio which was 1:1. However, sex ratio in the age category of 15-44 was 1:2, male to female.

Table 6.1 Population composition by age and sex in percentage.

Sex	Age in years					
	0-4	5-14	15-44	45 +	unknown	total
Male	12.3	16.6	8.2	0.7	12.0	49.8
Female	12.0	16.7	15.9	0.4	5.3	50.2
Total	24.3	33.3	24.1	1.1	17.3	100

6.2.2 *Distribution of index children by age and sex.*

Index children were in the age range 6-40 months. A total of 310 children were in this age category, 48% were male and 52% were female.

About 17% of the index children were less than 12 months, 43% were in the age range 12-23.99 months, and 41% were in the age range 24-40 months.

6.2.3 *Dependency Ratio and Average Household size.*

The dependency ratio of the study population was 1:2, and the average household size was 6 people. Both are in line with results seen in other developing societies.

6.2.4 *Residential status.*

Approximately 95% of the total population were permanent residents of a household. Nearly 4% worked in towns far from home while 1% went to boarding schools. These two groups came home infrequently.

6.2.5 *Marital status.*

About 68% of the population were children. Of the remaining 32% of the population, 31.9% were married, and 0.2% were widowed. No cases of divorce were encountered. This could be attributed to the fact that a divorced woman receives a poor welcome at her ancestral home as she is seen as an extra burden.

6.2.6 *Number of pregnancies.*

Around 27% of the mothers had up to two pregnancies, 26% had up to four pregnancies, 26% had up to six pregnancies and 21% had more than six pregnancies.

6.2.7 *Number of live children.*

About 28% of the mothers had up to two children, 29% had up to four, 25% had up to six and 18% had

more than six children.

6.3 Morbidity Experience.

Morbidity data was collected on 310 children between 6-40 months of age. Each participating mother was asked whether or not her child aged between 6-40 months had been sick during the seven days prior to the survey. If the child was reported to have been sick the mother was asked to describe the symptoms of the child's illness. The possible causes of the illness were precoded and limited to diarrhea, fever, vomiting, abdominal pains, difficult breathing and others.

Approximately 31% of all the children were reported sick. Some children suffered from multiple symptoms. About 8% of the children had diarrhea, 20% had fever, 7% had vomiting, 10% had other problems and 4% had difficult breathing. Data demonstrated a much higher prevalence of illness among children aged between 6-12 months. The health variables which seemed important in the etiology of malnutrition were abdominal pains, vomiting, and diarrhea. It was observed that children who had been ill the previous week tended to have a low weight-for-age.

6.4 Socioeconomic Factors.

6.4.1 *Land ownership and use.*

Table 6.2 shows distribution of households according to the amount of land both owned and cultivated. Almost 10% of the households were landless, 83% owned up to 4 hectares, and 7% owned more than 4 hectares. Average land size was 1.5 hectares. Nearly 11% did not cultivate any land, 88% cultivated up to 4 hectares, and 1% cultivated over 4 hectares. Average area under cultivation was 0.8 hectares.

Table 6.2 *Distribution of households by size of land owned and cultivated in the study area.*

Size of land	land owned		land cultivated	
	n	%	n	%
None	26	9.7	29	10.7
0-<0.8 Hac	54	20.2	114	42.7
0.8-<2 Hac	106	39.7	101	37.8
2.0-<4 Hac	62	23.2	19	7.1
Over 4 Hac	19	7.1	4	1.5
Total	267	100.0	267	100.0

Land size was not related to nutritional status of a child. This supports the hypothesis that size of

landholding per household is not associated with nutritional status.

6.4.2 *Crop production.*

The two main cash crops grown in the study area were coffee and pyrethrum. Only 14% grew coffee while 1% grew pyrethrum. Common food crops grown were maize and beans although millet and sorghum were also grown in some areas. About 7% of the households harvested maize, 79% harvested beans and 16% harvested millet or sorghum during the last season. Also during the last season the average maize harvested was 641kgs, beans 107.9kgs and millet or sorghum was 36kgs. During the last lean season 45% of the households bought maize while 21% bought beans.

6.4.3 *Livestock ownership.*

Livestock ownership per household was unequally distributed; 68% of the households kept cows, 41% kept goats or sheep and 60% kept chicken. Some households kept more than one type of livestock.

There was no association between total livestock owned and nutritional status.

6.4.4 *Income.*

It was difficult to establish peoples' income since most people were not ready to disclose their real income. However an estimate was made as accurate as possible using both prior knowledge of the occupation of the individual based as well as salary estimate.

Table 6.3 shows cash income distribution among heads of household and mothers. About 53% of the male head of household compared to 86% of the mothers did not report to have any source of income from employment. Almost 4% of the heads of household compared to 1% of the mothers earned over Ksh 2000 per month. This categorization excluded

Table 6.3 Distribution of heads of household and mothers by cash income.

Amount Ksh	heads of household		mothers	
	n	%	n	%
None	141	52.8	227	87.0
< 500	5	1.9	8	3.0
501-1000	46	17.2	6	2.3
1001-2000	64	24.0	20	7.6
Over 2000	11	4.1	3	1.1
Total	267	100.0	264	100.0

farmers and income from farm products. Mean income was Ksh 700 for heads of household and Ksh 150 for mothers.

When total income of a household was considered, there was a weak association with nutritional status. It was observed that children from households that had low income tended to have a poor nutritional status. This was true even when income of the head of the household was considered. This supports the hypothesis that income of the head of the household is associated with the nutritional status of the children in the household.

6.4.5 *Education.*

Table 6.4 shows distribution of mothers and heads of household according to their levels of formal education. Around 16% of the females did not have any formal education compared to 14% of the heads of household. Only 3% of the heads of household had college education while only 1% of the mothers had college education.

Nearly 52% of the population had received primary education. Out of this 18% had gone up to class three and 34% had been up to class eight. About 9% had received secondary education and 1% had

received college training. About 38% were illiterate.

Table 6.4 Distribution of heads of household and mothers by their level of education.

Educ level	heads of household		mothers	
	n	%	n	%
Illiterate	37	14.2	43	16.3
Class 1-3	6	2.2	27	10.2
Class 4-8	153	57.1	155	58.7
Form 1-4	63	23.5	36	13.7
Higher Educ	8	3.0	3	1.1
Total	267	100.0	264	100.0

There was no association between parental education and nutritional status. There was very little difference between fathers and mothers level of education. However, children form households where fathers had very low and/or no formal education tended to be of low nutritional status.

6.4.6 *Occupation.*

Table 6.5 shows distribution of heads of household and mothers by their occupation. Approximately 85% of the mothers were farmers compared to 32% of the heads of household. Only 12% of the mothers were in

heads of household. Only 12% of the mothers were in gainful employment compared to 60% of the heads of household. Nearly 3% of the mothers compared to 8% heads of household were self employed.

Table 6.5 Distribution of heads of household and and mothers by their occupation.

Occupation	heads household		mothers	
	n	%	n	%
Farming	85	32.1	224	84.8
Casual worker	50	18.7	4	1.5
Regularly employed	110	41.0	29	11.0
Self employed	22	8.2	7	2.7
Total	267	100.0	264	100.0

There was no significant association between parental occupation and nutritional status. Children whose fathers were regularly and/or self employed tended to have a better weight-for age.

6.4.7 *Housing.*

Over half (55%) of the households had grass thatched roofs. Approximately 77% of the households had mud floors. Only 78% of the households had a kitchen.

Around 67% had a latrine while there was no latrine

in 33% of the households. Mothers who reported means of rubbish disposal as compost totaled 17%, while 13% burnt their rubbish and 70% threw rubbish anywhere. Almost 74% of the households had other structures in the compound while 26% did not have.

When housing variables were entered in the correlation matrix, no significant association was found between these variables and nutritional status.

6.5 Maternal Time Availability.

6.5.1 *Water availability.*

Table 6.6 shows distribution of households according to type of water source during the wet and dry seasons respectively.

Table 6.6 *Distribution of households by type of water source during the wet and dry season.*

Type	Wet season		Dry season	
	n	%	n	%
Pipe	13	4.9	9	3.3
River-well	245	91.7	245	95.9
Rain	8	3.0	1	0.4
Purchase	1	0.4	1	0.4
Total	267	100.0	267	100.0

The most common source of water was river-well during both the wet season (90.6%) and the dry season (91.4%). During the dry season 9% used piped water while 13% used piped water in the wet season.

The nature of the source of water did not seem to have any effect on the the child's nutritional status.

Table 6.7 shows the distance to water source during both the wet and dry season. About 90% of

Table 6.7 *Distribution of households by distance to source of water during the wet and dry.*

Distance in km	Wet season n	Wet season %	Dry season n	Dry season %
Less than 2	240	89.9	197	73.8
2 to 4 km	19	7.1	32	12.0
Over 4 km	8	2.9	38	14.2
Total	267	100.0	267	100.0

the mothers traveled less than 2km to the water source during the wet season compared to 74% during the dry season. During the wet season only 7% traveled between 2-3 km and 3% traveled for over 4km during the wet season. During the dry season 12% traveled between 2-4 km and 14% traveled for over 4 km to the source of water.

There was no significant association between distance to the source of water and nutritional status. It was observed that children from households where mothers traveled longer distances to the source of water tended to have a low height-for-age.

Table 6.8 shows the distribution of mothers according to the amount of time they take to reach the water source during the wet and dry season. Only 47% of the mothers took up to one hour and 53% took more than one hour to get water during the wet season. The average time taken to draw water was about 3 hours during the dry season and about one hour during the wet season.

Table 6.8 *Distribution of mothers by the time they take to draw water during the wet and dry season.*

Time in min	dry season		wet season	
	n	%	n	%
Less than 60	125	46.8	172	64.4
60 to 120	89	33.3	85	31.9
Over 120 min	53	19.9	10	3.6
Total	267	100.0	267	100.0

6.5.2 *Collection of firewood.*

About 55% of the mothers spent more than two hours

collecting firewood per day (Table 6.9). The average time taken to collect firewood was about 2 hours (104 minutes) a day.

The time taken to get firewood was a significant association with nutritional status ($p<.05$). This association was negative.

6.5.3 *Farm work.*

Almost 82% of the mothers spent more than two hours on the farm while only 16% spent less than two hours on farm work. The average time spent on the farm was about 4 hours (211 minutes). Only 1% of the mothers did not do any farm work (Table 6.9).

6.5.4 *Meal preparation.*

Nearly 66% of the mothers spent less than one hour a day on meal preparation, 29% spent up to two hours and 4% spent over two hours on meal preparation (Table 6.9). The average time taken to prepare meals was about one hour (63 minutes).

No association was found between time spent on farm work, or meal preparation and nutritional status. When the total time spent on all selected household chores was combined, there was a significant negative association with nutritional status as measured by weight-for-age ($p<.05$). This

finding supports the hypothesis that time spent on household chores is associated with the nutritional status of preschool children.

Table 6.9 *Distribution of mothers by time spent on collecting firewood, farm work, and meal preparation.*

Time in min	Firewood		Farm work		Meal prep	
	n	%	n	%	n	%
None	3	1.1	4	1.5	1	0.4
Less than 60	86	32.2	9	3.4	175	65.5
60 to 120 min	118	44.2	35	13.1	78	29.2
Over 120 min	60	22.5	219	82.0	13	4.8
Total	267	100.0	267	100.0	267	100.0

6.6 Biodemographic variables

6.6.1 *Sex*

Using sex based reference standards, a significant association was found between sex of a child and his/her nutritional status as measured by weight-for-age ($p<.05$). Malnutrition was more prevalent in males than in females.

6.6.2 *Age*

The prevalence of malnutrition increased with age for all indicators. There was a negative association between age and weight-for-age ($p<.05$).

6.6.3 *Number of pregnancies.*

A significant association was found between the number of pregnancies a mother had had and the nutritional status as measured by weight-for-age ($p<.05$). This association was negative. The total number of live children in a household was negatively associated with weight-for-age but the relationship did not reach statistical significance.

6.7 Twenty-Four hour recall diet survey.

The objective of this survey was to establish the frequency of meals amongst index children in the study population. Young children of a household were fed from the same meal as adults apart from the very young ones who were exclusively breastfed. All children were fed three times a day on average.

6.7.1 *Daily Meals.*

On average there were five meals served in a day. These included breakfast, midmorning meal, lunch, snack and afternoon supper.

All children were given breakfast which consisted of porridge, milk or tea. Tea or milk was served

with bread. Only 9% of households gave bread to their children, 56% of households gave porridge, 32% gave tea, 8% gave milk and only 4% gave eggs at breakfast. The most common meal at breakfast was porridge made from millet flour and water with or without sugar and/or milk.

Approximately 66% of the households fed their children between breakfast and lunch time. More than half (66%) of these households gave milk, 25% gave porridge, 6% gave tea and 3% gave other kinds of foods. Tea or milk was served either with eggs (11% of the households) or bread (1%).

Table 6.10 shows distribution of households by type of meal served in a single day. Almost all (99.6%) of the households served lunch to their children. The most common food was ugali served in 45% of households. Around 22% of the households served githeri (mixture of maize and beans), 21% served plain beans and only 2% served other foods like rice and potatoes. Ugali was served with a stew made from vegetables in all households except one household which served meat stew.

Nearly 54% served afternoon snacks to their children. More than half of these households (54%) gave milk, 19% gave porridge, 13% gave eggs, 8%

gave tea and 6% gave other foods.

At supper time 86% of the households served ugali to their children with either vegetable or meat stew. Only 7% served other foods while 7% served milk.

Table 6.10 *Distribution of households by type of meal served in a day.*

Meal	Proportion of households serving meal (%)
Breakfast	100
Midmorning	66
Lunch	96.6
Snack	54
Supper	96.6

6.8 Nutritional status.

Nutritional status of the selected children was measured using weight-for-age, weight-for-height, and height-for-age as anthropometric indicators.

6.8.1 *Weight-for-age.*

Weight-for-age reflects both previous growth and present nutritional conditions. Children below -2 standard deviation are malnourished. According to

this categorization 18.4% of the study children were malnourished as measured by weight-for-age.

Table 6.11 shows distribution of children by weight-for-age and sex.

Table 6.11 *Distribution of children by weight-for-age and sex.*

SEX	Weight-for-age z-score (%)						Total	
	< -2sd		-2 to +2sd		> +2sd			
	n	%	n	%	n	%	n	%
Male	37	24.7	112	74.7	1	0.6	150	100
Female	20	12.5	139	86.9	1	0.6	160	100

More boys (24.7%) than girls (12.5%) were malnourished as demonstrated in table 6.11.

There was a highly significant association between nutritional status and sex (p=015).

Table 6.12 shows malnutrition prevalence as measured by weight-for-age according to age. Only 9.6% of children in the age range 5-11.99 months were malnourished compared to 17.4% in the age range 12-23.99 months and 23% in the age range 24-40 months. Few children in the age range 5-11.99 months (1.9%) and age range 12-23.99 months (0.8%) were overweight while no child in the age range 24-

40 months was overweight. Malnutrition prevalence increased with age.

There was a significant association between nutritional status and age ($p<.05$).

Table 6.12 *Distribution of children by weight-for-age and age.*

	Weight-for-age z-score (%)							
AGE(Mos)	< -2		-2 to +2sd		> +2sd		Total	
	n	%	n	%	n	%	n	%
5-11.99	5	9.6	46	88.5	1	1.9	52	100
12-23.99	23	17.4	108	81.8	1	0.8	132	100
24-40	29	23.0	97	77.0	0	0.0	126	100

6.8.2 *Height-for-age.*

Height-for-age measures chronic malnutrition. Values less than -2.00 standard deviation of the

Table 6.13 *Distribution of children by height-for-age and sex.*

	Height-for-age z-score (%)							
SEX	< -2sd		-2 to +2sd		> +2sd		Total	
	n	%	n	%	n	%	n	%
Male	45	30.0	92	61.3	13	8.7	150	100
Female	42	26.2	110	68.8	8	5.0	160	100

standard height-for-age indicate stunting. Of all study children 28.1% were stunted according to this measurement. More boys (30%) than girls (26.2%) were stunted (Table 6.13).

Stunting was highest in the age category 12-23.99 months (Table 6.14).

Table 6.14 *Distribution of children by height-for-age and age.*

	Height-for-age z-score (%)							
AGE (Mos)	< -2sd		-2 to +2sd		> +2sd		Total	
	n	%	n	%	n	%	n	%
5-11.99	15	28.8	36	69.2	1	2.0	52	100
12-23.99	46	34.8	74	56.1	12	9.1	132	100
24-40	26	20.6	92	73.0	8	6.4	126	100

6.8.3 *Weight-for-height.*

Weight-for-height measures current nutritional condition of an individual. Values less than -2.00 standard deviation of standard weight-for-height indicates wasting. Out of all study children, 12.9% were wasted. Wasting was more prevalent in male (18.7%) children than in females (8.0%) (Table 6.15).

Table 6.15 *Distribution of children by weight-for-height and sex.*

SEX	Weight-for-height z-score (%)					
	< -2sd		-2 to +2sd		> +2sd	
	n	%	n	%	n	%
Male	28	18.7	114	76.0	8	5.3
Female	13	8.0	134	84.0	13	8.0

SEX	Total	
	n	%
Male	150	100
Female	160	100

Prevalence of wasting increased in children older than 12 months of age (12.8%) compared with those under one year (9.6%) and rose to 14.3% in the 24-40 month age group (Table 6.16).

Table 6.16 *Distribution of children by weight-for-height and age.*

AGE (Mos)	Weight-for-height z-score (%)					
	< -2sd		-2 to +2sd		> +2sd	
	n	%	n	%	n	%
5-11.99	5	9.6	33	63.5	14	26.9
12-23.99	17	12.8	107	81.1	8	6.1
24-40	18	14.3	108	85.7	0	0.0

AGE (Mos)	Total	
	n	%
5-11.99	52	100
12-23.99	132	100
24-40	126	100

Stepwise regression was used to identify, amongst the factors that showed associatons with nutritional status, those factors that were the

probable causes of malnutrition. These were income of a household, time spent by the mother on household chores and sex of a child.

Total time spent on household chores contributed about 30% to the nutritional status. Income of the head of the household contributed about 12% and sex of child about 10%.

The correlation coefficients of the variables with weight-for-age were very low. Therefore no conclusive statements could be made about the factors that affected nutritional status of the index children. However, data demonstrated trends of low weight-for-age in households with low income, where mothers spent more time on household chores, where fathers had very low and/or no formal education, where mothers had had more than six pregnancies, and the age and sex of the index child. There could be other factors which may have influenced the nutritional status of children.

CHAPTER SEVEN

7.0 DISCUSSION.

7.1 summary.

The objective of this study was to establish the prevalence of protein-energy malnutrition and identify its probable etiological determinants among children aged between 6-40 months. It had been hypothesized that time spent by the mother on daily household chores is associated with nutritional status of her preschool child. Secondly, it had been postulated that land size of a household is not associated with a child's nutritional status. The last hypothesis was that socioeconomic status of a household will determine the nutritional status of its children.

7.2 Nutritional status.

According to the anthropometric measurements, 18.4% of the children studied were malnourished (weight-for-age). This prevalence is lower than that of the entire country. CBS (1980) recorded a national malnutrition prevalence rate of 25%. Prevalence of P.E.M in Kamnarok Mosop is slightly lower than that in the Baringo Arid and Semi-Arid Project area (21-

29%). Although weight-for-age results indicate a public health problem, the situation in Kamnarok is not alarming.

Using height-for-age measurement, 28.1% of the children were stunted and stunting was highest in the age range 12-23.99 months. In Central Province CBS (1977) recorded stunting of 31% among the surveyed children. In the Third Rural Child Nutrition survey (CBS 1983) 19.4% of the surveyed children in Baringo/Laikipia District were stunted. In this survey the National level of stunting was 24%. In the CBS (1983) survey children between 6-60 months of age were surveyed yet in this study only those between 6-40 months qualified for the study. This may account for the differences in the figures since there is 'catch-up' growth in children over 40 months of age and also death may have occurred due to malnutrition related problems.

Weight-for-height was also used to assess the nutritional status and 12.9% of the surveyed children were wasted. More boys (18.7%) than girls (8.0%) were wasted. Wasting increased with age. CBS (1983) reported wasting of 6.4% in Baringo/Laikipia District and a National figure of 3.0%. In CBS (1980) 13.5% and 13.7% of surveyed children in rural and urban areas respectively were wasted.

More boys than girls were wasted in rural areas in this survey.

In the CBS surveys percentiles were used to categorize children into malnourished and well nourished while in the present survey standard deviations were used. In this study, only children up to 40 months old were included in the survey yet the CBS survey included children up to 60 months of age.

7.3 Biodemographic Factors.

The total number of pregnancies a mother had had was an important factor in the etiology of malnutrition. Young children are dependent on their parents, especially the mother, and are not yet old enough to be sent off to earn some income or to even assist with domestic work in the home. Though birth order was not significantly associated with nutritional status, it was observed that children who were of a lower birth order (fourth born and below) tended to have a poor nutritional status.

Malnutrition was more prevalent amongst males than females. This finding agrees with the CBS (1980) results where girls in rural areas appeared to be slightly less undernourished than boys using sex based reference standards. However data collected

by CBS (1979) using Harvard standard both sexes combined showed that boys were of better nutritional status than girls. This is rather surprising since very few studies, if any, have reported sex bias in Africa. Several studies have reported sex bias in India where boys are favored over girls. It may be possible that lifestyle of herding activities takes away boys from home at meal times hence poorer nutritional status. Otherwise, there is need for further research on the relationship between sex and nutritional status.

Prevalence of malnutrition increased with age. It was high in children in the age range 12-40 months. Melville (1988) also found a high prevalence of malnutrition in children 12-35 months old in Jamaica. This higher prevalence can be related to weaning foods given to children in terms of amounts given, age when these foods are introduced and level of hygiene during preparation of these foods. The amounts given may not be enough for the nutrient needs of a growing child. These foods may also be introduced abruptly and at earlier age before a child has developed its digestive system properly or too late for an individual child so that the child not get enough nutrients needed for

its growth. Poor hygiene will precipitate childhood infections and thus increase nutritional needs.

7.4 Morbidity variables.

The morbidity prevalence was higher in children less than a year old than in those over one year of age. This finding is similar to Niemeyer et al's (1985) finding in a study carried out in the rice fields of Kano Plains. This is an age when most mothers start weaning their children. It is also an age when a child begins to crawl around picking things in its way only to eat them, a very important source of infection.

7.5 Socioeconomic Variables.

Parental education was not associated with nutritional status. There was very little difference between mothers and fathers level of formal education. Over half of both the fathers (81.5%) and mothers (85%) had primary level of education. However, children from households where the father had had fairly good formal education tended to be of a better nutritional status. It is surprising that maternal level of formal education had no effect on a child's nutritional status yet several studies have demonstrated an association.

For example Victoria (1986), Wray (1969), Sanjur (1970) and Rao (1987) demonstrated an association between nutritional status and maternal education. However, CBS 1983 found an unanticipatedly higher prevalence of stunting in children whose mothers had some post secondary education. There is need to compare nutritional status of children of both mothers with low and/or no formal education with those of mothers with more formal education.

Total income of a household was not significantly associated with nutritional status. However, it was observed that children from households that had a higher income tended of good nutritional status. There was an association between father's income and nutritional status. Hijaz (1974), Kielmann (1976), Martorell (1984) and Rao (1987) all found similar results.

However maternal income did not show any association with nutritional status. It is possible that even where a mother has her own income, the head of the household retains control over it making her still dependent on the man. The results of this study demonstrated that the higher the income of a household the better the nutritional status of its children.

When cash crop farming was considered, there was no

evidence of poor nutritional status in children from households that practised cash crop farming. This finding compare well with Hoorweg et al 1983 and CBS 1979 results where there was no evidence of a negative association between cash crop cultivation and nutritional status. Cash crop farming has been widely perceived as a causal factor of malnutrition. When commercial farming and especially cash crop farming is studied in relation to nutrtitional status, one has to consider mediating factors such as ecological potential, land and labor availability, and how the income generated is spent especially with respect to household food security.

Food crop production, when considered separately, did not show any association to nutritional status. Most of what is harvested is sold in the market. Cash income generated from the sale of food harvested is used to purchase food in times of need. It is possible that when the food left in the store is depleted, some families may not have money to purchase food at the time of need. Some households harvest less food than what they would need for the full satisfaction of their families. Such families get some small income from casual labor which they may use to buy food and other

neccesities.

Livestock number was not associated with nutritional status. This may be because livestock is kept as an economic resource and not for family consumption. Grass, which is the main source of food for these animals, is not easily available. As shown in other studies land size alone does not influence the nutritional status of children since soil quality, climatic changes and location of the land affect its potential in relation to its productive capacity. Haaga (1986), Kielmann (1976), Smith (1982), Nabarro (1983) and Victoria (1986) found also that land size was not associated with nutritional status of a child.

It was observed that, children from households where fathers were regularly employed tended to be of a better nutritonal status. Valverde (1977), Rawson (1981), Cervantes (1981), and Stinson (1983) found an association between parental occupation and nutritional status. Occupation can be associated with amount of income; the better the type of occupation in terms of renumeration the higher the income. This may have a positive effect on the nutritional status children in households with increased earnings.

7.6 Maternal Time Availability.

Over half of the households traveled for less than two kilometers to the source of water both during the dry (73.8%) and wet (89.9%) season. Distance to a water source during the dry season was related to malnutrition though it was not significant. Some sources of water dry up during the dry season adding to the increased distance to the source of water.

Children from households where mothers spent more time to draw water tended to have low height-for-age. Over half of the households spent more than one hour to get water especially during the dry season. Most water sources dry up and even when there is some water in the wells it is rapidly exhausted as more and more people draw it. Thus, in most cases one has to wait at the well for it to fill up again.

The time spent on collecting firewood was significantly associated with malnutrition. Firewood has become very scarce yet it is the most common source of fuel in Kenyan rural communities. The scarcity of firewood has affected the time available for meal preparation and child care activities.

When total time spent on various listed household chores was put together a negative significant association was found with nutritional status. Mothers have less time to care for their children. Children are left in the care of older siblings/ a grandmother/ a neighbor. Similar findings have been demonstrated by Thompson (1967), and Vis (1981). Popkin (1976), FAO (1979), Carloni (1984) and Holmboe-Ottesen (1986) agree too that insufficient time for women to perform food related activities within a household especially child feeding will have a negative effect on the nutritional status of its children.

CHAPTER EIGHT

8.0 CONCLUSION

8.1 Introduction.

Though no conclusive statement can be made about the determinants of nutritional status, factors which have come up as probable determinants of nutritional status are the age and sex of a child, family's socioeconomic status as measured by household income, and maternal time availability as measured by time taken to get firewood which is the main source of fuel. Other factors which are of importance are distance to the source of water during the dry season, time taken to draw water during the dry season, number of pregnancies a mother had had and morbidity experience of an individual child. There is need for more research into causative factors of malnutriton in Kamnarok Mosop.

However from the factors that have been associated with malnutrition, it is evident that one intervention package cannot alone be enough for the improvement of a child's nutritional status. A number of interventions thought plausible for the improvement of a child's nutrition status have been briefly discussed below. They have implications for rural development projects. It is a Government

policy that nutrition concern be introduced into rural and agricultural development programs and activities in order to attain better quality of life. With this in mind it is hoped that the following recommendations will be considered by any development projects in the area.

8.2 RECOMMENDATIONS

8.2.1 Baseline Data.

All development projects have been decentralized to the Districts through the District Focus for Rural Development Program. It is important that before any project is set up, the project planners should collect baseline relevant data as a part of the project operation. These data should be analyzed systematically by the planners to help define specific geographic areas and the target group where emphasis should be placed during project implementation. This will help channel limited resources to the areas and groups of greatest need. Nutritional status of children, especially, should be used as one of the dependent indicators.

8.2.2 Women Groups.

Women groups are beginning to have great impact in

the society. Unfortunately they do not involve all women probably because of social, economic and or political differences. Mothers in this society are not highly educated. They could be encouraged to form groups through which literacy campaigns and nutrition and/or health education can be organized.

8.2.3 Maternal time availability.

Ways and means should be found that will help reduce maternal workload. For example, boreholes should be dug in convenient places in the village especially where there is no piped water. This will help to reduce travel distance and time taken to get water. Water storage tanks and surface dams would be appropriate to trap rain water.

To reduce time spent in gathering firewood mothers should be encouraged to plant trees, with the assistance of the Forest Department. This Department should arrange to supply seedlings at a fair price to farmers. Extra trees in the forest (especially those that are broken by the wind) should be sold or given to the mothers. Where possible solar energy can be developed and used for cooking.

8.2.4 Further Research

There is need for further research of the "microecology" of the sex difference. This will help to clarify the strong correlations between nutritional status, sex and age. Other areas of need are; research on weaning practices among the Tugens, and the relationship between infection and nutritional status.

The number of pregnancies a mother had had was associated with nutritional status. This might be mediated through birth weight. However, we did not have information on birth intervals of the children. It would be appropriate for some research to examine the relationship between the birth intervals of the study child and the older child, and the nutritional status of the study children.

More research need to be carried out, in Kamnarok Mosop, to identify other factors that have influenced the nutritional status of the children.

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APPENDIX 1

MAP OF BARINGO DISTRICT

BARINGO DISTRICT

MAP NO. 2

POLITICAL BOUNDARIES

BC – BARINGO CENTRAL

BE – BARINGO EAST

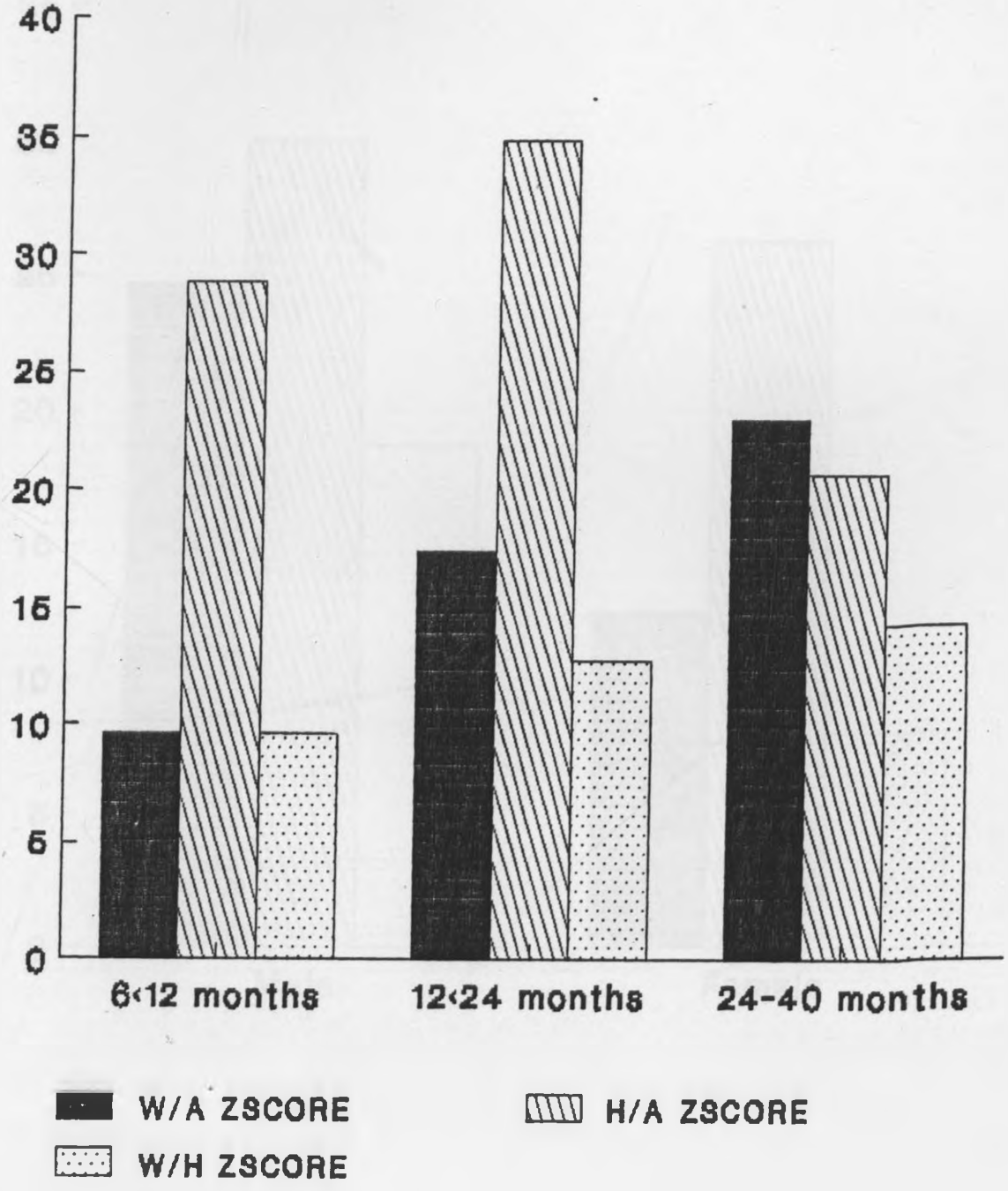
BN – BARINGO NORTH

BS -- BARINGO SOUTH

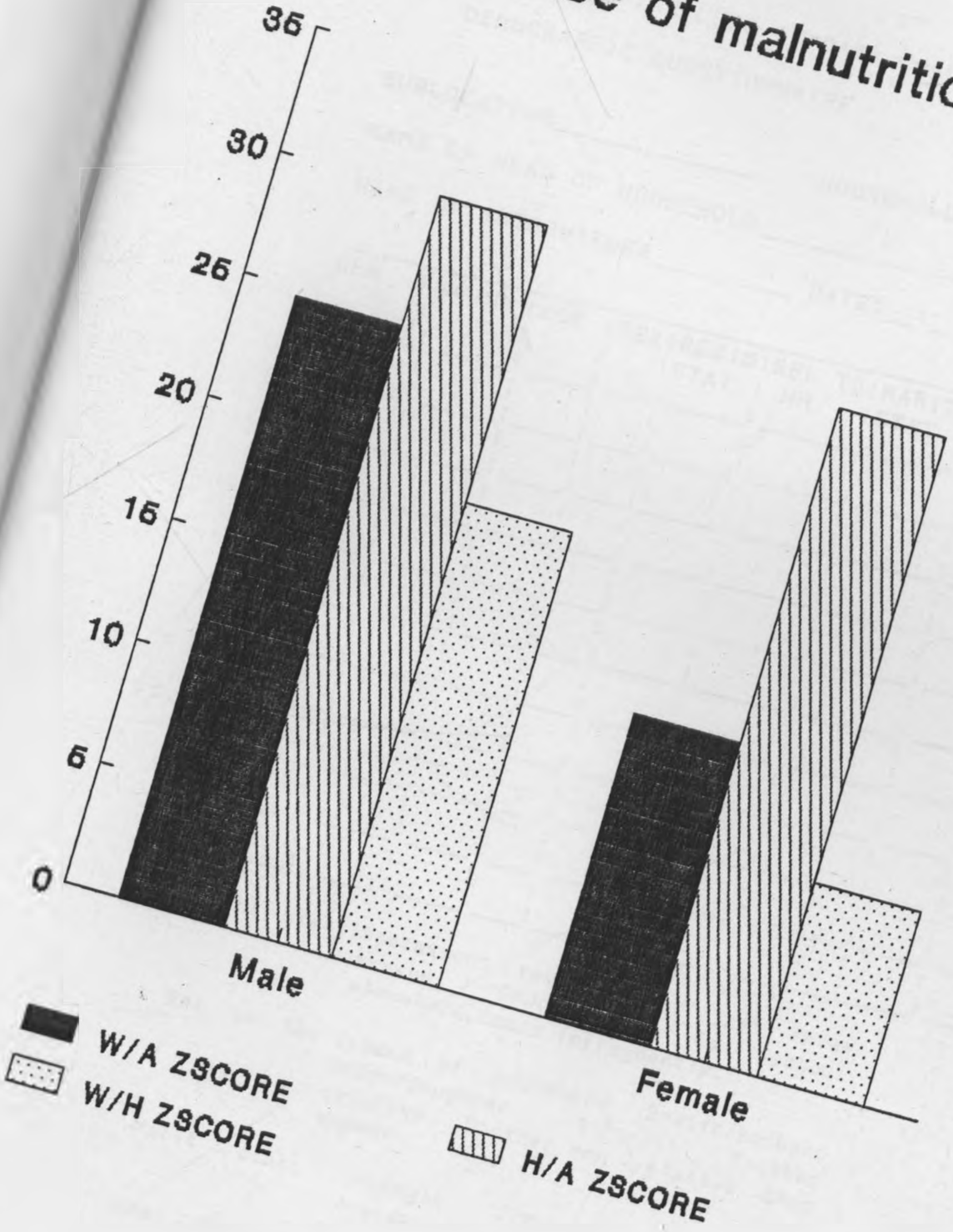
APPENDIX 2

BAR GRAPHS OF AGE AND SEX BY NUTRITIONAL STATUS

Prevalence of malnutrition by age



Prevalence of malnutrition by sex



APPENDIX 3

QUESTIONNAIRE USED IN DATA COLLECTION

DEMOGRAPHIC QUESTIONNAIRE

SUBLOCATION_____ HOUSEHOLD NO :__:__:__:

NAME OF HEAD OF HOUSEHOLD_____

NAME OF INTERVIEWER_____ DATE:__:__:__:_:__:__:

SER #	NAME	AGE	SEX	RESID STAT	REL TO HH	MARIT STAT	EDUC	OCC
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

Resid stat;1=permanent resident for last three months 2=works/goes to school elsewhere,comes infrequently.

Rel to hh; 1=head of household 2=Wife/husband 3=Son/daughter 4=Parent 5=other relative 6=other non relative 8=no answer

Marit stat; 1=single 2=Married 3=divorced 4=widowed 5=other 8=no answer.

Occ; 1=Farming 2=Casual-worker 3=Going to school 4=Regularly employed 5=Self-employed.

ANTHROPOMETRY QUESTIONNAIRE

SUBLOCATION_____ HOUSEHOLD NO:__:__:__:

NAME OF HEAD OF HOUSEHOLD_____

NAME OF INTERVIEWER_____ DATE:__:__:__:__:_:_:

Complete one form for each child between 6-40 months of age.

1. Name of subject_____ Sex :__:

   1=male 2=female

2. Date of birth :__:__:__:__:__:__:
   D D M M Y Y

3. Name of caretaker_____

4. Relationship of caretaker to child_____

5. Age of mother/caretaker in years. :__:__:

6. Is mother/caretaker pregnant now? :__:
   1=yes 2=no

7. How many times has mother/caretaker been pregnant?

   :__:__:

8. How many children does the mother/caretaker have alive?

   :__:__:

ANTHROPOMETRY

1. Weight to the nearest 0.1kg.

   :__:__:.__: :__:__:.__: :__:__:.__:

2. Height/Length to the nearest 0.5cm.

   :__:__:__:.__: :__:__:__:.__: :__:__:__:.__:

MORBIDITY QUESTIONNAIRE

SUBLOCATION_____ HOUSEHOLD NO. ¦__¦__¦__¦

NAME OF HEAD OF HOUSEHOLD_____

NAME OF INTERVIEWER_____ DATE¦__¦__¦__¦__¦__¦_¦

To be addressed to the caretaker of the index child.

Name of the child_____ Age ¦__¦__¦ (Mos)

1. Within the last seven days has this child had any of the following illness?

	1=yes 2=no
Vomiting	¦__¦
Fever	¦__¦
Cough and sore throat	¦__¦
Abdominal pains	¦__¦
Difficult breathing	¦__¦
Other specify_____	

SOCIOECONOMIC QUESTIONNAIRE

SUBLOCATION_____HOUSEHOLD NO. |__|__|__|

NAME OF HEAD OF HOUSEHOLD_____

NAME OF INTERVIEWER_____ DATE|__|__|__|__|_|_|

1. Do you own or rent any land? |__|
   1=yes 2=no

If you own land		If you rent land	
total acreage	acreage under cultivation	total acreage	acreage under cultivation

2. Do you grow any cash crops? |__|
   1=yes 2=no.

Type	Amount sold	unit price	total cost

3. What food crop do you grow?

Type of crop	Amount harvested

4. Are there times in a year when you have to buy food?

|__|
1=yes 2=no.

5. If answer to 4 is yes how much did you buy last season?

Type of food	Amount bought

6. Do you keep any animals? |__|
1=yes 2=no.

7. If answer to 6 is yes what animals do you own?

Type of animal	Number

8. Do you or any member of the family have any cash income?

Member of family	no	yes	how much	source

3=casual labor 4=other
8=no answer

10. INVESTIGATOR APPRAISE THE QUALITY OF THE HOUSE AND FILL THE FOLLOWING ITEMS CORRECTLY.

Wall	Roof	Floor	Kitchen	Toilet
1=brick	1=iron	1=wood	1=present	1=present
2=mud	2=grass	2=mud	2=absent	2=absent
3=wood	3=other	3=cement		
4=other		4=other		
¦__¦	¦__¦	¦__¦	¦__¦	¦__¦

11. Number of rooms in the house. ¦__¦__¦

12. Where do you throw your rubbish?

codes: 1=compost/waste bin 2= bury in ground
3=burn regularly 4=throw anywhere
5=other

TIME DISTRIBUTION AMONGST HOUSEHOLD CHORES

SUBLOCATION_____ HOUSEHOLD NO.¦__¦__¦__¦

NAME OF HEAD OF HOUSEHOLD_____

NAME OF INTERVIEWER_____ DATE¦__¦__¦__¦__¦__¦_¦

To be addressed to mother of index child.

Mother's name_____ Age ¦__¦__¦
years

1. How many of the following chores do you have to do every day?

	# of times	Time in min
fetch water	_____	_____
fetch firewood	_____	_____
prepare meals	_____	_____
work in the shamba	_____	_____

2. Do you work for someone else outside your home? ¦__¦
1=yes 2=no

3. If yes how many times per week? ¦__¦
how many hours per day? ¦__¦
how much are you paid? ¦__¦__¦__¦

4. What is the source of drinking water in the wet season? ¦__¦

1=piped water 2=rain water 3=river/well/spring
4=purchase 5=other.

5. How far is the source of water during the wet season?

¦__¦

1=less than 2km 2=2-4km

3=4-6km 9=do not know

6. What is the source of water during the dry season?

¦__¦

1=piped water 2=rain water

3=river/spring/well 4=purchase 5=other

7. How far is the source of water during the dry season? ¦__¦

1=less than 2km 2=2-4km

3=4-6km 9=do not know

8. How long does it take you to get water during the dry season? ¦__¦__¦__¦
minutes

9. How much water do you use per day during the dry season?

¦___¦__¦
(litres)

10. How much water do you use per day during the wet season?

¦__¦__¦
(litres)