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" AN INVESTIGATION OF THE CAUSES OF
INFANT AND CHILD MORTALITY IN
BONDO DIVISION OF
SIAYA DISTRICT "

A MAJOR PROJECT PRESENTED TO THE POPULATION STUDIES AND
RESEARCH INSTITUTE IN PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR A POST GRADUATE DIPLOMA IN POPULATION
STUDIES, OF NAIROBI UNIVERSITY (1988/89)

BY

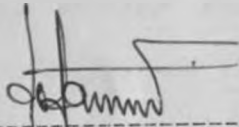
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DECLARATION

I certify that this project report is my original work, carried out by me, David Samo Onyango Otiemo, a Postgraduate Diploma in Population Studies at the Population Studies and Research Institute, University of Nairobi, 1988/89.

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<u>Table of contents</u>	<u>Page</u>
Project title	(i)
Declaration	(ii)
Acknowledgement	(iii)
List of tables	(vi-vii)
List of figures	(viii-ix)
Bibliography	(x-xi)
 <u>Section 1</u>	
General Introduction	1
1.1 - Introduction	1-2
1.2 - Background of the Study Area	3-4
1.3 - Problem Statement	5-7
1.4 - Objectives of the Study	7-8
1.5 - Rationale	8-9
1.6 - Scope and Limitations	10-11
1.7 - Literature review	12-17
1.8 - Theoretical Framework	17-20
1.9 - Conceptual Hypothesis	21
1.10 - Operational Hypothesis	22
 <u>Section 2</u>	
Data Sources, Quality and Methodology	23-26
2.1 Introduction	23-24
2.2 Data Sources	24

2.3 Data Limitations	24-25
2.4 Methodology	25-26

Section 3

Discussions of the Findings	27-50
3.1 Introduction	27
3.2 Locational Variability	27-28
3.3.1 Differentials by medical and health facilities	28-32
3.3.2 Differentials by disease patterns	32-44
3.3.3 Differentials by geographical location	45-47
3.3.4 Overview for Rondo Division	48-49

Section 4

Summary and Policy Implication	50-54
4.1 Introduction	50
4.2 Major findings	50-52
4.3 Recommendations for policy making	52-53
4.4 Recommendations for further Research	53-54

LIST OF TABLES

1. Table 1A
- Mortality indicators for Kenya from various censuses.
2. Table 1B
- Infant mortality rates (IMR) rates for various developed countries for selected regions in a given year.
3. Table 3A
- Distribution of health units by location in Bondo
4. Table 3B
- Distribution of water sources by Type of water source and location in Bondo
5. Table 3(C and D)
- Estimation of water source and health units respectively by distance in kilometres and by location in Bondo
6. Table E
- Disease pattern and its distribution by causes and location in Bondo
7. Table 3(F and G)
- Distribution of deaths by age in single years and by sex and by major causes of death between 1985 and 1989 in Bondo

f

8. Tables 3(H₁, H₂, H₃, H₄ and H₅)
- Distribution of deaths caused by measles, kwashiokor, diarrhoeal and stomach related problems, malaria and Broncho - Pneumonia and other respiratory diseases by location and by year of occurrence in Bondo
9. Table 3I
- Distribution of acute respiratory disease by month and year of occurrence for children aged 0-5 years at Usigu Dispensary in Bondo Division
10. Table 3J
- Distribution of diseases in 1988 by month and their causes
11. Table 3K
- Distribution of malnutrition cases by month and year of occurrence
13. Table 3L
- Distribution of diseases by cause and sex and by location
14. Table 3M
- Distribution of Rainfall in milimetres by month and year
15. Table 4A
- Distribution of Personnel by type of profession and health units in Bondo

List of Figures

1. Figure 1 - Siaya District with demarcated boundary of Bondo division
2. Figure 2 - Siaya District, Population, Density, Regional differentials
3. Figure 3 - Agro-Economic zones of Siaya District
4. Figure 4 - Siaya District soils
5. Figure 5 - Health units in Siaya - Focus on Bondo region

List of Figures

1. Figure 1 - Siaya District with demarcated boundary of Bondo division
2. Figure 2 - Siaya District, Population, Density, Regional differentials
3. Figure 3 - Agro-Economic zones of Siaya District
4. Figure 4 - Siaya District soils
5. Figure 5 - Health units in Siaya - Focus on Bondo region

List of Figures

1. Figure 1 - Siaya District with demarcated boundary of Bondo division
2. Figure 2 - Siaya District, Population, Density, Regional differentials
3. Figure 3 - Agro-Economic zones of Siaya District
4. Figure 4 - Siaya District soils
5. Figure 5 - Health units in Siaya - Focus on Bondo region

SECTION 1

GENERAL INTRODUCTION

1.1 INTRODUCTION

Although mortality declined considerably in developing countries after the second world war, there remain significant differences in mortality among population groups in nearly all countries.

Appropriate policy measures for reducing these differentials need to be developed and implemented. Studies of mortality differentials in terms of causes are useful in at least three ways.

First, such studies provide information for assessing inequalities among people with respect to life expectancy and health. Second, data on mortality ~~causes~~ help to identify those underprivileged segments of the population who experience higher mortality levels. These population groups are an appropriate target of policies and programmes for improving health conditions and survival chances.

Finally, studies of mortality and their interrelationships on the basis of which proper policy measures for reducing mortality are developed, selected and improved. Generally, Kenya has experienced rapid population growth due to rapid drop in mortality in the last two decades.

But some parts of Kenya, especially in the Western and Nyanza provinces, mortality has been noted to have dropped with less rapidity.

The infant and child mortality in these regions are still high.

The general drop in mortality in Kenya is known to depend on the spread of the benefits of modern science technology and the resulting improvement in the quality of life in the country.

Table 1 below shows mortality indicators for Kenya from various censuses.

Indicator	Census dates				
	1948	1962	1969	1979	1984
IMR	184	174	119	84	82
L.E.	35	1 42.5	2 49	3 53.5	4 58.5

Source: Estimates from various census Reports: Central Bureau of Statistics, Nairobi. (Table 4.5 in Kenya's Population Growth and Development to the year 2000 AD edited by S.H. Ominde)

IMR - Infant mortality rate per 1000 live births.

L.E. - Life expectancy at birth for both sexes shown as average in 1,2,3 and 4 indices above.

A recent analysis of available data nationally show that improvement in the observed declines in infant mortality have been strongly related to malaria control, improved nutrition, provision and availability of health services eg. vaccination and immunization, and parental care through education and the general improvement in the living conditions of the population.

The purpose of this study is to identify those disease causes of mortality in Bondo Division responsible for the infant and child mortality in the region, and to correlate it to the availability of medical and health care in the region.

1.2 BACKGROUND OF THE STUDY AREA

Bondo division is a single constituency represented in parliament by one parliamentarian. Being one of the divisions comprising Siaya district, it covers most part of southern part of the district, bordering Lake Victoria.

Before the last parliamentary elections, Bondo constituency included the present Rarieda constituency which is now a division of its own.

Bondo covers an average area of about 975 sq.Km.

It is generally a semi-arid region experiencing rainfall ranging between 25mm in the lake region to 200mm annually during the long rainy period between the months of January and June. During this period a few areas with good fertile soils are cultivated with maize and millet which are the major staple foods in the division along with cassava and sorghum.

A large part of the region is covered with thick shrubs of tropical with thick vegetation with some scattered cactus and thorny trees.

Significant physical features include river Yala which forms a boundary between the division and Alego, running from Northern part of Sakwa location down to the lake through West Yimbo location.

Hilly parts include Abom hills in North Sakwa, Ramogi hills in Central Yimbo and Nango hills in Central Sakwa locations.

The temperatures of Bondo range between 24 c to 36 c during cold and hot seasons respectively.

Other activities include gold mining which is crudely done on small scale, and fishing as one of the other major activities in operation.

Lack of communicable roads has played down business in the region, and road transport is very expensive.

1.3 Statement of the problem

Kenya has the highest population growth in the world, estimated to be 4.1 percent per annum (World Bank report 1984). This high population growth has implications for the mortality trend in Kenya, especially for infants (Under one year of age) and children.

Infant mortality (number of children dying before completing one year to the number of live births) and child mortality rates are important because they show the direction of rate of acceleration of the population growth. With low infant and child mortality (i.e. having a large population potential base for future growth), there may be stability in later fertility increase due to ensured longer life expectancy as a result of improved medical and health facilities.

Whether gauged from psychological, social or economic perspective, the death of an infant or small child represents one of the most devastating of human experience. Every human birth is a unique event and the cost of the death of a child to the family and friends in psychological terms is, of course, inestimable.

From a social perspective, a high infant death rate colours the attitudes and perspectives of a whole society regarding the 'value' of a child.

A society hesitates to place too high a value on a new human life which, at best, has an uncertain probability of reaching a productive adulthood.

Finally, the economic cost of a prematurely terminated life is considerable, for example, the nutritional, health and medical resources spent on a child who does not live past early childhood, are, from societal perspective, largely a wasted resources.

It is for this reason that propels Kenya to ensure a reduction of its high infant and child mortality which ranges 82 infant deaths per 1000 live births (KCPS - 1984) in comparison to other developed countries as shown in the table below.

Table 1B below shows infant mortality rates (IMR) for various developed countries for selected regions in a given year.

<u>Country</u>	<u>Year</u>	<u>IMR</u>
Japan	1980	7
Australia	1980	11
USSR	1980	28
United Kingdom	1980	12
Sweden	1980	7
Algeria	1979	72
India	1979	172 (for 1973)
Iran	1980	108
China	1979	56 (UN - estimate)
Mexico	1978	44

Source: Population - An introduction to Social Demography by Paul E. Zopf Jr. (Page 180).

The largest number of deaths of infants aged 0-1 for each 100 live births in the developed countries of the world around 1980 was 33 for Yugoslavia while the lowest was shown by Japan (Table 1B). The average value of IMR for developed world is 12 infant deaths per 1000 live births (World Bank report, 1980). These values are likely to have changed for the better in the late 1980's.

The reduction of IMR value for Kenya can be met when major causes of mortality, especially in regions of high mortality like Bondo, are precisely known so that direct control measures are planned through necessary health services.

The inspiration of this research undertaking was geared toward this end, because with high infant and child mortality, there is an urge to reproduce more and the desire to have more children may persist beyond the time when fertility level could have been reduced to a minimum level (opsit).

Secondly, children's death contributes a very large proportion of deaths in developing countries in which Kenya is part, so that children are considered the major target group for reducing mortality levels and differentials.

Finally, child mortality reflects economic and social conditions in a more sensitive way than mortality of adults, which is strongly affected by bio-medical factors, in particular, physiological deterioration that proceeds with age, and in general less preventable than child mortality (UN, New-York-1985).

1.4 Objectives

The following are the objectives of this research project.

- (a) To find the major causes of mortality of infants and children in Bondo Division.
- (b) To help Divisional planners with priorities necessary for the locations as far as health conditions are concerned.

- (c) To help the government with the knowledge of types of diseases which contribute to the high infant and child mortality differentials in different regions.
- (d) To help strengthen the need for vital registration with causes for each location.
- (e) To find out whether the vital registration on infant and child mortality is complete and how it can be improved.

1.5 Rationale

An estimated life expectancy at birth for both sexes in Kenya stands at 58.5 years in comparison to 35 years in the 1948 (KCPS - 1984).

This shows positive signs of positive economic development in Kenya, though is yet below standard as compared to life expectancy at birth of 70 years ; average for the industrialized nations.

Although one may be content with improvement being made in development in Kenya, with life expectancy used as indicator of development for different regions in Kenya, regional differences are profound and need a lot of attention in order to achieve a general all round equitable development nationally.

Regional differences place Nyanza, Western and Coast provinces of Kenya as those with the lowest life expectancy ranging between 44 years and 47 years (WFS - 1977/78, KCPS-1984).

Contributory factors to such low life expectancy at birth in these regions are high infant and child mortality due to poor health facilities among others.

There is need therefore that if the country has to realize equitable distribution of its resources, as one of its national objectives, knowledge about the causes of such high mortality rates of infants of 120 infant deaths per 1000 live births (KCPS - 1984) which are still characteristic of such regions as Nyanza province, and Siaya district in particular, must be put as priorities in the development plans for such regions.

Such steps can be realized through research efforts like this one which in turn manage to forge and accelerate the rate of economic development for such regions, and eventually create national peace for the country.

1.6 The Scope and Limitations

The study will cover all constituencies in Bondo Division as given in the last parliamentary boundary divisions of 1988.

The study has chosen to cover all three variables as obtained in other studies for the country.

This does not mean that other variables do not contribute to mortality change in the region but due to time limit for the study period, only this number of variables could be conveniently completed.

A study including all other factors of socio-economic, biological environmental, cultural and medical as has been found to be effective in changing mortality level in Kenya, could have

required a lot more time, personnel, funds and detailed probing questionnaire for more information.

Because of time limit and other mentioned limiting factors above, the only three variables looked at include disease pattern, medical and health services, and geographical location using both secondary and primary data.

The disease pattern coverage was restricted to visits to only government health units, and only major disease causes were recorded.

The geographical details were limited to environmental conditions in each location of the six locations of the region. The medical and health service information was limited to the depth of the probe questionnaire which could not be very exhaustive because of nature of the respondents, most of whom couldn't spare much time for the interview, and considering the level of education which was basically of standard seven level on average.

1.7 Literature Review

The study of mortality has been a highly neglected area in almost all countries in Africa, but is one of the most important areas to be touched especially when one considers reduction of fertility for the control of population growth.

For the developing countries as a group studies show that life expectancy at birth is about 53 years. Life expectancy increased by a dramatic 50 percent between the early 1940's and the early 1970's, but this trend began to falter in the 1960s,

and has continued to slow.

Life expectancy at birth in Africa is now about 47 years, and in Latin America, about 61 years. In contrast, life expectancy in the developed regions is about 70 years (World Bank report - 1980).

In the poorest regions of low-income countries, half of all children die during the first year of life. In Africa as a whole, the infant mortality rate is over 100 deaths per 1000 live births compared with 15 infant deaths per 1000 live births in developed countries (ibid).

For those in the developing countries who reach the age of five, life expectancy is only six to eight years less than in developed countries. However, these people suffer frequently from non-fatal diseases e.g skin diseases, malnutrition e.t.c. Data on health conditions are available for only a few countries and are of doubtful reliability. Little information has been collected on impact of disease on economic and social activities. The few detailed studies that are available suggest that illness disrupts normal activities for roughly one-tenth of peoples' time in most developing countries (Koyugi - 1980).

Many of the illnesses are intermittent with recurrent acute episodes. These illnesses disrupt economic activity, often at critical times, such as the planting and harvesting seasons in the case of malaria (ibid). Degenerative chronic diseases (heart disease, stroke, diabetes, cancer, e.t.c) are less prevalent in developing than in developed countries, partly because smaller

proportions of the total population survive to late adulthood. Mortality rates differ within regions, for example, urban and rural areas (Kibet - 1981).

The crude death rate for 1960 in the rural areas of the developing world was estimated by the United Nations at 21.7 deaths per 1000 of total population compared with 15.4 deaths per 1000 of total population for urban areas (cnsf). In Kenya, little was known of the differentials between the urban and rural areas, given that proper population census to identify such factors as mortality was done in 1969, though with estimated figures for 1948 and 1962 (Table 1A).

Data on infant mortality are especially pertinent as they refer to the population most vulnerable to health hazards.

Infant mortality is grossly under reported in most developing countries, the degree of which is probably much greater for rural than for urban areas.

In Kenya infant mortality has been estimated using Brass type models by a number of scholars eg. Kibet (1981), Nyamwange (1982) and Mott (1979). These estimates have given different figures for both rural and urban with the former having higher figures (KFS - 1977/78). These differences, like for other countries, are the results of the marked contrast in socio-economic conditions between rural and urban areas, as are confirmed for Kenya (Kibet - 1981).

It has been found that life expectancy in the districts with high infant and child mortality is low in Kenya (Koyugi - 1980).

The life expectancy at birth obtained for males and female are 41.5 and 46.6 years respectively in Siaya district (Koyugi-1980). He further noted that mortality rates are highest in the first five years of life.

Mothers belonging to better off socioeconomic group have lower mortality (KCPS - 1984).

Classification of mortality levels in 1979 per 1000 of total population placed Siaya district among these with the highest mortality rate of 150 deaths and above (CBS, 1979 census). The 1979 census further revealed that Nyanza and Coast were the leading mortality rates of about 170 deaths per 1000 population, and the lowest of 38 deaths per 1000 population for Central province. The reasons advanced for the variability in infant and child mortality by district are that the low mortality districts are geographically located in the highland areas that are less malarious (although account should be noted of the incidence of other respiratory disease such as Tuberculosis, meningitis, e.t.c) (Kibet - 1981).

Some of this regional variation undoubtedly reflects the more tropical climate in these areas which is associated with a different pattern of illness causation than is found in the rest of Kenya (Mott, F.L-1979). Koyugi (1980) also found that malaria cases are highest in Siaya district in the months of May to August because of the favourable conditions of plenty of rains and overgrown vegetation during this period which was also supported by favourable warm climatic conditions of the region.

Further evidence show that increases in educational attainment as well as improvements in rural health services reduce substantially overall infant mortality (KCPS-1984).

It is apparent that many of the same health and nutrition factors conducive to actually raising fertility at the same time have dramatically improved survival chances for many infants and children.

While changing demographic factors help explain recent declines in infant mortality, it is emphasized that the major declines over time must be attributed to environmental causes such as improved food distribution systems, better access to medical and health services and perhaps improved health, measures (opsit).

In the U.K. there is evidence of early infant (or neonatal) death which directly reflect congenital malfunctions resulting from the birth process itself (World Bank - 1980). However, once an infant survives past early weeks of life, its chances of survival past childhood are extremely high because of the favourable environment in which it lives (ibid).

In contrast, an infant surviving past the early weeks of life, in Kenya, still has a substantial chance of dying both during the remainder of the first year of life as well as during the first few years after infancy (Kougi-1980).

According to Conde and Bounte (1971) and UN (1978, p-126), these exogenous causes which comprise external health and nutritional factors become increasingly important in determining the survival chances of older infants.

Although there were no direct estimates of infant mortality in the early 20th century in Kenya, several sample surveys taken between 1922 and 1933 in an attempt to arrive at direct measures of infant mortality provided a treasure of knowledge during the period (Knczynski, 1949 pp.212-215).

The survey in the then Central Kavirondo district in 1922 suggested that 413 infants per 1000 live births died in the first year of life (ibid). A similar survey carried out in Kisumu in 1925, 1926 and 1927 indicating mortality rates of 118, 277 and 237 respectively, indicated that the lower rates of mortality were due to improved housing (provided by the Uganda Railway) and fluctuations were thought to be due to the varying incidence of malaria during the survey years (ibid).

Preliminary information from the National Demographic survey in 1977 indicate that infant mortality in the first year has declined substantially in the period between 1969 and 1977.

According to World Bank report (policy paper, Feb 1980), the major killers of small children are gastro intestinal and respiring infections, measles, and malnutrition conditions for which inexpensive effective prevention or treatment is technically possible.

In Kenya, Koyugi (1980) found that malaria tops the list of major killers of infants and children for Siaya district followed by respiratory diseases as given by United Nations (1963) model. Kibet (1981) confirmed malaria as one of the major killers for both adults and children in Kenya.

1.8.1 Theoretical Framework

A framework to analyse infant and child mortality and their causes must take into account variables several which influence and determine the level of mortality.

These factors can broadly be classified as follows:

- (a) Demographic ✓
- (b) Environmental
- (c) Geographic
- (d) Economic and Political ✓
- (e) Medical and health care ✓
- (f) Cultural, not necessarily following in the the order.

1.8.2 Demographic Factors

These factors are basically divided into two classes. The first lot concerns the health of the mother to an extent of exposing an infant to mortality risks.

They include age of mother, the birth interval and the birth order of a child. The second lot refers to sex and age of child. In Kenya it has been found that mothers who marry at early ages do have high risks of high infant and child mortality due to lack of adequate knowledge about child care (KFS - 1977/78).

Other findings also state that male children are at higher risks of mortality than female children especially in the first year of childhood (1979 censuses).

It was indicated that these differ by regions with Nyanza and Coast provinces having the highest. While Central and Rift

Valley provinces the lowest. Other provinces fall in between (ibid).

1.8.2 Environmental factors

Some studies indicate that in Kenya, especially in the first five years of life, children die mainly from respiratory diseases which are environmentally oriented (opsit).

In a study by Koyugi for Siaya district, malarial cases were found to be determined by environmental conditions, being rampant in the month of June and July of each year due to an aftermath of long rains which contribute to thick bushes and many waterponds as breeding ground for mosquitos infected with malaria parasites. Apparently, in Mumias they are not allowed to grow maize and have greatly reduced malarial risks (Bradley - 1989 - Fieldwork Report).

1.8.3 Geographic Conditions

Regional differentials of mortality have been identified nationwide as well as at district level (KFS-1977). Studies show that due to climatic conditions, hot belts of Kenya, especially along the coast and around the lake region, do have high mortality rates. This is so because the climatic conditions of these regions favour the survival of diseases causing agents e.g Viruses, Bacteria, e.t.c.

In these regions e.g Nyanza and Coast provinces, the infant mortalities are very high yet, about 170 infant deaths per 1000

live births as compared to Central province which has an infant mortality of about 38 infant deaths per 1000 live births (ibid).

1.8.4 Economic and Political

At the macro-level, Kenyan government uses its resources to ensure adequate health facilities at the districts in terms of building Hospitals as well as health centres within each district (Development Plan 1984\88). Studies show that water projects are undertaken in the rural areas to help the rural community have clean piped water (ibid).

The road network is also being strengthened to help each region in the country have access to available resources.

Most rural parts of Kenya, especially the arid and semi-arid of the North and North-East lack adequate transport facilities. In certain parts of Kenya where access roads are already built, poor maintenance of the roads render them equally inaccessible.

1.8.5 Medical and Health Care

The distribution of medical and health services in Kenya is still not adequate. According to the 1977 National demographic survey, the Kenyan urban has better health facilities than the rural. The study noted that about half of medical facilities in Kenya are distributed in major towns e.g Nairobi, Mombasa and Kisumu.

Other studies indicated that some rural districts have better medical facilities e.g. Central province districts than any other districts in the country (CBS - 1979 census report).

Such districts with better health facilities have good transport infrastructure enabling easy movements for health, mobile clinics at all times of the year.

According to KCPS (1984) certain regions of Kenya, especially in the rurals lack ante-natal and post-natal clinics. Such deficiencies in medical and health services lead to infant and maternal deaths.

1.8.6 Cultural Factors

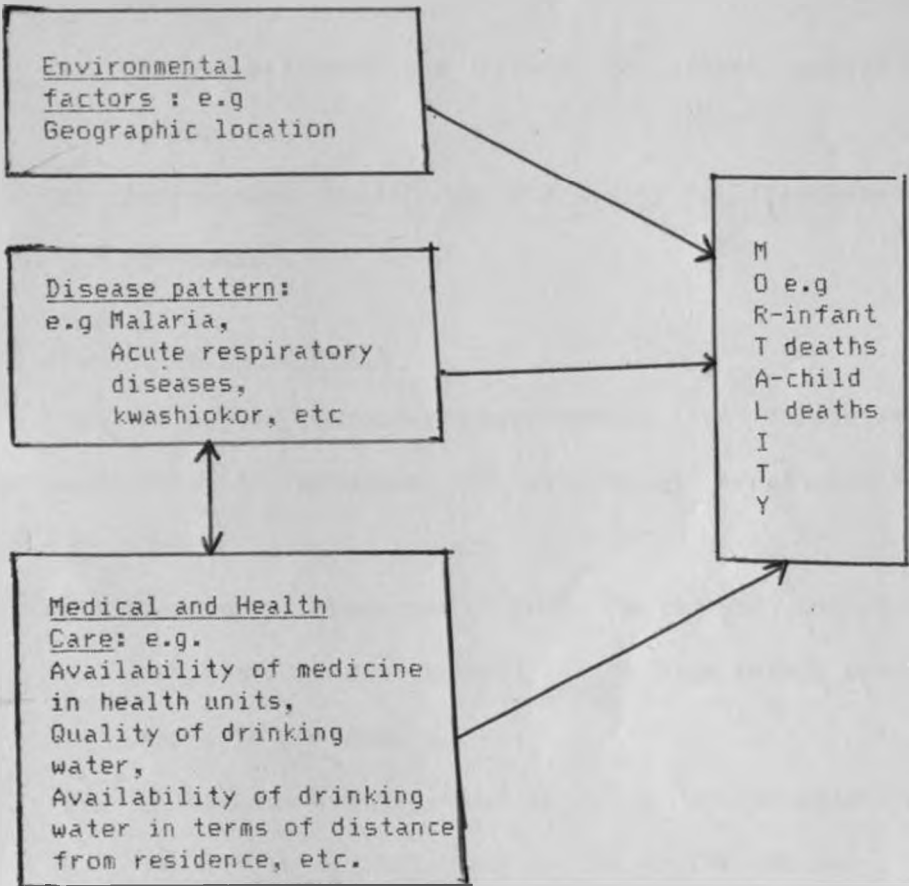
Some anthropological studies advanced in Kenya indicated that infants and children in some parts of the country die of malnutrition due food taboos and food habits practised (Ocholla-Ayayo and Z. Muganzi - field work report - 1986).

Other studies (KCPS-1984) indicated that shortened period of breastfeeding of babies result in severe illness of such children and some end up dying.

All the above factors have been studied in Kenya by region. This study will therefore use some of the findings above to apply to the region under consideration as had earlier been mentioned.

1.9 Conceptual Hypothesis

The following is the conceptual framework used in the study as a model of operations.



The following are the conceptual hypothesis as are given in the model:

- (a) Environmental factors are likely to affect mortality in Bondo.
- (b) Disease patterns are likely to effect mortality in Bondo.
- (c) Medical and Health care are likely to affect mortality in Bondo.

1.10 Operational Hypothesis

From the above conceptual hypothesis, the following have been identified to represent the operational hypothesis of the study:

- (a) Geographical location of Bondo with its hot climatic conditions is contributory to the high infant and child deaths in the region.
- (b) The various disease found in Bondo are responsible for the high infant and child deaths in the region.
- (c) Lack of adequate medical and health facilities in Bondo are likely to cause high infant and child deaths in the region.

SECTION 2

DATA SOURCES, QUALITY AND METHODOLOGY

2.1 INTRODUCTION

Many techniques which have ever been used in demographic work for the estimation of mortality data are consistent with instances of incomplete data which at times are unavoidable in both developing and the developed world.

This incompleteness of the data especially in mortality cases, and for Kenya in particular, has been attributed to:

- (i) Lack of adequate financial resources to carry out detailed surveys.
- (ii) Lack of adequate manpower to carry out the survey and handle with already available data at the right time required.
- (iii) Little or no application of the survey data in development plans due partly to (i) and (ii) above by certain researchers (Ronoh - 1982).

In Kenya, census data date back to 1948 and has been carried out decennially since 1969 with the last one done in August, 1989.

Other survey data include Kenya Fertility Survey (1977/78), National Demographic Survey (1977, 1983), Kenya Contraceptive Prevalence Survey (1984) and Kenya Demographic Health Survey (1983) among others.

Vital registration as a source of data is a new event worldily. In Kenya, the civil registration system is still not fully developed and, for this reason, it is not possible to use direct methods for measuring mortality in general.

Studies at PSRI have, therefore, used extensively the indirect methods (Koyugi and Kimani - 1988.

Complete registration of vital events like deaths was first reported in 1982 in Central province.

2.2 Data Sources

In this study the data used included primary and secondary data collected at the divisional health units of Bondo Division. The secondary data collected consisted of death cases and causes as are reported in the death registers at Bondo and Lwak Health Centres for infants and children aged 1 to 5 years of age between 1985 and 1989. This information was needed to help confirm the primary data findings. The primary data was collected using 30 questionnaires designed to cover the three variables as are given under operational hypothesis. The questionnaires were meant to help establish the causes of infant and child deaths in Bondo Division.

A general interview was administered to health personnel at each health unit to help confirm the major causes of infant and child mortality, viewed from morbidity stand point.

2.3 Data Limitations

The secondary data information was restricted to only in-patient deaths of children aged 0 to 5 years without consideration of still births.

Some vital information could sometimes be found missing, like age, sex or location of the registered death could be left out. The gap was filled for whichever the case in the analysis by

considering such cases under 'others' in the analysis table to minimize any errors.

The death cases registered at the Health Centres could not be taken representative of all deaths in the division because some unregistered cases, could be found at the sub-chiefs' offices, though they were left out because they had incomplete information.

2.4 Methodology

Both primary and secondary data will be used in the study. The secondary data to be collected comprise determination of diseases responsible for infant and child deaths from the death registers and correlation of these death cases with the regions of origin in the division.

The primary data collection will be done by administration of questionnaires designed including the three operational variables to women between the ages 15 to 29 years who come to the dispensaries or health centres for the treatment of their accompanying children.

Another lot of questionnaires are designed for the health personnel covering the level of adequacy of medical treatment and health care services they render to the patients, and any accompanying problems they incur during the services.

The analysis of data will be both quantitative and descriptive. The quantitative method used will be regression method of analysis along with descriptive statistical analysis.

No sampling technique will be used in the selection of the dispensaries or health centres in the division. This is because there are only 6 dispensaries with one in each of the 6 locations

of the division. This will enable adequate representation for each division.

With only one health centre in the division, there is no choice but to visit it.

Another health centre (Lwak) though now is in a different division of Rarieda, it will be necessary to visit it because it was part of Bondo division before the 1987's parliamentary divisions were done.

This is necessary because death cases of Bondo between 1985 and 1987 must have possibly been registered there.

A total number of 50 respondents will be randomly chosen for interviews at each dispensary with an assumption that all of them are from the location in which the dispensary is allocated. Precise information about 'actual distance' could not be assumed because most of the respondents reporting could not differentiate precise difference between distance in kilometres and in miles. Therefore, the interviewer had to assume an average estimate of the reported distance to reflect an appropriate figure. For respondents who reported the distance as 'near', this was taken as a reference to mean 'zero' distance with a representative figure of '0'.

Some respondents had to be selected ^{to} representative locations because they didn't know precisely which locations they belonged. This was as a result of the recent changes done in parliamentary boundaries, although the number involved was minimal.

SECTION 3DISCUSSION OF THE FINDING3.1 INTRODUCTION

Bondo division is part of Siaya district as is located in Figure 1 comprising numbers 12, 13 and 14. The new location boundaries have divided Yimbo location into three other locations and North Sakwa (NS) and South Sakwa (SS) locations reorganized to North Sakwa, South Sakwa and Central Sakwa (CS) locations as shown in table 3A.

It has six(6) dispensaries which are government aided (Figure 5). It covers a total area of 975 sq.km with a population of 140,253 persons with a female population of 749,958 as reported in the 1979 population census (Figure 2).

Bondo falls in lower Agro-eronomic zone of Siaya district, having lower rains, hotter and drier than any other parts of the district (figure 3). Most part of the division has a red and sandy soils (Figure 4).

3.2 Locational Variability

The six locations of Bondo are inhabited by Luos as the dominant ethnic group, though some non-Luo ethnic groups are found in certain locations. Bunyala's inhabit Central Yimbo (CY) and West Yimbo (WY) locations because these locations border Busia district which is inhabited by Bunyalas, and some migrant Ugandans are found in such islands like Mageta which is part of West Yimbo (WY) location which forms part of Kenyan boundary with Uganda.

Parts of South Sakwa, Central Sakwa and West Yimbo locations border Lake Victoria while North Sakwa and East Yimbo (EY) locations are traversed with river Yala. Major water projects in the area supply a region of about 80 sq.km. These include Uloma water project which serves Bondo urban centre and Nyamira Girls Secondary School. Usigu water project which serves Usigu dispensary. Both of these water projects are situated in Sakwa and Central Yimbo (CY) location.

Other water projects started on Harambee basis in early 1970s which are yet to be completed are North Sakwa - South Sakwa water projects which are getting minimal government assistance. These could serve Central Sakwa, North Sakwa and South Sakwa locations.

Most roads are untarmaced. The only tarmaced road linking Bondo and Kisumu passes through North Sakwa, East Yimbo and ends at Usenge in Central Yimbo location.

3.3.1 Differentials by Medical and health facilities

According to table 3(A), all the locations have in each at least a government dispensary which shows a balanced distribution, but North Sakwa location is the only one having a health centre.

TABLE 3A

Distribution of health units by type and location in Bondo

Type	Administrative locations						Total
	NS	SS	CS	EY	CY	WY	
Hospital	0	0	0	0	0	0	0
Health centre	1	0	0	0	0	0	1
Dispensaries	1	1	1	1	1	1	6
All government health units	2	1	1	1	1	1	7

Source: Division of Health, Ministry of Health, Bondo Statistics Office.

Bondo Health Centre has a capacity of 38 beds for in-patients including adults and children. It operates an MCH/FP clinic and is the only health unit in the division which has an in-patient clinic. The health centre has no doctor at the centre, but is headed by a clinical officer like the dispensaries in the region. A total of 2 clinical officers are assigned to the health centre (Table 4A).

Table 4A shows the distribution of all health personnel in Bondo division for government aided health units.

The Dispensaries in each location have fewer personnel in comparison to Bondo health centre. Serious cases are always referred to Siaya district Hospital which is about 15 km away. In case of any rainy day, cases from Bondo health centre can only be referred to Kisumu which is about 40 km away due to poor condition of the road connecting Bondo and Siaya.

Most of the dispensaries at times lack medicine due to delay in orders from Siaya District Hospital. During such a time, patients have either to travel to Bondo health centre or visit

private clinics around their places of residence. Some of the private clinics are very expensive, charging Ksh. 30 or above for simple ailments, and many atimes patients have been left stranded with no alternative.

Locations like South Sakwa, Central Sakwa and West Yimba are highly disadvantaged because they are very far from Siaya and their orders of medicine sometimes reach very late or may be temporarily closed especially during rainy seasons when no vehicles could pass to reach them. The other locations have their dispensaries near the main tarmaced road from Kisumu to Usenge, so quick alternative to Siaya district Hospital could be found through Kisian.

It has been found (Table 3B) that about 86.5% of the population of Bondo drink untreated water either ponds, dams, streams and river water. This poses a health problem given that the region has acute sanitation problem of lack of proper and adequate toilet latrines.

Table 3B
Distribution of water sources in Bondo division type of water source and location.

Water Source	Administrative locations						Total	%
	NS	SS	CS	EY	CY	WY		
Pond	20	32	24	12	6	10	104	36.9
Dam	9	4	2	5	3	2	25	8.9
1								
Tap water	10	3	10	1	4	10	38	13.5
River water	7	0	0	22	4	0	33	11.7
Lake water	0	5	6	8	22	16	57	20.1
Stream	4	6	3	2	1	9	25	8.9

1

Tap water including rain water tanks, bore holes fixed with pumps, and government and private water projects.

Most ponds are found in the three locations of Sakwa while the other three locations of Yimbo consume more of lake and river water. Table 3C below shows that the least distance travelled by the people of Bondo to a source of water is about 1.4 km with North Sakwa slightly advantaged.

Table 3C

Estimation of the water source' by distance in kilometres and location in Bondo.

Distance (km)	Administrative locations						Total	%
	NS	SS	CS	EY	CY	WY		
2								
0	22	16	15	18	13	8	92	32.6
1	10	13	10	15	9	17	74	26.3
2	4	8	10	8	7	21	58	20.6
3	6	6	5	3	6	1	27	9.6
4	8	7	5	6	5	0	31	10.9
Total	50	50	45	50	40	47	282	100.0

2
- refers to water sources reported as 'near' or 'at home'.

Although majority of people reported that they have a water source near or at home, a substantial amount of time is expected to be taken by women to get drinking water from the water source. It should also be noted that 41.1% of the people of Bondo walk more than 2 km to reach the water source.

Table 3D gives an estimated distance travelled to the nearest health unit regardless of it being private owned or government maintained clinic.

Table 3D
 Estimation of health units by distance in kilometres and by location in Bondo.

Distance (km)	Administrative locations						Total	%
	NS	SS	CS	EY	CY	WY		
0	26	12	4	9	5	2	58	20.6
1	0	8	3	3	3	2	19	6.7
2	3	6	12	8	6	4	39	13.8
3	2	4	6	7	10	0	29	10.3
4	6	4	1	5	4	3	23	8.2
5	2	0	4	0	7	19	32	11.3
6	5	4	2	5	3	0	19	6.7
7	5	3	8	6	0	11	33	11.7
8	1	5	4	4	2	6	22	7.8
9	0	0	0	3	0	0	3	1.1
10	0	4	0	0	0	0	4	1.4
20	0	0	1	0	0	0	1	0.4
Total	50	50	45	50	40	47	282	100.0

According to the table, the average distance travelled to a health unit is 3.8 km in Bondo. When both distance travelled to the water source and that to a health clinic are combined, on average, people in Bondo spend a distance of 2.6 km in drawing water and reaching a health clinic.

3.3.2 Differentials by disease patterns

Bondo division, being part of Siaya district, has been said to help in the contribution of malaria in the district (Koyugi-1980). He noted that in the district, malaria is the leading cause of mortality followed by acute respiratory diseases. Skin diseases were mentioned to be ranking third.

Table 3E below shows disease pattern and its distribution in the six locations of Bondo.

Table 3D
Disease pattern and its distribution by causes and location.

Diseases causes	Administrative locations						Total	%
	NS	SS	CS	EY	CY	WY		
1. Malaria	23	16	9	8	5	5	66	23.4
2. Broncho pneumonia and other related respiratory diseases	6	8	9	9	20	13	65	23.0
3. Diarrhoeal and other stomach problems	6	4	7	7	2	10	36	12.8
4. Skin diseases	7	13	8	8	1	5	42	14.9
5. Measles	6	6	10	14	10	9	55	19.5
6. Other causes	2	3	2	4	2	5	18	6.4
Total	50	50	45	50	40	47	282	100.0

The table indicates that malaria is the leading cause of infant and child mortality representing 23.4% of all cases followed by Broncho-Pneumonia (23.0%) and third is measles (19.5%). The leading locations with malaria cases are North Sakwa (34.9%), South Sakwa (24.2%), Central Sakwa (13.6%), East Yimbo (12.1%) and last are West and Central Yimbo sharing equally the rest. Table 3F below shows the distribution of deaths in Bondo between 1985 and 1989 by age in single years and by sex.

Table 3F

Single year age groups	Sex		Total	Percent
	M	F		
0	50	52	102	27.6
1	80	60	140	37.8
2	44	20	64	17.3
3	10	14	24	6.5
4	4	2	6	1.6
5	0	2	2	0.5
6-10	14	10	24	6.5
Sub-total	202	160	362	97.8
Others	2	6	8	2.2
Grand total	204	166	370	100.0

Source: Death Registers in the period of 1985 to 1989 (August) at Bondo and Lwak Health centres, Ministry of Health.

It is shown that the largest number of deaths in the period 1985/1989 in Bondo consisted of children aged one year representing 37.8% followed by infants (less than one year) representing 27.6%.

The death rate decreases as the child's age increase from 2 years.

In another table 3G below, which shows the distribution of deaths in Bondo between 1985 and 1989 by age in single years and sex and by major death causes.

Table 3G

The distribution of deaths by single year age groups and sex and by major death causes in Bondo between 1985 and 1985.

Age in single years and sex		Death causes					Total
		Q	BP	DP	M	K	
0	M	11	26	6	7	0	50
	F	9	23	14	6	0	52
1	M	15	33	7	16	9	80
	F	10	21	6	16	7	60
2	M	8	10	5	16	7	44
	F	3	2	1	2	12	20
3	M	3	4	1	0	2	10
	F	4	5	1	2	2	14
4	M	1	2	0	1	0	4
	F	1	0	1	0	0	2
5	M	0	0	0	0	0	0
	F	1	1	0	0	0	2
6-10	M	6	2	3	3	0	14
	F	3	3	1	3	0	10
Sub-total (M)		44	77	20	43	18	202
(F)		31	55	24	29	21	160
Others (M)		0	1	1	0	0	2
(F)		1	3	0	1	1	6
Grand total		76	136	45	73	40	370
Percent		20.5	36.8	12.2	19.7	10.8	100.0

Q	-	malaria
BP	-	Broncho-Pneumonia and other related respiratory diseases
DP	-	Diarrhoeal and other stomach problems
M	-	Measles
K	-	Kwashiokor

Source: Death registers in the period of 1985 to 1989 (August) at Bondo and Lwak Health centres, Ministry of Health.

The table shows that more male children than female children die of malaria and Broncho-pneumonia than the other diseases.

The leading cause of deaths of infants and children are Broncho-pneumonia and related diseases (36.8%) followed by malaria (20.5%) and third, measles (19.7%). This confirms the disease

pattern of table 3E.

Table 3H

Distribution of deaths by cause and sex and by year of occurrence

Death cause	Sex	Period of Years of occurrence					Total
		1985	1986	1987	1988	1989	
Q	M	14	10	10	6	3	44
	F	4	9	10	7	2	32
BP	M	36	12	16	8	6	78
	F	12	20	16	6	4	58
DP	M	5	8	4	3	1	21
	F	11	4	5	3	1	24
M	M	15	9	8	8	3	43
	F	6	11	10	3	0	30
K	M	1	2	5	8	6	18
	F	0	2	8	6	6	22
Total	M	71	41	43	33	19	204
	F	33	46	49	25	13	166
Percent	Both	28.1	23.5	24.8	15.7	8.6	100.7

Source: Death registers at Bondo and Lwak Health centres, Ministry of Health.

There has been a decrease in deaths since 1985. Both malaria and Broncho-pneumonia are the leading death causes of infants and children in each year.

More male children die each year than female children.

Table 3H

1

Distribution of measles deaths by location and sex and by year of occurrence.

Locations	Period of Years of occurrence					Total
	1985	1986	1987	1988	1989	
NS (M)	2	3	2	1	0	8
· (F)	1	1	2	0	0	4
SS (M)	2	1	0	0	0	3
(F)	2	2	1	0	0	5
CS (M)	4	0	1	1	0	6
(F)	2	3	1	0	0	6
CY (M)	1	0	0	0	0	1
(F)	1	0	0	0	0	1
EY (M)	1	3	0	0	0	4
(F)	1	1	0	0	0	2
WY (M)	0	1	0	0	0	1
(F)	2	0	0	0	0	2
Sub-total (M)	10	8	3	2	0	23
(f)	9	7	4	0	0	20
All other cases (M)	5	4	5	3	1	18
(f)	4	1	3	3	1	12
Grand total	28	20	15	8	2	73
Percentage	38.4	27.4	20.5	10.9	2.8	100.0

There is subsequent decrease over the years since 1985 on deaths caused by measles in Bondo.

Table 3H

2

Distribution of Kwashiokor deaths by location and sex and by year of occurrence.

Locations	Period of Years of occurrence					Total
	1985	1986	1987	1988	1989	
NS (M)	0	0	0	1	0	1
(F)	1	0	0	2	1	4
SS (M)	0	0	1	0	0	1
(F)	1	2	2	0	0	5
CS (M)	1	0	0	0	0	1
(F)	0	0	0	0	0	0
CY (M)	0	0	0	0	0	0
(F)	0	1	0	0	0	1
EY (M)	1	0	0	0	0	1
(F)	0	0	0	0	0	0
WY (M)	0	0	0	0	0	0
(F)	1	0	1	0	0	2
Sub-total (M)	2	0	1	1	0	4
(f)	4	3	3	2	1	12
All other cases (M)	2	1	3	4	4	14
(f)	0	0	3	4	3	10
Grand total	7	4	10	11	8	40
Percentage	17.5	10.0	25.0	27.5	20.0	100.0

There is a general slight increase in kwashiokor cases over the years since 1985.

South Sakwa location leads in number of kwashiokor cases followed by North Sakwa.

Table 3H

3

Distribution of diarrhoeal and stomach related deaths by location and sex and by year of occurrence.

Locations		Period of Years of occurrence					Total
		1985	1986	1987	1988	1989	
NS	M	0	1	1	0	1	3
	F	3	1	2	1	0	7
SS	M	2	2	2	2	0	8
	F	1	1	0	0	0	2
CS	M	1	0	0	0	0	1
	F	0	1	0	0	0	1
CY	M	1	0	0	0	0	1
	F	0	0	1	0	0	1
EY	M	1	0	1	1	0	3
	F	1	0	1	0	0	2
WY	M	1	0	0	0	0	1
	F	0	0	0	0	0	0
Sub-total (M)		6	3	4	3	1	17
(F)		5	3	3	1	0	12
All other cases							
(M)		2	1	3	1	1	8
(F)		0	1	2	4	1	8
Grand total		13	8	12	9	3	45
Percentage		28.9	17.8	26.6	20.0	6.7	100.0

Diarrhoeal and stomach related problems are on the decrease. North Sakwa and South Sakwa locations still lead in the number of cases followed by East Yimbo location.

Table 3H

4

Distribution of malaria death by location and sex and by year of occurrence.

Locations		Period of Years of occurrence					Total
		1985	1986	1987	1988	1989	
NS	M	4	2	1	1	0	8
	F	2	2	1	1	0	6
SS	M	1	0	1	0	0	2
	F	2	2	0	0	0	4
CS	M	4	0	0	0	0	4
	F	1	1	2	0	0	4
CY	M	1	0	0	0	0	1
	F	0	0	0	0	0	1
EY	M	2	2	0	0	0	4
	F	1	0	0	1	0	2
WY	M	2	1	1	0	0	4
	F	1	0	1	0	0	2
Sub-total (M)		14	5	3	1	0	23
(F)		7	5	5	2	0	19
All other cases							
(M)		3	5	7	3	2	20
(F)		2	3	3	5	1	14
Grand total		26	18	18	11	3	76
Percentage		34.2	23.7	23.7	14.5	3.9	100.0

Malaria deaths are on the decrease with 1985 having got the highest number of deaths representing 34.2% of the deaths in the period. North Sakwa leads in the number of deaths from malaria followed by Central Sakwa.

Table 3H

5

Distribution of Broncho-pneumonia and other respiratory disease deaths by location and sex and by year of occurrence

Locations		Period of Years of occurrence					Total
		1985	1986	1987	1988	1989	
NS	M	5	3	3	3	2	16
	F	2	3	2	1	0	8
SS	M	2	1	2	0	0	5
	F	2	3	2	2	0	9
CS	M	6	3	1	2	2	14
	F	2	4	2	1	1	10
CY	M	3	1	0	0	0	4
	F	2	2	1	0	0	5
EY	M	5	2	1	1	1	10
	F	2	2	1	2	1	8
WY	M	2	1	2	0	0	5
	F	1	0	1	0	0	2
Sub-total (M)		23	11	9	6	5	54
(F)		11	14	9	6	2	42
All other cases							
(M)		5	4	4	4	3	20
(F)		8	3	5	3	1	20
Grand total		47	32	27	19	11	136
Percentage		34.6	23.5	19.9	13.9	8.1	100.0

Deaths from Broncho-pneumonia are on the decrease over the years, but more deaths were contributed to by North Sakwa and Central Sakwa locations followed by East Yimbo.

Table 3I
 Distribution of acute respiratory disease
 by month and year of occurrence at Usigu
 Dispensary for children aged 0-5 years.

Month	Year of occurrence	
	1987	1989
January	174	123
February	162	146
March	182	113
April	178	132
May	211	148
June	261	182
July	248	163
August	192	141
September	158	-
October	112	-
November	143	-
December	152	-

Source: Out-patient registers at Usigu Dispensary.

- Either the figures were omitted from the registers or the investigation was done before the period.

The figures suggest that there is a reduction in the acute respiratory disease in 1989 as compared to 1987.

Table 3J
Distribution of diseases in 1988 by month and their causes.

Month	disease causes							Total	%
	A	B	C	D	E	F	G		
January	1078	212	327	162	128	49	68	2024	6.5
February	1115	198	298	212	321	79	23	2246	7.3
March	1310	321	589	173	298	102	219	3012	9.7
April	1256	422	732	216	452	130	202	3410	11.0
May	1426	442	884	218	460	112	241	3783	12.2
June	1178	426	703	163	382	113	224	3167	10.3
July	1214	238	799	132	370	109	213	3075	9.9
August	1064	100	817	100	132	83	168	2464	7.9
September	1008	108	608	120	168	122	273	2407	7.8
October	1073	61	203	66	232	39	68	1742	5.6
November	1288	80	206	65	124	7	118	1888	6.1
December	1048	29	244	84	98	28	19	1550	5.0
Total	14058	2637	6410	1711	3165	973	1836	30790	99.3
Percent	45.5	8.5	20.7	5.5	10.2	3.0	5.9	99.3	

Source: Out-patient records at Bondo Health centre Ministry of Health.

The table shows diseases are rampant in the months of March to July. The highest contributor to many disease causes is malaria followed by Acute respiratory ailments. Skin diseases become third in the ranking. These values are computed without consideration of malnutrition cases which represent 0.7% when all cases are included.

Table 3K
Distribution of malnutrition cases by month and year of occurrence.

Month	Year of occurrence				Total	%
	1985	1986	1987	1988		
January	8	25	22	2	57	6.3
February	31	28	16	6	81	8.9
March	28	16	19	11	74	8.2
April	19	75	17	15	126	13.9
May	25	19	19	23	86	9.5
June	28	21	21	17	87	9.6
July	41	20	18	6	85	9.4
August	32	14	0	5	51	5.6
September	20	23	14	2	59	6.5
October	37	12	14	4	67	7.4
November	25	14	15	9	63	6.9
December	28	15	16	12	71	7.8
Total	322	282	191	112	907	100.0
Percent	35.5	31.1	21.1	12.3	100.0	

Source: All Health Units (government) - Out-patient registers
Bondo Division - Ministry of Health.

It is shown that malnutrition cases are on the decrease since 1985. There are slight differentials each month with higher cases in the months of April, July and December.

3.3.3 Differentials by geographical location

The climate of Bondo has contributed to conducive environment for many Viral and Bacterial growth. These organisms have been noted to be major contributors of ill-health (Koyugi-1980).

Table 3L
Distribution of diseases by cause and sex and by location

Disease cause	Sex	Administrative location							Total	%
		NS	SS	CS	EY	CY	WY	Others		
Q	M	8	2	4	4	1	4	20	43	11.6
	F	6	4	4	2	1	2	14	33	8.9
BP	M	16	5	14	10	4	5	20	74	20.0
	F	8	9	10	8	5	2	20	62	16.8
DP	M	3	8	1	2	1	1	8	24	6.5
	F	7	2	1	2	1	0	8	21	5.7
M	M	8	2	6	2	1	1	20	40	10.8
	F	4	6	6	4	1	2	10	33	8.9
K	M	1	1	1	0	1	0	14	18	4.9
	F	4	5	0	1	0	2	10	22	5.9
Total	M	36	18	26	18	8	11	82		19.9
	F	29	26	21	17	8	8	62		17.1
Percent	M	15.9	7.9	11.5	7.9	3.5	4.9		51.6	37.0
	F	12.8	11.5	9.3	7.5	3.5	3.5		48.1	99.7
Overall %		17.6	11.9	12.7	9.5	4.3	5.1	38.9		100.0
Total		65	44	47	35	16	19	226		
Overall %		28.8	19.5	20.8	15.5	7.0	8.4			100.0

Source: Death registers at Bondo and Lwak Health centres for 1985 to 1989, Ministry of Health.

- (a) - death cases for neighbouring locations registered at Bondo Health centre.
- (b) - all deaths excluding those with no location mentioned.
- (c) - all deaths considered.
- (d) - all other cases excluded.

More deaths are registered for North-Sakwa, South Sakwa and Central Sakwa locations than the other locations with North Sakwa, which is considered situated on a slightly higher altitude leading on the number of cases.

Table 3M
Distribution of Rainfall by month and year
in millimetres

Month	Year		
	1986/87 (average)	1988	1989
January	98.1	82.3	-
February	88.2	67.5	99.6
March	143.6	122.1	59.4
April	184.2	140.3	114.4
May	140.5	121.6	81.3
June	123.1	43.7	155.9
July	96.2	63.4	25.4
August	87.3	61.2	73.5
September	65.4	35.5	-
October	112.3	60.2	-
November	123.1	80.3	-
December	46.2	52.1	-
Average Annual rainfall	109.0	77.5	(87.1)

Source: Office of Agriculture, Bondo Division, Ministry of Agriculture.

() - Not actually representative of the year.

There are more rainfall in the months of March to June and September to November. The former represents the long rainy season while the latter represents the short rainy season in Bondo.

No comparison could be done for the various locations because lack of records to show.

3.3.4 OVERVIEW FOR BONDO DIVISION

It has been indicated in tables 3A that each location has only one government Dispensary. This is expected to serve an area estimated of 162.5 sq.km with an approximate population of 24,000 persons on average.

This indicates acute shortage of health centres. There is also an indication of lack of medicine at times due to lack of adequate all weather roads in the division.

This shows that there is general lack of adequate medical and health facilities because the area covered by each health unit and the population to serve is too large.

There is also general lack of health care because drinking water in the region is likely to be highly contaminated with death causing organisms.

Quite a number of diseases cause deaths to infants and children in Bondo. Unlike earlier findings, Broncho-pneumonia and related respiratory diseases are the leading killers of infants and children rather than malaria, although single deaths are caused by a multiple of combined causes.

Such diseases like measles had been eradicated in certain regions of the country by simple vaccination and immunization. For it to be one of the leading killers in a region, there must be acute lack of adequate supply of relevant medicine.

There is a general reduction of cases of death each year indicating some improvement in medication and health care.

Malaria cases are found to be high during the long and short rainy seasons.

This indicate that rain is a positive contributor to malarial cases partly because it provides water which is used as a breeding ground given that the region has many ponds and dams, and that during this period thick bushes grow which again serve as better homes for mosquitos which carry malarial parasites.

The acute respiratory disease may be air-borne given that the place at times is dry and dusty. This is also likely to be contributory to measles cases.

Kwashiokor is a deficiency disease caused by lack of food. This disease is rampant in the neighbouring locations as well as the bordering North Sakwa location. These regions lack fruits and protein contained foods given that they are far from the lake where the source of protein is fish. Diarrhoeal and stomach related problems are reported many in the locations of North and South Sakwa. These are the locations which lead in the number of Pond and Dam water. It is therefore likely that these diseases are water-borne and the water sources are highly contaminated given that they also act as water sources for animals.

Although malnutrition is reported as decreasing while kwashiokor, singled out on its own, is on the increase, it suggests that some of the respondents misreported or retained from accepting that malnutrition is yet a home problem. It is therefore likely that malnutrition is increasing when all cases unreported are considered. The high temperatures of the region

are likely to be effective in Viral and Bacterial activity and therefore help them multiply in numbers especially in the Northern region of Bondo. This region is slightly humid and normally get better rains.

Its temperatures are lower than the South. This is likely to be the cause of many deaths in North Sakwa and South Sakwa locations. Better rainfall in that region also contribute to many deaths from malaria.

SECTION 4SUMMARY AND POLICY IMPLICATION4.1 INTRODUCTION

This study achieved the objectives that it set out to accomplish, that is, to show that major causes of mortality to infants and children depend on geographical location, various diseases found in the region and lack of adequate medical and health facilities in Bondo.

The differentials have mainly been explained by various tables in section 3 and 4.

As explained this study cannot pride of being exhaustive as I have pointed out several shortcomings that besets it. Firstly there is the case of information omitted on relevant data. Secondly, is the issue of the differentials covered (only three) as opposed to a whole range of those available. This is however mainly because of the already mentioned limitations of time and funds.

Despite these shortfalls the importance of the study both as a ground work to further research and application in other regions of Kenya and as a tool for health policy formulation and implementation in Bondo division and even in the whole of the district should not be underscored.

4.2 MAJOR FINDINGS

The study had several major findings to its credit but which do not differ greatly from what has been found to exist at the district, provincial and national levels.

- (1) That infant and child mortality are caused by geographical location and regions in the division.
- North Sakwa and South Sakwa locations are the most disadvantaged given the conducive weather for Viral and Bacterial growth.
- (2) That medical and health care services are necessary to effect infant and child mortality in Bondo. There is negative relationship with the number of health units and medical availability.
- (3) That diseases cause infant and child mortality in Bondo, especially Malaria, Broncho-pneumonia and measles. Malnutrition cases are on increase though its pattern is not definite.

Table 4A
Distribution of personnel by type of profession and by health units in Bondo.

Type of profession	Number of staff in each health unit						Total
	Uyawi	Usigu	Gobei	Got Agulu	Got Matar	Bondo	
1. Doctor	0	0	0	0	0	0	0
2. Clinical Officer	2	1	1	1	1	2	8
3. Nurse	0	2	0	0	0	2	4
4. Mid-wife	0	0	0	0	0	3	3
5. Statistician	1	1	1	1	1	2	7
6. Fieldworker	0	0	0	0	0	2	2
7. Public health technician	0	1	0	0	0	1	2
8. Laboratory technician	0	1	0	0	0	2	3
9. Subordinate	2	3	1	1	1	6	14
10. Others	-	-	-	-	-	-	-
Total	5	9	3	3	3	20	43

There is uneven distribution of health personnel in each health unit showing that some health units are well staffed than others. Usigu in Central Yimbo and Bondo in North Sakwa are well served with staff than any others, although the number of staff in each health unit needs to be increased to match with the work load, especially for the field educators. The shortage of midwives in other health units indicate that only in Bondo is available ante natal and Post-natal services. This adds to the seriousness of lack of such facilities.

Highly noted is lack of doctors in each of the six dispensaries. Although clinical officers are in each of the health units, there is need to have a doctor in each of these health units to help ease the burdening load of referral cases at the District Hospital - Siaya.

4.3 RECOMMENDATIONS FOR POLICY MAKING

We are all aware that Kenya's development strategy is now focussed at the district level with divisions forming the nucleus. This is why this study chose to use a division at its most focus - on which socio-economic planning should be based.

It is true that government actions on any one of the determinants of infant and child mortality is in itself not enough to guarantee a reduction of the mortality level. What is needed is the correct form of combination of most of these determinants so as to reach a threshold from where infant and child mortality can decline substantially.

The government should therefore consider specific interventions

in medical and health care and services to control diseases, improve sanitation, nutrition and agriculture to mention a few. There is need therefore for the following to be checked:

- a) Improvement of medical and health care and services in Bondo division through combined forces of educating mothers on simple hygiene to boil drinking water, to visit health clinics for simple ailments of children and improve their sanitary conditions.
- b) Provision of tap water through government aided water projects in Bondo and any other regions in Kenya which have similar situations.
- c) Education of people on types of crops to grow which could help them have a balanced diet and improve their lot economically.
- d) Increasing immunization and vaccination programmes in those areas which really need it like Bondo.
- e) Building more health units which are government assisted and increasing personnel services in those ones already available.
- f) Improvement on roads and transport so that those few vehicles for medical personnel can easily visit the interiors for provision of services.

4.4 RECOMMENDATIONS FOR FURTHER RESEARCH

The following are recommendations to help in the direction of further research.

- a) It is necessary for the institute of Population Studies to

support collection of primary data to add to the treasury of information required in the library.

This would also help the government to compile the various problems for different parts of the country so that proper recommendations and planning are done for such areas.

- b) Especially for similar research in the same area, it would be necessary to compile the information for other variables which could not be covered so that proper policies are proposed and recommended to help in other similar regions in the country.

Because such studies which reach divisional level are still lacking, it is necessary to probe deeper into locational levels so that proper image about each division is met.

4

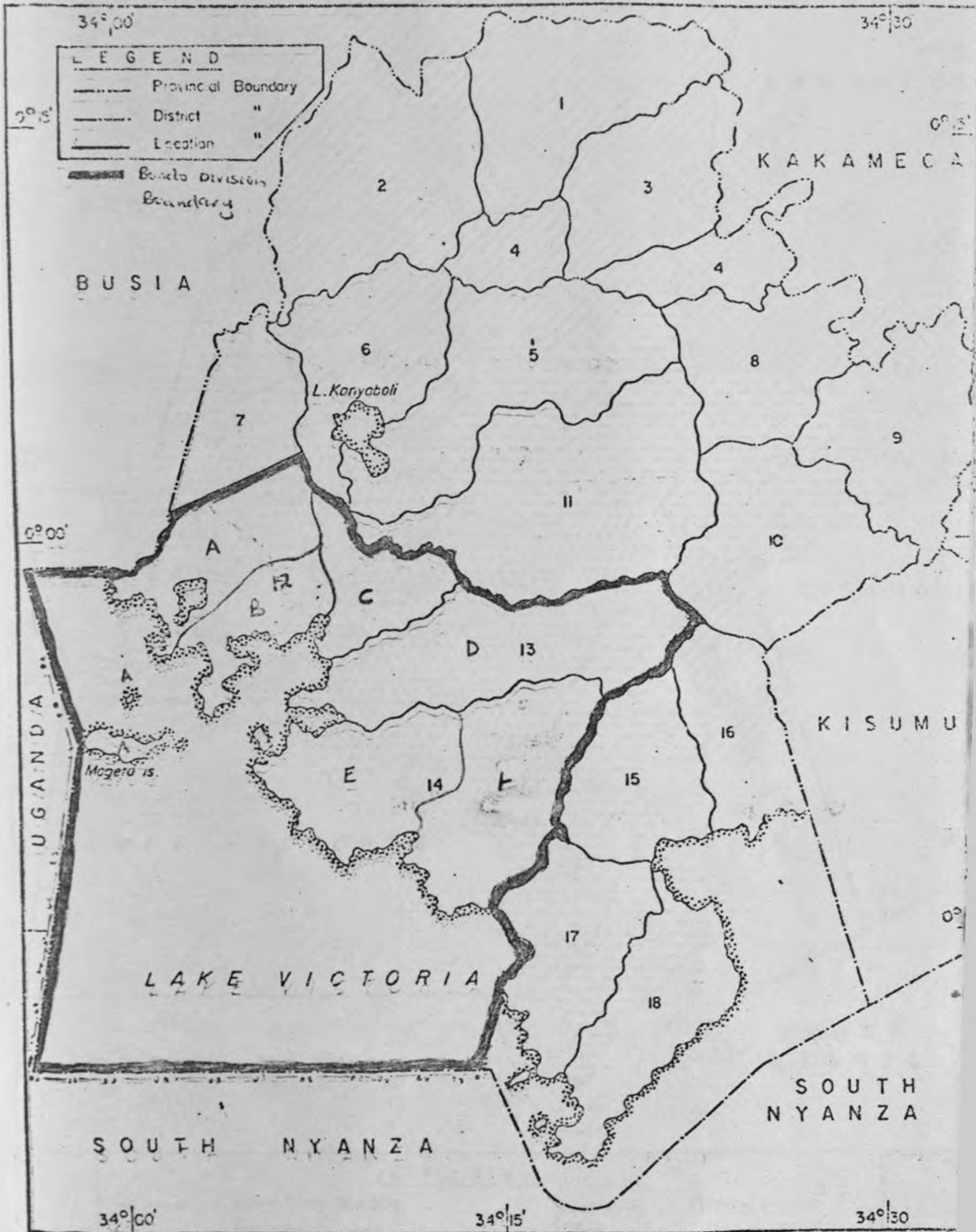
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FIGURE 1

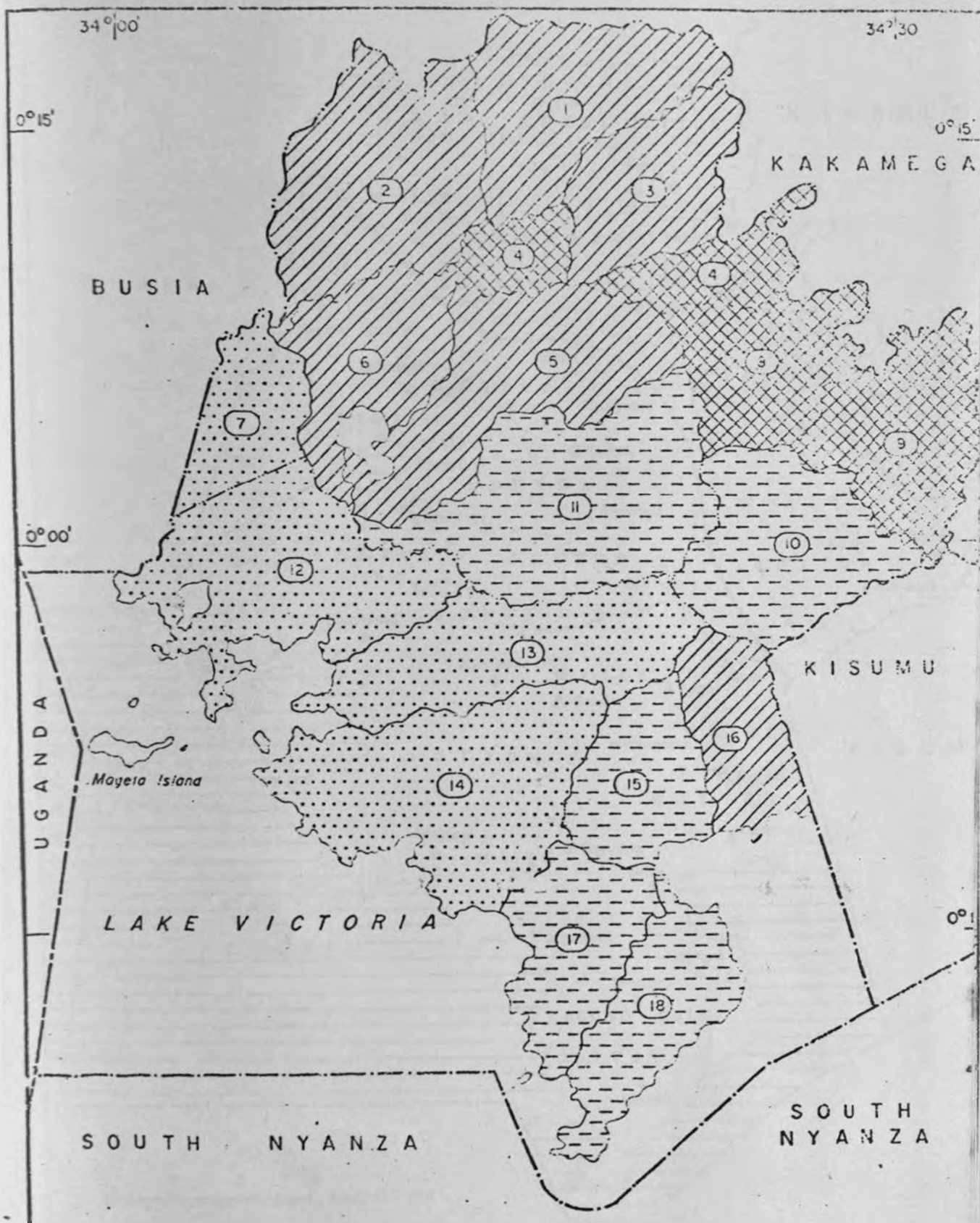
SIAYA DISTRICT.



LOCATIONS .

- | | | | |
|--------------------|--------------------|----------------|--------------------|
| 1 EAST UGENYA | 2 NORTH UGENYA | 3 UHOLO | 4 SOUTH UGENYA |
| 5 CENTRAL ALEGO | 6 WEST ALEGO | 7 USONGA | 8 NORTH GEM |
| 9 EAST GEM | 10 SOUTH GEM | 11 EAST ALEGO | 12 YIMBO (A, B, C) |
| 13 NORTH SAKWA (D) | 14 SOUTH SAKWA (F) | 15 WEST ASEMBO | 16 EAST ASEMBO |

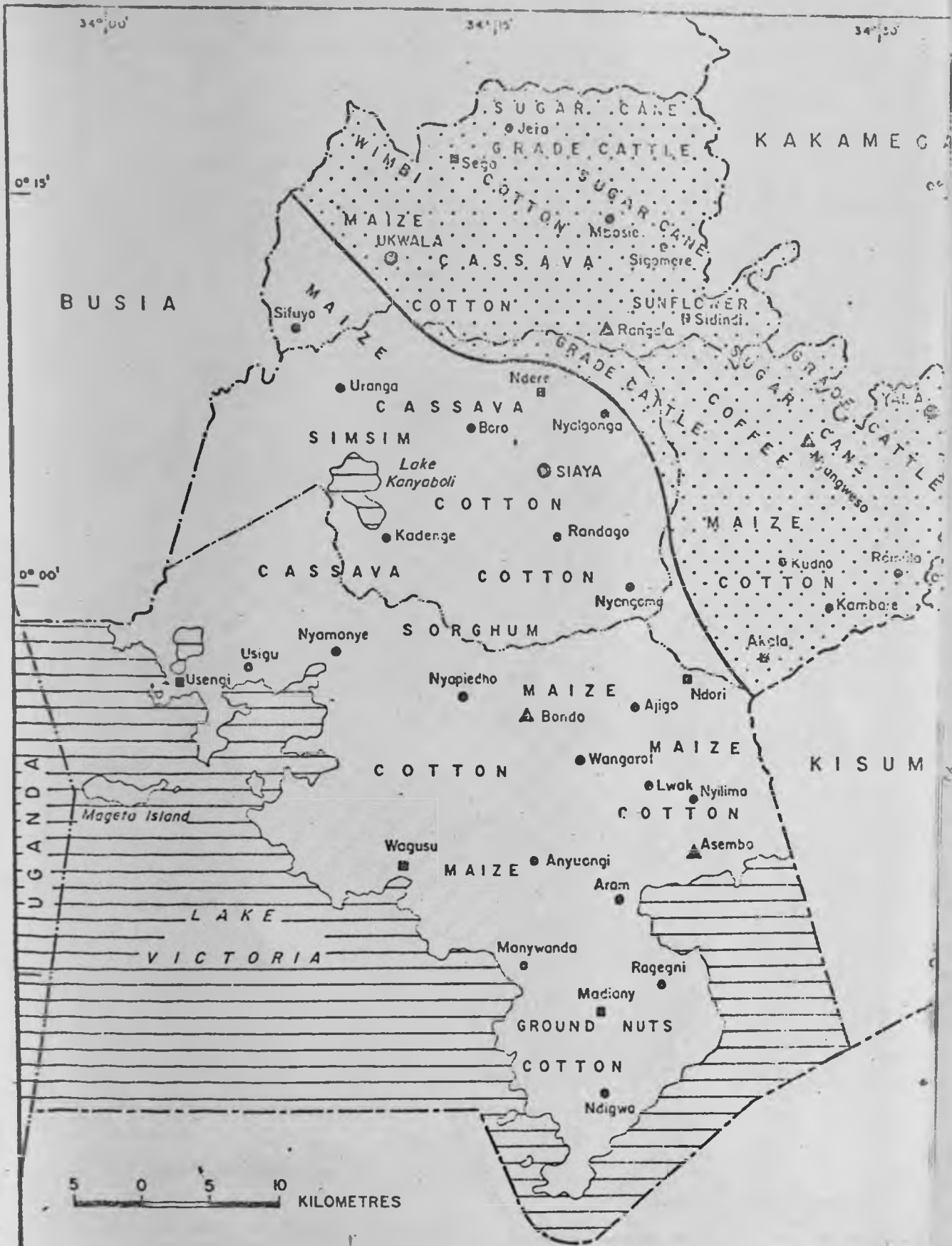
Fig 2 SIAYA DISTRICT: POPULATION DENSITY



LEGEND

	International Boundary		Persons per Km ² 100 — 150
	Provincial Boundary		151 — 200
	District Boundary		201 — 250
	Divisional Boundary		Over 250
	Location Boundary		

Fig. 3 AGRO-ECONOMIC ZONES



LEGEND












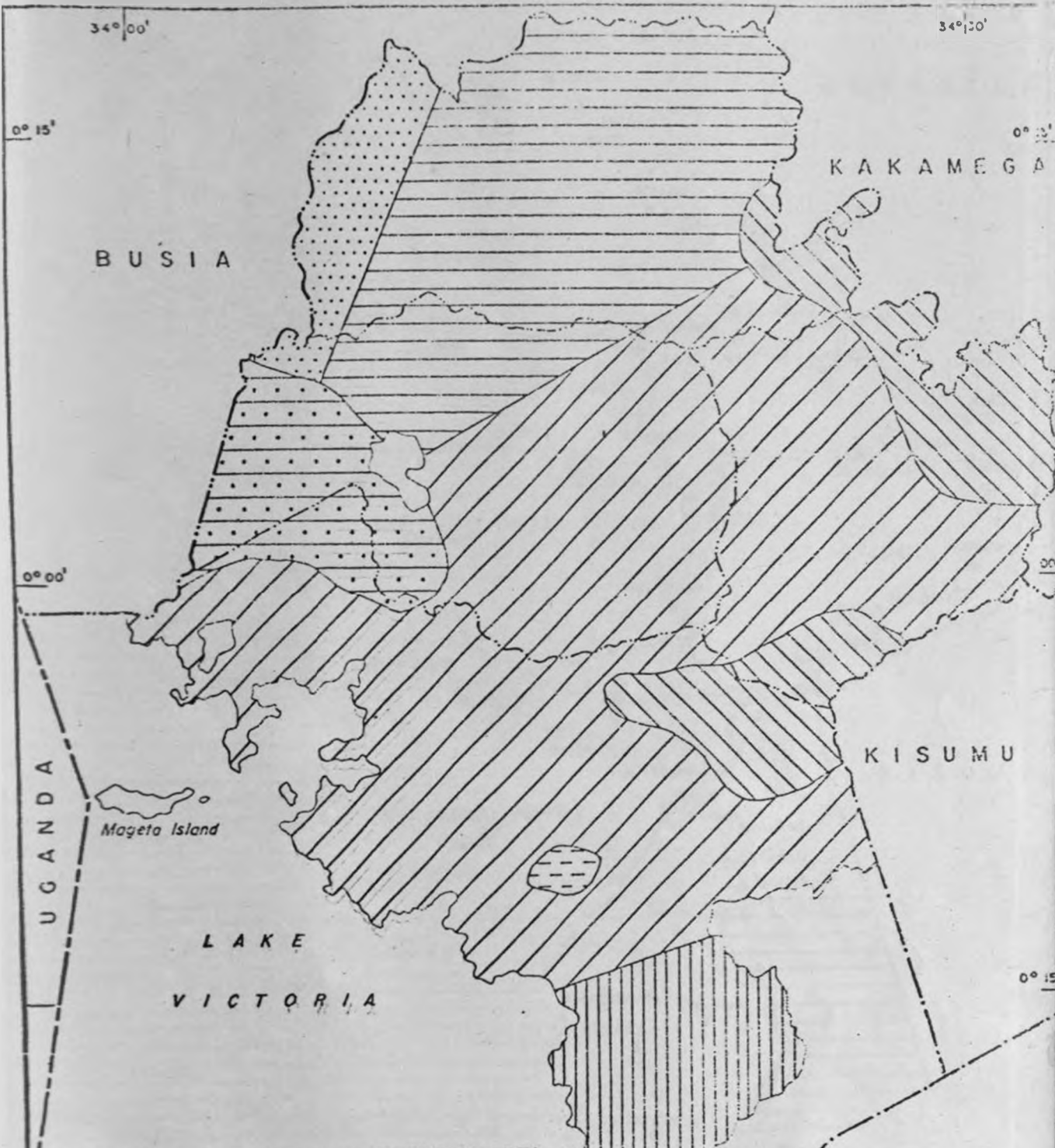
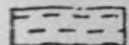


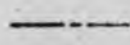

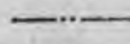



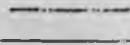

- | | | | |
|---|--------------------------|---|---|
|  | National Boundaries |  | Lower Agro-Economic Zone (Lower, Hotter, Drier) |
|  | Provincial Boundaries |  | Urban Centres |
|  | District Boundaries |  | Rural Centres |
|  | Division Boundaries |  | Market Centres |
|  | Zonal Boundary |  | Local Centres |
|  | Upper Agro-Economic Zone | | |

FIG. 4

SIAYA DISTRICT : SOILS.



LEGEND

- | | | | |
|---|--|---|--|
|  | Dark brown sandy loams |  | Red to strong-brown friable clays with laterite horizons, and black clays (Grumosolic soil). |
|  | Red friable clays (Latosolic soils); and Red to strong-brown friable clays with laterite horizons. |  | International Boundary |
|  | Peaty swamps; and alluvium and recent lacustrine deposits |  | Provincial Boundary |
|  | Red to strong-brown friable clay with laterite horizons |  | District Boundary |
|  | Dark brown sandy loams; and light yellow-brown sandy loams with laterite horizons |  | Divisional Boundary |
|  | Red friable clays (Latosolic soils) | | |

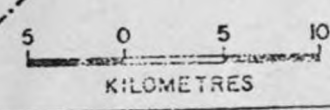
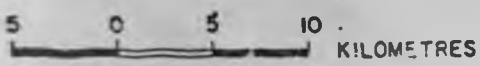
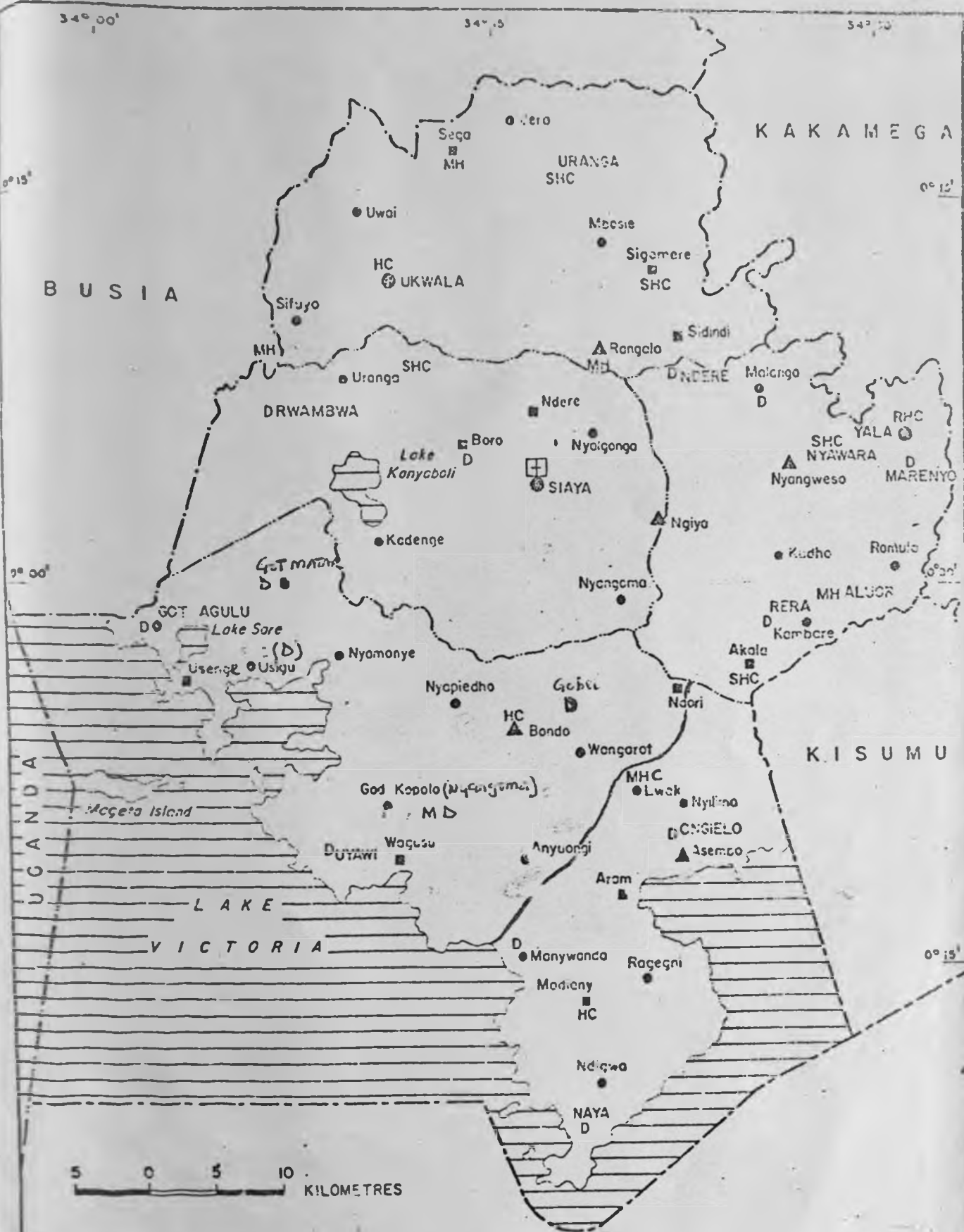


FIG 5 HEALTH UNITS



LEGEND			
	National Boundaries		Local Centres
	Provincial Boundaries		Siaya District General Hospital
	District Boundaries		MHC Mission Hospital Health Centre
	Division Boundaries		RHC Rural Health Centre
	Urban Centres		HC Health Centre
	Rural Centres		SHC Sub Health Centre
	Market Centres		D Dispensary