

UNIVERSITY OF NATAL


**LEVELS OF MORTALITY AND SOCIOECONOMIC
DIFFERENTIALS IN CHILD MORTALITY IN LESOTHO**

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**Submitted in Partial Fulfilment of the Requirements for the Masters
Degree in Population Studies, University of Natal Durban**

Declaration

I declare that this is my own unaided work except for acknowledged supervision and referenced citation. It has not been submitted previously for a degree at any university.

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Acceptance

This dissertation has been examined and accepted as meeting the requirements for the partial fulfillment of the Masters Degree in Population Studies.

Signed

**Prof. Akim Mturi
(Supervisor)**

Date

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Abstract

The main purpose of this study was two fold: to estimate mortality levels and to investigate socio-economic differentials in child mortality. Brass Indirect Techniques were used to estimate both child and adult mortality based on the 2001 Lesotho Demographic Survey. National estimates gave an IMR of 76 deaths per 1000 live births and a CMR of 30 deaths per 1000 live births. On the other hand, while the 1996 Lesotho Population Census showed life expectancy at birth as 59.5 years, the 2001 Survey gave an estimate of 55.4 years.

Generally speaking, males are more prone to death in Lesotho than females. Infant mortality rate is estimated to be 69 deaths per 1000 live births for females and 84 deaths per 1000 live births for males. Results on child mortality further emphasised that male children are indeed at the risk of death than female children in Lesotho, estimated at 34 and 26 deaths per 1000 survivors at age 1 but dying before age 5 respectively. On the other hand, there is a strikingly huge gap between male and female adult mortality levels. Although, this study did not cover the details of why this might be the case, this difference might be a reflection of the impact of HIV/AIDS epidemic. The life expectancy at age 20 was estimated as 38.1 years for males and 48.7 years for females. On the other hand, the 2001 life expectancy at birth has been estimated as 56.7 years for females and 54.1 years for males. The difference between the life expectancy at birth for males and females is not huge, but this does not rule out evidence that longevity in Lesotho has declined and mortality still remains high.

Analysis of differentials reveals that there exist socio-economic disparities measured using maternal variables. As was expected, there is an inverse relationship between improved education of the mother, housing, and sanitation and child mortality within households in Lesotho. Children residing in urban areas are better off in Lesotho compared with children residing in the rural areas. But, contrary to our expectation children that are raised in female-headed households that were assumed to be poor were found to be experiencing lower risks of dying when compared with children in male-headed households.

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CHAPTER 1

INTRODUCTION

1.1 Overview of the Area of Study

Lesotho is a small mountainous country covering an area of 30,355 square kilometres. This country is situated between 5,000 and 11,425 feet above sea level and entirely surrounded by the Republic of South Africa. According to the 1996 Lesotho Population Census the population of Lesotho was estimated as approximately 2.5 million. The Kingdom of Lesotho is comprised of four ecological zones namely, the Lowlands, the Highlands, the Foothills and the Senqu (Orange) River Valley.

The country is free from tropical diseases due to high altitude and a temperate climate, however like other Sub Saharan African countries she has recently been experiencing alarming HIV/AIDS related incidences (Grdanicki and Hall, 1999). BOS (1996a) concluded that, generally speaking, the level of mortality in Lesotho still remains high regardless of efforts being made to reduce it with males more prone to death than their female counterparts. Life expectancy at birth was estimated as 58.6 years for males and 60.2 for females.

1.2 Background of the Study

Since children are the future generation, it has been argued that they should be given higher priority for their survival, stability and advancement of all nations. Child survival and development are usually influenced by the status and role of women from infancy throughout adolescence (UNICEF, 2000). These, therefore make the status of women in a household and community a primary factor as far as child morbidity and mortality are concerned.

Among the major goals of the 1990 World Summit for Children and other international conferences such as the International Conference on Population and Development (ICPD) held in Cairo 1994 were: reduction of malnutrition and mortality among under 5 years old children to one half and one third of 1990 levels respectively; universal access to safe drinking water and to sanitary means of excreta

disposal, and last but not least, reduction of maternal mortality and adult illiteracy to at least half of their 1990 levels, with emphasis on female literacy (UNICEF, 1990).

Lesotho is a signatory to almost all resolutions made emanating from these international forum and meetings on population, women, children and the like. Consequently, she has been and is making efforts to provide improved protection of children and women in especially difficult circumstances as recommended in the 1990 World Summit for Children. For instance, Sechaba Consultants (1999) specify the following: more females than males are educated, to be exact 93% and 72% respectively, an increase in access to water in both rural and urban areas although the coverage is insignificant and proportion of households with pit latrines in all parts of the country has increased from 75.4% to 79.9%.

Nevertheless, women in Lesotho constitute a large proportion to the entire population, explicitly 51.3% females and 48.7% males (CIA, 2002) and even more literate than their counterparts, but they are still regarded as minors that is, their decisions within households and society is dependent upon males' (Letuka, 1994; Grdanicki and Hall, 1999). If thoroughly studied, the patriarchal nature of the society in Lesotho might be one of the factors that impede development being made to enhance the status of women including child survival and development programmes. It is evident that, the 1998 political riots coupled with high retrenchment rate of Basotho men in the South African mines have left many children in Lesotho in deleterious circumstances (Sechaba Consultants, 1999).

Despite these hardships, Lesotho has experienced a decline of under 5 mortality from 148 deaths per 1000 live births in 1990 to 132 deaths per 1000 live births in 2001 (UNICEF, 2001). However, these estimates are still unacceptably high despite commitment and efforts of the government of Lesotho in reducing them. With increasing cases of the HIV/AIDS epidemic, the expectation is that trends of both adult and child mortality rate will significantly rise higher than the prevailing levels. On the other hand, Lesotho has recently been declared as one of the most poverty stricken sub Saharan African country (BOS, 2001a). This implies that, infant and child deaths in Lesotho might actually be higher than what the literature depicts –

based on information collected from surveys and censuses dating as far back as 1996, in this era of HIV/AIDS and poverty.

“Adult mortality estimates combined with infant and child mortality estimates give a clear picture of mortality conditions of a given population,” (Sambisa, 1990:182). This is attributable to the likelihood of female adult mortality levels in particular; to influence infant and child mortality estimates hence their inclusion in this study. However, it is important to highlight that, although adult mortality will be captured in this study the main focal point is child mortality; adult survivorship probabilities will be used particularly in the construction of the life-table. In the light of the situation of children and women in Lesotho, this study envisages to examine differentials that maternal socio-economic background variables can pose on child mortality with the main focus on the following indicators: education, place of residence, source of water, toilet facility, method of waste disposal, number of rooms per housing unit, household size and household position of the mother.

1.3 Statement of the Problem

Mortality is an important indicator for describing overall social and economic well-being of a country. Just like many other countries in the developing world, Lesotho is striving to achieve acceptable levels of mortality. Apparently, there has been a substantial and consistent decline in mortality during the recent past in Lesotho (BOS, 1996a). However, there is currently a number of factors taking place that may influence mortality among which are poverty and the HIV/AIDS pandemic. It is therefore important to regularly examine trends in mortality levels and the variations that they may bring given the different socio-economic strata existing among Basotho.

The determinants of childhood mortality include socio-economic differentials. These are fundamental contributing factors to unacceptable levels of mortality and worse; the record of socio-economic progress has been uneven in most developing countries (Cleland et al., 1992). Lesotho is no exception in this regard. For instance, despite efforts made to increase water coverage in the rural areas, Grdanicki and Hall (1999) conclude that malnutrition and quite a number of deaths among children in the rural areas of Lesotho are due to lack of clean water compared to the urban areas. On the

other hand, maternal education was found to be inversely and invariably related to child mortality levels in Lesotho (BOS, 1996a).

The main question addressed in this study is to what extent can child mortality levels in Lesotho be attributable to these existing socio-economic disparities? By and large, socio-economic variations have an impact on overall mortality levels within any given human population and these coupled with the escalating levels of HIV/AIDS pandemic have policy implications that require estimation of current child and adult mortality levels in the country of study.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Researchers concur that the status of women in a household and within a society plays a significant role as far as child survival and development are concerned. Mosley and Chen (1984) indicate that, each of the maternal factors has been shown to exert an independent influence on both child health and survival. They further argue that child-care and survival are largely dependent on mothers' skills and time both at pregnancy period and after birth. However, these require that a woman is in a position which can permit her family afford improved standard of living. Tuoane (1995) states that, the most common measure of women's status is the use of socio-economic indicators such as education, place of residence, to mention but a few. Below is a discussion of some of the identified set of intermediate variables for the purpose of this study.

2.1.1 Maternal Education

Studies from developing countries have shown that mothers' literacy and schooling are closely related to child health and survival (Sandiford et al., 1995). More often than not, educated mothers assume improved status in terms of their level of autonomy in decision making. Greater female autonomy means that the woman will be much more likely to decide that a sick child needs early treatment and will be better able to interact with the outside world to seek such treatment (Caldwell, 1979; Sandiford et al., 1995; Hobcraft, 1993). Sandiford et al. (1995) emphasise that in some cases domestic child-care may even substitute professional-care assuming that, the former is only better among the educated.

Recent studies still consider this variable crucial in enhancing child survival even after control of other factors (Hobcraft, 1993; Basu, 1990). "Even preceding analysis has shown that maternal education is the single most significant determinant of marked differences in child mortality", argue Caldwell (1979:408). UN (1985) points out further that, even the sum of direct determinants of child mortality doubled would

yield less than the effect of providing each woman with 10 years of schooling. Surprisingly, Mturi and Curtis (1995) found out that, in Tanzania neither maternal education nor partner education had a significant role in infant and child mortality after controlling for other factors. Thus, need for further investigation of these relationships within different human populations and between different countries to either strengthen and / or clarify findings made by other researchers in their areas of study.

Basu (1990) indicates that, the status of women is more important in influencing differentials in handling of illness between male and female children as a result of their acquired independence through schooling. This can be perceived as either having a positive or negative effect on child health depending on its sex. For instance, Mosley and Chen (1984) verify that in economics terms, a family's investments in child-care may be conditional on expected returns. Indeed, in Kenya where girls are valued for the bride-price they bring, child survival rates are slightly higher for females than for males while in South Asia where female dowry is the main concern, the reverse is true (ibid). Hobcraft (1993) clarifies that in such societies educated mothers may become more effective at discriminating little valued children.

Nonetheless, maternal education may be associated with emphasis on child quality ensuring fewer children to increase chances of survival as a result of greater food and human capital investment hence improved health status of all. Das Gupta (1990) revealed that in rural Punjab – India the relative excess mortality of second and later daughters was greater for the children of educated mothers. This substantiates that maternal education can also be adopted as a tool in reducing fertility in countries with high rates hence increased health status due to sufficient resources.

However, Das Gupta (1990) argues that, while maternal education may improve people's basic abilities towards child survival it does not make it homogeneous. Extensive analysis of World Fertility Survey (WFS) data suggests that child survival varies widely between socio-economic strata with mother's education being a particularly strong predictor (Cleland et al., 1992). But, it should be noted that, rising literacy levels and declining mortality at national level do not necessarily bring out greater equality (Hobcraft, 1993). This is mainly attributable to general observation

made within populations that, upper classes (highly educated) are usually resistant to the diseases because they have better diets and even live in superior environments. Even when conditions are being improved for all, they stand a better chance since they can easily afford these improvements due to their greater socio-economic resources (Daugherty and Kanimeyer, 1995).

On the other hand, Mosley (1983) argues that education has contributed more to mortality decline than the provision of health services. In his study of some of the countries in Sub Saharan Africa, Hobcraft (1993) concluded that educated mothers are strikingly informed and likely to be in use of ORS packets for diarrhoea episodes. Moreover, educated mothers are more likely to have received prenatal care, initiated immunisation and even more likely to have ensured that they are fully vaccinated (ibid). Studies conducted in Lesotho highlight that; immunisation rate remains low despite the interventions being employed (Sechaba Consultants, 1999) regardless of evidence made that a lot of mothers have at least primary education, which has substantial advantage in terms of reduced mortality risks for children (Grdanicki and Hall, 1999).

2.1.2 Area of Residence

In contrast to historical experience of the West, those living in urban sector of developing countries tend to enjoy better health than rural residents (Johnson, 1964). Lalou and LeGrand (1997) explain that, naturally urban areas owe their health advantage to improved infrastructure, access to fairly regular and abundant food supplies, public health interventions, and greater availability of health services and more effective control of the environment disease compared to the countryside. These might be some of the reasons for the lower urban mortality of children living in urban areas of developing countries.

Sechaba Consultants (1999) indicate that, only 14% of the households in Lesotho live in the urban areas with a present male heading them. Among 86% of the households residing in the rural areas, a majority of them are likely to be headed by a present female whose absent male is a migrant labourer. Migration to urban areas was found to be very rare in such families. It is therefore undoubtful that, female-headed households in Lesotho are poorer than male-headed households, which are mostly

residing in urban areas. In situations such as this, children are the most vulnerable since they are dependent on their parents, particularly their mothers. For instance, BOS (2001a) indicates that, 10 years preceding the 2001 Lesotho Demographic Survey, IMR for the rural areas was higher with an estimate of 80/1000 live births while that of urban areas was much lower than the national estimate.

Although some studies reflect that development in the Third World has led to advantages of life in the cities, in recent years these advantages have faded due to urban population explosion matched by inadequate sanitation and health services (WHO, 1991 cited in Daugherty and Kanimeyer (1995). Basta (1977) established that the health of the urban poor might therefore be as bad as that of rural residents. In addition, the inequality gap in urban areas is not narrowing compared to rural areas where literacy levels and public expenditure on health and social services are continuing to be greater (Bicego and Boerma, 1991). Evidently, rural-urban ratios in Kenya have fallen as health facilities have been brought into or nearer rural areas and communities have improved.

Timeaus and Lush (1995) confirm that mortality of the children of the urban poor is often as high as that of rural children. Basu (1990) argues that provision of health services does not lead to their better utilisation, and availability of such services varies greatly depending on their distribution within both urban and rural areas. Equally important, is the fact that, being employed does not mean that an individual has an income to enable her family to have access to health services (ibid). These, therefore, explain the disparities in child mortality within the same and different geographical settings of a country.

In short, town and countryside alike, children born in better-off households have significantly higher chances of surviving than those born in poorer households (Lalou and LeGrand, 1997). However, this does not discard evidence that, generally urban populations of developing worlds are more advantaged than their rural counterparts. This implies that, even if a child is born in deleterious conditions socio-economic characteristics of his/her household can substantially reduce this handicap regardless of geographical setting.

2.1.3 Source of Water

Mosley and Chen (1984) spell out that mechanisms of disease transmission in the environment may be defined by epidemiological studies – for example, the relationship between environmental contamination and disease. In this case, both quality and quantity of water are regarded as important determinants of exposure to waterborne diseases. Makoa (1998) points out that unsafe water often carries dangerous germs, which consequently cause disease such as typhoid, cholera, dysentery, diarrhoea, etc. “Indeed, waterborne diseases contribute to the death of at least 4 million children in developing countries every year,” (UN, 1996:259 cited in BOS (2001a).

Generally, water contamination can be scaled by source of supply, whereby unprotected wells and springs, river and ‘donga’¹ are amongst the most risky sources of exposure to water related diseases with piped water and boreholes acting as the safest. Mosley and Chen (1984) argue that open sources of water have faecal contamination potential and this is closely related to type of toilet facility used by a household coupled with use of soap and water. Timeaus and Lush (1995) emphasise therefore that, increases in quantity of water used in a household have more effect on health than improvements in water quality. This implies further that, even those sources that may be regarded as safe might not be effective if they are not efficient to meet the demand.

On the other hand, Grdanicki and Hall (1999) argue that, in Lesotho there has been an increase in rural water sector from 58.3% to 64.7% while the urban water has seen the number of private connections increase from 17,000 to 25,000. Despite this improvement in access to water, cases of infant and child morbidity and mortality associated with water contamination are still high. Moreover, men and children who are not attending school often do not wash and in such families only 10 litres of water are used compared to 30 litres that were recommended by WHO (1994). Timeaus and Lush (1995) argue that, provision of water supply to a dwelling is a crucial step in development of services that leads to substantial use of water. However, the above evidence suggests that since ample water allows bathing, washing and cleaning

including drinking and food preparation, it would be wise for policy makers, planners and health engineers to align quantity with quality.

2.1.4 Type of Toilet Facility

Tekçe and Shorter (1984) argue that, type of toilet facility that a household uses symbolises domestic hygienic care hence a good indicator of child exposure to unhealthy living conditions. As mentioned earlier, this is one form of environmental contamination reflecting various routes of spread of diseases, and closely related to waterborne disease often as a result of faecal contamination of the environment (Mosley and Chen, 1984). These diseases include: skin infections, diarrhoeal diseases for food and waterborne infections and neonatal tetanus for disease spread by skin and soil.

Nevertheless, Timeaus and Lush (1995) indicate that type of toilet facility used may be associated more closely with morbidity and nutritional status than with mortality. Gill (1994) found out that, in Lesotho, families with no clean water supply and with no latrine are more likely to have malnourished children. Apart from the effect of diarrhoea on children, malnutrition is an aspect of poverty – inability of families to afford better dietary food and health services led alone being in a position to have a pit latrine.

Studies in contemporary developing countries have shown that, public health engineers, epidemiologists, demographers and other public health specialists recommend use of Ventilated Improved Pit-latrines (VIPs) and / or a flush toilet by households to reduce child morbidity and mortality associated with environmental factors. Egyptian children were found to be less likely to have diarrhoea if they lived in households with access to a flush toilet (Timeaus and Lush, 1995). On the other hand, Grdanicki and Hall (1999) made an observation that; proportion of households with pit latrines in all parts of Lesotho has increased, even though most the latrines are of dubious quality, offering little protection against disease.

¹ A donga refers to one form of a galley usually caused by soil erosion, however depending on the extent of erosion.

Furthermore, Stephens (1984) indicates that the effect of improved water and toilet facilities on child mortality may vary between individuals depending on socio-economic status of a family. In Brazil, Timeaus and Lush (1995) report that children from both poor and more wealthy households have higher rates of diarrhoea if they have poor water and sanitation facilities than if they have access to piped water and flush toilet. Even so, it does not say lack of toilet facility and unhealthy sanitation facilities do not increase the likelihood of illnesses and deaths (Makoa, 1998).

2.1.5 Waste Disposal

Domestic waste collection is one of the primary ways of improving living conditions, of reducing pollution of surface and ground water, and of reducing exposure of people, particularly children to hazardous waste materials (Varty, 1999). Therefore, effective measures of waste collection are very important as far as public health and sanitation are concerned. Varty (1999) points out that, “the volume of waste disposal by the municipality is an indicator which is related to efficiency and level of service provision for waste management.” However, this is quite problematic in developing countries. Dugbaza (2001) made the following observation in Lesotho:

...the proportions of household heads who said they disposed of their household rubbish at their own dumpsites (77.5%), those who said they had no access to rubbish disposal (11.3%) and those who said they disposed of their household rubbish in ‘other ways’ (6.8%)...probably about 95.6% of households disposed of their household rubbish privately. (Dugbaza, 2001:59).

Household privately organised waste disposal can pose life-threatening conditions to both household members and the community at large, because it is likely that it does not conform to best practice. Dumpsites in Lesotho are located at sites that are convenient to individual households, usually close to home (Dugbaza, 2001). Sites close to sources of water for drinking have the effect of contaminating ground water and surface water especially in rainy seasons and therefore impose health risks to the population (ibid). Once again, this emphasises the need to simultaneously improve quality and quantity of water, by providing treated water and encouraging proper and safe disposal of excreta and waste for the sake of children and the community.

2.1.6 Housing and Congestion in the Household

Housing is typically the family's most important economic asset. Mosley and Chen (1984) spell-out that both size and quality are essential factors. These strongly influence the child risk of exposure to infectious disease (Puffer and Serrano, 1973). Poor families are usually victims of disease associated with housing since they cannot afford conditions that come up with improved health such as sanitation facilities. Aaby (1988) states that skin infections such as measles was particularly severe among poor people living under bad housing conditions, in small overcrowded apartments and in crowded institutions as stressed by older epidemiological studies.

Chen et al. (1980) point out that larger houses with small number of family members seem to be linked with lower mortality particularly in urban areas of developing countries. BOS (1996a) observed that households in urban areas consist of parents and children (nuclear families) versus extended families in rural households hence increase survival chances in the latter compared to the former. However, studies in developing countries further suggest that rapid urbanisation has led to a fall in the standard of living of urban dwellers as a result of unplanned settlements, which often have no or limited services and even occupy arable land. This strengthens an argument made earlier that urban poor households are as worse-off as rural households (Timeaus and Lush, 1995).

“Poor ventilation and crowded sleeping conditions predispose household members to respiratory and skin infections” Mosley and Chen (1984:37). They stress that adequate sanitation requires separate rooms for different household activities such as cooking, bathing, toilets, sleeping, and storage of water and food. Mosley (1983) found out that even when a child is immunised, the child still remains at risk to any other infectious disease due to poor socio-economic and environmental conditions prevailing around him/her. Seemingly, the more there are susceptible individuals living together, the greater the risk that someone will be exposed – usually children are the victims.

2.2 Summary

From what has been discussed above, a majority of children in Lesotho are brought up in poor female-headed households. These households are therefore likely to have high rates of both infant and child mortality related to malnutrition, diarrhoea and acute respiratory infection. These are the consequences of poverty, lack of improved toilet facilities and clean water coupled with crowded homes, low levels of education and inaccessibility and belated use of growth monitoring facilities (Sechaba Consultants, 1999; Gill, 1994) but most important, the patriarchal nature of the society in Lesotho (Grdanicki and Hall, 1999).

It is therefore undoubtful that, both women and children in Lesotho suffer the consequences of being marginalized even in situations where efforts are being made to enhance their position. However, the expectation with this study is that, much more light will be shed on why there are discrepancies in both infant and child mortality estimates given the variations in socio-economic status of women in Lesotho. For instance, children in better off households that is where the mother is educated, and probably residing in an urban area where there are job opportunities hence good foodstuffs, services, facilities and medicines are likely to be less exposed to health risks given the advantageous statuses of their households.

Nevertheless, these variations are also weighted by the different categorises that further characterise a given socio-economic variable. For example, rural and urban areas alike, improvement in housing and sanitation (toilet facility, waste disposal and source of water) reduces child mortality depending on the type or main facility being used within a household. This remains even in the case of the level of education attained by the mother, however in this case the impact of socio-economic development on child mortality would be much more evident in households with mothers who have been to school compared to those with mothers with no schooling. Otherwise, for households with literate mothers child mortality will reduce with attained level of education. By and large, socio-economic development is inversely related with child mortality.

CHAPTER 3

CONCEPTUAL FRAMEWORK, OBJECTIVES AND HYPOTHESES

3.1 Introduction

In developing countries' populations, correlation between mortality and socio-economic characteristics are used to generate casual inferences about child mortality (Mosley and Chen, 1984). They emphasise that to achieve unbiased policy and programme recommendations both social and medical science methodologies should be incorporated into a coherent analytical framework of child survival. This requires identification of a set of intermediate variables that directly influence the risk of morbidity and mortality. On the other hand, conceptual framework requires both a definition of these proximate determinants of mortality and a redefinition of the dependent and independent variables (ibid).

For the purpose of this study, the identified intermediate determinants of child mortality were classified as follows:

1. Maternal Education.

This refers to information gathered by a mother through schooling. For example, the effect on child mortality varies with the level of education attained.

2. Area of Residence.

This relates to the usual place of residence. The argument here is that, child mortality is influenced by whether he/she is residing in rural or urban area.

3. Environmental Factors.

These include factors that may lead to infection and ultimately death such as method of waste disposal, type of toilet and household water source.

4. Housing Conditions.

These cover elements of a housing structure – size of the household and number of rooms per housing unit. The argument being that, crowded sleeping conditions predispose household members to respiratory and skin infections.

5. Sex of Household Head

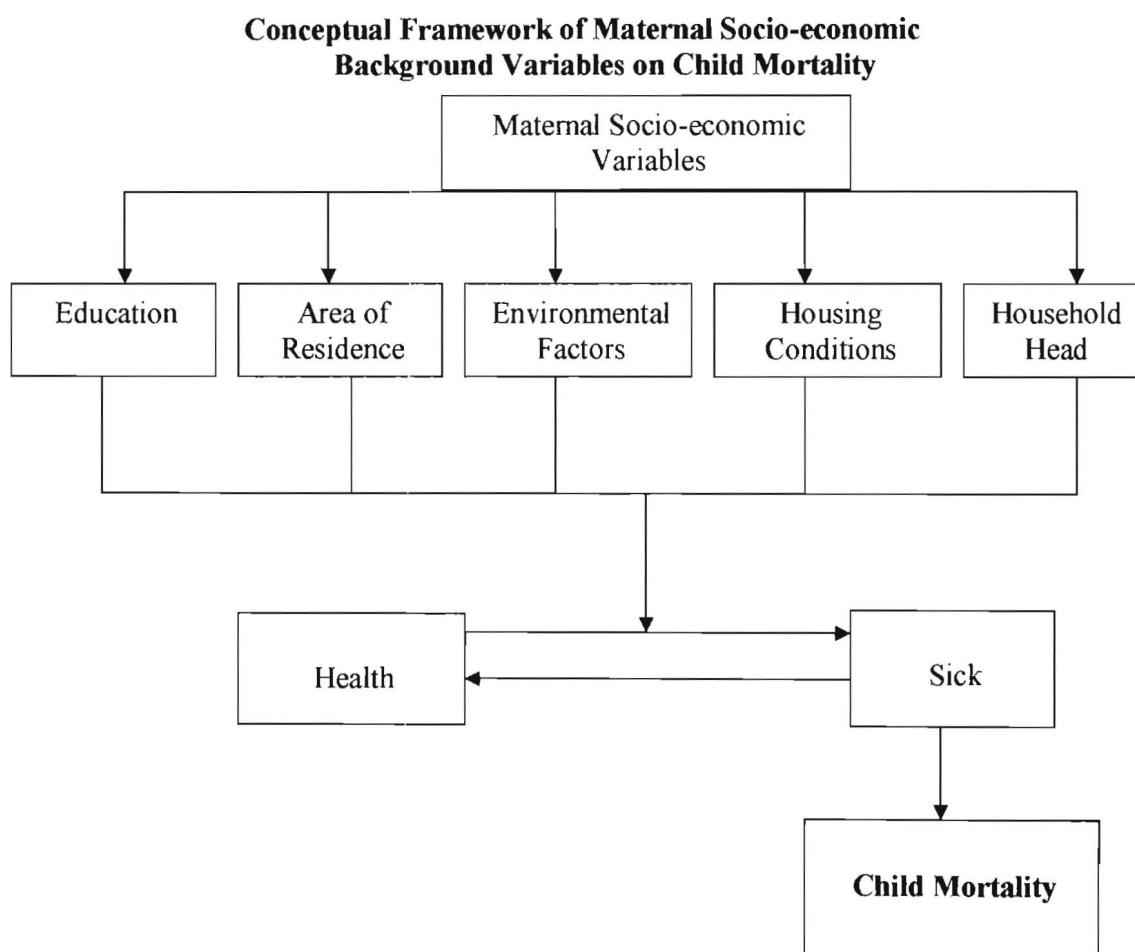
This determines the relationship of the mother with other household members. The assumption being that, female-headed households are poor hence likely to experience high rates of child mortality compared to their counterparts.

3.2 Maternal Socio-economic Background Variables and Child Mortality

Figure 1 gives a background summary of this study, which emanated from the literature reviewed on the relationship between socio-economic variables and child mortality. To arrive at a clear and concise linkage of the dependent and independent variables, the study has adopted the framework developed and recommended by Mosley and Chen (1984:29).

According to the framework, maternal socio-economic background variables namely, (education, area of residence, environmental factors, housing conditions and household position) identified for the purpose of this study have a direct influence on the health status of a child. They can shift a healthy status to unhealthy status (sickness). However, maternal socio-economic status can enable a mother to have access to illness control measures, which can influence the rate of recovery either to a healthy status of a child or otherwise lead to death.

Figure 1



3.3 Objectives of the Study

The main objective of this study is to show how infant and child mortality varies between socio-economic characteristics of women in Lesotho. Specific objectives are as follows:

1. To estimate infant and child mortality levels.
2. To assess the differentials in child mortality in Lesotho.
3. To estimate adult mortality levels.
4. To construct female and male life-tables from estimated survivorship probabilities.

3.4 Hypotheses

1. Child mortality is negatively correlated with mother's level of education.
2. Child mortality is higher in rural areas compared to urban areas.
3. Child mortality is higher in households with no toilet facility than in those that have toilet facilities.
4. Child mortality is lower in households that use pipes as their main source of water compared with those which use other sources of water.
5. Child mortality is higher in households which have their own dumpsites compared with those which use communal dumpsites.
6. Child mortality is positively related with household size.
7. Child mortality is negatively related with number of persons per room in a housing unit.
8. Child mortality is higher in female-headed households compared to male headed-households.

CHAPTER 4

RESEARCH METHODOLOGY

4.1 Data Collection and Sample Design

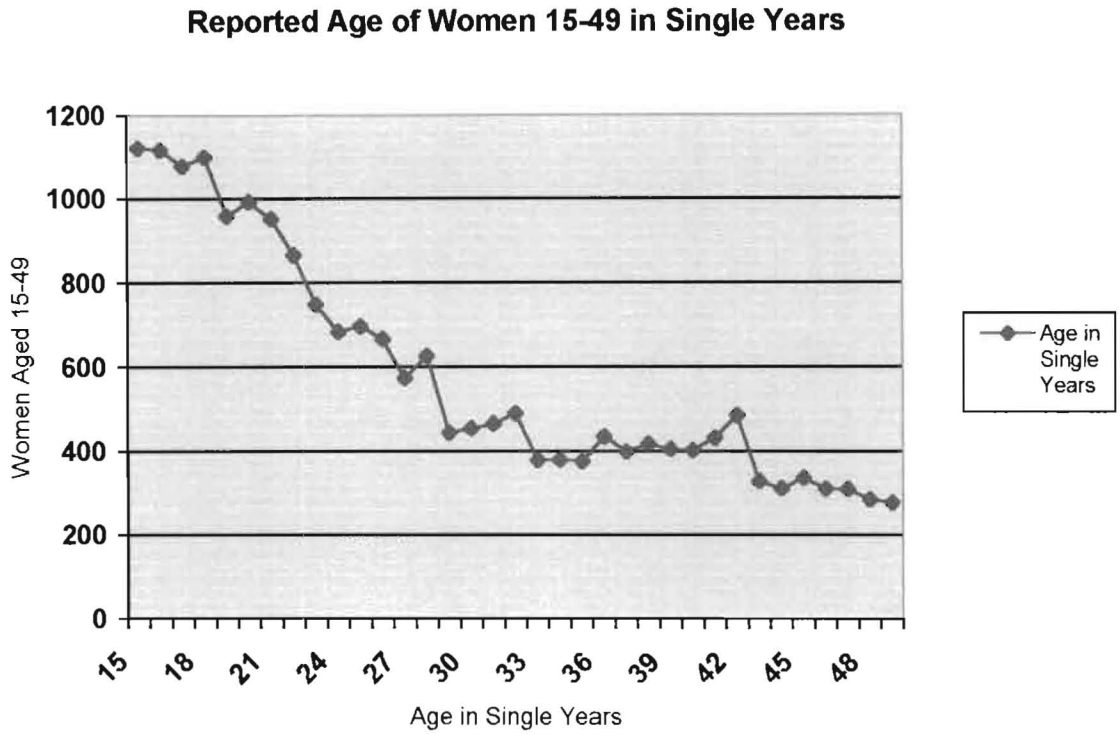
This study will be based on data from the 2001 Lesotho Demographic Survey conducted by the Bureau of Statistics Lesotho in private households. The survey was mainly carried-out to evaluate the results of the 1996 population census and gives recent demographic estimates. It followed a two-stage sample design. The first stage of sampling units or Primary Sampling Units (PSUs) was the clusters – two or more adjacent enumeration areas were selected and put together as one big enumeration area. These were selected with probability proportional to size that is, the number of households within the clusters served as a size measure. The Second Stage Sampling Units (SSUs) were the individual enumeration areas, which were randomly selected. All households were enumerated within the selected enumeration areas in all ten districts of Lesotho. In this survey, a total of 39, 944 men and 41,446 women were captured, and 20,197 of these women were eligible to questions related to their fertility.

4.2 Evaluation of the Quality of Data

4.2.1 Evidence for Errors of Age Misreporting

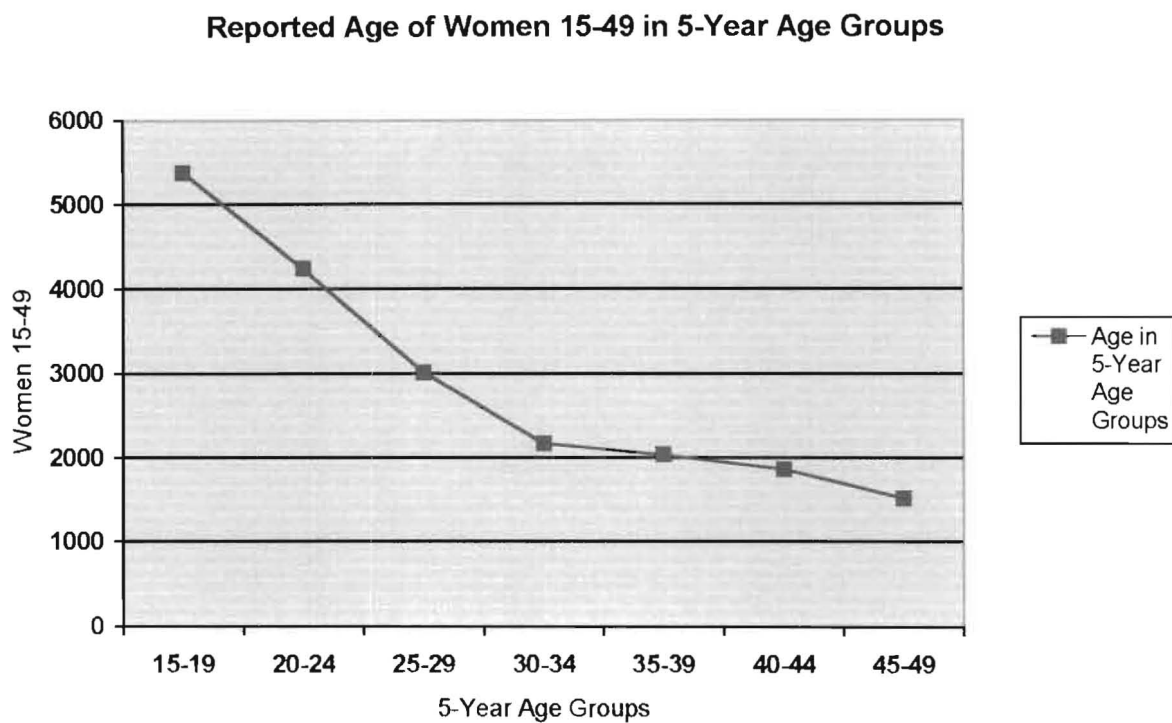
To assess the quality of age reporting in the 2001 LDS, age of women in reproductive ages (15-49) was graphed as presented in figure 2 below. A plot of the single age distribution is suppose to gradually decline with increasing age indicating stability in demographic parameters namely, fertility, mortality and migration of a given country. Figure 2 does show this trend although there is an indication of irregularities in certain ages. This suggests that some ages were preferred than others, but the problem is not very serious as the heaps are not very large. Moreover, if one studies the graph closely, a realisation will be made that these preferred ages/ or digits do not follow any regular pattern say, multiples of 5, zero ending and the likes. Fro instance, age heaping is somewhat at the following ages: 18, 21, 28, 33, 37 and 43 respectively with no specific pattern or trend. In short, there is no exceptional evidence of disparity in this data.

Figure 2



Although figure 2 portrays slight distortions in single age data, this data was further presented in 5-year age groups to eliminate even those insignificantly preferred digits. As figure 3 depicts, the age grouping procedure has certainly reduced irregularities observed in single age data. On average, data on age reporting by women in reproductive ages in the 2001 LDS is satisfactory.

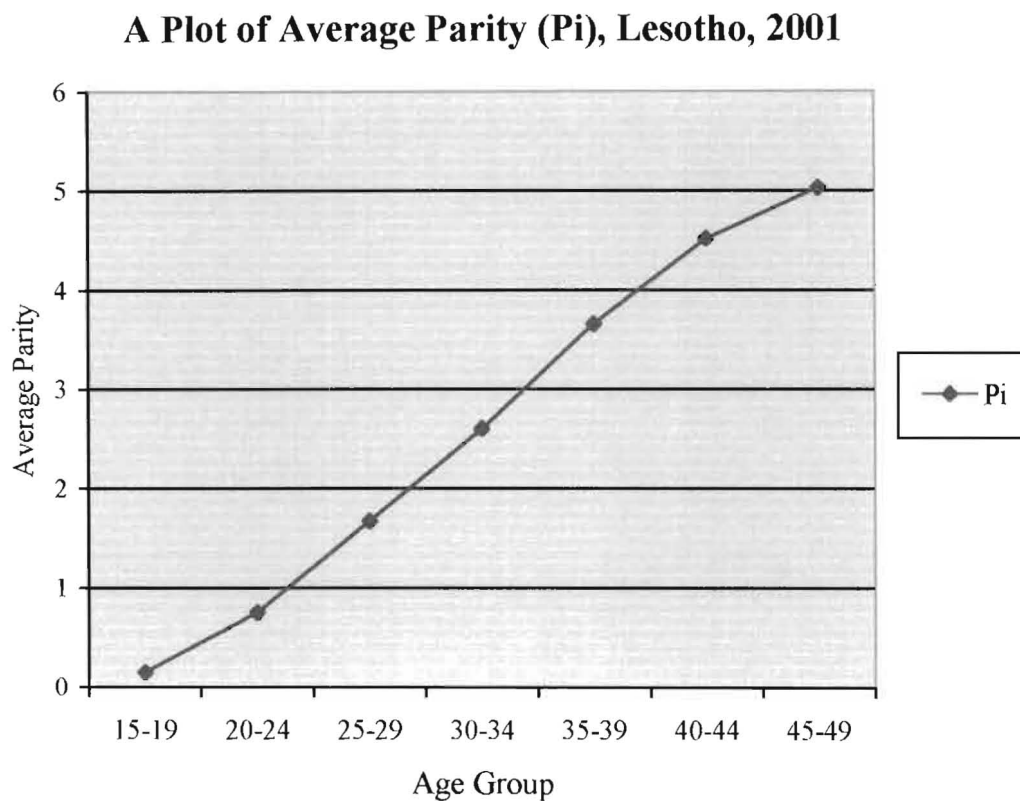
Figure 3



4.2.2 Evidence for Omission of Births

As indicated earlier in this section, data on children ever born (CEB) can sometimes be problematic and unreliable. One way of assessing the quality of data on children ever born is examining the pattern of the average parities (P_i) reported by women of each age group. Based on this rough estimate, data for Lesotho seem to be satisfactory as figure 4 below portrays. That is, average parities increase with the age of mother until age group 45-49, which also implies that fertility has not been rising in the past.

Figure 4



4.2.3 Child Survival Data

Accuracy in reporting number of children dead can be observed by an increase in proportion dead with the age of mother. However, this is dependent on reported children ever born (CEB) – if there has been omission in CEB, this expectation might be distorted. Nevertheless, figure 4 shows no evidence of inconsistency in data on parity. On the same note, if one studies table 1 below clearly, it is evident that proportion dead does rise rapidly with the age of mother particularly at age 30-34 onwards. This observation holds due to the fact that, children of older mothers are in general older and hence exposed to heavier mortality and for a long period of time compared to their counterparts.

Furthermore, if one discards statistics on dead children as reported by young mothers at age 15-19, another interesting behaviour can be noticed. Both national and male estimates increase with the age of mother and only interrupted at age 30-34, while female estimates fluctuate until the same age group. This is an indication that in this instance, as usually expected there was higher mortality among male compared to female children. For instance, reported male children dead alone are more than national estimates. But, generally speaking, the lack of gradual progression of proportion of children dead suggests either differential shifting in women in experiencing mortality especially those with higher mortality or the likelihood to omit dead children than those alive particularly in the case of female children. On the same note, we should not rule out Daugherty and Kanimeyer (1995) observation that, on average males are more prone to death than females as table 1 below shows.

Table 1

Proportion of Children Dead both Sexes Combined
and Separate Classified by Age of Mother

Age Group	i	Both Sexes D(i)	Female D(i)	Male D(i)
15-19	1	0.0882	0.0876	0.0893
20-24	2	0.0913	0.0838	0.0975
25-29	3	0.0928	0.0800	0.1042
30-34	4	0.0835	0.0751	0.0917
35-39	5	0.0941	0.0859	0.1018
40-44	6	0.1174	0.1149	0.1186
45-49	7	0.1321	0.1190	0.1464

According to Teklu (1996) the sex ratio at birth for sub Saharan African countries is lower than what is observed in other countries that is, 105 to 107. Teklu further states that for sub Saharan African countries the range is assumed to lie between 101 and 104. Given this piece of information, the overall sex ratio at birth as depicted by both 1996 Population Census and the 2001 Lesotho Demographic Survey (LDS) in table 2 below implies plausible range of 101 to 107. However, if one examines the 2001

LDS ratios by age of women, excess male births appear to have been recorded in the survey excluding the problematic age group 15-19. This is so in age groups 20-24, 25-29, 30-34 and 40-44. Nonetheless, the sex ratio at birth reflected by the 2001 Demographic Survey does not deviate largely from that recommended by Teklu (1996).

Table 2

Sex Ratio Based on Data from the 2001 L DS
and the 1996 Lesotho Population Census

Age Group	i	Sex Ratio at Birth 2001	Sex Ratio at Birth² 1996
15-19	1	0.97	1.06
20-24	2	1.09	1.06
25-29	3	1.08	1.04
30-34	4	1.08	1.04
35-39	5	1.01	1.04
40-44	6	1.09	1.04
45-49	7	1.03	1.06

4.2.4 Conclusion

Evaluation of the 2001 Lesotho Demographic Survey section of data assessed that is, children ever born, survival data and age reporting by mothers does follow the normal expected pattern. Even where there are some irregularities, this is not exceptional or absurd. For instance, the age grouping procedure has successfully reduced some slight distortions in the single age data. Average parity expectedly increases with the age of mother until age group 45-49, and on the other hand proportion dead does as well rise rapidly with the age of mother particularly after age 30-34 onwards. However, there it is evident that omission of child deaths was sex selective – both

² Data extracted from the 1996 Census Data Report on Children Ever Born and Number Surviving as Reported by their Mothers.

national and male estimates increase with the age of mother and only interrupted at age 30-34, while female child estimates fluctuate until the same age group. Last but not least, the sex ratio at birth does not deviate largely from that recommended by Teklu (1996) that is, 105 to 107. In short, this data permits and guarantees application of the Brass Indirect Technique of Estimation of Child Mortality and plausible results respectively.

4.3 Analytical Procedure

4.3.1 Trussell's Version of Brass Model of Indirect Estimation of Child Mortality

Overall estimates of both infant and child mortality in this study will be based on an indirect technique. This will follow a method originally developed by William Brass (1968)³ and later revised by Trussell (1975). This requires estimation of proportion of children dying between birth and age 5 among those ever born reported by women in age intervals 15-49, that is, $D(i)$. The multiplier $k(i)$ enables the conversion of $D(i)$ – proportion of dead children into estimates of the probability of dying before reaching certain childhood ages $q(x)$. Trussell's version of Brass model is generally presented in the following form of equation:

$$q(x) = k(i).D(i) \text{ ----- } 1$$

- i – age group of mothers.
- x – age of children.
- $D(i)$ – proportion of children dead.
- k – multiplier for non-mortality factors.
- $q(x)$ – probability of dying at exact age x .

The proportion of child deaths to children ever born, classified by age of mothers will determine the crude child mortality in the recent past. The method will further be used to yield reference periods to which mortality estimates computed refer, that is, some years before the survey. For the age pattern of child mortality, these crude child mortality rates will be converted into defined life-table indices using Coale and Demeny West Model Life Table. The West Model Life-table was used for the 1996 Lesotho Population Census' estimates and therefore will also be adopted in this study

³ This technique is discussed in depth in Trussell and Menken (1984)–Techniques for Estimating Child Mortality.

for consistency. Mainly the West Model Life-table is traditionally used in most African countries since it was developed from the largest number of life-tables and their mortality patterns do not deviate systematically from those embedded in the standard pattern of mortality. This gives exact estimates of both implied infant and child mortality for both sexes combined and/ or separate:

1. Infant Mortality Rate (IMR) denoted as; ${}_0q_1$, which is the probability of dying before celebrating the first birthday.
2. Child Mortality Rate (CMR) denoted as; ${}_4q_1$, which is the probability of dying between ages 1 and 5.

The Brass Indirect Technique of Estimation of Child Mortality usually operate under certain assumptions that do not need to be violated:

1. The risk of dying of a child is a function of only the age of the child not any other factors.
2. Fertility and childhood mortality have remained constant in the recent past.

4.3.2 Socio-economic Differentials in Child Mortality

To assess the differentials in the above estimated parameters, the Trussell's version will further be applied. This is expected to identify the gap in the estimated mortality levels associated with variations in socio-economic status of women. That is, the relationship between child mortality and identified maternal characteristics namely, education, area of residence, source of water, toilet facility, method of waste disposal, number of rooms per housing unit, household size and household position. These background variables were extracted from the 2001 LDS and categorised further as follows:

A. Education.

Highest level of education attained:

1. Primary.
2. High School.
3. Tertiary.

B. Area of Residence.

1. Urban.
2. Rural.

C. Environmental Factors.

Three main questions were on water and sanitation:

- i. What is the main source of water for this household?
 1. Pipe.
 2. Borehole.
 3. Other

- ii. What is the main toilet facility for this household?
 1. No toilet.
 2. Pit latrine
 3. VIP.

- iii. How does this household dispose of its refuse/rubbish?
 1. Own rubbish dumpsite.
 2. Communal and no Dumpsite

D. Housing Conditions.

1. Number of persons per room in a housing unit.
2. Household size.

In this case, respondents were asked to indicate their number of rooms per housing unit and number of persons living and sleeping in their respective households.

E. Sex of Household Head.

This would determine child mortality based on whether a household is male or female-headed.

4.3.3 Brass Model of Indirect Estimation of Adult Mortality

Orphanhood method is one of the procedures used to indirectly estimate adult mortality based on the survival status of parents. This relies on a simple and easy question to answer: “is your mother or father still alive?” A possible response could either be a yes, no or not known. The orphanhood technique was developed by Brass and Hill (1973), and presents Female Adult Mortality in the following form:

$$\ln(25+n)/\ln(25) = W(n).S(n-5) + [1 - W(n)].S(n) \text{ ----- 2}$$

$\ln(25+n)/\ln(25)$ is the conditional survivorship probability.
 $S(n)$ is the proportion of respondents aged n to $n+4$ with mother alive.
 $W(n)$ is a weighting factor employed to make allowance for typical age pattern of fertility and mortality.

The weighting factor $W(n)$ depends on the mean age at maternity denoted by M ; expressed as:

$$M = \sum a(i).B(i) / \sum B(i) \text{ ----- 3}$$

$a(i)$ is the mid-point of age group i .
 i is age group of mothers.
 $B(i)$ is the number of births in a given year to women in age group i .

Once M has been computed, $W(n)$ – weighting factor can be calculated by interpolating linearly so that proportions of respondents with mothers alive can be converted into survivorship probabilities.

Paternal Orphanhood Method of Estimating Male Adult Mortality follows the same principles as the Maternal Orphanhood Method of Estimating Female Adult Mortality detailed above. The only difference is that in this case since $M = 28.3$ and less than 36 years, survivorship probabilities for fathers can be given as:

$$\ln(35+n)/\ln(32.5) = W(n).S(n-5) + [1 - W(n)].S(n) \text{ ----- 4}$$

Here the value of 25 is replaced by 32.5 to allow for the fact that men are usually older than women at the birth of their children. Just like in the case of Indirect Estimation of Child Mortality, time reference to which estimated survivorship probabilities refer can be approximated in the orphanhood method.

4.4 Smoothed (Relational) Life-table

There are differences between male and female mortality at most ages, which requires separate life-tables for both sexes, therefore female and male populations' life-table will be constructed. Derivation of smoothed life-table values, relies on the following general formula for estimation of l_x values:

$$l_x^* = (1.0 + \exp(2\alpha + 2\beta\lambda_s(x)))^{-1} \text{-----} 5$$

α and β are parameter values estimated, provided a linear relationship exist between logit transformation of the estimated life-table and logit transformation of the selected standard. If one denotes estimated l_x values by $\lambda(x)$ then the logit transformation of the estimated survivorship probabilities (females only) can be given as:

$$\lambda(x) = \text{logit}(1.0 - l_x) = 0.5 \ln[(1.0 - l_x) / l_x] \text{-----} 6$$

These are computed from a set of child survivorship probabilities and conditional adult mortality survivorship probabilities hence relational life-table. The ‘SI Methods’ are one procedure, which allow smoothing and interpolation of an incomplete set of survivorship probabilities to come up with missing l_x values. As mentioned above, these require a set of estimated l_x values in 5-year age groups and a selected standard lifetable that approximates the pattern of mortality in the population being studied. The Coale-Demeny West Model Lifetable will be adopted in this regard for the same reason given in the section on Brass Model of Indirect Estimation of Child Mortality that it represents mortality pattern set in the general mortality pattern and for consistence since it was also used in the 1996 Population Census estimates.

CHAPTER 5

RESULTS AND ANALYSIS

5.1 Infant and Child Mortality

Table 3 below presents infant and child mortality estimates. Mortality levels corresponding to mothers of age groups 15-19 and 40-49 are usually ignored in the analysis of indirect estimation of child mortality. This is because young mothers often experience exceptionally high deaths of their children especially at infancy, while older women on the other hand are likely to underreport their children ever born including those who have died due to memory lapse. Therefore, credible results cannot be based on this data.

Table 3

Trussell's Version of Brass Model of Indirect Estimation of Child Mortality

Age Group Index <i>i</i>	Age of Children <i>x</i>	$q(x)$	Reference Date		West Mortality Levels	Implied ${}_{1q_0}$	Implied ${}_{4q_1}$
			<i>t</i>	Year			
1	1	0.0832	1.3	1999.7	16.62	0.0832	0.0340
2	2	0.0939	2.6	1998.4	17.02	0.0784	0.0313
3	3	0.0937	4.3	1996.7	17.47	0.0733	0.0283
4	5	0.0857	6.2	1994.8	18.39	0.0631	0.0226
5	10	0.0986	8.4	1992.6	18.12	0.0660	0.0243
6	15	0.1217	10.8	1990.2	17.30	0.0753	0.0295
7	20	0.1358	13.7	1987.3	17.16	0.0769	0.0304

Implied IMR (${}_{1q_0}$) gives an estimate of 76 deaths per 1000 live births when age groups 20-29 are pooled together. If we consider the 1996 census, which showed an IMR estimate of 74 deaths per 1000 live births, the above results reflect that infant mortality has risen slightly by only 2 deaths. On the other hand, the estimate of child mortality (CMR) based on the sum of age groups between 20-29 yields 30 deaths per

1000 survivors at age 1. These estimates refer to a time period approximately 3-4 years before the survey. As expected, infant mortality is higher than child mortality in Lesotho.

To further explore the consistency of mortality estimates (q_x) by the Brass Model, these estimates were converted into mortality levels in the Coale-Demeny system, linearly interpolated and re-estimated both sexes combined from the West Model Life-table. An examination of the levels revealed that, indeed estimates of $q(1)$ imply relatively high mortality as depicted by relatively low levels in the Coale-Demeny Models and therefore should not be considered. The overall west mortality level for age groups 20-29 was 17.25. This gave an implied IMR of 69 deaths per 1000 live births for females and 84 deaths per 1000 live births for males. Furthermore, implied child mortality emphasised that male children experience death than female children in Lesotho estimated at 34 and 26 deaths per 1000 survivors at age 1 respectively.

5.2 Socio-economic Differentials in Child Mortality

Differentials in child mortality within human populations exist because of the variations in socio-economic status of different households as table 4 indicates. As highlighted in the literature review, these variations extend to the different categories that characterise a given socio-economic variable. For instance, both infant and child mortality seem to be decreasing with increasing level of education attained by the mother. That is, children of primary school mothers are worse-off compared to high school and tertiary mothers. On the other hand, tertiary mothers are associated with less child mortality as compared to primary and high school mothers respectively.

It is not surprising that mother's; level of education is inversely associated with infant and child mortality in Lesotho. As we saw in the literature, this is attributable to the fact that literate mothers have the ability to interact easily with the outside world. For this reason plus other advantages of them being educated, they can learn effortlessly about child development and survival strategies hence their children are better off compared to their counterparts. Equally important, is observation made that children of literate mothers enjoy this benefit more as their mother improves their education. For this reason, they are also more likely to have either been immunised and/ or vaccinated hence healthier than children of less educated mothers.

More often than not, urban children are advantaged than those in the rural areas. As was expected, more than half of both infant and child mortality take place in rural areas in relation to urban areas. This is an indication that there are variations in availability and accessibility to health services and facilities coupled with other factors such as education of the mother, sanitation, housing conditions and others as we shall see. Urban dwellers are often advantaged even where conditions are being improved for all. For instance, expectant mothers have minimal excuses for not attending antenatal care hence stand a better chance in their pregnancy, which their unborn babies and infants depend on. This is unlike in the rural areas where clinics and health centres might be available, but in remote and inaccessible places.

Children in urban areas are also well off in terms of ample resources and opportunities around them that benefit their health development such as day care, which lessens further exposure to death risks while the mother is away. This is contrary to what is often found in the rural areas – a child left in the responsibility of older people or young girls who often use unsafe out-dated techniques and are naïve for proper childcare respectively. Lesotho is no exception in this regard as depicted by the differentials in child mortality in table 5 hence the difference in rural and urban child mortality.

Contrary to our expectations, table 4 also shows that female-headed households are better off as far as infant and child mortality is concerned compared to male-headed households.

Apparently, women in Lesotho occupy quite a big number of jobs in the informal sector (Sechaba Consultants, 1999), so even if the husband is not working, widowed or unmarried the likelihood is that women in Lesotho are striving to earn some income one way the other than men. It is worth mentioning however that, where a husband is not working (in male-headed households) chances are that the husband does not want his partner to fend for the family given the patriarchal nature of Lesotho society – inferiority complex hence high child mortality cases. Therefore, if we consider that the South African mine industries which were the major employer of Basotho men have been retrenching lots of them, it is not surprising though unexpected that male-headed households experience high child mortality in Lesotho.

Housing characteristics give very interesting results in relation to child mortality. Contrary to our expectation, child mortality in Lesotho is negatively related with household size. This is an indication that as household size enlarges, chances of better child care also increases hence lower risks of child mortality compared to households in which there are only few members. This observation may particularly render in cases where the mother is working and therefore away most of the time. In large households, the absence of the mother relatively may not disadvantage the child since there would either be siblings and/ or older people to take the responsibility of the mother be it feeding, bathing or even playing to mention but a few, some of which though important may not be offered to a child raised in a small household.

Similarly, households with less than two persons per room do not experience high child mortality. This is because where there is adequate space there is also low risks of infection such as skin diseases or measles, which is common among young children. Equally important, living conditions such as type of toilet facility, method of waste disposal and source of water may directly affect contamination of the environment in which the child is born and thereby increasing the likelihood of this situation to facilitate incidence of various infectious diseases such as diarrhoea.

Results associated with source of water conform to the hypothesis that households, which use pipe as their main source of water, have low child mortality compared to other sources. The other category in this case consisted of spring, well, dam and river. Likewise, households with no toilet facility experience exceptionally high infant and child mortality. This observation even holds where method of waste disposal is concerned - households with their own dumpsites have slightly lower infant and child mortality compared to their counterparts that use communal dumpsites. Together these can lead to the persistence of those diseases associated with the environment a child is born in.

If one accesses the situation of Lesotho, it should be evident that those households with their own refuse dumpsites are as bad as those that use communal or do not have dumpsites. For instance, Dugbaza (2001) explains that private dumpsites are located at sites that are convenient to the households – usually very close to homes. Moreover, rubbish at the dumpsite (private or communal) is often not burnt properly

and quickly. Obviously, this has the effect of contaminating ground water or any close sources of drinking water, which can eventually affect consumers, children being the most vulnerable.

Table 4

Infant and Child Mortality Differentials by Selected Maternal Socio-economic Background Characteristics

Socio-economic Characteristics	IMR	CMR
Maternal Education		
Primary	81	33
High School	60	21
Tertiary	33	7
Area of Residence		
Urban	45	13
Rural	76	31
Source of Water		
Pipe	53	17
Borehole	85	35
Other (spring, well, river, dam)	64	23
Main Toilet Facility		
No toilet	71	27
VIP	28	6
Pit latrine	62	22
Method of Waste Disposal		
Own Refuse Dumpsite	63	22
Communal and No Dumpsite	65	24
Housing Characteristics		
<u>Number of Persons per Room</u>		
1-2 Persons per Room	27	5
3-5 Persons per Room	43	12
5+ Persons per Room	60	21
<u>Household Size</u>		
1-3 Members	73	29
4-7 Members	67	25
8+ Members	70	27

Sex of Household Head

Female	62	22
Male	93	39

Estimates based on women at age group (25-29) since their reported cases seemed more consistent compared to the rest of the other age groups hence more reliable.

5.3 Adult Mortality

Table 6 indicate that the estimated survivorship probabilities decline with the age of mother. These estimates portray quite high life expectancy at age 20 that is, 48.7 years when age groups 20-29 are pooled together than one would have expected. It is also evident that this has not been improving in last 9-10 years to which it refers. On the other hand, the 1996 Lesotho Population Census estimated 53 years life expectancy at age 20 for females in Lesotho, which implies the life expectancy at age 20, has actually declined by 4 years.

If one assumes that HIV/AIDS has been striking more at young ages particularly in developing countries including Lesotho say 20-34, it becomes difficult to comprehend that more than 80% of respondents reported survival status of their mothers as still alive. However, possible explanation that one can come up with to clarify this observation is that one caused by adoption. Presumably, adoption effect has biased the survivorship probabilities upward – children in foster families reporting their foster parents as their biological parents. Even the levels of mortality to which Lesotho female population is subject to are so high between 18 and 21 suggesting that female adult mortality is very low in this country. It is noteworthy however that, these results are not convincing hence the desire to compute a complete life-table for additional verification, and equally important, to compare them with those of the male adult mortality estimates.

Table 5

Brass's Technique for Estimating Female Adult Survivorship Probabilities

Age Group	S(n)	$l(25+n)/l(25)$	Reference Period	West Mortality Level	e_{20}
15-19	0.9164	-	-	-	-
20-24	0.8966	0.9150	8.6	17.7	48.57
25-29	0.8601	0.8980	10.1	18.6	48.77
30-34	0.8088	0.8660	11.3	19.0	50.87
35-39	0.7413	0.8200	12.1	19.4	50.93
40-44	0.6539	0.7560	12.4	19.7	51.00
45-49	0.5631	0.6650	12.1	20.2	51.10
50-54	0.4313	0.5570	14.0	21.2	53.44

Table 6

Brass's Technique for Estimating Male Adult Survivorship Probabilities

Age Group	S(n)	$l(35+n)/l(32.5)$	Reference Period	West Mortality Level	e_{20}
15-19	0.7362	-	-	-	-
20-24	0.6714	0.677	9.5	10.1	38.1
25-29	0.5877	0.584	11.5	10.2	38.1
30-34	0.4948	0.469	13.4	10.1	38.1
35-39	0.3954	0.339	15.3	10.1	38.0
40-44	0.2897	0.204	17.1	8.2	35.7
45-49	0.2012	0.107	18.9	10.0	37.9
50-54	0.1458	0.084	23.4	-	-

Although it is often accepted that female adult mortality is less than male adult mortality, it is difficult to understand the difference that exist between the two estimates depicted in tables 6 and 7 above. The margin is unbelievably large. Respondents orphaned by their fathers seem to rapidly increase in table 7 compared to female orphans in table 6. Perhaps male adult mortality estimates as well, have been biased by adoption effect. However, in this case probably fostered respondents who have always known their grand fathers as their biological fathers reported their fathers' survival status; and if we assume that males experience more death than

females then proportion of respondents with fathers alive should be low. On the same note, this could also be a reflection of the impact of HIV/AIDS epidemic.

Similarly, the gap is very big between the life expectancy at age 20 of adult males and females, 38.1 and 48.7 years respectively and this has remained constant for males in the past 10 to 12 years prior to the survey. The life expectancy at age 20 for males in 1996 was 51 years⁴, and this compared to 38.1 years in 2001 indicates that longevity for adult males in Lesotho is reducing fast –13 years since 1996. However, studies made in Lesotho state that, the data for adult males has proved inconsistent – often affected by errors hence unreliable (BOS, 1996a).

5.4 Summary

As far as the 2001 Lesotho Demographic Survey is concerned mortality in Lesotho still remains. The usual observation was also made that males experience death more than females both at childhood and adulthood. Although this study does not cover the details of why this might be the case, it is strikingly evident that male adults are at the risk of death compared to their female counterparts. For instance, the life expectancy at age 20 is only 38.1 years for males while that of females is 48.7 around the same exact age - approximately 11 years' difference.

On the other hand, infant mortality is higher than child mortality Lesotho with female children less prone to death compared to male children. To be precise, 69 deaths per 1000 live births for females and 84 deaths per 1000 live births for males at infancy were estimated. CMR estimates further emphasise that male children are indeed at the risk of death than female children in Lesotho, estimated at 34 and 26 deaths per 1000 live births respectively. Overall mortality estimates suggest that in Lesotho, females are better off than males at all ages. The next chapter on the life-table will approximate the number of years a newborn male and female child can live based on the 2001 Lesotho Demographic Survey and that compared with the 1996 Population Census to find out if generally longevity has declined or increased in Lesotho.

⁴ The 1996 Population Census life expectancy at age 20 for males was based on the widowhood method because the orphanhood method was affected by high under reporting of fathers' deaths that led to errors.

CHAPTER 6

THE LIFE-TABLE

6.1 Female and Male Population Life-tables

For the purpose of this study two different sets of points were identified in the plot illustrated in figure 4 and 5 below. The point corresponding to childhood survival probabilities, and the other point representing adult survival estimates. For females the points on childhood estimates cluster above and below the middle of the trend line in a C-shape, however if one focuses on the right of (or below) the graph two points namely l_2 and l_{15} can be picked in a linear pattern. Points based on adult mortality on the other hand are linearly linked from the bottom right of the graph throughout the trend line to the middle left. Only two points from these estimates, l_{35} and l_{40} show a continuation of a straight line of already considered points derived from child survivorship probabilities namely; l_2 and l_{15} . These points used in the fitting procedure are highlighted in table 8 below.

Figure 5

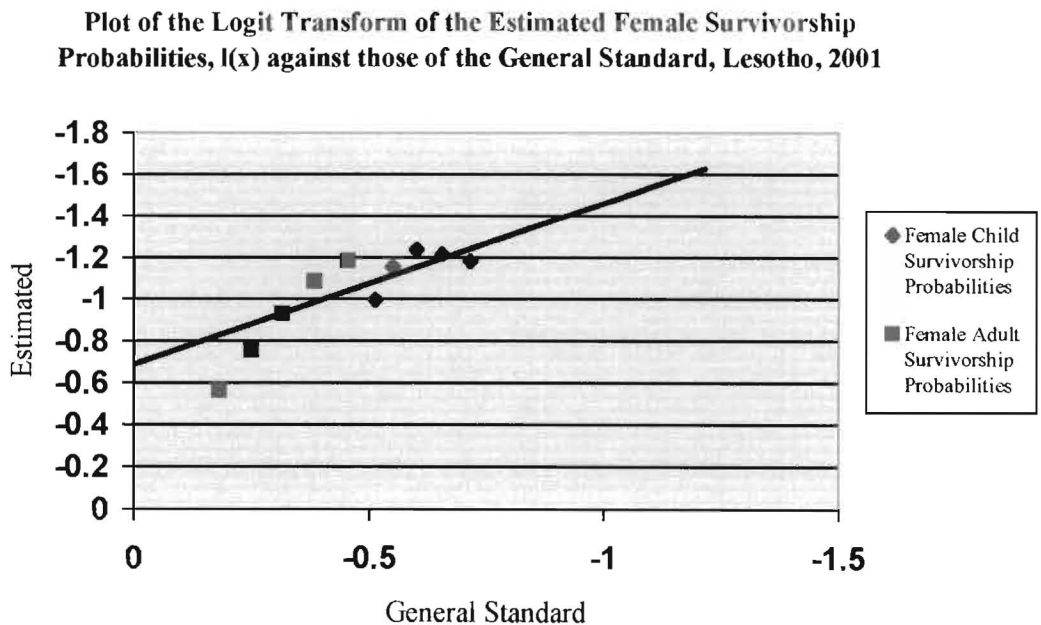
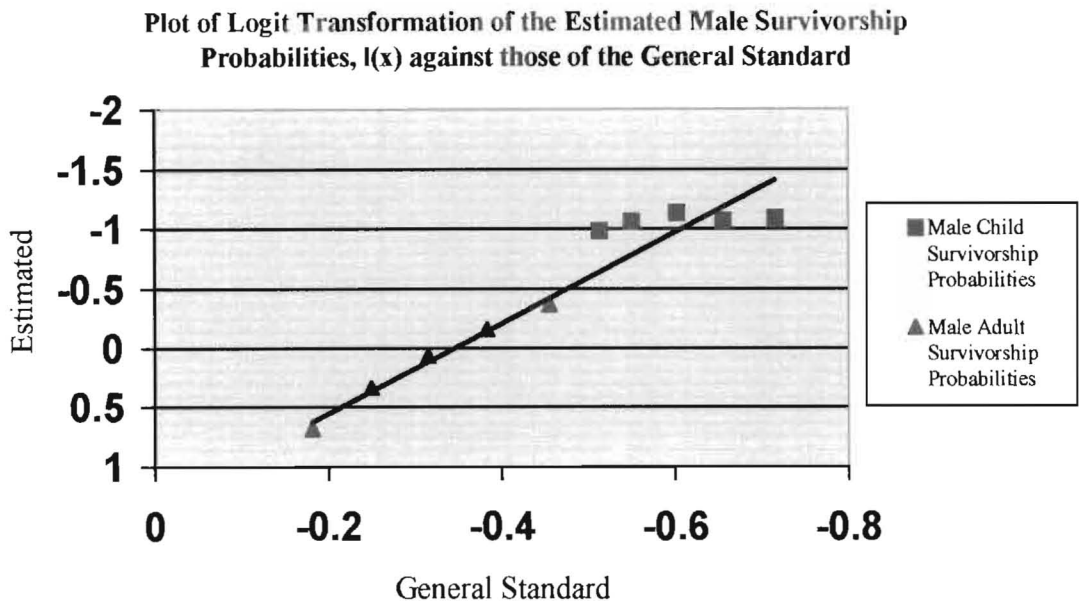


Figure 6



On the other hand, it was not easy to come up with a single linearly linked survivorship probabilities out of male estimates plotted in figure 5 above. Firstly, points on child mortality survivorship probabilities linearly cluster above the trend line from its right throughout to the left. Secondly, points presenting adult mortality are linearly linked exactly on the trend line from its bottom to the middle. None of these points from either child or adult survivorship estimates gave plausible estimates of a continued linked linear relationship of the two-survivorship probabilities. Lastly, an alternative was to estimate the life-table from estimated West Mortality Levels from either child or adult mortality levels.

Estimates from male adult mortality were completely discarded in this exercise even though they show a more consistent trend compared to male child estimates. As mentioned earlier, points on male adult mortality are likely to be erroneous due to adoption effect hence misleading. Therefore, the male population life-table was constructed out of the male child mortality estimates given that the section on evaluation of the data on children ever born and those surviving in chapter 4 revealed no disparities in this data. The West Mortality Levels estimated for male child mortality are given in table 8. An average of levels in age group 20-29 was used to

linearly interpolate the life-table to which male child mortality levels refer. Table 11 illustrate the Life-table of Male Population, Lesotho Demographic Survey, 2001 as portrayed by level 16 in the West Model Life-table.

Table 7

Logit Transformation of the Estimated and Standard Survivorship Probabilities, Lesotho, 2001

Age (x)	General Standard $\lambda_s(x)$	Estimated $\lambda(x)$
2	-0.7152	-1.1830
3	-0.6552	-1.2151
5	-0.6015	-1.2391
10	-0.5498	-1.1544
15	-0.5131	-0.9972
20	-0.4551	-1.1881
25	-0.3829	-1.0876
30	-0.3150	-0.9330
35	-0.2496	-0.7582
40	-0.1816	-0.5654

Having selected the most reliable set of points representing survivorship probabilities for childhood and adult ages parameter values α and β were estimated. Estimated values of α and β were -0.4301 and 1.0745 respectively. These were fitted in equation 5 given in chapter 4 for computation of smoothed lifetable probabilities with children at infancy (0 – 1) assuming a survivorship probability of 1.0 as indicated in table 9 below. This emanates from the fact that, usually births originate from a standard number of births or a given cohort referred to as a radix. Clearly, this radix, l_0 is presented in table 10 and 11 –with a value of 100, 000 live births.

l_x – value (number of people surviving at a specific age) decline with increasing age indicating that as a person grows older her chances of surviving decreases as survival probabilities (l^*_x) in table 9 also show. These go hand-in-hand with T_x – total number of person years lived after a specific age. For instance, a newborn baby at T_0 has more number of years to live compared to any other person at any specific age, and this is supposed to decrease as age increases indicating that a person is getting older

hence a high probability of dying (q_x). In actual fact, a complete life-table consists of the indices portrayed in tables 10 and 11, and these tell a life story of a person since birth until death. The life expectancy - e_x approximates the total number of years a person at a certain age can live, as we shall see in the discussion that follows below.

Table 8

Male Child Mortality Estimates

Age Group	Age	l_x	West Mortality Level
15-19	1	0.9130	16.3
20-24	2	0.8991	16.6
25-29	3	0.8950	16.8
30-34	5	0.9062	17.9
35-39	10	0.8938	17.7
40-44	15	0.8776	17.2
45-49	20	0.8501	16.5

Table 9Estimated Smoothed Survivorship Probabilities, $l^*_{(x)}$

Age x	General Standard $\lambda_s(x)$	“SI” Method
0	-	1.000
2	-0.7152	0.9166
5	-0.6015	0.8959
10	-0.5498	0.8851
20	-0.4551	0.8627
30	-0.3150	0.8230
40	-0.1816	0.7774
50	-0.0212	0.7121
60	0.2100	0.6008
70	0.5818	0.4037
80	1.2375	0.1419

Table 10Smoothed Life-table for Female Population,
Lesotho Demographic Survey, 2001

Age x	q_x	l_x	L_x	T_x	e_x
0	0.0834	100,000	191,660	5,673,135	56.73
2	0.0226	91,660	271,875	5,481,475	59.80
5	0.0121	89,590	445,250	5,209,600	58.15
10	0.0253	88,510	873,900	4,764,350	53.83
20	0.0460	86,027	842,850	3,890,450	45.10
30	0.0554	82,300	800,400	3,047,600	37.03
40	0.0840	77,740	744,750	2,247,200	28.91
50	0.1563	71,210	656,450	1,502,450	21.10
60	0.3281	60,080	502,250	846,000	14.08
70	0.6485	40,370	272,800	343,750	8.51
80	0.8581	14,190	70,950	70,950	5.00

Table 11

Life-table for Male Population, Lesotho Demographic
Survey, 2001 Based on Male Child Mortality Levels

Age x	q_x	l_x	L_x	T_x	e_x
0	0.09916	100,000	93,332	5,412,230	54.12
1	0.04308	90,084	350,069	5,318,897	59.04
5	0.01389	86,203	427,723	4,968,829	57.64
10	0.01028	85,006	422,932	4,541,105	53.42
20	0.02235	82,805	409,581	3,700,700	44.69
30	0.02749	79,002	389,800	2,891,033	36.59
40	0.04244	74,279	363,830	2,123,202	28.58
50	0.07660	67,181	323,552	1,413,210	21.04
60	0.15226	55,459	257,026	795,268	14.34
70	0.30796	36,874	157,118	327,506	8.88
80	0.58366	14,438	49,658	70,469	4.88

As appreciated earlier that the results on female adult mortality were quite low hence not convincing, table 10 indicates that, the life expectancy at birth for females in Lesotho is 56.7 years, that is compared to 54.1 years for males as show in table 11. The 1996 Lesotho Population Census on the other hand, gives an estimate of the life expectancy at birth as 58.6 years for males and 60.2 years for females (BOS, 1996a). This implies that, longevity in Lesotho has reduced by approximately 5 years for males and 3 years for females. Apart from the fact that mortality has risen in Lesotho for both sexes, these results emphasise that females are less prone to death risks compared to their male counterparts.

Furthermore, the difference between male and female life expectancy in 2001 at any specific age is very small, meaning that the gap between male and female mortality levels is not as large as estimates on adult mortality levels implied. However, this does not rule out the fact that the overall mortality level in Lesotho is still high and declining.

CHAPTER 7

CONCLUDING REMARKS AND RECOMMENDATIONS

7.1 Summary and Conclusion

The main purpose of this study was two fold: to estimate mortality levels and to investigate socio-economic differentials in child mortality. Indirect techniques have been used to estimate both child and adult mortality. Although these estimates derived from survey data cannot be expected to be as precise as those obtained from vital registration, they do indicate reasonable variations in child mortality levels that exist between selected maternal background characteristics in the country of study.

As was expected, urban-rural differentials suggest that urban children are better off compared to their rural counterparts – more than half of both infant and child mortality take place in the rural areas of Lesotho. On the other hand, improved education of the mother reduces mortality indicating that children of mothers who have primary education are worse off compared to those whose mothers have been through high school and tertiary education. Similarly, tertiary mothers are associated with least cases of child mortality as compared to both high school and primary mothers respectively.

Households with no toilet facility experience exceptionally high risks of child deaths. This even holds where method of waste disposal is concerned. Moreover, households with their own dumpsites have lower infant and child mortality estimates compared to their counterparts that use communal dumpsites. Results associated with source of water conform to the hypothesis that households that use pipe as their main source of water have lower child mortality cases compared to those that use other sources. The above results indicate that child survival is closely related with living conditions in which he/she is born. The identified variables can directly affect and/ or be affected by contamination of the environment thereby increasing the likelihood of various infectious diseases such as diarrhoea and typhoid, which may eventually lead to deaths mainly among children.

In the same way, housing characteristics show that congestion in households has a negative impact on child survival. Households with 1-2 persons per room experience less child mortality compared to those with more than 2 persons per room. Contrary to our expectation, household size is negatively related with both infant and child mortality, implying that large households offer more chances of child care compared to small households hence lower risks of child mortality in relations to households with fewer members.

Equally important, is the unexpected observation made between male and female-headed households. Children raised in female-headed households of Lesotho are more advantaged than their counterparts in male-headed households. This is due to the fact that females are more likely than males to support their families in terms of food and other needs particularly where situations are difficult (Greene and Biddlecom, 2000). This could also be justification as to, why many women in Lesotho occupy a lot of jobs in the informal sector – presumably they are more commitment in supporting their families and children than males.

Apart from the observed differentials in child mortality in Lesotho, the 2001 Lesotho Demographic Survey further shows that, overall mortality levels in the country are still high. The usual observation that male generally experience death more than females both at childhood and adulthood was also made. Estimates on adult mortality revealed that, the life expectancy at age 20 is 38.1 years for males and 48.7 years for females, a difference of roughly 11 years. Although this study did not cover the details of why this might be so, it was strikingly evident that male adults in Lesotho are at the risk of death compared to their female counterparts.

On the other hand, infant mortality is higher than child mortality in Lesotho with female children less prone to death compared to male children. Precisely, 69 deaths per 1000 live births for female and 84 deaths per 1000 live births for males at infancy were estimated. CMR estimates further emphasised that male children are indeed at higher risk of death than female children estimated at 34 and 26 deaths per 1000 live births respectively.

Furthermore, the 1996 Population Census shows the life expectancy at birth as 58.6 years for males and 60.2 for females (BOS, 1996a) while the 2001 Lesotho Demographic Survey gives an estimate of 54.1 years for males and 56.7 years for females. This implies that longevity in Lesotho has reduced by approximately 5 years for males and 3 years for females. The difference between the life expectancies at any age of males and females is very small, which suggests that the gap shown in male and female adult mortality is not as huge as implied. In a nutshell, mortality in Lesotho is still high and there are signs that mortality has started to raise perhaps due to the escalating levels of HIV/AIDS epidemic.

7.2 Recommendations

Urban-rural differentials in child mortality could be an indication of the need of decentralisation. Apparently, Maseru City Council (MCC) is the only municipal body functioning in Lesotho and stationed in the capital city Maseru. As it is, its services do not cover half of the needs of the people out there. Bringing services and facilities closer to the community especially in the rural areas could reduce unnecessary child deaths that often emanate from poor environmental management.

Considering child mortality differentials between female and male-headed households and results on female adult mortality, one can conclude that the situation of children and women in Lesotho is not as bad as one would have anticipated. Therefore, responsible bodies such as health inspectors, planners, to mention but a few should continue emphasising enhancement of the status of women. For instance, encouraging integrated health programmes could do this since these include both women and men unlike family planning services that focus on women alone. Integrated health programmes are likely to promote communication between partners and at the end of the day reduce infant and child mortality levels particularly in male-headed households.

On the other hand, the government of Lesotho should stress the importance of the education of females not only because they are the one solely responsible for child care, but because of evidence that maternal education has the greatest positive effect on child survival (Kabir and Ahamed, 2001).

There is need to explore in depth the difference that exist between male and female mortality at all ages in Lesotho. The aim in this case should be to enhance sustainably the quality of life of all Basotho. The enthusiasm of the 1994 ICPD and other international conferences of promoting human population development should remain and be pursued.

Alternatively, policy makers and planners could focus on the relationship between adult mortality, literacy and unemployment. A lot of Basotho men who used to work in the South African mines are illiterate, and when sent back home the fact that they are unskilled limit their chances of getting employed again (Sechaba Consultants,

1999). Improved adult education could reduce mortality to reasonable levels assuming that the level of employment would also increase thereby enabling households to have access to basic requirements such as food, medicine, clothing and proper shelter.

Nonetheless, not all socio-economic development are imminent, but indeed where efforts are being made relative progress would eventually surface. However, programmes and projects to be and already implemented should be monitored and evaluated for rapid positive progress to be made. Otherwise, the situation is likely to deteriorate further given the effect of HIV/AIDS pandemic and other increasing determinants of mortality such as unemployment, rapid urbanisation and crime to mention but a few.

Bibliography

- Aaby, P (1988) Overcrowding and Intensive Exposure: Major Determinants of Variations in Measles Mortality in Africa. Institute of Ethnology and anthropology, Copenhagen.
- Basta, S.S (1977) *Nutrition and Health in Low Income Urban Areas of the Third World*. Ecology of Food and Nutrition. Vol. 6 pp113-124.
- Basu, A.M (1990) *Cultural Influences on Health Care Use: Two Regional Groups in India* Studies in Family Planning. Vol. 21 Issue 5.
- Bicego, G and J.T, Boerma (1991) *Maternal Education and Child Survival: A Comparative Analysis of DHS Data*. World Conference. Washington, D.C.
- BOS (1996a) Population Census Analytical Report. Maseru, Lesotho. Vol. III.
- (1996b) Population Census Data Report. Maseru, Lesotho Vol. III.
- (1998) *Exposing Geographic Inequity.* " Lesotho's Multiple Indicator Cluster Survey - A District Level Report. UNICEF Lesotho (ed.) CLF Printers.
- (2001a) Lesotho Demographic Survey Preliminary Analytical Report. Maseru, Lesotho.
- (2001b) *The Questionnaire*. Lesotho Demographic Survey. Maseru, Lesotho.
- Brass, W and A. Coale (1968) "Methods of Analysis and Estimation" Demography of Tropical Africa. William Brass et al. (eds.) Princeton: Princeton University Press. pp 88-150.
- Brass, W. and Ken Hill (1973) "Estimating Adult Mortality from Orphanhood". International Population Conference.
- Caldwell, J.C (1979) *Education as a Factor in Mortality Decline: An Examination of Nigerian Data*. Population Studies. Vol. 33 No. 3.
- Cleland, J; G. Bicego and G. Fegan (1992) *Socio-economic Inequalities in childhood Mortality: the 1970s to the 1980s*. Health Transition Review. Vol. 2 No. 1.
- Chen, L.C; M, Rahman and A.M, Sarder (1980) *Epidemiology and Causes of Death among Children in a Rural Area of Bangladesh*. International Journal of Epidemiology. Vol. 9 pp 25-33.
- CIA (2002) The World Fact Book.
www.cia.gov/cia/publications/factbook/fields/2119.html Page last up-dated on 01/January/2002.

- Das Gupta, M (1990) *Death Clustering, Mother's Education and the Determinants of Child Mortality in Rural Punjab, India*. Population Studies. Vol. 44 pp 489-505.
- Daugherty, H.G and K.C.W, Kanimeyer (1995) An Introduction Chapter, "Mortality." The Guildford Press: London.
- Dugbaza, T (2001) "Water and Sanitation." Lesotho Demographic Survey Preliminary Analytical Report. Prepared by UNFPA for the Bureau of Statistics: Maseru, Lesotho.
- Finkle, J.L and B.B, Crane (1975) *The Politics of Bucharest: Population, Development and the New International Economic Order*. Population and Development Review. Vol.1 No.1.
- Gill, D (1994) The Situation of Children and Women in Lesotho. D. Ambrose; J. Bloem; P. Cole; J. Gay; D. Gill; S. Gill; T. Phuroe (eds.) Prepared by Sechaba Consultants for the Ministry of Planning, Economic and Manpower Development: Maseru, Lesotho,
- Grdanicki, J and D, Hall (1999) The Situation Update of Children and Women in Lesotho. J. Gay; R. Cadribo; T. Foulo; D. Hall; J. Bloem; K. Lerotholi; M. Mohatla; L. Raditapole; J. Grdanicki; G. Mathot and K. Grossenbacher (eds.) Prepared by Sechaba Consultants for UNICEF Lesotho: Maseru: Lesotho.
- Greene, E.M and E, Biddlecom (2000) Absent and Problematic Men: Demographic Accounts of Male Reproductive Roles. www.europrophen.org.
- Hobcarft, J (1993) *Women's Education, Child Welfare and child Survival: A Review of the Evidence*. Health Transition Review. Vol. 3 No. 2.
- Johnson, G (1964) *Health Conditions in Rural and Urban Areas of Developing Countries*. Population Studies. Vol. 17 pp 293-309.
- Kabir, M and M.M, Ahamed (2001) *Differentials in Infant and Child Mortality Rates in Bangladesh*. Jahangirnagar University, Dhaka, Bangladesh.
- Lalou, R and T.K, LeGrand (1997) *Child Mortality in the Urban and Rural Sahel*. Population: An English Selection. Vol. 9 pp 147-168.
- Letuka, P et al.(1994) "Inheritance in Lesotho." Women and the Law in Southern Africa. Epic Printers: Maseru, Lesotho.
- Makoa, I.M (1998) The Effects of Demographic Factors and Environmental Conditions on Under-Five Survival in Lesotho: Thesis Paper. Makerere University: Uganda.

- McIntosh, C.A and J.L, Finkle (1995) *The Cairo Conference on Population and Development: A New Paradigm?* Population and Development Review. Vol. 21 No.2
- Mosley, W.H (1983) *Will Primary Health Care Reduce Infant and Child Mortality? A Critique of some Current Strategies with Special Reference to Asia and Africa.* Seminar on Social Policy Health and Mortality Prospects.
- Mosley, W.H and L.C, Chen (1984) *An Analytical Framework for the Study of Child Survival in Developing Countries.* Population and Development Review. Vol. 10 pp 25-45.
- Mosley, W.H and S, Becker (1991) *Demographic Models for Child Survival and Implications for the Health Programmes.* Health Policy and Planning. Vol. 6 No. 3.
- Mturi, J.A and S.L, Curtis (1995) *The Determinants of Infant and Child Mortality in Tanzania* Health Policy and Planning. Vol. 10 No.4.
- Puffer, R.R and C.V, Serrano (1973) Patterns of Mortality in Childhood. Pan American Health Organisation: Washington, D.C.
- Sambisa, W (1990) "Mortality Overview in Zimbabwe: A Chitungwiza Case Study." Chapter 7.
- Sandiford, P.C; J. Cassel; M. Montenegro; G. Sanchez (1995) *Impact of Women's Literacy on Child Health and its Interaction with Access to Health Services.* Population Studies. Vol. 49 Issue 1.
- Sechaba Consultants (1999) Poverty Assessment Discussion Paper. Prepared for the Ministry of Ministry of Planning, Economic and Manpower Development: Maseru, Lesotho.
- Stephens, P.W (1984) *The Relationship between the Level of Household sanitation and Child Mortality – An Examination of Ghanaian Data.* Population Studies Centre Working Paper. University of Pennsylvania: Philadelphia. No. 10
- Tekçe, B and Shorter, F.C (1984) *Determinants of Child Mortality: A Study of Squatter Settlements in Jordan.* Population and Development Review. Vol. 10 suppl.
- Teklu, T (1996) Indirect Methods of Estimating Infant and Child Mortality in sub Saharan Africa. Department of Social Statistics: University of Southampton.
- Timeaus, I. M and L, Lush (1995) *Intra-urban Differentials in Child Health.* Health Transition Review. Vol. 5 pp 163-190.

- Trussell, J (1975) *A Re-estimation of the Multiplying Factors for the Brass Technique for Determining Childhood Survivorship Rates*. Population Studies. Vol. 29 No. 1 pp 97-107
- Trussell, J and J, Menken (1984) *Estimating Levels, Trends and Determinants of Child Mortality in Countries with Poor Statistics*. Population and Development Review. Vol. 10 Suppl.
- Tuoane, M (1995) Socio-economic Status of Women and Fertility in Lesotho. Demographic Unit, Department of Statistics. National University of Lesotho: Roma, Lesotho. No. 22.
- UNICEF (2001) "UNICEF Strategies in Water and Environment Sanitation." Water and Environment Sanitation (WES). www.unicef.org.
- (2000) End of Decade Database: Infant and Child Mortality. www.unicef.org.
- (1990) World Summit for Children. www.unicef.org.
- UN (1983) "*Indirect Techniques for Demographic Estimation: Manual X*." Population Studies. Department of International Economics and Social Affairs. No. 81.
- (1985) Socio-economic Differentials in Mortality in Developing Countries. New York.
- Varty, S (1999) "*Environmental Health Indicators: Framework and Methodologies*." Protection of the Human Environment and Environmental Health Series. WHO: Geneva.
- WHO (1994) AIDS a Threat to National Development. Maseru, Lesotho.