

INFANT AND CHILD MORTALITY DIFFERENTIALS IN THE
SOUTHERN REGION OF MALAWI

by

Daisy D. Momba

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D E C L A R A T I O N

Except where otherwise indicated, this
thesis is my own work.

Daisy Doreen Momba

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A B S T R A C T

This study is based on the 1984 Malawi Family Formation Survey, a nationwide sample survey conducted by the National Statistical Office in collaboration with the Ministry of Health. The study has attempted to examine variations in infant and child mortality by demographic and socio-economic variables using unweighted data for the Southern Region only. Children were the unit of analysis and probabilities of dying in infancy or childhood were calculated by the various variables.

The results indicate that both infant and child mortality is highest among children of teenagers. Differences by sex were not statistically significant. Moreover, infant and child mortality is higher among first order and high order births than among births of second or third order. Furthermore, mortality declines as the length of the birth interval increases. Also, twins had higher infant and child mortality than singletons. Infant and child mortality declined as the mother's education increased. Similar results were found when the education of the mother's current or last husband (if widowed, divorced/separated) was used. Rural areas have higher infant and child mortality than urban areas. Households using facilities like piped water, flush toilet and owning a radio in working condition have lower infant and child mortality than those that use other sources of drinking water, have a pit latrine or none and have no radio. Health care factors like mother's medical check during pregnancy, place of birth, birth attendant and immunisation also influence infant and child mortality.

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CHAPTER 1

INTRODUCTION

This thesis deals with differentials in infant and child mortality in the Southern Region of Malawi using data from the 1984 Malawi Family Formation Survey. The purpose of this chapter is to explain the objectives and organisation of the study and to describe the study area.

1.1 THE OBJECTIVE AND ORGANISATION OF THE STUDY

The major objective of this study is to investigate variations in infant and child mortality in relation to some demographic and socio-economic factors. The demographic factors that have been studied include: the age of the mother at the time of birth of the child, the sex and birth order of the child, the birth interval and the type of birth (whether the child was born singly or was from a multiple birth). The socio-economic factors include the mother's education, current residence and her current or last husband's education (if widowed, divorced/separated), some health care factors and some household facilities.

The health care factors as referred to in this study are: whether the mother had a medical check during pregnancy or not, whether the child was born in a hospital/clinic or not and whether or not the child was vaccinated. The household facilities include the source of drinking water, type of toilet facility and whether or not the household had a radio in working condition. This study has been organised as follows:

Chapter 2: Sources and Evaluation of Data and Methodology

Chapter 3: Demographic Differentials in Infant and Child Mortality

Chapter 4: Socio-Economic Differentials in Infant and Child Mortality

Chapter 5: Summary and Conclusion

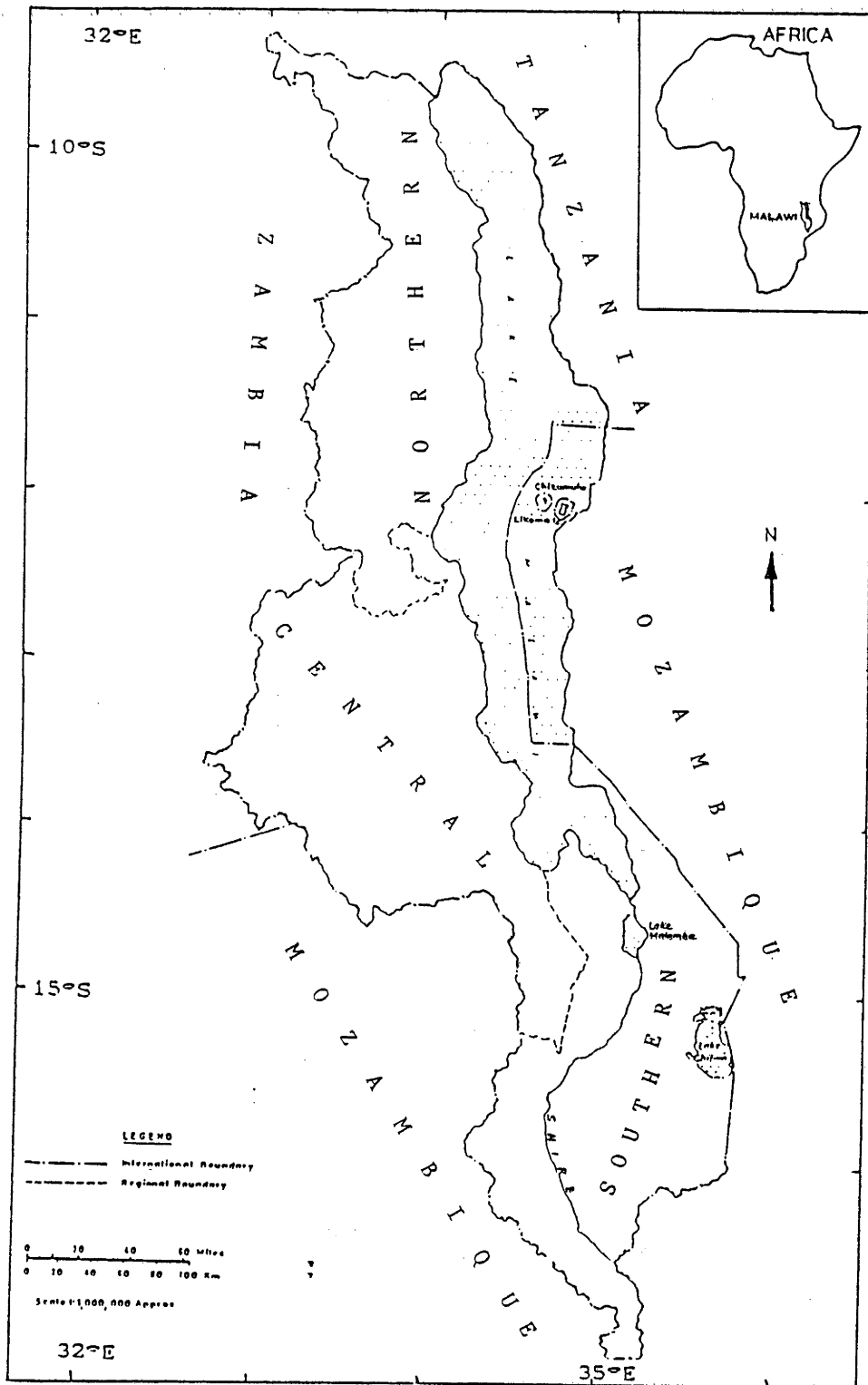
Chapters 3 and 4 present the findings of this study. In order to facilitate a better understanding of the findings, a review of the relevant literature with special emphasis on Africa is given at the beginning of each section.

1.2 BACKGROUND INFORMATION

1.2.1 THE STUDY AREA AND THE PEOPLE

Malawi is a land-locked country in South-Eastern Africa (see insert, Figure 1.1). It has a total area of 118,484 square kilometres of which 94,276 square kilometres is land and 24,208 square kilometres is water. It is bordered to the North-East by Tanzania, to the South-East and South-West by Mozambique and to the West by Zambia. It is a long and narrow country which measures 901 kilometres in length and 80 to 161 kilometres in breadth (National Statistical Office (NSO), 1984a:3).

Figure 1.1 Republic of Malawi: Regions



Source: National Statistical Office

The country is divided into three administrative regions: Northern, Central and Southern. (see Figure 1.1). The Northern Region occupies about 29 per cent of the country's land, the Central about 38 per cent and the Southern Region, about 34 per cent (NSO, 1984a:22). There are five districts in the Northern Region, nine in the Central and ten in the Southern Region. Of the four major urban areas, two are in the South and one in each of the other two regions. Malawi was under British colonial rule from 1891 until the attainment of Independence in 1964. During the colonial era, the country was known as Nyasaland.

Topographically, Malawi contains the final section of the East-African Rift Valley system which runs through the entire length of the country. The Northern part of the country is mostly hilly and mountainous with the highest plateau (Nyika) up to 2,606 metres above sea level. The Central Region is essentially a plain with a few scattered peaks. The Southern Region is dominated by Zomba and Mulanje mountains with peaks of 2,087 and 3002 metres above sea level respectively (NSO, 1985:7).

The country has two seasons: the wet season from November to April and the dry season from May to October. The weather is generally mild in most parts of the country except the Lower Shire Valley in the South and the Lake shore area in the Central and Northern Regions. These areas usually experience temperatures of above 37 degrees Celsius during the hottest months of October and November (NSO, 1984a:5).

Malawi's economy is based on agriculture. In 1983, 40 per cent of the Gross Domestic Product and over 88 per cent of the total exports were from the agricultural sector (NSO, 1985:3). The four principal export crops produced by estates are tobacco, sugar, tea and groundnuts. Smallholder farmers are primarily engaged in food production.

Culturally, Malawi consists of ethnic groups which to a large extent share a common history, culture and religious beliefs (Tew 1950:30). Many languages and dialects are spoken throughout the country. However, Chichewa, the national language, is spoken by the majority of the population. English is the official language (NSO, 1984a:7).

Traditionally, both patrilocal and matrilineal marriages are prevalent. The 1977 Census showed that at least 98 per cent of all women were or had been married (NSO, 1984b:6). The mean age at marriage was 17.7 years for the nation as a whole, with 18.4 for the North, 17.8 for the Central and 17.4 years for the Southern Region. Polygamy exists in the society and the 1977 Census indicated that it is most prevalent in the Northern Region. The joint extended family system is so strong that some important personal decisions can be influenced by the kinship group.

1.2.2 POPULATION GROWTH AND DISTRIBUTION

The 1966 Population Census was the first census after the country attained its Independence in 1964. This gave a total population of four million. In the 1977 Census, the second census, the total population enumerated was 5.5 million (NSO, 1984a:18). The population density per square kilometre increased from 43 persons in 1966 to 59 in 1977

(NSO, 1984a:22). Almost 50 per cent of the population was in the Southern Region during the 1977 Census; about 39 per cent was in the Central and almost 12 per cent was in the Northern Region (NSO, 1984a:22-23). The estimated population for 1987 is 7.5 million (NSO, 1984b:132). The rate of population growth is estimated at 3.2 per cent per annum for the period 1982-87 (NSO, 1984b:119). The Total Fertility Rate (TFR) derived from the 1977 Census was 7.6 children per woman. Some selected estimates of demographic characteristics for the period 1977-92 are given in Table 1.1 below.

Table 1.1 Selected Characteristics of Projected Population For Malawi, 1977-1992

Characteristic	Sex	1977-82	1982-87	1987-92
Crude Birth Rate ^a		54.9	54.0	53.1
Crude Death Rate ^a		23.9	21.8	19.8
Geometric Growth Rate ^b		3.1	3.2	3.3
Infant Mortality Rate ^c	Male	178	162	147
	Female	152	139	126
	Both	165	151	137
Life Expectancy at Birth (Years)	Male	39.2	41.4	43.5
	Female	42.4	44.6	46.8

Note: ^a Per 1000 persons per year
^b Per 100 persons per year
^c Per 1000 live births per year

Source: NSO, 1984b:119 (Table 9.3)

1.3 THE HEALTH SITUATION IN RELATION TO INFANT AND CHILD MORTALITY

1.3.1 THE HEALTH POLICY AND ITS IMPLICATIONS

The Government's overall health policy is "to raise the level of the health of all Malawians through a sound services delivery system which will promote health by preventing, reducing, curing disease, by protecting life and fostering general well-being and increased productivity" (Ministry of Health (MOH), 1986:3.4).

The emphasis of the first five-year Health Plan, which covered the period 1964-69, was on the development of manpower as a means of minimising health service delivery problems (MOH, 1981:25). The 1973-88 Health Plan emphasised the expansion of basic health services. It included a mini-plan on Maternal and Child Health (MCH). The major objective of the MCH plan was to improve the health of mothers in the reproductive ages and children under the age of five years (MOH, 1981:25 and MOH, 1986:4.7). This was to include, among other things, the expansion of immunisation, health and nutrition education for children and pregnant women, antenatal and post-natal care and improvements in safe water supply and sanitation (MOH, 1986:4.7).

In addition, the government adopted the Primary Health Care (PHC) approach in 1978. The major objective was to achieve full community participation in solving health problems (MOH, 1981:26).

However, the success of all these efforts has not yet been realised. With regard to child survival, the available data indicate that infant and childhood mortality is very high. This has been attributed to several factors. These

include lack of adequate skilled manpower, lack of access to modern health facilities, lack of knowledge about and skills in childrearing among families, especially among mothers, and factors relating to ineffective management of the health services delivery system (MOH, 1986:4.7-4.9).

The mother's childrearing practices are largely influenced by traditional customs and beliefs. The adoption of modern childrearing practices is largely confounded by illiteracy. The 1977 Census gave a very low educational level for the population, especially for women. The literacy rate for persons aged five years and above was about 31 per cent for males and about 15 per cent for females (NSO, 1984a:141).

In addition to the above factors, the government realises that closely-spaced pregnancies are detrimental to the health of the mother and the child. As a result, the child-spacing programme was introduced in 1982. The rationale for the programme is to reinforce traditional methods of child-spacing with modern methods. This is expected to help reduce infant/child and maternal mortality.

1.3.2 SOURCES OF MORTALITY DATA

Malawi does not have an official birth or death registration system. This implies that planners have to rely on data from censuses, surveys and hospital records to obtain estimates of mortality. Data on causes of death are usually obtained from in-patient statistical reports compiled by the Statistical Unit of the Ministry of Health. This type of data is generally limited in two ways: firstly, there is under-reporting of certain diseases in some age

groups. Secondly, the regional variation in the access to health facilities leads to distortions in reported causes of death among in-patients (MOH, 1986:2.4). Despite these shortcomings, the data portray some valuable information. It has been found that children under the age of five years account for about 57 per cent of all deaths in the country even though they constitute only 20 per cent of the total population (MOH, 1986:2.5). Table 1.2 shows the ten leading causes of death for children under five years of age from in-patient statistics. In addition, in-patient statistics indicate that prematurity, tetanus, pneumonia and diarrhoea are the four major causes of neonatal mortality. Post-neonatal mortality is usually associated with pneumonia, diarrhoea, malnutrition, malaria and measles (MOH, 1986:2.7).

Table 1.2 The Ten Leading Causes of Death Among Children Aged 0-4 Years, Malawi: 1983^a

Disease	Reported Deaths	% of All Deaths	Cumulative Percentage
1. Measles	975	16.2	16.2
2. Pneumonia	786	13.0	29.2
3. Nutritional Deficiency	673	11.2	40.4
4. Malaria	611	10.1	50.5
5. Anaemia	549	9.1	59.6
6. Diarrhoeal Diseases	504	8.4	68.0
7. Tetanus	256	4.2	72.2
8. Nervous System Diseases	96	1.6	73.8
9. Accidents and Injuries	89	1.5	75.3
10. Tuberculosis	28	0.5	75.8

Note: ^a Based on 6,028 reported hospital deaths

Source: MOH, 1986:2-5 (Table 2.2)

1.4 INFANT AND CHILD MORTALITY LEVELS IN AFRICA

Africa, particularly Sub-Saharan Africa, has the highest levels of infant mortality in the developing world (United Nations, 1984:6). Malawi is no exception. Table 1.3 shows infant mortality rates for some African countries. It can be seen from this table that most African countries have infant mortality rates of more than 100 per 1000 live births. In addition, in most African countries, neonatal deaths alone constitute up to more than 50 percent of all infant deaths in one year (ECA Population Division, 1979:383).

Table 1.3 Infant Mortality Rates in Some African Countries

Source	Country	Year	Infant Mortality Rate
1	Algeria	1978	112
2	Botswana	1980-85	79
1	Egypt	1976	116
1	Gambia	1970	217
3	Ghana	1971	122
2	Kenya	1980-85	82
1	Liberia	1970-71	165
2	Lesotho	1971	114
4	Malawi	1987-92	137
1	Mauritania	1970-74	125-150
1	Mauritius	1980	32
1	Morocco	1972	162
1	Senegal	1975	157
1	Sierra Leone	1970-71	254
2	Swaziland	1980-85	129
2	Tanzania	1967	160-165
1	Togo	1964-67	141-162
1	Zambia	1967-69	140
1	Zimbabwe	1964-69	95-105

- Sources: 1. United Nations, 1984:6-7 (Table 1)
 2. United Nations, 1986:72-73
 3. Awusabo-Asare, 1980:42 (Table 3.1)
 4. NSO, 1984b:119 (Table 9.3)

Early childhood deaths (1-4 years) in much of tropical Africa, especially in rural areas have been found to equal or exceed those under one year of age. This includes Malawi (1971-72) and is considered as a possible reflection of malnutrition and infectious or parasitic diseases (ECA Population Division, 1979:381 and Gaisie, 1979:450). Moreover, an examination of the distribution of early childhood deaths in some African countries indicate that a large proportion of the deaths occur during the second year of life (Gaisie, 1979:450).

It has also been found that in most African countries, infant and early childhood deaths constitute a major proportion of all deaths within a year. They account for up to more than 50 percent of all male deaths and up to more than 60 percent of all female deaths in some countries where data are available (ECA Population Division, 1979:381). As already mentioned, infant and child deaths constitute about 57 per cent of all deaths in Malawi.

CHAPTER 2

SOURCES AND EVALUATION OF DATA AND METHODOLOGY

2.1 SOURCES OF DATA

This study has used data collected in the Malawi Family Formation Survey (FFS) which was conducted by the National Statistical Office in collaboration with the Ministry of Health. The survey was carried out from May to early July, 1984. The major objective of the FFS was to collect baseline data for the child-spacing programme which was launched in 1982. Among other things, the FFS collected data on mortality, fertility, birth history, breastfeeding, antenatal and under-five clinic attendance, current knowledge, attitude and practice of contraception, and attitude towards family size.

The survey was based on three-stage sampling. The country was divided into four strata with varying numbers of enumeration areas (EAs). These were: Rural-Agricultural (5607 EAs), Other Rural, comprising estates and rural trading centres (261 EAs), Major Urban, covering the major urban areas of Blantyre, Zomba, Lilongwe and Mzuzu (306 EAs) and Other Urban, covering the other urban areas in the country (115 EAs).

The first stage involved the selection of 200 EAs. A total of 140 EAs were selected from the Rural-Agricultural stratum, 10 from Other Rural, 41 from Major Urban and 9 from Other Urban. In rural areas, the EAs were selected with equal probability whereas in urban areas they were selected with probability proportionate to size.

At the second stage, 60 households were selected in each EA using systematic random sampling. A questionnaire on "Particulars of the household" was administered to these households. The third stage involved the selection of a sub-sample of the 60 households in each EA. Forty households were selected from each EA in the Northern region and 30 households from each EA in the Central and Southern regions. In addition to the questionnaire on "Particulars of the household", questionnaires for all women aged 15-49 years and all men aged 20-54 years were administered in these households.

Among other things, the questionnaire for women aged 15-49 years in the selected households collected birth history information. Moreover, for each child born from 1979 to the time of the survey, additional questions were asked. These included the mother's medical check during pregnancy, the place of birth of the child, the birth attendant if the child was not born in a hospital or clinic, and whether the child was given any vaccinations (see Appendix 5c).

The study has used unweighted FFS data for the Southern region only because data for the other regions were unavailable. This is a limitation in that the results may not be fully applicable to the whole country. However, considering that this region contains almost 50 per cent of the total population, and that the Malawians share more or less a common way of living, the results may still provide useful information about infant and child mortality patterns in Malawi.

A subset of children was created by extracting information on the birth history of each woman. Demographic and socio-economic factors as mentioned in Chapter One were then linked to each child accordingly. Hence, children were the unit of analysis.

There were 7,856 children in the subset, the earliest child having been born as far back as 1948 (see Appendix 1). Considering the low literacy level of the population under study, one should not assume that the reporting of details about a birth that occurred in the remote past is accurate. This especially applies to the date of birth and the age at death if the child died. Moreover, a common error encountered in most fertility surveys is the failure to report births and infant deaths that occurred in the distant past. This is common among older women (Timaeus and Balasubramanian, 1984:8). To eliminate this problem, it was decided that all births that occurred 20 or more years before the survey should be excluded.

As noted earlier, the survey was conducted from May to early July, 1984. Therefore, the cut-off point for the selection of births for the study of infant mortality would have been roughly mid-1983. This would have allowed all children to have been at least one year by the time of the survey. However, it is likely that the information on month of birth may not be reliable. To avoid this problem, selection was based on year of birth only. This meant that the year 1982 was taken as the end-mark for the selection of births for the study of infant mortality. Also, as already mentioned, the selection was limited to only the last 20

years before the survey. Incidentally, this turned out to be the post-independence period starting from 1965. Therefore, the infant mortality study is based on births that occurred during the period 1965-82 inclusive. There were 6,186 births during this period that occurred to women who were aged 15-49 years at the time of the survey in 1984.

In order to calculate the probability that a child will die between the first birthday and the fifth birthday, all children who were born less than five years before the survey should be excluded. This is to prevent truncation effects. This would mean selecting births that occurred up to mid-1979. However, for the reason given above, using the year of birth was preferred. This meant that the selection of births for the child mortality study had to end at 1978. Therefore, the study of child mortality differentials is based on children who were born during the period 1965-78 and who survived their first year of life. There were 3,655 children who survived the first year of life out of 4,284 children who were born during this period.

It is worth noting that the study is based on a cohort of births or children born during a particular period. Since the study has focused on the proportions that died in infancy or childhood in this cohort, one would say that the results presented in Chapters 3 and 4 are in fact probabilities rather than rates. This is because the denominator is the initial cohort size rather than a measure of exposure to risk. However, this distinction is not crucial as regards the major objective of the study.

2.2 EVALUATION OF DATA

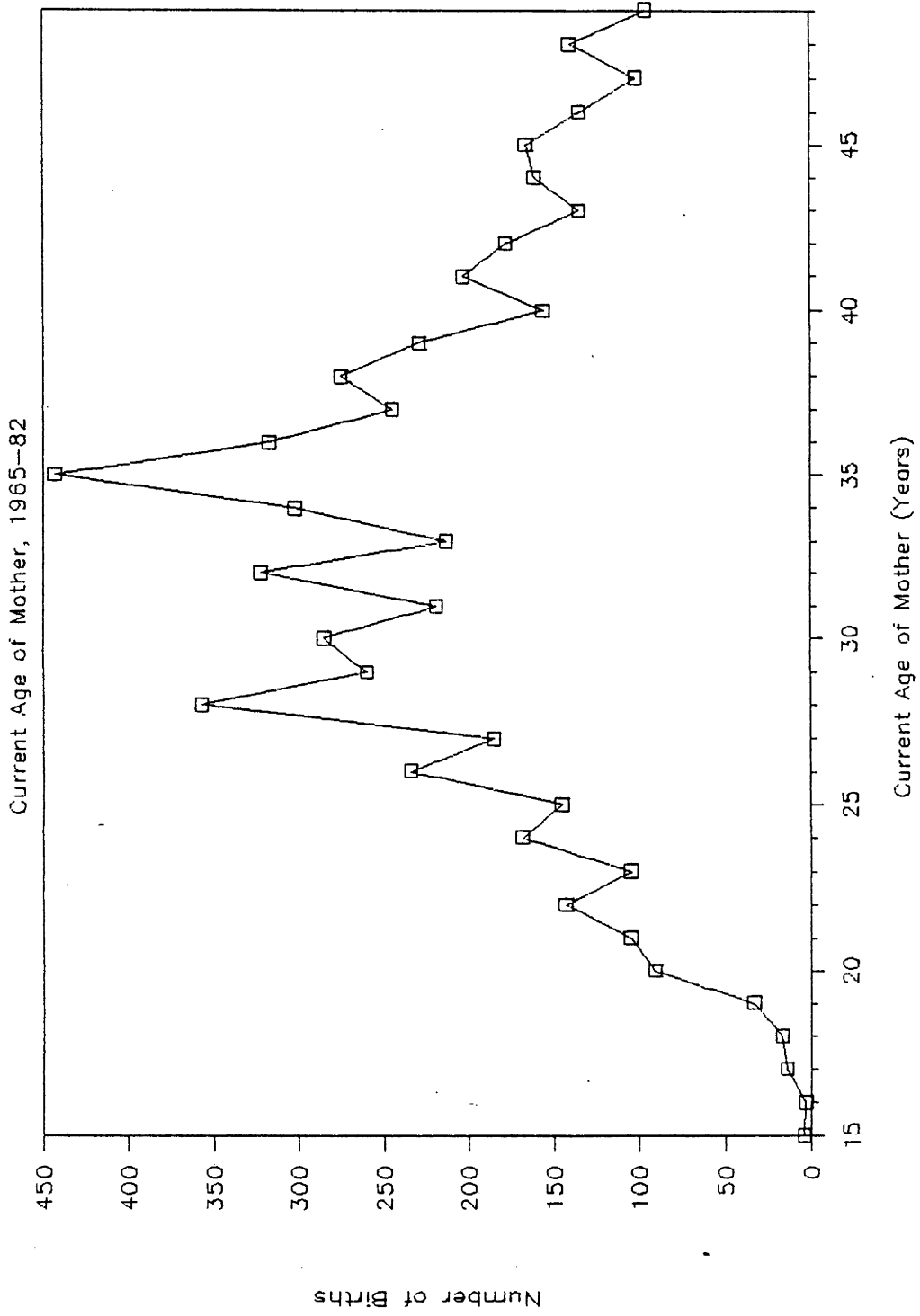
Despite the above-mentioned precautions, the possibility that the data are defective cannot be ruled out. Errors of various types include misreporting of the mother's characteristics such as age or education. Also, as mentioned above, the omission of births or deaths and the displacement of the ages at death of deceased children may occur.

Misreporting of the age of the mother, which is commonly associated with preference for certain terminal digits like 0 and 5 (see Appendix 2), may give biased estimates based on the age of the mother. Figure 2.1 shows the distribution of births by the mother's age at the time of the survey, in single years. The graph shows that there is considerable heaping at ages 30, 35 and slightly at 45 years. However it appears there is an avoidance of the ages 25 and 40 years. In addition, misreporting of the mother's socio-economic characteristics like education may also affect results based on such factors.

The omission of births or children who have died affect not only estimates based on birth order and birth interval but also the overall level of mortality. Estimates based on birth intervals are also usually affected by misreporting of dates of birth of children.

The birth history section of the questionnaire for women aged 15-49 years (see Appendix 5a) recorded the age at death of all deceased children in years and months. For this study the age at death in months was computed and the

Figure 2.1 Distribution of Births by



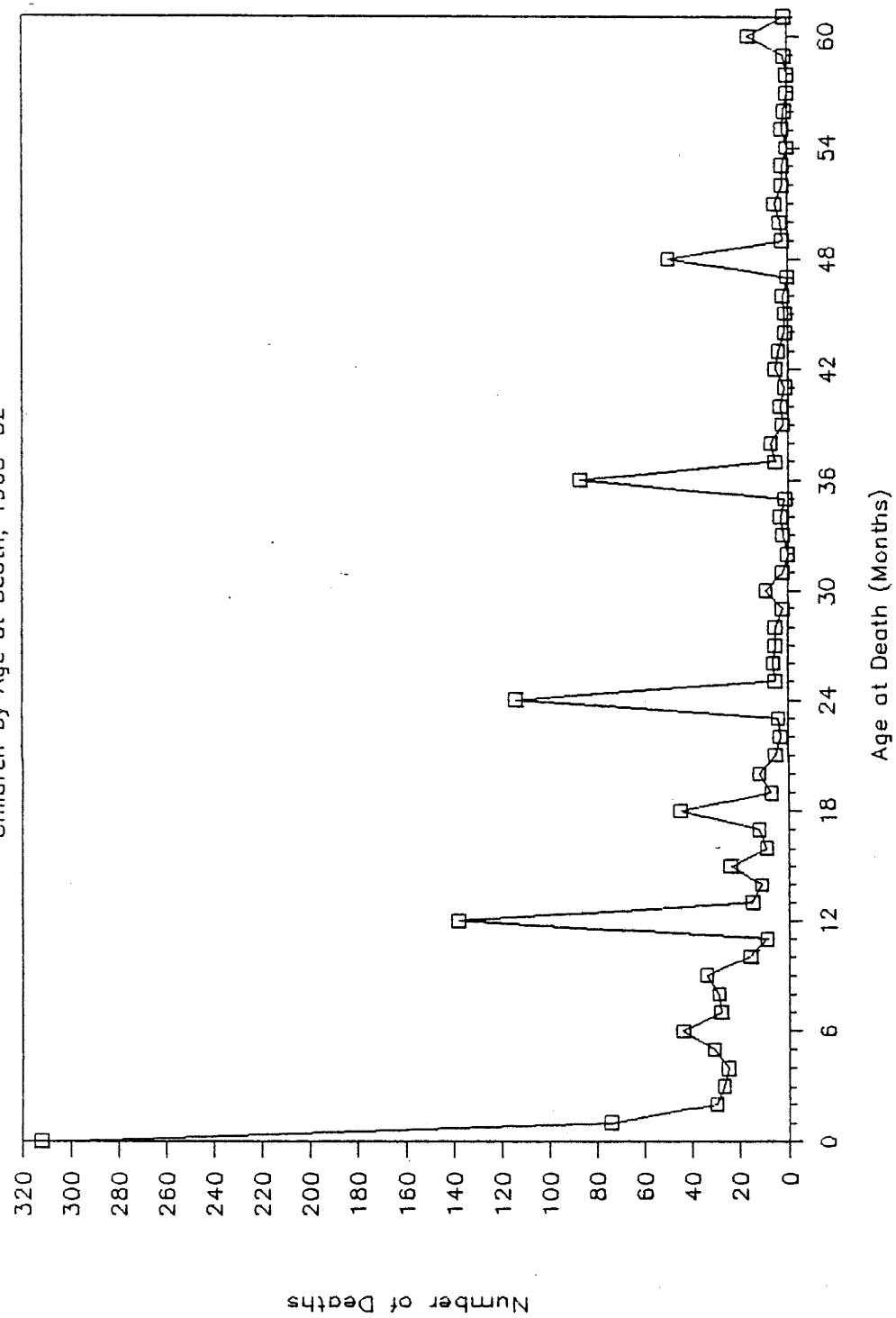
distribution of deceased children by age at death in months is shown in Figure 2.2 (see Appendix 3 also).

The distribution in Figure 2.2 indicates that there was a tendency among mothers (or enumerators) to round up the ages at death of deceased children to exact ages 1, 2, 3, 4 or 5 years. This results in heaping at ages 12, 24, 36, 48 and 60 months. Some deaths that occurred in the second year of life might have been reported as having occurred at exact age one year. This occurs usually if the child is not yet weaned or has not yet started walking. On the other hand, some children who died at ages less than one year may also have been reported as having died at exact age one year. Similar shifting may also have occurred in relation to ages 2, 3, 4 and 5 years.

For the study of infant and child mortality, the preference for exact age one year as the age at death of the child poses a major problem because this is the dividing point between infant and child deaths. Since infant mortality is associated with deaths that occur during the first year of life, the deaths at ages 0-11 months are usually taken as the basis for the study of infant mortality. However, with the observed heaping of deaths at 12 months in the data for this study, it is likely that using this division may underestimate the overall level of mortality. Even though the estimation of the level of mortality is not a primary concern for this study, precautions are still worth considering.

Ideally, one would redistribute the deaths that occurred at 12 months to the surrounding ages using a

Figure 2.2 Distribution of Deceased
Children by Age at Death, 1965-82



distribution of deaths from another population with a similar level of mortality to that of Malawi. This would have to be a country with good mortality data. Unfortunately, such data were not available at the time of this study. Therefore, no redistribution could be attempted. The only alternative which seemed plausible was to calculate probabilities of dying in infancy for various periods based on deaths at ages 0-11 and 0-12 months respectively. These would then be compared with infant mortality rates for Malawi from other sources for similar periods to see which of the two sets of probabilities were closer to the infant mortality rates for the whole country from other sources. However, one might say that this is a rather rough comparison because it involves rates on one hand and probabilities on the other. Despite this, one might argue that regarding the little distinction there is between a rate and a probability, the results are still comparable to some extent. Moreover, since mortality does not usually drastically change from one year to another, one would expect a rate and a probability referring to a particular period to be close to each other. The results of this comparison are presented in Table 2.1 below. It may be noted from this table that in general, the probabilities obtained from the 1984 Malawi Family Formation Survey are lower than the rates from other sources. However the rates based on deaths at ages 0-12 months are closer to the reported infant mortality rates from other sources than those based on deaths at ages 0-11 months.

Table 2.1 A comparison of Probabilities of Dying in Infancy for the Southern Region and Infant Mortality Rates for the Whole Country for Various Periods

Period	<u>Southern Region</u>		<u>Malawi</u>	
	Probabilities Based on: Deaths at Ages ^a		Infant Mortality Rates ^b	
	0-11 Months	0-12 Months	Reported	Estimated
1967-77	119	145	-	190
1971-72	133	165	142	190
1976-77	100	120	130	176
1977-82	80	97	-	165

Source: ^a Calculated from:

Malawi Family Formation Survey, 1984
(Southern Region Subset)

Using the formula: $A / B \times 1,000$

Where: A = Children who were born during the period t but died at ages 0-11 months or 0-12 months respectively

B = All children who were born during the period t

^b All the Infant Mortality Rates are from NSO, 1984b:54 except the estimated rate for 1977-82 which is from NSO, 1984b:119

The results for 1967-77 obtained from the 1984 FFS based on deaths at ages 0-11 and 0-12 months respectively, are both lower than the infant mortality rate of 190 estimated from the 1977 Census for the same period. However, the 1971/72 probability based on deaths at ages 0-11 months (133) is lower than both the reported and the estimated rates (142 and 190) obtained from the 1970-72 Malawi Population Change Survey (MPCS) for the same period. On the other hand, the

rate based on deaths at ages 0-12 months (165) falls in between that of the reported and the estimated infant mortality rate. Considering the fact that there was some under-reporting of births in the MPCS (NSO, 1984b:19) and that the estimated infant mortality rate for 1971/72 was 190 per 1000 live births, one would tend to prefer the probability based on deaths at ages 0-12 months. This is because this probability is closer to the estimated infant mortality rate than that based on 0-11 months. However, one may also suspect that probably there was some under-reporting of births in the FFS too.

The 1976/77 probabilities of 100 and 120 based on deaths at ages 0-11 and 0-12 months respectively are both lower than the 1977 census reported infant mortality of 130 for the same period. However, that based on deaths at ages 0-12 months is closer to the reported rate from the census. Similarly, an evaluation of the data by age at death revealed that there was either under-reporting of deaths or misclassification of deaths by age in the census (NSO, 1984b:53). The estimated infant mortality rate for 1976/77 was 176 per 1000 live births. Again this indicates a possibility of under-reporting of deaths or misclassification of ages at death in the FFS.

Unfortunately, the 1977-82 probabilities of 80 and 97 do not have a reported rate to compare with. However, just by looking at the trend of the reported and estimated rates from the other sources for the preceding periods it can be seen that there seems to have been a decline in infant mortality since 1971. Having this in mind, one would have

expected the reported rate for the period 1977-82 to have been slightly lower than the reported rate of 130 for 1976/77. This would fit in with the declining trend of the reported rate (from 142 in 1971 to 130 in 1976/77) and the decline of the estimated rate (from 190 in 1971/72 to 165 in 1977-82). However, it seems it may not have been as low as 80 per 1000 live births as the probability based on 0-11 months indicates. Therefore, it seems the probability of 97 deaths per 1000 live births based on 0-12 months could have been closer to the reported rate for this period if it were available.

Following the above exploration, deaths at ages 0-12 months were used for the study of infant mortality in the light of the various demographic and socio-economic factors. On the other hand, deaths at ages 13-60 months were used for child mortality. It should be noted however, that the emphasis of this study is on examining differentials in infant and child mortality by the various demographic and socio-economic factors rather than to estimate the level of infant and child mortality. Whether the above results obtained from the FFS are low or not, it is believed that the differences in infant and child mortality by the various factors under study will still be reflected.

2.3 METHODOLOGY

As pointed out earlier, the study of infant mortality is based on births that occurred during the period 1965-82. On the other hand, the child mortality study is based on children who were born during the period 1965-78 and who survived the first year of life.

As mentioned above, the probability of dying in infancy was calculated based on deaths at ages 0-12 months. On the other hand, the probability that a child who survived the first year of life will die by five years of age is based on deaths at ages 13-60 months. The formulae are therefore as follows:

Probability of Dying in Infancy: $A / B \times 1,000$

Where: A = Children who were born during the period 1965-82 but who died at ages 0-12 months (by the respective demographic and socio-economic category).

B = All children who were born during the period 1965-82 (by the respective demographic and socio-economic category).

Probability of Dying in Childhood: $A / B \times 1,000$

Where: A = Children who were born during the period 1965-78 and who survived the first year of life but died at ages 13-60 months (by the respective demographic and socio-economic category).

B = All children who were born during the period 1965-78 and who survived the first year of life (by the respective demographic and socio-economic category).

CHAPTER 3

DEMOGRAPHIC DIFFERENTIALS IN INFANT AND CHILD MORTALITY

3.1 INTRODUCTION

This chapter examines the variations in infant and child mortality according to various demographic factors. These are: the age of the mother at the birth of the child, the sex and birth order of the child, the birth interval preceding the birth of the child and whether the child was born singly or was from a multiple birth (twins, triplets and so on).

3.2 AGE OF MOTHER

The age of the mother at the time of birth of the child plays a major role in determining the child's survival. Newland (1981, cited by Daka, 1983:20), pointed out that women who start childbearing in their teens or prolong it after their mid-thirties increase their children's risk of dying in infancy. Several studies have indicated that there is a consistent relationship between maternal age and mortality of both mothers and children. Early or late age at childbearing presents a great risk to the survival of the mother and the child. The age range 20-29 years has been determined to be the safest, when complications of pregnancy and childbirth are at a minimum. Rutstein used World Fertility Survey (WFS) data from 29 countries which included four African countries, namely, Senegal, Lesotho, Sudan (North only) and Kenya. In most of the 29 countries, infant mortality was lowest for mothers aged 20-29 years and much

higher among mothers who were aged less than 20 or above 30 years at the birth of their children. In Senegal, Northern Sudan and Kenya, the highest infant mortality rates were those of children who were born when their mothers were aged less than 20 years. However, using the same data, this U-shaped relationship was less strong for toddler mortality (the probability of dying at age one, ${}_1q_1$) and child mortality (Rutstein, 1983:15, 26-27).

Using the 1971 Supplementary Enquiry (S.E) of Ghana, Tawiah (1979:468) also found similar results. The lowest infant death rate by current age of mother was for the age group 20-24 years. The youngest and oldest mothers had higher infant death rates in comparison to the age group 20-24 years. Kandeh (1982:125) also found that in Sierra Leone, the highest percentage of infant deaths occurred to children whose mothers were aged less than 20 years at the time of their birth. It was lowest for the age group 20-24 years.

This study has also used the age of the mother at the birth of the child to assess the differences in infant and child mortality. This was computed as follows:

$$A = B - [C - D]$$

Where A = The age of the mother at the child's birth

B = The year of birth of the child

C = The year of the survey (1984)

D = The age of the mother at the survey

Table 3.1 indicates that regardless of the current age of mother infant mortality is highest among children born

Table 3.1 Infant and Child Mortality by Age of Mother at Birth of Child and Current Age of Mother

Age of Mother at Child's Birth	Infant Mortality*					Child Mortality**				
	Current Age of Mother					Current Age of Mother				
	<25	25-29	30-34	35+	Total	<25	25-29	30-34	35+	Total
<20	138 (535)	155 (407)	212 (278)	147 (150)	159 (1370)	120 (142)	108 (344)	132 (219)	133 (128)	120 (833)
20-24	74 (148)	105 (626)	122 (468)	148 (527)	120 (1769)	-	101 (247)	95 (411)	120 (449)	106 (1107)
25-29	-	40 (148)	95 (486)	159 (834)	126 (1468)	-	-	73 (177)	116 (701)	107 (878)
30-34	-	-	64 (109)	124 (843)	118 (952)	-	-	-	109 (524)	109 (524)
35+	-	-	-	112 (627)	112 (627)	-	-	-	96 (313)	96 (313)
Total	124 (683)	114 (1181)	126 (1341)	137 (2981)	129 (6186)	120 (142)	105 (591)	100 (807)	113 (2115)	109 (3655)

Notes: * For the Infant Mortality panel, the figures in parentheses are the number of live births in the respective categories for the period 1965-82

The probabilities of dying in infancy are per 1,000 live births in the respective categories

** For the Child Mortality panel, the figures in parentheses are the number of children who were born during the period 1965-78 and survived the first year of life

The probabilities of dying by age five are per 1,000 children who survived the first year of life

Source: Malawi Family Formation Survey, 1984
(Southern Region Subset)

when their mothers were aged less than 20 years. It then declines as the age of the mother at the birth of the child increases. However, this is with the exception of the current age of mother 35 years and over where the trend is not clear. This inconsistency could be an indication of omission of infant deaths by older women. It could also be an indication of the inability to accurately report ages which is more likely to occur among older women than among younger women. This may in turn affect the estimate of the age of the mother at the birth of the child. The declining trend in infant mortality within each current age group as the age of the mother at the birth of the child increases could be an indication of a decline in infant mortality over the years. This is also consistent with the fact that within each group of mother's age at child's birth, the infant mortality generally increases as the current age of the mother increases.

The table also shows that like infant mortality, child mortality is highest among children born when their mothers were teenagers. Thereafter, it decreases as the age of the mother at the child's birth increases. A more consistent pattern than that of infant mortality is observed within the current age group 35 years and above.

3.3 SEX OF CHILD

Data from most countries, whether reliable or not, seem to indicate that there is an outstanding difference in infant and child mortality between the two sexes. In general, male mortality tends to exceed female mortality at all ages. This has been found by Rutstein (1983:25) using the WFS data from 29 countries including Senegal, Lesotho, Kenya and Northern Sudan. Mott (1982:14-15) also using the Kenya Fertility Survey found that this differential was evident for most parity levels. The Cameroon and Nigeria Fertility Surveys also showed an excess of male infant and child mortality rates (WFS, 1983:7 and WFS, 1984:12-14).

Data from Ghana for the period 1950-72 also indicate that infant mortality is higher for males than for females (Awusabo-Asare, 1980:80). Tawiah (1979:471) found that this differential also holds for both infant and child mortality in Ghana. However, the male infant mortality was 23 per cent higher than the female rate whereas the male child mortality rate was only 12 per cent higher than that of females. Using the Cape Coast Project data of Ghana, Jain (1982:282) found that the infant mortality rate for males (100) was higher than that of females (84). However, childhood mortality rates were almost equal for the two sexes (86 for boys and 85 for girls). The consistent pattern of higher male than female mortality for both infants and younger children was also found for Benin, Togo, Gabon, Central African Empire and West Cameroon based on data of the 1960s (Ohadike, 1983:37).

The higher mortality rate among male infants is usually explained in biological terms. On average, male babies are less mature than female babies of the same gestational period. This is said to be usually true of lung development. It is also suggested that this possibly makes male babies more vulnerable to respiratory distress (Waldron, 1983:148).

However, in some African and almost half the Asian countries, it has been observed that there is a transformation from higher male infant mortality to higher female early childhood mortality (Behm and Vallin, 1980:28). In a review of mortality conditions throughout the world by the United Nations, a pattern of higher female than male childhood mortality was found in many countries. For example, in Sub-Saharan Africa, this was evident from the life tables of Kenya, Mauritius, Upper Volta and Cameroon (United Nations Population Division, 1983:19). Similar results have been found for Liberia, Libyan-Arab Jamahiriya and Mauritius (Ohadike, 1983:37). Tunisian life tables for the period 1968-69 and Egyptian life tables for 1960 and 1965 also indicate that female mortality was higher than that of males at all ages below five years (UN Population Division, 1983:19). Dorjahm (1976), as cited by Tawiah (1979:471) also reported that at ages 1-4 years, there was an excess of female mortality over male mortality in Egypt and Tunisia.

These findings of excess female mortality over male mortality are usually taken as a reflection of the status of women within the society. Lopez and Ruzicka (1983:1) suggest that in societies where there is discrimination against

females, more female than male children may die. In the same way, Behm and Vallin (1980:28) suggest that a differential that is biological in origin can be reversed by social factors. They point out that some cultural factors tend to give less value to female children. As a result, female children may be less cared for. This may increase their risk of dying.

Table 3.2 shows the probabilities of dying in infancy and childhood by sex as derived from this study. These probabilities clearly indicate that mortality is higher among male infants than among female infants. However, the difference is not so great as observed in some of the studies cited above, such as those of Tawiah (1979:471) and Jain (1982:282) for Ghana. Furthermore, there seems to be a transition from higher male infant mortality to higher female childhood mortality. However, the difference is not great.

A Z-test of difference between proportions indicated that the difference in mortality between the two sexes is not statistically significant at the 5 per cent significance level ($Z=0.7317$ for infant mortality and -0.1942 for child mortality). This implies that in the Southern Region of Malawi, there is no difference in the chances of survival among male and female children after they survive the first year of life. Since the differences in infant mortality for males and females are known to be biological, the fact that these differences disappear in early childhood may be an indication that there is no preferential treatment for either male or female children in this region.

Table 3.2 Infant and Child Mortality By Sex of Child

Sex	Infant Mortality	Child Mortality
Male	132 (3165)	108 (1853)
Female	126 (3020)	110 (1801)
Total	129 (6185)	109 (3654)

Notes: As in Table 3.1

Excludes one case where the sex of the child was not stated.

Source: Malawi Family Formation Survey, 1984
(Southern Region Subset)

3.4 BIRTH ORDER OF CHILD

The birth order of the child is also said to determine his/her chance of survival. The general finding is that "the risk of mortality is high for first order births, decreases for second and third order births, increases slightly for fourth order births and then rises sharply for higher order births" (Kandeh, 1982:121). In his analysis of data from Sierra Leone, Kandeh found that the highest percentage of infant deaths occurred to first order children. The second highest percentage was that of birth orders of six and above. Second and third order children had the lowest mortality (Kandeh, 1982:128). He then states that this pattern of mortality is usually related to maternal age: Most first births occur to young women aged less than 20 years. This implies that these women will have high order births by the time they reach age 30 years or

above. The result is usually low birth weight of first order and higher order babies. This increases their risk of dying (Kandeh, 1982:121). This reasoning is also supported by Rutstein when he says that there are many reasons to believe that infant and child mortality is associated with birth order. Firstly, first births are more likely to occur to mothers who are "biologically, mentally, socially and economically unprepared to bear and bring up a child". On the other hand, high order births are more likely to occur to mothers who are physically worn out and older, they are more likely to be affected by sibling competition in terms of food, care and other family resources and they are likely to be cared for by someone other than the mother (Rutstein, 1983:29). In his study of WFS data from 29 countries, in general Rutstein found a U-shaped curve for infant mortality in relation to birth order. In comparison to second and third children together, first born children were four per cent more likely to die in infancy. Fourth to sixth order children were five per cent more likely to die. Seventh or higher order children had an excess mortality of almost forty per cent in relation to second and third order children (Rutstein, 1983:29). On the other hand, toddler and child mortality, for all countries together, rose sharply with birth order (Rutstein, 1983:30). Armagnac and Retel-Laurentin (1981:225) found that in Upper Volta, the highest infant mortality levels were associated with the highest fertility levels. Flegg (1982:444) summarises the relationship between fertility and mortality as follows:

"High fertility implies high parity and closely-spaced births, and a high proportion of births to quite young or older mothers. The consequences are a greater probability of maternal malnourishment, birth complications and abnormalities, low birth weights, and earlier weaning".

In relation to the age of the mother, several studies have shown that in general, for the same birth order, infant and child mortality increase as the age of the mother increases. However, this is with the exception of those mothers who give birth at ages which are premature for such parity levels (Pringle, 1969 cited by Mott, 1982:12). The Kenya Fertility Survey also showed similar results (Mott, 1982:12-13). The Cameroon Fertility Survey showed that mortality was higher among children of first order and of birth orders above six and that this was associated with very young or very old mothers (WFS, 1983:7).

Table 3.3 shows infant and child mortality by birth order as obtained from this study. This table indicates that infant mortality is highest for first births, declines and is lowest for third and fourth order births. Thereafter, it increases again as the birth order increases. These results correspond to those of Kandeh and of Rutstein cited above. They could also be possibly related to the fact that quite a large proportion of births that occur to teenage mothers do not survive their first year of life (see Table 3.1). On the other hand, higher order births of five or six and above occur to either older women or younger women who have had closely-spaced births. This increases the mortality risk of their infants. This is supported by the infant mortality results by age of mother in Table 3.4. These results indicate that whereas having a baby at less than 20 years of

age increases the child's risk of dying during infancy, regardless of birth order, the risk is even higher if the birth is of second or higher order (168) than if it was first (153). This could be related to the fact that having a second or higher order birth while in the teenages implies that the births are closely-spaced. Moreover, for first and second order births, the infant mortality is lowest for the births that occur to women aged 20-29 years. This is possibly related to the fact that the mother is both biologically and socially ready to bear and rear a child satisfactorily. Of all the births that occurred to women aged 30 years or above, first and second births together experience the highest infant mortality (146). For third or higher order births, the safest age of mother seems to be 30 years or above.

On the contrary, the child mortality results in Table 3.3 indicate a more or less opposite pattern to that of infant mortality. Second order children have considerably higher child mortality compared to first and third order children. For first order births, this could be due to the fact that after surviving the first year of life, the chance of surviving to five years of age becomes great. The fluctuating pattern persists as the birth order increases.

Table 3.4 shows that, like infant mortality, child mortality is highest among children whose mothers were less than 20 years old at the time of their birth (120). Furthermore, among children whose mothers were aged less than 20 years at the time of their birth, child mortality is

highest among second order children. Also, of all the births that occur to women aged 30 years or above, first and second order births together experience the highest mortality in childhood. The phenomenon of higher child mortality among second order children than among first children could be due to the effects of closely-spaced pregnancies which usually lead to early weaning of the child, as will be discussed in the next section.

Table 3.3 Infant and Child Mortality By Birth Order of Child

Birth Order	Infant Mortality	Child Mortality
One	140 (1442)	98 (884)
Two	132 (1199)	123 (762)
Three	117 (994)	108 (629)
Four	118 (804)	130 (469)
Five	125 (606)	113 (336)
Six +	132 (1141)	89 (575)
Total	129 (6186)	109 (3655)

Notes: As in Table 3.1

Source: Malawi Family Formation Survey, 1984
(Southern Region Subset)

Table 3.4 Infant and Child Mortality by Birth Order of Child and Age of Mother at Birth of Child

Birth Order	Infant Mortality			Child Mortality		
	Mother's age at Child's Birth			Mother's age at Child's Birth		
	<20	20-29	30+	<20	20-29	30+
One	153 (881)	118 (535)	146++ (96)	110 (528)	80 (339)	152++ (66)
Two	168 (362)	113 (767)		151 (219)	107 (494)	
Three/Four	168 (125)	120 (1345)	88 (328)	106 (85)	122 (812)	104 (201)
Five+	- (2)	146 (590)	120 (1155)	- (1)	97 (340)	98 (570)
Total	159 (1370)	123 (3237)	115 (1579)	120 (833)	107 (1985)	104 (837)

Notes: As in Table 3.1

++ Refers to first and second order births together

- Probability not calculated because of small number of cases

Source: Malawi Family Formation Survey, 1984
(Southern Region Subset)

3.5 BIRTH INTERVAL

Several researchers have pointed out that there are several methodological problems associated with the study of the relationship between the length of birth interval and infant or child mortality. This is because there are confounding factors, some of which are discussed below.

Firstly, a common problem to most analyses is how to determine which interval to use: that between two live births, that between two pregnancies or that between one birth and the following conception (Gray, 1981:95; Pebley and Millman, 1986:71). The problem with using the interval between two live births is that all conceptions that led to stillbirths or abortions will be omitted and this will affect the length of the birth interval. On the other hand, if conception is used as a marking point, difficulties in determining when a conception occurred may arise.

The second problem is the effect of an infant death on the length of the birth interval. It has been found in several societies that the birth interval tends to be shorter if the child born at the beginning of that interval dies. This is usually explained in terms of parents' wish to replace the dead child as soon as possible. On the other hand, it is said to be biological because the death of an infant who was still breastfeeding means that the suppressive effect of breastfeeding on ovulation is lost. This may lead to an earlier conception. However, many studies do not take into account whether the preceding child survived until the conception of the later child or whether the death of the previous child antedated the conception of

the subsequent child, a fact which is rather very difficult to assess (Gray, 1981:94-95; Pebley and Millman, 1986:72). Despite this, even if the older child survives, the risk of dying of the index child has been found to be negatively related to the length of the birth interval.

Another problem is that the length of the previous birth interval may also be associated with infant and child mortality in that a prematurely born baby is both more likely to die and inevitably born after a shorter interval than would have been the case if he or she was born after the normal gestation period. Unfortunately, most studies do not control for this factor because information on "gestational age at birth" are usually not available (Pebley and Millman, 1986:72).

Despite the above-mentioned methodological problems, it is well known that the time elapsed between the birth of a child and the end of the previous pregnancy influences infant and child mortality. The mortality risk may apply to both children, at each end of the birth interval, if the interval is very short. There are several ways in which child-spacing may affect the child's chances of survival.

Firstly, a longer subsequent birth interval allows for a longer period of breastfeeding of the previous child (Pebley and Millman, 1986:76). A child born after a very short interval when the previous child is still alive usually leads to an abrupt and premature weaning of the previous child. Weaning increases the risk of poor nutrition, ill health and death (Winikoff, 1980:114). Secondly, short birth or pregnancy intervals may increase

pregnancy complications because the mother's reproductive and nutritional resources are depleted. This usually results in low birth-weight babies (Kandeh, 1982:122). Thirdly, children of closely spaced intervals compete for scarce family resources like food and parental care. Having very young children of similar ages may not give the mother opportunity to give full attention to either of them (Rutstein, 1983:30; Pebley and Millman, 1986:76). Lastly, Pebley and Millman (1986:76) also suggest that close birth spacing is associated with higher mortality because infectious diseases may be easily transmitted among siblings of similar ages.

Kandeh (1982:131) found that children born after a short birth interval of less than twelve months had the highest mortality. This steadily declined as the length of the birth interval increased. Infant mortality was lowest for children born 37 months or more after the previous pregnancy. Rutstein (1983:35) found that children born less than two years after the previous birth were more likely to die even after surviving the first year of life. He also found that children born after intervals of four years or more were less likely to die than those born after the more normal intervals of two or three years.

For this study, birth interval refers to the time elapsed between two live births. It is therefore worth noting that the length of the birth interval can be affected by the omission of stillbirths or abortions as mentioned above. Ideally, the age at first marriage could have been used to obtain the birth interval for first

births. However, this was not done to avoid the effect of premarital births. Moreover, the effect of the interval between first marriage and first birth is not a matter of interest in this study. This is because most of the effects of the length of the birth interval discussed above do not seem to apply to the interval between first marriage and first birth. Therefore, the birth interval analysis is based on second and higher order births only. Furthermore, during the survey, children from multiple births were assigned consecutive birth orders and in the data set for this study, all multiple births were twins. Since the birth interval was calculated using the birth order, year of birth and month of birth, this meant that all 'second' twins would have had a birth interval of zero. To avoid this problem, birth intervals for all pairs of twins were excluded. However, their birth orders, years of birth and months of birth were used when calculating the birth intervals for births that occurred after them, if any.

Table 3.5 shows the probabilities that a child will die in infancy or childhood in relation to the length of the preceding birth interval as obtained from this study. It is very clear that both infant and child mortality is highest among children born within one year of the last live birth. The mortality then declines as the length of the birth interval increases, with the exception of child mortality where it increases for those born five years after the previous child. This may be an indication that whereas long birth intervals of say two to four years may be advantageous, very long birth intervals may not necessarily

Table 3.5 Infant and Child Mortality⁺⁺ by Length of Preceding Birth Interval

Birth Interval (Months)	Infant Mortality [*]	Child Mortality ^{**}
< 12	221 (113)	167 (66)
13-24	140 (1292)	124 (768)
25-36	117 (1734)	111 (1025)
37-48	87 (745)	107 (429)
49-60	85 (246)	64 (141)
61 +	74 (285)	88 (182)
Total	117 (4415)	112 (2611)

Notes: ⁺⁺ Refers to second and higher order births only.

For figures in parentheses, see Table 3.1

* Excludes 1442 first births and 91 pairs of twins Birth intervals were not calculated for 147 births because the month of birth was not stated for either the index or the preceding child.

** Excludes 884 first order children and 77 children from twin-births who had survived their first year of life. Birth intervals were not calculated for 83 children due to the reason stated in above.

Source: Malawi Family Formation Survey, 1984
(Southern Region Subset)

be due to a willingness to space births. As Rutstein points out, the effect of "longer than normal" birth intervals is not very clear. He says whereas the mother has had more time to prepare for the next child, both biologically or in terms of child care, very long birth intervals may be a result of health problems. These may include a desire to stop childbearing, so a child born after a very long birth interval may not necessarily be welcome (Rutstein, 1983:30-31). A linear regression indicated that the decline in infant mortality as the length of the birth interval increases is statistically significant at the 5 per cent level ($t=-4.2923$).

Table 3.6 shows the differences in infant and child mortality by birth interval and age of the mother at the child's birth. It is obvious from this table that children born less than two years after the previous live birth experience the highest mortality in infancy and childhood, regardless of the age of the mother. Furthermore, infants born less than two years after the previous birth and to women aged less than 20 years, experience a considerably higher mortality (188) than that of infants born after birth intervals of three years or more within the same age group of mother (128). On the other hand, infants born less than two years after the previous live birth to women aged 30 years and above, experience mortality more than three times (186) that of infants born after an interval of three to four years to women of a similar age (51).

Table 3.6 Infant and Child Mortality by Length of Preceding Birth Interval and Age of Mother at Birth of Child

Birth Interval (Months)	Infant Mortality			Child Mortality		
	Mother's age at Child's Birth			Mother's age at Child's Birth		
	<20	20-29	30+	<20	20-29	30+
<24	188 (170)	132 (697)	186 (338)	118 (110)	130 (438)	136 (162)
24-35	141 (198)	115 (1077)	106 (564)	138 (123)	102 (670)	113 (309)
36-47	128++ (86)	106 (464)	51 (273)	145++ (55)	116 (268)	96 (146)
48+		86 (289)	70 (259)		98 (183)	54 (147)
Total	156 (454)	115 (2527)	108 (1434)	132 (288)	112 (1559)	103 (764)

Notes: As in Table 3.5

++ Refers to birth interval 36 months and above

Source: Malawi Family Formation Survey, 1984
(Southern Region Subset)

The probability of dying in infancy then declines as the length of the birth interval increases. However, the rise in infant mortality for the birth interval of four years or more for births that occurred to women aged 30 years and above (70) is also striking. This may be related to Rutstein's suggestion (cited above) that long birth intervals for older women may not necessarily be due to a willingness to space births but could be because of health problems associated with childbearing.

On the contrary, the trend of child mortality across the mothers' age groups is not as clear as that of infant mortality. For children born when their mothers were aged less than 20 years, the probability of dying increases as the length of the birth interval increases. However, this pattern may not be conclusive because of the small number of cases in this age category. On the other hand, since the birth interval analysis is based on second and higher order births only, this implies that such parity levels are generally premature for this age of mother. Nevertheless, the rates for children born when their mothers were aged 20-29 years and 30 years or above seem to indicate that like infant mortality, child mortality declines as the birth interval increases. The probabilities also indicate that the advantage of birth intervals of three years or more for births that occur when the mother is aged 30 years or above is evident only if the child survived the first year of life (96, 54).

3.6 TYPE OF BIRTH

The risk of dying is also known to be associated with the type of birth. Multiple birth babies (twins, triplets and so on) have been found to have a higher mortality risk than singletons. This high risk among multiple births is generally associated with greater frequency of low birth-weight due to crowding or competition for nutrition in the womb. It is also associated with premature deliveries and complications during delivery (Federici and Terrenato, 1980:338). In his study of 29 countries, Rutstein (1983:34) found that on average, children from multiple births had more than four times the risk of dying during infancy. None of the 29 countries had an infant mortality of less than 150 per 1000 births for children of multiple births, only Sudan and four other countries had an infant mortality of less than 200 per 1000 live births. For toddler and child mortality, the excess of mortality for children from multiple births persisted but was less pronounced than that of infant mortality. In conclusion, Rutstein states that the excess of infant mortality for multiple births could be due to both biological factors and competition for food and care during infancy. On the other hand, he suggests that the mortality at ages over one year could mainly be due to competition. However, these differences were based on small numbers of cases. Only 1.8 percent of the children from the 29 countries were from multiple births.

Similarly, the data for this study indicated that multiple births are a rare event. Only about three per cent of the births were from multiple births and, as already

pointed out, all of them were twins. Similarly, of those children who survived the first year of life, only slightly over two per cent were from multiple births. However, despite this limitation, the differences in mortality are so large as to be compelling. Infant mortality is more than twice as high among twins as among singletons (see Table 3.7 below). Likewise, child mortality is higher among twins than among single-born babies. Despite this, the difference in child mortality between the two groups is not as great as that of infant mortality. This indicates that the chances of survival for twins increases greatly after they celebrate their first birthday.

Table 3.7 Infant and Child Mortality by Type of Birth

Type of Birth	Infant Mortality	Child Mortality
Single	124 (6004)	109 (3578)
Twin	280 (182)	130 (77)
Total	129 (6186)	109 (3655)

Notes: As in Table 3.1

Source: Malawi Family Formation Survey, 1984
(Southern Region Subset)

A Z-test of the difference between proportions showed that the difference in infant mortality between twins and singletons is statistically significant at the 5 per cent level ($Z=-6.1660$). However, the difference is not statistically significant for child mortality ($Z=-0.5850$).

CHAPTER 4

SOCIO-ECONOMIC DIFFERENTIALS IN INFANT AND CHILD MORTALITY

4.1 INTRODUCTION

This chapter presents infant and child mortality differences in terms of socio-economic factors. These include the mother's education, current residence, her current or last husband's education, some household characteristics and some health care factors. As already mentioned, a literature review is presented at the beginning of each section to provide a setting for the results of the study.

4.2 MOTHER'S EDUCATION

There is extensive evidence that maternal education plays a major role in determining the level of infant and child mortality. An increase in the level of maternal education leads to a decline in infant and child mortality. Caldwell (1979:409-410) found that among various socio-economic factors, maternal education was the only significant factor that influenced infant and child mortality in Nigeria. He suggested reasons why maternal education was important regardless of the father's characteristics. He said that educated mothers tend to be less 'fatalistic' about illness and adopt many alternatives in child care. They are more capable of approaching medical doctors than illiterate women. Therefore, they tend to use medical facilities more than illiterate women. He also suggested that educated women tend to look after their

children in their own way and are more likely to break off from traditional ways of child care.

Behm and Cochrane (1980, cited in United Nations, 1985:19) also found that child mortality in developing countries is more closely related to maternal education than to any other socio-economic variable. Caldwell and McDonald (1981), Farah and Preston (1982) and Rosenzweig and Schultz (1981), cited in United Nations (1985:20) also found that maternal education was significant even after controlling for income, husband's occupation and other socio-economic variables like housing structure and possession of consumer durables.

In Sierra Leone, mothers with no education had the most infant and child deaths while those with post-secondary education had the least infant and child deaths (Kandeh, 1982:162-165). Similar results were found for Kenya (Mott, 1982:16), for Tanzania (1973) and for Ghana (1960) (United Nations, 1982:108-109). Tawiah (1979:475) also reports similar findings for Ghana.

Table 4.1 gives the results of infant and child mortality by mother's education and age at the time of birth of the child as obtained from this study. From this table, it can be seen that infant mortality is highest among births that occur to women with no education and lowest for those with upper primary and above. Those that occurred to women with lower primary fall in between. This finding is true for all age at birth categories. In spite of this, being born to a mother with no education gets less risky in terms of infant mortality as the age of the mother increases.

Table 4.1 Infant and Child Mortality by Mother's Education and Age at Birth of Child

Mother's Education	Infant Mortality*				Child Mortality**			
	Mother's Age at Child's Birth				Mother's Age at Child's Birth			
	<20	20-29	30+	Total	<20	20-29	30+	Total
No Education	194 (723)	149 (1910)	123 (1114)	150 (3747)	135 (443)	125 (1182)	110 (617)	123 (2242)
Lower Primary	139 (373)	117 (729)	108 (351)	120 (1453)	137 (227)	109 (457)	98 (174)	114 (858)
Upper Primary +	95 (274)	45 (598)	61 (114)	61 (986)	55 (163)	41 (346)	44 (46)	45 (555)
Total	159 (1370)	123 (3237)	115 (1579)	129 (6186)	120 (833)	107 (1985)	104 (837)	109 (3655)

Notes: * For the Infant Mortality panel, the figures in parentheses are the number of live births in the respective categories for the period 1965-82

The probabilities of dying in infancy are per 1,000 live births in the respective categories

** For the Child Mortality panel, the figures in parentheses are the number of children who were born during the period 1965-78 and survived the first year of life

The probabilities of dying by age five are per 1,000 children who survived the first year of life

Lower Primary refers to Standard One to Standard Five

Upper Primary + refers to Standard Six and above

Source: Malawi Family Formation Survey, 1984
(Southern Region Subset)

This also applies to children born to mothers with lower primary education. In contrast, the risk of dying for infants whose mothers have upper primary and above follows a U-shape. It is lowest among births to women aged 20-29 years and higher for births to women aged less than 20 years and 30 years or above. Moreover, for age less than 20 years, the infant mortality is more than twice that for age 20-29 years. This implies that education plays a major role where the age of the mother and infant mortality are concerned. Moreover, there is a U-shaped relationship between the age of the mother at the child's birth and infant mortality in the category upper primary and above. However, this category has the smallest numbers.

Table 4.1 also shows that just like infant mortality, child mortality is inversely related to the education of the mother. It is highest among children whose mothers had no education and declines as the educational level rises. Moreover, child mortality is lowest among children of women aged 20-29 years with upper primary or higher education.

These results imply that for both infant and child mortality, mothers aged 20-29 years with at least upper primary school education experience less child loss than mothers who are under 20 years or 30 years or above of the same educational level. Another interesting fact to be noted is that higher infant and child mortality for children born to mothers aged less than 20 years is evident at all educational levels. Also, the decline in mortality across the education categories is less dramatic between the category 'No Education' and 'Lower Primary' but quite great

between the last two education categories. The overall infant mortality for lower primary is almost twice that for upper primary and above, while the child mortality for lower primary is almost three times that for upper primary and above. This agrees with most findings from other studies where the impact of having no education and having just a few years of primary schooling have been found to be almost equal when various comparisons are made. A Smirnov test indicated that both infant and child mortality are highly related with the mother's education ($X^2=36.1564$ for infant mortality and $X^2=14.2462$ for child mortality at the 5 per cent significance level).

4.3 FATHER'S EDUCATION

Apart from occupation, the father's education is regarded as an indicator of socio-economic status, income and living conditions of a family. It is therefore taken as a contributing factor to infant and child mortality. "Increased education of the father, if it raises purchasing power, may improve housing and sanitation facilities and the quality of food and clothing and enable parents to take better advantage of health care" (United Nations, 1985:57).

In Kenya and Lesotho, the child mortality ratio for fathers with one to three years of education was greater than that for fathers with no education. In Ghana, the ratio was greater for higher education groups. In Sierra Leone, the father's education was found to be positively related to child mortality (United Nations, 1985:59). Therefore, it seems the father's education does not contribute to a reduction in infant and child mortality in these countries.

On the other hand, it may be due to the fact that the current "father" is not necessarily the genitor of the child, or that the data on paternal education is less accurate.

Nevertheless, in other developing countries, it has been found that the two factors are inversely related. For example, Hogan and Jivan (1973, cited by United Nations, 1985:59) showed that paternal education in Tanzania had a significant effect on child mortality in the absence of other socio-economic factors.

This study attempted to examine the pattern of infant and child mortality by education of the mother's current or last husband (if widowed, divorced/separated), controlling for the mother's education. However, to speak of education of mother's husband is rather clumsy when in most cases these could be the children's fathers. Therefore, the term "father's education" has been used. The results are presented in Table 4.2. These results indicate that infant mortality is highest among children whose "fathers" have no education. This is followed by those who have lower primary and is lowest for fathers with upper primary or above. After controlling for mother's education, infant mortality is highest for children whose mothers have no education or who have lower primary and have husbands with no education. Within each education category of father, the infant mortality declines as the education of the mother increases. However, by taking the mother's education as the base and looking at the trend of mortality by education of father,

Table 4.2 Infant and Child Mortality Among Children of Ever-married Mothers by Father's Education and Mother's Education

Father's Education	Infant Mortality				Child Mortality			
	Mother's Education			Total	Mother's Education			Total
	No Education	Lower Primary	Upper Primary+		No Education	Lower Primary	Upper Primary+	
No Education	168 (1860)	168 (279)	41 (122)	161 (2261)	124 (1100)	180 (161)	68 (73)	128 (1334)
Lower Primary	137 (1098)	119 (536)	118 (102)	130 (1736)	128 (680)	115 (339)	61 (66)	120 (1085)
Upper Primary+	115 (660)	100 (618)	60 (719)	91 (1997)	113 (389)	83 (348)	40 (398)	78 (1135)
Total	149 (3618)	121 (1433)	64 (943)	129 (5994)	124 (2169)	114 (848)	46 (537)	110 (3554)

Notes: AS in Table 4.1

Father's Education refers to the education of the mother's current or last husband (if widowed, divorced or separated)

Father's Education 'Not Stated' = 107 cases for Infant Mortality and 71 cases for Child Mortality

Source: Malawi Family Formation Survey, 1984
(Southern Region Subset)

the decline in mortality as education of the father increases is applicable to the first two education categories only. For mothers with upper primary or above, the infant mortality is lowest for children whose fathers have no education. This is followed by those whose fathers have upper primary or above (60). The combination of mother with upper primary or above and father with lower primary seems to yield the highest infant mortality (118) in this category. This finding is inconsistent with the general expected trend.

The pattern of child mortality shown in Table 4.2 is similar to that of infant mortality in that mortality declines as the father's education increases, even after controlling for the mother's education. As expected, mortality is lowest where both parents have upper primary or above. Yet, it is not highest where both parents have no education. Within each category of father's education, the declining trend of mortality as the education of the mother increases is only true for fathers with at least some primary education. For fathers with no education, the mortality by education of mother follows an inverted U-shaped relationship. A Smirnov test indicated that the education of the father is significantly related to infant and child mortality at the 5 per cent significance level ($\chi^2=34.5351$ for infant mortality and $\chi^2=14.5627$ for child mortality).

The distribution of births by the mother's number of times married revealed that the majority of mothers married only once. However those that married twice or more also

constituted a considerable proportion. This may introduce error in the analysis because the inclusion of mothers who married more than once assumes that their husband (or last husband if currently widowed or divorced) was the father of the child. In connection to this, an attempt was made to determine whether different results would be obtained after selecting children of mothers who married once only. However, despite this another drawback still remains. This is that some of the births might have occurred before the mother got married and may not have been of the current husband. The results gave a similar finding, that infant or child mortality is highest among children whose "fathers" have no education. However, after controlling for mother's education, similar inconsistencies regarding the trend of infant mortality by father's education in relation to mother's education upper primary or above were observed. This inconsistency may not be realistic because of the small number of cases in the mother's education category upper primary and above (see Appendix 4).

4.4 MOTHER'S RESIDENCE

The literature on infant and child mortality in Africa indicates that to a large extent child mortality can be affected by the mother's place of birth or community in which she grew up. This contrast is usually made in terms of rural and urban areas. It is believed that mothers who grew up in rural areas are more likely to practice traditional methods of child care that may directly or indirectly influence their children's risk of dying. These include less frequent use of modern health facilities. On

the other hand, those who were brought up in urban areas are more likely to seek modern medical care. This relationship assumes that people who grew up in rural areas are less likely to be affected by changes in socio-economic status due to say, education, occupation or income (Kandeh, 1982:148).

In his study of Sierra Leone, Kandeh (1982:154) found that children of mothers who grew up in villages had higher infant mortality than those whose mothers grew up in urban areas. Farah and Preston (1982) also found that regional birth place differences were significantly related to infant and child mortality in Sudan. Further, they found that in Egypt, the child mortality rate was lower among persons born and living in urban areas than those born in villages (United Nations, 1985:112-113).

On the other hand, infant and child mortality has also been studied using the mother's place of current residence where data on mother's place of birth or childhood residence is not available. This has also been studied in terms of rural and urban residence. Mortality rates have been found to be higher in rural than in urban areas. This has been attributed to better educational facilities and knowledge of and access to health facilities which exist in most urban areas but are lacking in most rural areas. However, exceptions may occur where public health services are poor in major cities.

Data from various African countries like Algeria for 1969-71, Chad for 1963-64, and Liberia for 1970, to mention just a few, show higher infant mortality in rural than in

urban areas (ECA Population Division, 1979:385). In Ghana, all regions except three had higher rural infant deaths (Tawiah, 1979:473). Tabutin in 1976 (cited by Behm and Vallin, 1980:29) found that in Algeria, during 1969-70 the infant mortality rate was lowest in the metropolitan area as compared to other urban and rural areas.

Evidence from the Kenya Fertility Survey shows that infant mortality was higher among rural women than among urban women. This was true for both younger and older women regardless of their level of education (Mott, 1982:17-18). Gebretu in 1977 as cited by Gaisie (1979:452) found that in Ethiopia, the child mortality in urban areas was lower than in rural areas. However, conflicting evidence was found by Hogan and Jivan for Tanzania where mortality in the capital city Dar-es-Salaam was higher than in other urban areas (United Nations, 1985: 251). They explained this in terms of a higher completeness of death registration in the capital as compared to other urban areas.

The analysis by mother's residence in this study refers to the mother's current residence, that is, at the time of the survey. This assumes that the mother's residence was basically the same since the birth of the child and throughout his/her first five years of life. Table 4.3a shows infant and child mortality rates by rural/urban residence and mother's education. As expected, infant and child mortality levels are higher in rural than in urban areas and are highest among children whose mothers have no education. Moreover, within each residence category, mortality declines as the education of the mother increases.

Table 4.3a Infant and Child Mortality by Mother's Current Residence and Education

Mother's Residence	Infant Mortality				Child Mortality			
	Mother's Education				Mother's Education			
	No Education	Lower Primary	Upper Primary+	Total	No Education	Lower Primary	Upper Primary+	Total
Rural	152 (3236)	124 (1004)	82 (355)	141 (4595)	126 (1952)	123 (579)	76 (183)	122 (2714)
Urban	135 (511)	111 (449)	49 (631)	94 (1591)	103 (290)	97 (279)	30 (372)	72 (941)
Total	150 (3747)	120 (1453)	61 (986)	129 (6186)	123 (2242)	114 (858)	45 (555)	109 (3655)

Notes: As in Table 4.1

Source: Malawi Family Formation Survey, 1984
(Southern Region Subset)

Table 4.3b Infant and Child Mortality by Mother's Current Residence and Age at Birth of Child

Mother's Residence	Infant Mortality				Child Mortality			
	Mother's Age at Child's Birth				Mother's Age at Child's Birth			
	<20	20-29	30+	Total	<20	20-29	30+	Total
Rural	177 (988)	139 (2337)	116 (1270)	141 (4595)	130 (575)	123 (1443)	112 (696)	122 (2714)
Urban	113 (382)	81 (900)	110 (309)	94 (1591)	97 (258)	63 (542)	64 (141)	72 (941)
Total	159 (1376)	123 (3237)	115 (1579)	129 (6186)	120 (833)	107 (1985)	104 (837)	109 (3655)

Notes: As in Table 4.1

Source: Malawi Family Formation Survey, 1984
(Southern Region Subset)

The difference between 'No Education' and 'Upper Primary+' within each residence category is greater for infant mortality than for child mortality and also greater in urban areas than in rural areas. This is possibly because educated women are more likely to live in urban areas. A Z-test of the difference between proportions showed that there is a significant difference in infant and child mortality between rural and urban areas ($Z=4.9474$ for infant mortality and $Z=4.1322$ for child mortality).

Table 4.3b shows the results for infant and child mortality by mother's residence and age at birth of the child. As observed above, both infant and child mortality is higher in rural than in urban areas. Moreover, this relationship applies to all age groups. Teenage mothers continue to experience the highest infant and child mortality regardless of residence.

4.5 HOUSEHOLD CHARACTERISTICS

The characteristics of the dwelling place have long been seen as having an influence on infant and child mortality. This usually includes the type of water supply and lavatory facilities as well as the type of building materials used to construct the house. Harrington (1974) in her study of some West African societies, related the child's chance of survival to a series of factors which govern exposure to disease, including the type of dwelling unit (United Nations, 1985:237). In Sudan, a study of the determinants of child mortality showed that the type of dwelling unit had a significant influence on child mortality. Child mortality was high among people living in

houses made from mud (United Nations, 1985:238). In Sierra Leone, infant and child mortality rates increased as the quality of the dwelling structures decreased. This also applied to water supply and sewage disposal. However, in all cases the results were not statistically significant (Kandeh, 1982:169-174).

Housing conditions determine the incidence of infectious diseases which may in turn affect health. Moreover, the transmission of infectious disease in Africa through water supply and insanitary lavatory facilities contributes to the contamination of weaning foods (United Nations, 1985:237-238). All these factors tend to influence infant and child mortality.

This study has used the information from the 'Particulars of the Household' questionnaire (see Appendix 5b) to assess the impact of household facilities on infant and child survival. The problem associated with this kind of analysis is that the type of household facilities reported at the time of the survey may not have been necessarily the same as those at the time of the child's birth or childhood. However, it is assumed that if there is any effect due to such inconsistency, it may not be so large as to adversely affect the findings.

Table 4.4 shows the probabilities that a child will die in infancy or childhood by some household facilities and mother's education. Generally, the results indicate that within each household facility, infant and child mortality decreases as mother's education increases. Moreover, the difference in infant and child mortality is much greater

Table 4.4 Infant and Child Mortality by Selected Household Facilities and Education of Mother

Household Facility*	Infant Mortality				Child Mortality			
	Mother's Education				Mother's Education			
	No Education	Lower Primary	Upper Primary+	Total	No Education	Lower Primary	Upper Primary+	Total
Source of Drinking Water								
Piped	142 (990)	138 (537)	48 (632)	113 (2159)	115 (592)	107 (309)	35 (369)	90 (1270)
Other**	153 (2744)	110 (916)	85 (354)	137 (4014)	126 (1642)	118 (549)	64 (186)	120 (2377)
Total	150 (3734)	120 (1453)	61 (986)	129 (6173)	123 (2234)	114 (858)	45 (555)	109 (3647)
Toilet								
Flush	61 (49)	67 (89)	43 (375)	49 (513)	103 (29)	66 (61)	31 (227)	44 (317)
Pit Latrine	140 (2019)	119 (960)	75 (544)	124 (3523)	131 (241)	125 (568)	45 (289)	118 (2098)
None	165 (1666)	136 (404)	45 (67)	156 (2137)	113 (964)	100 (229)	128 (39)	111 (1232)
Total	150 (3734)	120 (1453)	61 (986)	129 (6173)	123 (2234)	114 (858)	45 (555)	109 (3647)
Radio in Working Condition								
Available	130 (570)	119 (444)	50 (621)	97 (1635)	66 (364)	105 (276)	31 (353)	64 (993)
Not Available	154 (3164)	121 (1009)	80 (365)	140 (4538)	134 (1870)	119 (582)	69 (202)	126 (2654)
Total	150 (3734)	120 (1453)	61 (986)	129 (6173)	123 (2234)	114 (858)	45 (555)	109 (3647)

Notes: As in Table 4.1

* 13 Cases for Infant Mortality and 8 cases for Child Mortality were 'Not Stated' in each of the three Household facility categories

** Includes Boreholes, Rivers, Springs, Lakes or Dams

Source: Malawi Family Formation Survey, 1984
(Southern Region Subset)

between Lower Primary and Upper Primary or above than between No Education and Lower Primary.

In relation to the source of drinking water, infant and child mortality is generally lower among children whose mothers' households use piped water than those that use water from other sources. However, an unexpected result was obtained for the infant mortality category 'Lower Primary' where mortality is higher in households using piped water than those using water from other sources.

Moreover, it is interesting to note that the drop in infant mortality from 'No Education' to 'Lower Primary' for piped water is very small (142 to 138) as compared to that for other sources (153 to 110). This dramatic drop for other sources of drinking water could have some implications for the Health Education Programme of which one of the elements is to encourage people to have safe drinking water by boiling to prevent water-borne infections. This could partly explain why for piped water the difference between 'No Education' and 'Lower Primary' is smaller. A Z-test showed that infant mortality is significantly lower in households that use piped water than in those that use other sources ($Z = -2.6966$ at the 5 per cent significance level). The difference in child mortality between the two categories is also statistically significant ($Z = -2.7778$).

The comparison based on toilet facilities is more a reflection of rural/urban residence. Despite this, it is shown that households with flush toilets have the lowest infant and child mortality. Moreover, on the whole, households with a pit latrine have lower infant mortality

(124) than households with none (156). The fact that infant mortality for upper primary and above is higher for households with a pit latrine (75) than for households with no toilet (45) may not be conclusive because of the small number of cases in the 'None' category.

However, with regard to child mortality, households with a pit latrine have higher mortality (118) than those with none (111). This pattern of higher child mortality for households with a pit latrine than for those without any may have some hygienic implications. Pit latrines can be a source of disease if they are not properly looked after. This can lead to contamination of weaning foods through flies, as mentioned earlier in this section. This explains why this pattern does not apply to infant mortality because during infancy the child is mostly breastfeeding and is therefore less affected by contaminated food. A Chi Square test applied to deaths and survivors of infancy and childhood respectively, confirmed that there is an association between the probability of dying in infancy or childhood and the type or availability of toilet facility ($\chi^2=43.9062$ for infant mortality and $\chi^2=15.8274$ for child mortality).

The results by possession of a radio in working condition indicate that households with a radio have lower infant and child mortality than those without a radio. By using this variable, it is assumed that the mothers in households with a radio in working condition are in a better position than those without a radio. This is because it is assumed that they are able to listen to some health related

programmes presented regularly on radio. These normally include items on the mother's role in taking care of the family, how mothers can take care of themselves during pregnancy, especially in terms of nutrition, and how they can look after themselves and the child after delivery. The immunisation schedule and their related or other diseases are also explained through such programmes. However, having a radio can also be taken as an indication of the socio-economic status of the household, which may also have implications for childrearing practices. A Z-test showed that both infant and child mortality are significantly higher in households without a radio in working condition than in those that have a radio. At the 5 per cent significance level, $Z=-4.5263$ for infant mortality and $Z=-5.2991$ for child mortality.

4.6 HEALTH CARE

There seems to be a relationship between maternal health care during pregnancy and infant mortality. For example, Srinivasa et al in 1976 found that perinatal mortality was six times higher and neonatal mortality was twice as high among children born to mothers with poor utilisation of medical services during pregnancy (Ramaiya and Kumar, 1977: 116).

The utilisation of health services is determined by several factors. Education is one of the factors that determines the use of the health care system. Duke (1982:103) found that there was a high level of knowledge and use of health facilities among people with high levels of formal education. Luft et al (1976, cited by Kean

1984:16) also found that education was related to the likelihood of getting a medical check. Income, which is related to education, may also determine the likelihood of using health care where some payment is required. Lack of transport, which is related to income, length of travel time, lack of certain services in an area and attitude towards health personnel can also influence decisions about where to go for medical help (Duke, 1982:105; Clarke 1973, cited by Kean, 1984:9). Anderson and Bartkus in 1973 found that lack of obstetrical and gynaecological services in an area led most females to seek help elsewhere (Kean, 1984:20).

The questions on health care used in this study were only asked in relation to children born from 1979 to the time of the survey in 1984 (See Appendix 5c). Because the study of infant mortality is based on births up to 1982 only, this means that these variables can only be studied using births for the period 1979-82. Because of the few years involved, the number of cases for these variables are very small. Hence, analysis by controlling for any demographic or socio-economic factor could not be done. There were only 1,902 births during the period 1979-82.

A breakdown of births by response to the questions on health care indicated that there were a lot of 'Not Stated' cases (see notes for Table 4.5). This problem is more serious with these variables than with any other variable because the number of cases is already very small.

Table 4.5 shows infant mortality results based on the health care variables. These results clearly indicate that

Table 4.5 Infant Mortality by Selected Health Care Factors *

Health Care Factor	Infant Mortality
Antenatal Care **	
Mother had Medical check During Pregnancy	78 (1578)
Mother did not have Medical check During Pregnancy	112 (285)
Total	83 (1863)
Place of Birth **	
Child born in hospital or clinic	68 (1213)
Child not born in hospital or clinic	112 (650)
Total	83 (1863)
Birth Attendant ***	
Traditional Birth Attendant	91 (55)
Other **	114 (589)
Total	112 (644)
Immunisation ****	
Child Vaccinated	42 (1667)
Child not vaccinated	435 (193)
Total	83 (1860)

Notes: * This table refers to births that occurred during the period 1979-82 only
For figures in parentheses, see Table 4.1

** 39 cases 'Not stated'

*** Refers to births that did not occur in hospital or clinic; 6 cases 'Not Stated'

** Includes member of family, somebody else or nobody

**** 42 cases 'Not Stated'

Source: Malawi Family Formation Survey, 1984
(Southern Region Subset)

having a medical check during pregnancy increases the child's chance of survival during the first year of life. As can be seen from the table, infants whose mothers did not have any medical check during pregnancy have higher infant mortality than those whose mothers did. However, from the question on medical check (see Appendix 5c) it is not known whether the mother had a health check throughout pregnancy or not. Possibly this explains why a Z-test indicated that the difference in infant mortality by whether the mother had a medical check during pregnancy or not is not statistically significant ($Z=-1.9209$).

The place of birth of the child seems to contribute to the survival of the child during infancy. Survival is higher among infants who were born in a hospital or clinic than among those who were not born in a hospital or clinic. This difference was found to be statistically significant at the 5 per cent level ($Z=-3.3333$).

For the births that did not occur in a hospital or clinic, an attempt was made to compare their survival by looking at whether their birth was attended by a Traditional Birth Attendant (TBA) or some other assistant. This was to see if the Ministry of Health TBA programme has had any impact. The results indicate that of all the babies that were not born in a hospital or clinic, those delivered by a TBA had lower infant mortality than those delivered by other people. However, there is a limitation to the interpretation of these results because the births attended by TBAs are much fewer as compared to the 'other' category. In relation to this factor, a Z-test showed that there is no significant

statistical relation between the survival of births attended by a TBA and those attended by other untrained people ($Z=-0.5169$).

Immunisation is another factor that contributes to the child's chances of survival. From the results, there seems to be a great difference in infant mortality between the infants who were immunised and those who were not immunised. Those who were not immunised experienced a mortality level more than ten times as great as that experienced by children who were immunised. As presented in Table 1.2, measles, one of the diseases that can be prevented by immunisation, is the leading cause of death among children aged 0-4 years. One may suggest that to some extent measles contributes to the observed difference in infant mortality between the infants who were immunised and those who were not immunised, as seen in Table 4.5. As expected, the difference in mortality between the children who were immunised and those who were not immunised is statistically significant ($Z=-18.7143$).

Nevertheless, even though the probability of dying in infancy for the infants who were not immunised is higher than that of those who were immunised, as anticipated, it is rather too high. This could be due to a truncation effect that arises because the immunisation schedule is associated with the infant's age. Since vaccinations are given progressively as the child grows and attains the required age for a particular type of immunisation, this could mean that some infants may have died before being immunised. The distribution of deaths by age at death in single months by

whether they were immunised or not supports this suggestion. About 60 per cent (50 out of 84) of deaths among infants who were not immunised occurred before they were aged one month. About 18 per cent occurred in the first month. The other 22 per cent occurred between the second and the twelfth month. On the other hand, for the infants who were reported to have had vaccinations, only about 9 per cent (6 out of 70) died before age one month. In addition, the distribution of deaths by age at death in single months seemed to be plausible. This explains why the infants who were not immunised have an abnormally higher infant mortality than those who were immunised. Therefore, it would be reasonable to conclude that most of the children who were not immunised were so because they died early rather than to suggest that they died because they were not immunised. Moreover, from the nature of the question on immunisation it is not possible to tell whether the infants who were reported to have had vaccinations received all the vaccinations under the EPI programme.

With the shortcomings associated with the questions on medical check of mother during pregnancy and immunisation of the infant, the results may not fully indicate the extent to which these factors influence infant mortality. Such limitations call for a cautious interpretation of the results.

CHAPTER 5

SUMMARY AND CONCLUSION

Using the 1984 Malawi Family Formation Survey data, this study has attempted to examine infant and child mortality differentials in the Southern Region of Malawi. Given the homogeneous nature of the country, it is likely that the results give some insight into infant and child mortality differentials in Malawi as a whole.

Using children as the unit of analysis to obtain probabilities of dying in infancy or childhood, the study has revealed that there are differences in infant and child mortality by various demographic and socio-economic factors. Various statistical tests were applied to test the significance of the results by the various variables whenever appropriate.

In Chapter Three, the age of the mother at the child's birth is shown to be related to infant and child mortality in the Southern Region of Malawi. Both infant and child mortality are highest among births that occur when their mothers are aged less than 20 years. This conforms to findings of other African studies. Unexpectedly, the study does not indicate that infant and child mortality are higher for children born when their mothers are aged 35 years or above. This is attributed to reporting errors among older women.

Infant mortality is higher for males than for females as expected. This relationship is then reversed for child

mortality. However, both findings are not statistically significant.

Unlike other African studies, the analysis by birth order does not show any consistent pattern for child mortality although infant mortality generally follows the pattern found in other studies. It was found to be highest among first order births, then declines and is lowest for third and fourth order births before increasing again as the birth order increases. The high mortality of first and high order births is related to the age of the mother at the child's birth, and birth-spacing as explained in more detail in Chapter Three. In addition, the study has also shown that infant and child mortality are generally highest among mothers aged less than 20 years at the birth of their children, regardless of birth order. However, the study does not show that for the same birth order, infant and child mortality increases as the age of the mother increases. Instead, there is a declining trend. It has also been found that first and second order births together experience the highest infant and child mortality among women aged 30 years or above.

Both infant and child mortality are highest for children born within one year of the previous birth. The mortality risk then declines as the birth interval increases. These results are statistically significant and consistent with findings from other studies. This study goes further by indicating that for each length of birth interval, infant mortality is highest among teenagers. These findings have implications for the child-spacing programme

mentioned in Chapter One. Since the main objective of the programme is to encourage mothers to widely space births so as to improve the health of both the mother and the child, these results clearly support this cause. Birth intervals of two or more years can help reduce the levels of infant and child mortality. It is interesting to note that anthropological studies show that the concept of child-spacing already exists in Malawi. This is particularly with regard to traditional methods, for example, among the Yao, the husband and wife were expected to abstain from sexual relations until a special ritual intercourse was performed when the child was about four or five months to "immunise" him/her against the dangers of sexual activity. Moreover, another child was not to be born while the other child was still breastfeeding (for about 2 years) (Tew, 1950:19). Among the Tumbuka, sexual relations were not resumed until the child had been weaned at about two years of age (Tew, 1950:63). Similar traditional practices and related taboos also exist among the other ethnic groups in Malawi. In addition, Nowa (1986:67-68), using data for Mzimba district in Malawi found that among currently married women who were aware of a birth-spacing method, most of them knew of abstinence. And among the women who reported using a method of child-spacing, 50 per cent of them practiced abstinence. He also found that knowledge and use of modern methods like the pill and IUD were very low. Similar data on the national level also indicate that most women know or use traditional methods or abstinence as methods of child-spacing (NSO, 1987:10). These findings serve as a basis for the child-

spacing programme. An appreciation of the traditional methods whether reliable or not may help to put across the major objective of the programme which is still in its early stages. A link between the traditional and modern methods is necessary to dispel rumours which may arise due to lack of understanding of the major objective of the programme. This will in turn lead to a high receptivity. Even though there are indications that the actual spacing of births among women of various ages is between two to three years (NSO,1987:13), the results of this study call for a recognition of the adverse effect that birth intervals of less than 2 years have on the child's chances of survival.

The analysis by type of birth indicates that both infant and child mortality are higher among twins than among singletons. However, this difference is significant for infant mortality only. This finding seems to confirm the fact that the high mortality of twins during infancy is mainly due to biological factors, as other researchers have suggested.

In terms of the socio-economic factors examined in Chapter Four, the study shows that there are differences in infant and child mortality by mother's education and current residence, "father's" education, household facilities and health care variables.

Like other studies, this study has shown that infant and child mortality are inversely related to the mother's education. This is so regardless of the age of the mother at the child's birth. The analysis by education of the mother's current or last husband (if widowed, divorced/separated)

controlling for mother's education also shows that infant and child mortality are negatively related to the "father's" education. This finding is contrary to the findings of other African studies mentioned in Chapter Four, except that for Tanzania. The findings regarding mother's education and "father's" education are statistically significant for both infant and child mortality. This implies that with resources available, mass education can help reduce infant and child mortality.

Differences in infant and child mortality have also been observed according to the mother's residence at the time of the survey. Mortality is higher in rural than in urban areas as expected, and this applies to all mother's age groups and educational levels. This finding might be due to factors including sanitation, water supply, and unequal distribution of health facilities between rural and urban areas. Considering that about 90 per cent of the population of Malawi live in rural areas, improvements in the above areas through health education and appropriate development plans (as are already underway) can help reduce the level of infant and child mortality in rural areas. This may in turn reduce the overall infant and child mortality.

An examination of differences in infant and child mortality by household facilities also gave useful results. Children in households that used piped water experienced a lower infant and child mortality than those in households that used other sources. However, unlike the study of Sierra Leone conducted by Kandeh mentioned in Chapter Four, these results were statistically significant. This finding

emphasises the importance of safe drinking water and calls for a continued improvement and expansion of the water supply system, especially in rural areas. Moreover, continued health education about the importance of boiling drinking water where safe drinking water is not available is also an important factor.

As expected, infant and child mortality was lowest in households that used flush toilets. This comparison based on toilet facilities is a reflection of rural-urban residence in that flush toilets are mainly a characteristic of urban areas. The difference between households with a pit latrine and those with none is particularly striking. Generally, households with a pit latrine had lower infant mortality than households with none. However, with regard to child mortality, the opposite was observed. This was taken as having some hygienic implications in that pit latrines that are not properly cared for can be a source of disease. This can occur through contamination of weaning foods through flies. It was confirmed that the association between the probability of dying in infancy or childhood and the type or availability of toilet facility is statistically significant.

Ownership of a radio in working condition was found to be associated with lower infant and child mortality and this is statistically significant. The mechanism through which this variable operates to affect infant and child mortality is very difficult to assess. However, it is likely that having a radio may to some extent indicate the socio-economic status of the household. It is also assumed that

having a radio helps the mother to learn more about modern methods of childrearing through radio health programmes.

Lastly, an attempt to look at child survival by some health care variables was not detailed because these variables only apply to births that occurred up to five years before the survey, which meant that the number of cases was very small. The results do not indicate that infant mortality is significantly lower among births that occurred to mothers who had a medical check during pregnancy than among mothers who did not have a medical check. This has been attributed to the nature of the question on which this analysis was based. There is a significant difference in survival between children born in a hospital or clinic and those not born in a hospital or clinic. This emphasises the importance of health centre delivery as opposed to home delivery.

Of those births that did not occur in a hospital or clinic, there was no significant difference in survival between births that were delivered by trained TBAs and those delivered by other people. This unexpected finding was attributed to the small number of births delivered by TBAs. Lastly, infant mortality was found to be significantly higher among children who were not immunised than among those who were immunised. However, the difference between the two categories was abnormally high. This finding is explained in terms of the nature of the question in that it was not possible to assess whether those children who were immunised were actually fully immunised. It was also found

that a large proportion of the deceased children who were not immunised died by age one month.

As there have been no previous detailed studies on infant and child mortality differentials in Malawi, it is hoped that the findings of this study will encourage further research, especially by extending this analysis to the remaining two regions to obtain a national coverage. Application of proper life-table methodology may be useful. However, a further analysis may concentrate on the most recent births. It is also hoped that some of the findings of this study and the suggested national analysis will support or encourage formulation of some government policies. The examination of infant and child mortality differentials by the various demographic and socio-economic factors using data for the whole country would also help to overcome the uncertainty encountered in drawing conclusions regarding some of the findings which were based on small numbers of cases in the present study.

REFERENCES

- ARMAGNAC, C and A. RETEL-LAURENTIN
1981 "Relations between Fertility, Birth Interval, Foetal Mortality and Maternal Health in Upper Volta", Population Studies, Vol.35, No.2, (December), pp.217-234.
- AWUSABO-ASARE, Kofi
1980 "Estimating Fertility and Childhood Mortality for the Western region of Ghana from Pregnancy History Data", Unpublished M.A Thesis, Canberra: Australian National University.
- BEHM, H. and J.VALLIN
1980 "Mortality Differentials Among Human Groups" in Biological and Social Aspects of Mortality and the Length of Life, Proceedings of a Seminar at Fiuggi, Italy, May 13-16, 1980, ed. S.H. Preston, pp.11-37. Liege: International Union for the Scientific Study of Population.
- CALDWELL, J.C.
1979 "Education as a Factor in Mortality Decline: An Examination of Nigerian Data", Population Studies, Vol.33, No.3 (November), pp.395-413.
- DAKA, O.M
1983 "A Comparative Study of Infant and Child Mortality in Zambia, Lesotho, Swaziland and Botswana" Unpublished Diploma Seminar Paper, Legon: Regional Institute for Population Studies, University of Ghana.
- DUKE, J.P.
1982 A Model to Determine Low-Income Consumer Knowledge and Use of the Health Care System for Planning an Extension Education Programme, Ph.D. Thesis, Degree Date: 1974. Michigan: University Microfilms International.

ECA POPULATION DIVISION

- 1979 "Correlational Variations in the Determinants of Death and Infant Mortality Rates in Africa", Population Dynamics: Fertility and Mortality in Africa, Proceedings of the Expert Group meeting on Fertility and Mortality Levels and trends in Africa and their Implications, Monrovia, Liberia, 26th November-1st December, 1979; United Nations Economic Commission for Africa: Population Division, (ST/ECA/SER.A/1), pp. 380-393.
- FEDERICI, N and L.TERRENATO
1980 "Biological Determinants of Early Life Mortality", Biological and Social Aspects of Mortality and the Length of Life, Proceedings of a Seminar at Fiuggi, Italy, May 13-16, 1980, ed. S.H. Preston, pp. 331-361. Liege: International Union for the Scientific Study of Population.
- FLEGG, A.T.
1982 "Inequality of Income, Illiteracy and Medical Care as Determinants of Infant and Child Mortality in Underdeveloped Countries" Population Studies, Vol.36, No.3, (November), pp.441-458.
- GAISIE, S.K.
1979 "Mortality, Socio-Economic Differentials and Modernization in Africa", Population Dynamics: Fertility and Mortality in Africa, Proceedings of the Expert Group meeting on Fertility and Mortality Levels and Trends in Africa and their Implications, Monrovia, Liberia, 26th November-1st December, 1979; United Nations Economic Commission for Africa: Population Division, (ST/ECA/SER.A/1), pp.441-463.
- GRAY, R.H.
1981 "Birth Intervals, Postpartum Sexual Abstinence and Child Health", Childspacing in Tropical Africa: Traditions and Change, eds. Hilary J. Page and Ron Lesthaeghe, pp.93-109. London: Academic Press.
- HOBBCRAFT, J.N., J.W. MCDONALD and S.O RUTSTEIN
1984 "Socio-Economic Factors in Infant and Child Mortality: A Cross-National Comparison", Population Studies, Vol.38, No.2 (July), pp.193-223.

- JAIN, S.K.
1982 "Mortality in Ghana: Evidence from the Cape Coast Project", Population Studies, Vol.36, No.2, (July), pp.271-289.
- KANDEH, H.B.S.
1982 Infant and Child Mortality in Sierra Leone, Ph. D Thesis, Degree Date: 1979, London: University Microfilms International.
- KEAN, W.L.
1984 Patterns of Medical Care Utilization: Childbirth in Three Texas Towns, Ph.D. Thesis, Degree Date: 1980, London: University Microfilms International.
- LOPEZ, Alan D. and Lado T.RUZICKA (Eds)
1983 Sex Differentials in Mortality: Trends, Determinants and Consequences, A Selection of Papers Presented at the ANU/UN/WHO meeting held in Canberra (Australia), 1-7 December, 1981. Miscellaneous Series No. 4, Department of Demography, Australian National University, Canberra.
- MINISTRY OF HEALTH
1981 "Report of Workshop on Health and the Family" held at Grand Beach Hotel, Salima, 25th-27th August, 1981, Lilongwe.
- MINISTRY OF HEALTH
1986 The National Health Plan of Malawi: 1986-1995
Lilongwe.
- MOTT, F.L.
1982 "Infant Mortality in Kenya: Evidence from the Kenya Fertility Survey" WFS Scientific Reports, No. 32, (August), Voorburg, Netherlands: International Statistical Institute.
- NATIONAL STATISTICAL OFFICE
1984a Malawi Population Census 1977: Analytical Report, Volume I, Zomba.
- NATIONAL STATISTICAL OFFICE
1984b Malawi Population Census 1977: Analytical Report, Volume II, Zomba.

NATIONAL STATISTICAL OFFICE
1985 Malawi in Figures 1985, Zomba.

NATIONAL STATISTICAL OFFICE
1987 Malawi Family Formation Survey 1984, Zomba.

NOWA, J.H.
1986 "Fertility and the Use of Birthspacing Methods in Malawi: An Exploratory Study of Mzimba District", Unpublished M.A Thesis, Canberra: Australian National University.

OHADIKE, Patrick O.
1983 "Evolving Indications of Mortality Differentials by Sex in Africa", Sex Differentials in Mortality: Trends, Determinants and Consequences, A Selection of Papers presented at the ANU/UN/WHO meeting held in Canberra (Australia), 1-7 December, 1981; eds. Alan D.Lopez and Lado T.Ruzicka, pp.33-52. Miscellaneous Series, No. 4, Department of Demography, Australian National University, Canberra.

OLUSANYA, P.O.
1979 "Evidence for the Variation and Decline of Mortality in Nigeria", Population Dynamics: Fertility and Mortality in Africa, Proceedings of the Expert Group meeting on Fertility and Mortality Levels and trends in Africa and their Implications, Monrovia, Liberia, 26th November - 1st December, 1979; United Nations Economic Commission for Africa: Population Division, (ST/ECA/SER.A/1), pp.394-421.

ORUBULOYE, I.O and J.C. CALDWELL
1975 "The Impact of Public Health Services on Mortality: A Study of Mortality Differentials in a Rural Area of Nigeria" Population Studies, Vol.29. No.2, (July), pp.259-272.

PEBLEY, Anne R. and Sara MILLMAN
1986 "Birthspacing and Child Survival", International Family Planning Perspectives, Vol.12, No.3, (September), pp.71-79.

- RAMAIYA, Kamini and R. KUMAR
1977 Abstracts of Selected Research Studies in Child Health and Nutrition: Part II of Review of Research in Child Health and Nutrition, T.I.S.S Series No.40. Bombay: Unit for Child and Youth Research, Tata Institute of Social Sciences.
- RUTSTEIN, S.O.
1983 "Infant and Child Mortality: Levels, Trends and Demographic Differentials", WFS Comparative Studies, No. 24, (September), Voorburg, Netherlands: International Statistical Institute.
- TAWIAH, E.O.
1979 "Some Demographic and Social Differentials in Infant and Early Childhood Mortality in Ghana", Population Dynamics: Fertility and Mortality in Africa, Proceedings of the Expert Group meeting on Fertility and Mortality Levels and Trends in Africa and their implications, Monrovia, Liberia, 26th November-1st December, 1979; United Nations Economic Commission for Africa: Population Division, (ST/ECA/SER.A/1), pp.464-487.
- TEW, Mary
1950 Peoples of the Lake Nyasa Region, London: Oxford University Press.
- TIMAEUS, Ian and K. BALASUBRAMANIAN
1984 "Evaluation of the Lesotho Fertility Survey 1977" WFS Scientific Reports, No.58, (August), Voorburg, Netherlands: International Statistical Institute.
- UNITED NATIONS
1982 Levels and Trends of Mortality Since 1950, A Joint Study of UN and WHO, (ST/ESA/SER.A/74). New York: Department of International Economic and Social Affairs.

UNITED NATIONS POPULATION DIVISION

1983 "Patterns of Sex Differentials in Mortality in Less Developed Countries", Sex Differentials in Mortality: Trends, Determinants and Consequences, A Selection of Papers presented at the ANU/UN/WHO meeting held in Canberra (Australia), 1-7 December, 1981; eds. Alan D. Lopez and Lado T. Ruzicka, pp. 7-32. Miscellaneous Series, No. 4, Department of Demography, Australian National University, Canberra.

UNITED NATIONS

1984 Concise Report on the World Population Situation in 1983: Conditions, Trends, Prospects, Policies, (ST/ESA/SER.A/85), New York: Department of International Economic and Social Affairs

UNITED NATIONS

1985 Socio-Economic Differentials in Child Mortality in Developing Countries, (ST/ESA/SER.A/97) New York: Department of International Economic and Social Affairs.

UNITED NATIONS

1986 1983/84 Statistical Yearbook, Thirty-Fourth Issue, New York: Department of International Economic and Social Affairs

WALDRON, Ingrid.

1983 "The Role of Genetic and Biological Factors in Sex Differentials in Mortality", Sex Differentials in Mortality: Trends Determinants and Consequences, A Selection of Papers presented at the ANU/UN/WHO meeting held in Canberra (Australia), 1-7 December, 1981; eds. Alan D. Lopez and Lado T. Ruzicka; pp. 141-164. Miscellaneous Series, No. 4, Department of Demography, Australian National University, Canberra.

WINIKOFF, B.

1980 "Weaning: Nutrition, Morbidity and Mortality Consequences", Biological and Social Aspects of Mortality and the Length of Life, Proceedings of a Seminar at Fiuggi, Italy, May 13-16, 1980, ed. S.H. Preston, pp. 113-150. Liege: International Union for the Scientific Study of Population.

WORLD FERTILITY SURVEY

1983 The Cameroon Fertility Survey, 1978: A Summary
of Findings, No. 41, (October), London.

WORLD FERTILITY SURVEY

1984 The Nigerian Fertility Survey, 1981-82: A
Summary of Findings, No. 49, (September),
London.

Appendix 1 Distribution of Births by Year of Birth, 1948-84

Year of Birth	Number of Births	Year of Birth	Number of Births
1948	1	1967	200
1949	2	1968	220
1950	3	1969	238
1951	7	1970	266
1952	10	1971	290
1953	16	1972	299
1954	19	1973	336
1955	29	1974	352
1956	36	1975	379
1957	37	1976	444
1958	60	1977	427
1959	64	1978	504
1960	94	1979	414
1961	85	1980	496
1962	104	1981	494
1963	121	1982	499
1964	156	1983	576
1965	153	1984	237
1966	188	Total	7856

Source: Malawi Family Formation Survey, 1984
(Southern Region Subset)

Appendix 2 Distribution of Births by Current
Age of Mother, 1965-82

Current Age of Mother	Number of Births
15	4
16	3
17	14
18	17
19	33
20	91
21	105
22	143
23	105
24	168
25	145
26	234
27	185
28	357
29	260
30	285
31	219
32	322
33	213
34	302
35	443
36	317
37	245
38	275
39	229
40	156
41	203
42	178
43	135
44	161
45	166
46	135
47	102
48	140
49	96
<hr/>	
Total	6186

Source: Malawi Family Formation Survey, 1984
(Southern Region Subset)

Appendix 3 Distribution of Deceased Children by Age at Death, 1965-82

Age at Death (Months)	Number of Deaths	Age at Death (Months)	Number of Deaths
0	312	31	2
1	74	32	0
2	30	33	2
3	27	34	3
4	25	35	1
5	31	36	87
6	44	37	5
7	28	38	7
8	29	39	2
9	34	40	3
10	16	41	1
11	9	42	5
12	138	43	4
13	15	44	1
14	11	45	1
15	24	46	2
16	9	47	0
17	12	48	50
18	45	49	2
19	7	50	3
20	12	51	5
21	5	52	2
22	3	53	2
23	4	54	0
24	114	55	2
25	5	56	1
26	6	57	0
27	5	58	0
28	5	59	1
29	2	60	16
30	9	61	1

Source: Malawi Family Formation Survey, 1984
(Southern Region Subset)

APPENDIX 4 Infant and Child Mortality Among Children Whose Mothers Married only Once by Father's Education and Mother's Education

Father's Education	Infant Mortality				Child Mortality			
	Mother's Education			Total	Mother's Education			Total
	No Education	Lower Primary	Upper Primary+		No Education	Lower Primary	Upper Primary+	
No Education	162 (944)	188 (122)	45 (89)	156 (1155)	109 (531)	161 (62)	40 (50)	109 (643)
Lower Primary	120 (617)	111 (306)	126 (79)	118 (1002)	97 (380)	128 (188)	59 (51)	103 (619)
Upper Primary+	106 (434)	77 (404)	57 (541)	78 (1379)	90 (254)	73 (233)	41 (294)	66 (781)
Total	137 (1995)	106 (832)	63 (709)	115 (3536)	101 (1165)	106 (483)	43 (395)	91 (2043)

Notes: As in Table 4.1

Father's Education refers to the education of the mother's current or last husband (if widowed, separated or divorced)

Father's Education 'Not Stated' = 23 cases for Infant Mortality and 12 cases for Child Mortality

Source: Malawi Family Formation Survey, 1984
(Southern Region Subset)

APPENDIX 5:
EXTRACTS FROM
THE MALAWI FAMILY FORMATION SURVEY
QUESTIONNAIRES

Appendix 5a

PART C: BIRTH HISTORY

EXPERIMENTER: RECORD DETAILS OF EACH LIVE BORN CHILD IN THE TABLE BELOW AGAINST CORRESPONDING YEAR OF BIRTH FOR THE CHILD, STARTING WITH THE LAST LIVE BIRTH. PROCEED TO RECORD DETAILS OF OTHER PRECEDING LIVE BIRTHS, YEAR BY YEAR, SETS RESPECTIVELY.

BIRTH YEARS ORDER ASD	YEAR BORN	NAME OF THE CHILD	SEX M = 1 F = 2	MONTH OF BIRTH	SURVIVAL OF CHILD Alive = 1 Dead = 2	IF DEAD, AGE AT DEATH	
						YEARS	MONTHS
39-40	41-42		43	144-45	46	47-49	49-50
	1964						
	1963						
	1962						
	1961						
	1960						
	1959						
	1958						
	1957						
	1956						
	1955						
	1954						
	1953						
	1952						
	1951						
	1950						
	1949						
	1948						
	1947						
	1946						
	1945						

BIRTH YEARS ORDER ASD	YEAR BORN	NAME OF THE CHILD	SEX M = 1 F = 2	MONTH OF BIRTH	SURVIVAL OF CHILD Alive = 1 Dead = 2	IF DEAD, AGE AT DEATH	
						YEARS	MONTHS
39-40	41-42		33	144-45	46	37-49	49-50
	1964						
	1963						
	1962						
	1961						
	1960						
	1959						
	1958						
	1957						
	1956						
	1955						
	1954						
	1953						
	1952						
	1951						
	1950						
	1949						
	1948						
	1947						
	1946						
	1945						

EXPERIMENTER: CHECK IN I.5, PART 8 FOR TOTAL NUMBER OF CHILDREN EVER BORN ALIVE TO THE WOMAN DURING HER WHOLE LIFETIME. ENSURE THAT ALL BIRTHS HAVE BEEN RECORDED ABOVE.

Appendix 5b

PART E: HOUSEHOLD FACILITIES

1.	
WHAT IS YOUR MAIN SOURCE OF DRINKING WATER?	
Piped inside DU = 1	
Piped outside DU = 2	
Borehole = 3	
Well = 4	
River/Spring = 5	<input type="checkbox"/> 46
Lake/Dam = 6	
2.	
WHAT TOILET FACILITIES DO YOU HAVE?	
Flush toilet = 1	
Pit Latrine = 2	
Bucket Latrine = 3	<input type="checkbox"/> 47
None = 4	
3.	
IS THERE A RADIO IN WORKING CONDITION IN THE HOUSEHOLD?	
Yes = 1	<input type="checkbox"/> 48
No = 2	

Health Care Variables

PART D: DETAILS ABOUT LAST BIRTH WHICH OCCURRED IN 1979 OR MORE RECENTLY

2.1 ENUMERATOR: CHECK IN BIRTH HISTORY: PART C. IF NO LIVE BIRTH IN 1979 OR MORE RECENTLY, GO TO 7.2, PART F. OTHERWISE RECORD THE NAME OF THE LAST BORN CHILD AND THE SURVIVAL STATUS: NAME: _____ ALIVE = 1/DEAD = 2 <input type="checkbox"/>		
2.2 When you were pregnant with(name), did you go to any clinic, etc., for a medical check?	YES = 1 NO = 2	51
2.3 Was the child born in a hospital or a clinic? ENUMERATOR: IF YES, GO TO 2.5	YES = 1 NO = 2	52
2.4 Were you attended by a traditional birth attendant, a member of the family, somebody else or nobody?	Traditional birth attendant = 1 Member of the family = 2 Somebody else = 3 Nobody = 4	53
2.5 After the child(name) was born, did you go to any clinic, etc., for a medical check on your health?	YES = 1 NO = 2	54
2.6 Has the child been given any vaccinations/immoculations by a nurse or a doctor to prevent illness?	YES = 1 NO = 2	55

PART E: DETAILS ABOUT OTHER BIRTHS IN 1979 OR MORE RECENTLY

5.1 ENUMERATOR: CHECK IN BIRTH HISTORY: PART C, AND ENTER DETAILS OF ALL BIRTHS (EXCEPT LAST BIRTH) THAT OCCURRED IN 1979 OR MORE RECENTLY.				
ENUMERATOR: RECORD THE FOLLOWING INFORMATION FOR EACH BIRTH AS INDICATED IN THE HEADINGS	LAST BUT ONE BIRTH	SECOND FROM LAST BIRTH	THIRD FROM LAST BIRTH	FOURTH FROM LAST BIRTH
5.2 ENTER THE NAME OF THE CHILD →				
5.3 ENTER THE SURVIVAL STATUS ALIVE = 1 DEAD = 2				
5.4 When you were pregnant with(name), did you go to any clinic, etc., for a medical check? YES = 1 NO = 2				
5.5 Was(name) born in a hospital or a clinic? ENUMERATOR: IF YES, GO TO 5.7 YES = 1 NO = 2				
5.6 Were you attended by a traditional birth attendant, a member of the family, somebody else, nobody? = 1 = 2 = 3 = 4				
5.7 After(name) was born, did you go to any clinic, etc., for a medical check on your health? YES = 1 NO = 2				
5.8 Has (name) been given any vaccinations/immoculations by a nurse or a doctor to prevent illness? YES = 1 NO = 2				

87-90

91-94

95-98

99-102

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