Fertility Transition in Lesotho: The Recent Trends, Socioeconomic Factors and Proximate Determinants.

By

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DECLARATION

Submitted in fulfilment / partial fulfilment of the requirements for the degree of Masters in Population Studies, in the Graduate Programme in the School of Development Studies, University of KwaZulu-Natal,
Durban, South Africa.

I declare that this dissertation is my own unaided work. All citations, references and borrowed ideas have been duly acknowledged. I confirm that an external editor was/was not used and that my Supervisor was informed of the identity and details of my editor. It is being submitted for the degree of Masters in Population Studies in the Faculty of Humanities, Development and Social Science, University of KwaZulu-Natal, Durban, South Africa. None of the present work has been submitted previously for any degree or examination in any other University.

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ABSTRACT

There is a general perception that fertility has been declining over a decade in Lesotho, and this has sparked the debate that fertility transition is drawing closer in Lesotho. The growing concern was stimulated by limited studies showing the effect of socio-economic factors on fertility in Lesotho and variations in proximate determinants. The paper examines recent fertility trends in Lesotho using various demographic techniques of fertility estimation and determines whether the onset of fertility transition has begun in Lesotho. The secondary aim is to assess and control errors in the Lesotho Demographic and Health Survey of 2004, thus providing robust and reliable estimates.

The analysis utilizes the secondary data from 2004 Lesotho Demographic and Health Survey (LDHS). The data set comprised of a sample of 7095 women who participated in the survey. The use of 1996 Lesotho Population Census and 2002 Lesotho Reproductive and Health Survey were made to facilitate comparison with 2004 LDHS, and to provide differentials and measure changes over time in fertility. The P/F ratio method developed by Brass and the modified version, Relational Gompertz Model are employed and used to assess the quality of data as well as determining fertility levels and trends.

The findings reveal that the overall fertility among women in Lesotho during 2004 LDHS is 4.02. Application of different methods depicts that fertility remains high in Lesotho, although considered moderate according to sub-Saharan standards. Despite the fact that TFR is high, overall fertility decline is evident. The estimates of fertility range between 3.5 and 5.6 depending on the technique in use. The reason for the high observed fertility is that women in the rural areas still cherish quite a substantial family size. Nevertheless, changing acceptance and perception of using contraception, delayed marriage, high levels of education and economic development among women in Lesotho contributes considerably to fertility declines in Lesotho. As a result, disparities that continue to propel fertility levels within population groups incite reassessment of existing research and policy so as to enhance development strategies as well as action programmes.

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DEDICATION

I dedicate the research to my Nephews Bafox, K'hali and Lebile. Your Love resembles eternity guys, if it were not because of your permanent innocent smile, aunty Afna would not have made it.

You are naughty yet brilliant, beautiful boys. Aunty loves you for that. You will always be dear to my heart.

Love Always

ACRONYMS

ASFR	Age Specific Fertility Rate
BOS	Bureau of Statistics
CBR	Crude Birth Rate
CDR	Crude Death Rate
CEB	Children Ever Born
CWIQ	Core Welfare Indicator Questionnaire
DTT	Demographic Transition Theory
GDP	Gross Domestic Product
GNP	Gross National Product
IMR	Infant Mortality Rate
LPC	Lesotho Population Census
LDHS	Lesotho Demographic and Health Survey
LDS	Lesotho Demographic Survey
LHWP	Lesotho Highlands Water Project
LRHS	Lesotho Reproductive Health Survey
MOHSW	Ministry of Health and Social Welfare
OECD	Organisation for Economic Co-operation and Development
PAS	Population Analysis Spreadsheet
PRSP	Poverty Reduction Strategy Paper
SACU	Southern African Customs Union
TF	Total Fertility
TFR	Total Fertility Rate
TMFR	Total Marital Fertility Rate
TNMR	Total Natural Marital Rate
UN	United Nations
UNHCR	United Nations High Commissioner for Refugees
UNDP	United Nations Development Project

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CHAPTER ONE

INTRODUCTION

1.1 Background to the Problem

Fertility is a bio-social phenomena and its transition is viewed as a one-way process that changes from high to low or low to high within a defined spectrum (Timaeus, 2005). The major concern is how to date the onset of the fertility decline. While there are many ways in which fertility decline can be determined, the focus in this work shall be the method whereby high births and deaths reach the peak, thereafter declines gradually after stabilising for a certain period of time. This method is said to use the date of the peak in fertility that precedes 10 percent as suggested by Bryant (2005). Transitional fertility is not homogeneous across all areas and time due to various effects widely existing in each population. Many social scientists believe that fertility transitions are artefacts of economic and technological changes of the modern era (Bulatao *et al*., 2003). These transitions emanate from economic development, mass communications, effective programs of public health and curative epidemics, and related social changes (Hirschman, 1994).

Timaeus and Onuoha (1995: 99) define fertility transition as "a sustained and usually irreversible decline in fertility driven by the increasing use of contraception, sterilisation, and abortion to limit family size." There is no consensus among experts and demographers as to whether the possibility of birth control (contraception) was widely known in pre-transitional societies. Nonetheless, some social scientists argue that pre-transitional fertility was controlled in that social controls kept fertility below biological maximum (Swartz, 2002). The argument is that in the past, men were to marry if or when they were able to support their families economically; therefore, in this respect marriage was postponed. Attached also was an issue of prolonged breastfeeding, which served as a way to reduce fertility although unintended.

Globally, fertility transition began in parts of France by the end of the eighteenth century (Casterline, 2001). Although birth and death rates declined dramatically, population growth remained high due to population momentum. Most of the Organisation for Economic Co-operation and Development (OECD) countries currently have replacement or below replacement levels of fertility (Kirk et al., 1998). The population in more developed countries initiated its change way before the 20th century due to steep declines in birth and death rates emanating from socio-economic and technological revolutions (Population Bulletin, 2004).

Total Fertility Rate (TFR) has currently fallen below replacement level, that is, the level at which population is unable to replace itself in the short run. Replacement level fertility is often considered as 2.1 children *per* woman on average (United Nations (UN), 2001). Albeit consensus about reducing fertility, countries strive to maintain an average of two children per woman in their entire reproductive age.

In Africa, the onset of fertility transition and its subsequent pace was evident in the late 1970s (Casterline, 2001). Comparatively, fertility in Africa is declining but not as rapid as in the OECDs; rather it remains very high in some parts of the continent (Caldwell, 1982; Be-Ofuriyua, 2002). There are several reasons cited for this stall in fertility including slow socio-economic development and lack of importation of technologies from industrialised world (Watkins, 1986). However, despite the said stall, by mid-1980s, the decline extended to most of less developed countries (Bongaarts, 2003). It took two generations for fertility decline to spread across sub-Saharan Africa. The first few countries to experience the decline include Uganda, Ghana, Kenya and South Africa. Over the last two decades, fertility rates in these countries have declined vividly (Kalipeni, 1995).

With the spread of fertility decline through much of the developing world, the focus of the debate about future fertility trends is shifting from the early to the intermediate phases of the transition. According to (PRB, 2005), the medium variant of the most recent UN projections, some of the sub regions of the developing world will have ended their transitions by 2025-30 with TFR at or below 2.1. In many developing countries, large proportions of young people virtually guarantee that population will continue to grow during periods of declining fertility and even after fertility drops to replacement (Haupt and Kane, 2004).

Weeks (2005) shows that Southern Africa has TFR of three and will reach replacement level fertility by 2040. Majority of developing countries, more especially sub-Saharan African countries, have not yet reached the end of their transitions. On the other hand, Weeks (2005: 254) shows that in "the 1950s sub-Saharan Africa experienced very high fertility" but recently fertility rates are declining although UN predicts that it will still be the region with the highest yet lower than previously. The Population Reference Bureau (2005) also prove that total fertility rates among the Sub-Saharan African countries are at 3.0 on average and so the speed of the decline has a tendency of slowing as countries reach very low fertility levels. This being the case, the likelihood is that they will reach the same levels as the European countries and United States of America (USA). In summary, the total fertility rates in USA and Europe have reached levels at and below replacement while the sub-Saharan

countries are struggling to reach 2.1, and the pace of the decline is slow hence sub-Saharan Africa will not be the same as Europe and the United States in twenty years from now.

In Sub-Saharan Africa, specifically Lesotho, which is the subject matter of analysis in this work, the general fertility pattern show significant declines, which is comparatively lower than most of African countries (UNDP, 2006). The reduction in fertility levels can be tracked by examining the different censuses and surveys. When comparing the previous censuses and demographic health surveys, for the period commencing 1986 to 2004, the general fertility pattern shows significant declines from the high of 5.4 to current TFR of 3.5 (UNDP, 2006). By the year 1976 it was revealed that, TFR was as high as 5.4 children *per* woman (BOS, 1976). Ten years subsequent to that, fertility was estimated at 5.3 during the 1986 census (BOS, 1987). The drop of fertility by 0.1 implies a slower pace of reductions in fertility among the women in Lesotho during the period of ten years. The average number of children *per* woman further declined to 4.1 in 1996. In addition, the decline of population reflected in the intercensal results also relates to the decline in total fertility. The survey carried out in 2001 depicted TFR of 4.2 (LDS, 2001) while the subsequent TFR reported in the 2004 survey estimated at 3.5 (LDHS, 2004). The reduction of overall fertility in Lesotho and its slow pace is an outcome of a variety of factors ranging from proximate determinants, cultural revolutions, economic and social factors.

In a nutshell, Lesotho is a relatively small country, about 30,355 square kilometres of which slightly more than ten percent of the land is arable (BOS, 2004). Lesotho is completely surrounded by the Republic of South Africa (RSA), and it is divided into four agro-ecological zones, namely, Lowlands, Foothills, Mountains and the Senqu River valley, which differ in terms of size, topography and climate. The country is further sub-divided into ten administrative districts. Maseru is the capital city of Lesotho, one district that has accrued much in terms of development of infrastructure and economic well-being more than any other district. The country is also sub-divided into two residential areas; urban and rural areas and the majority (about 80 percent) of the population reside in rural areas.

Economically, Lesotho has experienced revenue declines from 44 percent to 42 percent as a share of GNP, resulting from a drop in the Southern African Customs Union (SACU) related revenues (UNDP, 2006). On the other hand expenditure continued to rise, resulting in a deficit of 6.3 percent of GNP in 1998/99. For the period 1991-1997, GDP and GNP growth rates were on average 7.8 percent and 4.1 percent respectively. This growth rate was stimulated by two major activities in the economy namely, the construction of the

Lesotho Highlands Water Project (LHWP) and the expansion in manufacturing where *Basotho* women with low levels of education are mostly employable. Measures of GNP and GDP during the period 2001/2004 picked up from a fall by two percent. However, the estimates by this period were moderate, 4.3 percent and 7.9 percent respectively (World Bank, 2005).

During 1998, domestic output fell by 8.6 percent as against 3.5 percent increase in the previous year. For many families in Lesotho, labour migration system became the source of income for relatively a long time. In addition, migrant labour income declined due to retrenchments, particularly in the South African gold mines. The number of mine workers has been declining from a peak of 125,000, 76,000 to about 69,000 for the years 1989, 1998 and 1999 respectively. Inflation rate fluctuations affected the population tremendously (UNHCR, 2005)

Lesotho is ranked one of the countries with highest literacy rates in Sub-Saharan countries. Female literacy levels are continuously increasing; from the 1996 census literacy rate was at 90 percent. According to 2002 LRHS, the rate increased to 91.2 percent and a further increase experienced to 94.5 percent in 2004 (BOS, 2004). However, unemployment is a major drawback responsible for high poverty and fertility levels. In 1999 alone, the estimates show that Lesotho had labour force of about 795,000, 58 percent of which were employed both inside and outside the country (UNHCR, 2004). However, trends show that women who constitute 52 percent of the population are still subject to a number of discriminatory practices, especially at work places where higher positions are generally occupied by men. Currently, the UN employment rate is estimated at 42 percent (World Bank, 2008). The estimates reveal that every year 25,000 new entrants enter the labour force, while the economy generates only 9,000 jobs per annum. (UN, 2004).

As far as health care services are concerned, the population's access to health care facilities is adversely low and requires more effort to improve the system focusing on the highlands and mountainous areas (BOS, 2004). Currently, where health care facilities are existent, a large proportion (86 percent) of the people lives within a five kilometres distance from a health facility. Despite the high prenatal coverage of approximately 87 percent for at least one visit, a high proportion of births still occur outside health facilities (BOS, 2004; MOHSW, 2008). In this regard one of government's objectives is to make births safe for both mother and child whenever they occur through the strengthening of community based heath care.

The 2006 preliminary results predict that total population of Lesotho is estimated at 1.8 million, however, the projections based on the 1996 Lesotho population census reveal 2.2 million population (BOS, 2008). The annual population growth rate was 1.5 percent *per* annum during the 1986-1996 periods (BOS, 1996). According to the 1996 population census, the crude birth rate (CBR) for Lesotho was 30 births per 1,000 compared with 37 *per* 1,000 in the 1986 population census indicating a gradual decline of births within 10 years period. TFR of Lesotho declined by more than one child between 1986 and 1996. The Crude Death Rate (CDR) increased from 11.6 deaths to 12.8 deaths *per* 1,000 over the same period. The infant mortality rate (IMR) has been declining steadily (MOHSW, 2001). It was estimated at 113 deaths *per* 1,000 live births in 1976 (BOS, 1976) and it fell to 85 deaths *per* 1,000 in 1986 and 74 deaths *per* 1,000 in 1996 (BOS, 1996).

The degree of completeness, accessibility, validity, consistency, representation and accuracy are some of the attributes of appropriate data. In their article on 'assessment of data quality,' Pipino and associates (2002) assert that these dimensions define a good quality data comparable at national and international standards. Generally, a distinct drawback that undermines demographic data is most likely to be found in the realm of its quality, a necessary condition for carrying out national development plans and decision-making (Brass, 1996; Cleveland, 1989). Similarly, data collected in Lesotho is often criticized for being unreliable and unrepresentative because it exhibits incompleteness and lacks accuracy (Mba, 2003; Mturi and Hlabana, 1999). There are conditions that contribute significantly to discrepancies in the data.

Poor physical terrain in Lesotho is one leading situation of over and undercounting. Firstly, the terrestrial boundaries are usually not apparent, thus causing double counting. Sometimes, several population groups are missed out merely because they were expected to fall under certain enumeration areas whereas they are not subsumed under such area. While at times, mountainous features of the country prohibit proper enumeration of certain groups of population due to lack and/or poor road infrastructure (BOS, 1996). Thus, such areas are unreachable and compromise the quality of data. The floating population existent in Lesotho also hamper the accuracy of data collection (Sembajwe, 1990). Data collection is documented from as far as early 1970s and beyond in Lesotho; however, quality of fertility data is dubious because of the aforementioned reasons (Mpiti and Kalule-Sabiti, 1985). Thus, data cleaning is a critical prerequisite to any user otherwise it would distort meaning in the reporting and analysis of such data.

1.2 Statement of the Problem

The estimates of fertility in Lesotho by the BOS are different and contradictory, especially when one uses different models, which should not be the case. Also in the main, there are a few studies that have been done to examine trends and factors that affect fertility in Lesotho. Thus, according to Mturi and Hlabana (1999), the Lesotho population census conducted in 1986 shows a TFR of 4.1 and is projected to gradually decline to 2.5 in the 21st century due to breastfeeding patterns, contraceptive use and delay of women in getting married. In addition, Maseribane (unpublished, 2005) showed that TFR dropped to an average of 3.5 children *per* woman in the 1990s, and the reason for this decline was found to be prolonged breastfeeding (Mturi and Hlabana, 1999). Other studies show that intermediate determinants are main factors that have contributed to the decline in fertility in Lesotho (Mpiti and Kalule-Sabiti, 1985; Mturi, 1998). However, Pollak and Watkins (1993: 471) contend that there are other explanations, such as socio-economic factors, for fertility transitions besides 'explanations based solely on proximate determinants.' The reality of studies showing the impact of socio-economic factors on decline in fertility and the onset of fertility transition is minimal or nonexistent in Lesotho, and this has prompted this study being conducted. The research, therefore, attempts to fill-in the gaps by determining the onset of fertility transition in Lesotho and identifying socio-economic factors responsible for the decline in fertility in Lesotho during the period 1996 to 2004. In addition, the study seeks to clean data before estimating plausible estimates of fertility.

1.3 Research Objective

The major objective of the research is to establish recent variations in fertility rates in Lesotho in the period commencing 1996 to 2004 in order to assess the likely reasons for the currently observed fertility rates. This will be achieved through undergoing the following specific objectives;

- To assess quality of data for women in reproductive ages (15-49 years) in Lesotho
- To estimate total fertility rate for 2004
- To examine socio-economic factors as well as proximate determinants of fertility, in particular, education, place of residence and marriage
- To determine the onset of fertility transition

1.4 Justification of the Research

A few studies conducted in relation to trends in fertility have always excluded or given minimal attention to socioeconomic factors in establishing the patterns of fertility in Lesotho. In their research on 'Fertility in Lesotho' Mturi and Hlabana (1999) had an interest on the recent trends of fertility concentrating specifically on proximate determinants. For instance, Hlabana (2006 unpublished dissertation) estimated fertility levels in Lesotho focusing on application of P/F ratio methodology. In this study, the estimates were calculated taking into account only proximate determinants. On the other hand, Maseribane (2006 unpublished dissertation) looked at fertility trends in the context of Lesotho highlighting the impact of proximate determinants. Therefore, paucity of studies in the area implies that little is known about the effect of socio-economic factors on fertility decline. The changes in fertility levels have been realised although the reasons for such state of affairs have not been widely explored.

Some sub-Saharan countries such as Zimbabwe, Kenya and South Africa have documented the onset of fertility transition (Caldwell and Caldwell, 2001). Recent fertility trends in Lesotho also provide a forecast that relates existing fertility levels to the onset of fertility transition; therefore, it is important to determine and confirm the onset of fertility transition in Lesotho. It is important that the research be conducted so as to contribute knowledge and thinking which is of practical significance in various demographic endeavours. The research will also contribute to population policy matters by helping decision and policy makers to perfect their fertility control measures as spelled out in the population policy of Lesotho.

1.5 Limitations of the Research

The major hindrance is that both methodologies; Brass P/F ratios and Bongaarts' Proximate Determinants draw on quantitative techniques. In most cases, these techniques do not go deeper into the reasons why fertility increases or declines. Therefore, more interesting information is missed out. Secondary data that are used for purposes of this study are subjected to errors inherent in the data sets, thus this forces the author to assess data quality before its use.

One other main setback of the research is that analysis is limited to one data set. Initially, it was planned that 2006 Lesotho population census data would be incorporated into

the study. However, the delay on the part of the BOS in compiling and releasing the results prohibited the use of this data set.

The analysis of the paper is based on the 2004 LDHS; however, results from other studies based on are used for comparison and to make sense of the trends. The disadvantage of using 2004 LDHS only as a focal point is that, it becomes difficult to compare some interesting contemporary issues such as HIV and AIDS affecting fertility, for the reason that questions related to such issues are not covered prior 2004 LDHS.

Finally, comparison of results is limited due to, at the outset, the nature of data sets which are partially different. The questions asked during the 2004 LDHS require detailed information (for instance, why, how) from each family member and there are specific additional information required from men, women and children whereas questions asked during the 1996 population census provide basic information. Secondly, the time period between the years is far apart hence the characteristic nature of the population could have totally changed. Thirdly, questions on fertility are barely asked in the 1996 Lesotho Population Census and thus limited to women aged 15 to 49 only.

1.6 Organisation of the Research

The research is divided into five chapters. The first chapter provides background information of the study and the country in which the study focuses on. It presents the main objectives of the study, which should be aid in answering the problem. Limitations of the study are also presented in the first chapter, to highlight the challenges that prohibited some of the main issues and lastly provide the organisation of the research. The second chapter mitigates creative research done by other authors in relation to the research topic. Chapter three explains methodologies used to address the problem. The findings of the study are presented in chapter four. The last chapter provides summary of discussions, conclusions and recommendations made in relation to the research findings.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The chapter introduces and provides the background information on trends of fertility based on various fertility transition studies. It delineates what other authors say about fertility transition and its determinants. The chapter is divided into various parts or sections. Firstly, presentation of global trends and fertility levels highlighting past experiences on increases and reductions in fertility across all continents. Fertility trends in sub-Saharan Africa (SSA) are as well discussed with reference to countries that experienced declines at an earlier stage, hence are indicating to be ahead with fertility transition. Strong emphasis is placed on Lesotho, the region where the study is based. Furthermore, the chapter examines different theories of fertility transition. A layout over-viewing determinants of fertility is presented, distinguishing between each proximate determinants' contribution on fertility variation where each of the proximate determinants is discussed in detail. These include marriage, contraception, abortion and postpartum infecundability. A review of other determinants provides a re-assessment on what is known so far in relation to determinants of fertility in Lesotho. Lastly, the chapter presents the theoretical framework highlighting background information on the framework, the developers of such framework and how it came about.

2.2 Fertility Levels and Trends Globally

Trends in fertility are of interest to demographers and social scientists because a better understanding of the change in fertility patterns assists in policy formulation and planning. Previously, perceptions to fertility measurements and the implications attached to them assumed less importance because of, for instance, the number of live births per year was invariably insignificant (Jain and McDonald, 1997). Nonetheless, the changing facet of population growth subsequent to rising investment in human capital which has grown significantly is characteristic of current trends and that evidently illustrates variations in fertility levels (Suliman, 2002). Therefore, the need to plan for current and future populations makes it important to carry out research from time to time. For

instance, fertility trends present measurements on variations in total fertility that assist in planning for current and future educational needs.

Recently, there have been considerable contributions to the study of fertility transition. Various studies have been undertaken to unpack the relationship between proximate and socio-economic determinants of fertility decline in the contemporary societies, in particular to the emerging or modern role of each of the determinants of fertility (Beguy, 2009; Kalipeni, 1995). These studies divulge in debates surrounding fertility transition worldwide yet comparatively, sub-Saharan Africa in particular has been evidenced to have fertility declining at a slow pace (Cohen, 1998). Therefore, the region specifically relates these arguments to the ultimate transformations that are currently occurring across African societies.

The contemporary patterns of fertility transition from high to low fertility rates that are virtually universal prove that low fertility is not only contributed by development, but other factors also have a significant contribution (Narayan and Pen, 2006). For instance, Brazil falls under developing countries yet it is experiencing the rapid fertility decline. Comparatively, some developed worlds had in effect development owing to declines in fertility from as early as the 1960s (Bulatao et al., 2001) whereas others engaged a number of factors to the reductions in fertility. The major social changes such as industrialisation, urbanisation and consequently internal migration and female labour force participation practically dismantled enthusiasm to have large families thus marking the onset of fertility decline in Brazil (Caetano, 2001). Moreno and Sigh (1996) argues that although it is at a very insignificant level and to a specific population group, but to some extent contraceptive use generally contributed to reductions in fertility.

Ever-increasing number of countries attaining replacement level fertility including those from developing worlds assures less importance of development to reductions in fertility levels (Agyei-Mensah and Casterline, 2002; Lucas, 1992). However, proximate determinants reassure their continuity as relevant factors contributing to declines in fertility. Mexico, is one of the developing countries had the onset of fertility decline beginning late in 1970s where the average number of births per woman fell precipitously

from seven to under three births in thirty years, the profound consequences of family planning, more specifically contraceptive use (Carter and Sutch, 2003).

2.3 Fertility Trends in sub-Saharan Africa with Special Emphasis on Southern Africa

While assessing the state of affairs facing Lesotho's population from now going through to the future, Locoh and Hertrich (1994) alerts that it should be noted that generally total fertility rates of between 5 and 7 are paramount to norms and values of not only one specific country but throughout sub-Saharan Africa. The debates on fertility differentials among African societies shape fertility dynamics and mould them into what they become in impending years. In measuring overall fertility behaviour in a certain population; unlike between societies, one needs to take note of existing norms and values coupled with cultural, socio-economic and other determinants throughout Africa because they invariably exert pressure on human behaviour. That, however, has tremendous impact on population momentum, but most importantly fertility rate. The continuance of high fertility (between 5 and 7 children per woman) owing to boy children preferences is characteristic of societies of third world countries (Kalipeni, 1995). Accordingly, fertility as the main influential feature of increasing high population growth in Africa plays an important role in policy implications and reformulation.

Similar to many other African societies, Nigeria has sustained high fertility patterns. Social and biological factors are responsible for persistent fertility behaviour patterns that place Nigeria in a slow pace group of countries experiencing high but gradually declining fertility. On the other hand, for about two decades, Kenya experienced marked stability in fertility declines which took the country a longer period of time to commence reductions in fertility. According to 1989 Kenyan Demographic and Health Survey, the high response towards engraved attitudes to family sizes and contraceptive use changed gradually.

2.4 Fertility Levels in Lesotho

It is not many years ago when Lesotho was identified among countries with the highest total fertility rate (Mba, 2003). However, the toll has taken a turn and fertility transition seems to have established traction in Lesotho. Although still high at approximately 3.4

according to the world's standards, the current TFR indicates a remarkable decline in recent years. Lesotho falls within countries that are categorised under high rank populations which have the highest fertility levels in the world (Bureau of Statistics, 2003b). Issues related to poverty and development levels determine certain behaviours that overly affect fertility. Higher fertility levels are associated with high prevailing poverty levels predominantly among rural populations (Kirk and Pillet, 1998). Likewise, Lesotho is no exception, particularly because most of the communities are agrarian. Therefore, Lesotho experiences high fertility particularly among rural women. Contrarily, BOS (2005) claims that the onset of fertility decline took place under wide variety of socioeconomic conditions and spread quickly within cultural areas.

Comparing all the previous censuses from 1986 together with demographic health surveys, fertility has significantly declined from as high as 5.3 to current TFR of 3.5. According to 1986 census, fertility was estimated at 5.3 (BOS, 1987). It further declined to 4.1 shown by 1996 census. In addition, the intercensal results also relate to the decline in total fertility. The survey carried out in 2001 depicted TFR of 4.2 (LDS, 2001). Further to that is a TFR estimated at 3.5 (DHS, 2005). The information is summarised in Table 2.1:

Table 2.1 Trends in Fertility: Age Specific Fertility Rates for Lesotho Population Censuses 1986, 1996 and Surveys 2001 LDS and 2004 LDHS

Age	Censuses		Surveys	
Group	**1986**	**1996**	**2001**	**2004**
15-19	70	37	81	91
20-24	246	145	196	177
25-29	256	153	204	160
30-34	223	131	122	122
35-39	178	106	148	101
40-44	95	66	60	46
45-49	30	27	28	9
TFR	**5.3**	**4.1**	**4.2**	**3.5**

Source: BOS, 1986, 1996, 2001, 2004

2.5 Determinants of Fertility

There are many theoretical frameworks that were developed to facilitate the study of social, economic, environmental and biological determinants of fertility in the past. The few models that are notably of significant importance beginning with the demographic transition theory, the framework pioneered centuries ago, relates to pre-modern high mortality levels which had tremendous effects on increasing fertility. The fundamentals of modernization play a great role in shaping currently adopted frameworks that successfully explain the link between trends in reductions of fertility.

Many studies have observed fertility change mainly due to different factors. There are factors discussed by Bongaarts (1984) which are perceived to be responsible for fertility decline in different societies in aggregate and as individual factors. These demographic phenomena and events are classified as proximate determinants of fertility. The idea was introduced by Davis and Blake (1956) who distinctively identified direct factors from those that indirectly influence fertility. These factors are mainly responsible for variations in fertility and termed them intermediate factors defining variables that mediate between fertility and many other variables. Intermediate variables encompass biological and behavioural factors through which social, economic, psychological and environmental variables affect fertility outcomes within and outside the certain and specific boundaries (Boerma and Sharon, 2005). Davis and Blake referred to the direct variables as intermediate fertility variables that directly influence fertility. A few decades

later, Bongaarts (1978), in his studies on fertility termed these variables 'proximate determinants' of fertility.

The three grouped set of intermediate variables were identified and these include: factors affecting exposure to intercourse (proportions of women married), factors affecting exposure to conception (contraceptive use), and factors affecting gestation and successful delivery (induced abortion) (Davis and Blake cited in Kaplan and Bock, 2001). Each of these biological factors can be influenced by a set of behavioral intermediate variables that are directly linked to the biological factors. Bongaarts modified and formalized Davis and Blake's framework into a quantifiable model by including some variables and discarding those that he presumed to be of less importance to the model, thus contributing relatively less to the variations in fertility. A variable is relatively unimportant if fertility is largely insensitive to it, or, if it varies little between populations, or over time. In the same manner that Davis and Blake group the variables, Bongaarts (1978) distinguishes four proximate determinants as being mainly responsible for variations in fertility and from previous model he adds post partum infecundity, that is, duration of post partum amenorrhoea being a measure of exposure to conception, as the last variable, largely determined by duration and possibly intensity of breastfeeding (Reinis, 1992).

The proximate-determinants framework for fertility has been used extensively for a variety of purposes, including studies of the determinants of fertility, evaluation of factors affecting fertility trends, and comparative analysis. Its main use has been with decomposition analysis, using a simple statistical model for the relationship between the proximate determinants and fertility change. The joint effect of all the proximate variables determines fertility levels and trends. For the analysis of fertility differentials and trends only those determinants are meaningful whose effect differs in time and space. Altogether, for the analysis of fertility levels and trends, the four most important proximate determinants are the time spent in stable sexual unions, postpartum infecundability, contraception, and induced abortion. The study explores the impact of each one of the main determinants of fertility and they are presented and discussed in the following sections.

2.6 Proximate Determinants of Fertility

Marriage

The existence of measures of nuptiality for different countries allows for comparison of marriage rates and the contribution of marriage towards declines in fertility at varying levels. In traditional societies and societies that have strict regulation of sexual behaviour, marriage is a key determinant of fertility. This is because childbearing is seen to be limited within marital unions.

At present first marriage is delayed in African countries, and at any age the proportions of never married women are increasing. This behaviour seems to be related to increasing levels of education, urbanisation and economic opportunity. Also new attitudes and preferences among young women for later marriages and for remaining unmarried are preferences that seem to be prevalent in many parts of the world. Marital fertility has been defined as 'legitimate' fertility, that is, fertility occurring within marriage (Garenne et al., 2001). Even though factors such as education have contributed much in reducing marital fertility in Lesotho, it has been found that non-marital fertility remain high. In the past, Lesotho was characterised by early and universal marriage that was considered as the principal indicator of women's exposure to risk of pregnancy (Lesotho Demographic Survey, 2001; Makatjane, 1999).

Traditionally, *Basotho* nation attached importance to childbearing. Polygamous marriages were closely related to large families and provided an opportunity for men to have several wives and a pool of children. Most traditional African countries virtually practise early and universal marriage. Marriage patterns in Lesotho are characterised by early marriage and low celibacy, which is favourable to higher fertility (Mturi and Moerane, 2001). Premarital sex and childbearing practices were prohibited among Basotho people (Makatjane, 1999). Marriage was therefore, considered a safety net for young girls who became pregnant at an early age. Only children of married women have a place within lineage of their fathers and that of their mothers too.

Literature reveals that marriage is currently postponed in many African countries; proportions of never married women are increasing at any given age. The experience of delays in marriage in Zimbabwe initiated around early 1980s (CSO, 1995). Various

factors have a significant role on rising age at first marriage and differ with place of residence. Jejeebhoy (1996) says that improvements in women's education empower them to make informed decisions about the number of children they would want to have in their lifetime.

Urbanisation and economic opportunity and new attitudes and preferences among young women counteract with later marriages, motivation for remaining unmarried and preferences that seem to be prevalent in many parts of the world. This new behaviour seems to be related to increasing levels of education. The situation of delayed first marriage, earlier sexual intercourse and lack of access to family planning leaves an increasingly wide window of susceptibility to unplanned or unwanted pregnancies in Botswana (Manyeneng et al., 1985 cited in Lesthaeghe, 1989).

From another perspective, the onset of sexual activity has become progressively earlier, and at least half of young people surveyed in nine sub-Saharan countries had had sex before age 18 (PRB, 2006). Many girls in Lesotho become sexually active at 14 or 15 years of age (BOS, 2005). The question that remains unpacked is whether adolescent fertility in Lesotho, has an impact of reductions in overall fertility. Unlike in some countries, illegitimate fertility plays a greater role in maintaining high fertility in Lesotho. In South Africa for instance, Manzini (2001) shows that young girls that have their first born before age 19 are likely to postpone childbearing until later on in their reproductive life. This means that a large gap in terms of child spacing is prevalent among these women hence the reason why the rate of fertility in South Africa is not as high as it is perceived to be when compared to high rates of adolescent childbearing.

Early initiation of sexual practices is often offset by the beginning of risks of unintended pregnancies and sexually transmitted infections (STIs) among young people. These incidences sometimes force young adults to resort to illegal pregnancy termination. Manzini (2001) shows that such occurrences emerge because women lack knowledge, and they are easily pressured by their peers hence make unacquainted decisions. Likewise, adolescent childbearing is increasingly becoming a problem in California such that the government is forced to expand service systems because of increasing demand accompanied by sharp raising adolescent pregnancies (Berglas et al., 2003). However,

social science literature indicates that there is an increase in sexual activity among unmarried individuals, which has led to increases in childbearing outside of marital unions (Swartz, 2002).

The extension of education and training required so that young people can assume economic roles invariably pushes their marriage and childbearing age higher. The process of economic development, specifically post industrial development exerts pressure towards later marriage but greater sexual freedom as societies move away from a kinship-based economy to an economy that relies on prolonged education and training in social institutions outside the home. For instance, during the past century, virtually all Western countries experienced secular changes in education and fertility decline, although the postwar economic expansion drove down marriage age and drove up fertility (Caldwell and Caldwell, 2002). However, early marriage has become less tenable as the age of entrance into the labour force has risen sharply, and as women have experienced longer periods of training alongside men before entering the labour force.

Consequently, the costs of early childbearing have increased, and the onset of fertility has generally been delayed. Marriage less often follows a premarital conception than it did earlier in this century. The viability of early marriages has declined, so has the custom of marriage imposed on young couples as a consequence of premarital conception. Casterline, (2001) suggests that the United States has always had a pattern of earlier marriage compared with Western Europe and other North Atlantic countries. Likewise, sub-Saharan countries experienced the same phenomenon although lately the trend has changed; there is a shift towards later ages. During the mid-1960s, marriage age began to rise (Caldwell and Caldwell, 2002).

Contraception

In most populations, the most prevalent proximate determinant responsible for fertility reduction is increased use of contraception by married and unmarried couples (Bongaarts, 1987; Locoh and Hertrich, 1994). Contraceptive use is considered a deliberate practice undertaken to reduce childbearing (Bongaarts et al, 1984). Reduction in desired number of children is generally accelerated by activities related to family planning, inclusive of induced abortion practices, and is naturally experienced in countries that have advanced

in the fertility transition. It is common to associate fertility decline with widespread contraceptive use. Trends in contraceptive use, with the intention to limit fertility show that demand and use of contraception ascends in the early 1980s (Bongaarts, 2005). In most of the European countries, fertility decline was mainly due to increased contraceptive prevalence.

East Asia accomplished its replacement level fertility primarily due to high contraceptive practice (Hohn and Mackensen, 1980). Contraceptive use is the most important variable which has contributed strikingly in the stalling fertility rates in Columbia (Bongaarts, 2005). The prevalence of contraceptive use particularly among women is low and Guttmacher (1982) noted that approximately 5 percent of married women used family planning methods in Lesotho. Currently, the percentage of women using family planning has increased further and the World Population Datasheet shows that in 2007, 37 percent of women have access to all methods. Family planning programs are available in almost all hospitals in Lesotho (Ministry of Health and Social Welfare, 2005). However, the resources in these programs are not fully utilised and the Ministry of Health and Social Welfare (2005) suggests that the environment is not user friendly, particularly towards adolescents. Mturi (2003) found that parents acknowledge and feel that children have full access of family planning.

The effectiveness of family planning programs has improved dramatically on the continent over the past three decades, but still the programs do not meet all the women's demands (Garenne et al., 2000). The observed trend in birth intervals strongly suggests that contraception in South Africa is practiced at the same time to limit the number of children born, and to space childbearing contingent on the age of the mother's youngest child (Guengant, 2002*)*. Often women would appear to use contraception to delay childbearing until some distant and uncertain point in the future.

Modern contraceptives had been made publicly available to South Africans from the mid-1960s (Oni et al, 2005). Differentials in utilisation of contraceptives in rural areas are brought by service delivery problems prevailing in many sub-Saharan countries. Contraceptive availability was limited in rural areas in the early years of the family planning programs. Significantly, opposition to family planning was predominantly

found in countries with high levels of fertility. Contraceptive use remains limited for adolescents and apparently access to modern methods for adolescents have not markedly increased over the past two to three decades (Feyisetan and Bankole, 2002; Swartz, 2002; Mturi, 1999). The fertility transition appears to have been driven largely by the dramatic uptake of modern contraceptives upon the inception of South Africa's powerful family planning programme (Mbacke, 1994). This implies that other countries which still have high levels of fertility should consider investing in family planning and sustained contraception use. This implies that investments in family planning should be sustained and improved to meet the needs of women and families across the African continent.

Of the smaller percent of married *Basotho* women, more than half of currently married (60 percent) are currently using some method of contraception, as are two-thirds (65 percent) of women who were sexually active in the month prior the 1996 Census (Tuoane, 1999). Modern methods of contraception are almost exclusively used; less than one-tenth of one percent of women rely on traditional methods (LDS, 2001). Of the modern methods, injectables are by far the most widely used. The proportion that wants to have another child soon has declined slightly (from 16 to 12 percent), as has the proportion that wants another child later; from 12 percent to 9 percent (Tuoane and others, 2004). The proportion of married women who either want no more children or have undergone sterilization has remained stable in the recent past, 62 percent in 1998 and 61 percent in 2003 (SADHS, 2003).

Abortion

Termination of pregnancy although not favourable, is one factor in regulating fertility. Induced abortion is a serious health concern in many countries where it is not legalized, because of outcomes such as morbidity and maternal mortality. Abortion is illegal in Lesotho hence making the incidences of abortions not fully documented. However, the Lesotho Ministry of Health and Social Welfare (2005) contend that a significant number of female patients admitted for incomplete abortions depict an increase in the incidences of illegal abortions. Unwanted pregnancies coupled with unsafe abortions in Lesotho, results in pregnancy-induced health problems among women, particularly adolescents (Mturi and Moerane, 2001). The impact of induced abortion on fertility is unpleasant particularly because it may result in infertility and maternal deaths.

A high proportion of pregnancies that occur in teen years are terminated by abortion (LDHS, 2004). This has a dramatic effect on their abdomen that may lead to infertility. Strong religious forces discourage and oppose the availability of abortion as a means of preventing early and unwanted childbearing. Literature reveals that those who oppose abortion argue that it causes teenagers to have unprotected sex (Friedlander *et al*., 1980). Although abortion is legalised in some countries, it remains a controversial issue particularly with regard to young adults. However, fewer women resort to abortion in the late 1990s than in previous years. Earlier strong religion that helped discourage and control abortion made it possible to keep down high rates of abortion. Japan, Taiwan and Korea are reported to have managed to keep down rates of abortion, apparently by means of strong religion and social structures that discourage abortion at least among adolescents (Furstenberg, 1998). Among countries such as Kenya, Nigeria and Tanzania, adolescent girls make up more than half the women admitted to hospital for complications following illicit abortions (PRB, 2001; Kim, 1999). In countries where abortion on demand is not available, teenage pregnancy encourages illegal abortion with the attendant medical problems of pelvic infection and infertility (Gunningham et al., 1996).

Post-partum Infecundability

Post-partum infecundability, described as prolonged breastfeeding as well as sexual abstinence were used as a means of contraception and ensuring improved child health. Studies have shown that in most West African countries postpartum infecundability has contributed to fertility decline while in countries such as Botswana, Uganda and Zimbabwe the impact is minimal. Postpartum infecundability is more influential in societies where contraception use is low (Bongaarts, 1982). In the case of Kenya, fertility declines were caused by high practices of postpartum infecundability between 1988 and 1989 (Thomas and Muvandi, 1994). In Zimbabwe, studies have shown that breastfeeding is almost universal (Central Statistics Office (CSO), 1995). Mturi and Hlabana (1999) observe that breastfeeding is responsible for most of the decline in fertility in Lesotho. Child spacing in Lesotho ranged from two to three years between births with early and late childbearing (Bureau of Statistics (BOS), 2000).

2.7 Other Determinants

The socioeconomic implications of fertility decline are numerous and vary. Less attention has been given to socioeconomic factors in an African perspective because of ways in which societies respond to population change and its characterisation, norms and values engulfed in deep-rooted cultural practices. Recent patterns resemble a different view, which is presented within the following factors.

Educational Attainment

The relationship between education and fertility is much more complex. The underlying pattern most commonly shows a negative relationship, although positive relationships at very low and very high levels of schooling have been demonstrated (Bratti, 2003; Shapiro and Tambashe, 1997). Improvements in education play an important role in reducing fertility in other parts of Southern Africa. Increased education of women (mostly married women) was a strong driving force in fertility reductions in Zimbabwe (Zimbabwean Demographic Health Survey (ZDHS), 2005). Parents' aspiration to increase their educational attainment to secondary level and for their children to be educated has profoundly modified perceptions of the costs and benefits of children (Locoh and Hertrich, 1994). Bongaarts (1982) found that one of the reasons women postpone childbearing is that education competes with childbearing practices, therefore suggesting that women who wish to remain in school have to forgo childbearing until school completion. The drive is to improve their literacy, which has a positive effect on reducing mortality levels at early stages of life. There is a strong belief that formal education among Basotho women significantly affects childbearing (Makatjane, 1999). Parents may limit childbearing if they believe that fewer children enable them to come closer to achieving their aspirations, for themselves and their children (Bulatao et al, 2003). Females are more educated than males in Lesotho. It has been shown that men are concentrated between lower primary and upper primary categories, while females are concentrated between upper primary and secondary or higher (LDHS, 2004; BOS,). Education is one of the factors often considered consistent and important determinant of fertility, where higher education entails lower fertility (Kalipeni, 1995).

Schooling of women is often viewed as an indicator of socioeconomic development and the variable is also negatively associated with infant mortality, thus reducing the overall demand for children. Early pregnancy and childbirth limit a young woman's educational opportunities, compromise her ability to support herself and her family, and limit herself-determination and quality of life. Women tend to delay childbearing in order to complete their education. In an event that a woman becomes pregnant, she may be forced to leave school early upon having a child. Educational and employment opportunities play an important role as alternatives to high fertility (Kim, 1999).

There is lack of provision of schools to facilitate resumption of education after the child has been born in some countries. For instance, in countries such as Lesotho, Swaziland and Zambia, premarital fertility is prohibited and as a result if a girl falls pregnant, she is not allowed in school. In contrast, South Africa addresses the issue of adolescent pregnancy and parenthood differently (Kaufman et al., 2001). In cases of early childbearing, the girl is allowed to return to school as soon as delivery although she is forced to leave her baby at home and discontinue breastfeeding which may affect mother-child bonding (Gunningham, 1996).

Female Participation in the labour force

The increase in participation of women in the formal labour force has a negative influence on fertility. According to the Nigerian Fertility Survey (1981-1982), women who participate in the formal sector tend to have low fertility, particularly those with higher educational attainment (Friedlander et al, 1980). As the birth of a child and the care of small children often entails the temporary interruption of employment by the mother, most of all those who are highly educated and therefore, can expect higher wages, suffer important opportunity costs and psychological costs if they would like to proceed in their occupational career. On the other hand, when mothers return to work, the strains resulting from their fulfilment of two roles cause serious psychological costs. The Core Welfare Indicator Questionnaire (CWIQ) survey (2002) conducted in Lesotho shows that female participation in the formal sector has increased from 24.8 to 47.2 percent within 1997-2002 period. The rise in female labour force participation has

significant implications for fertility (BOS, 1996). Women opt for a smaller family size so that they could contribute to the family's welfare.

Several studies have documented a strong relationship between female workforce participation and fertility declines. For instance, in their study on fertility and female work, Potts and Marks (2001) assert that previously, female work and fertility had an inverse relationship unlike the current positive relations. There is no significant difference between black and white, rather fertility is homogeneous across the whole United States women (Reed and Udry, 1973). Women's engagement in the formal sector forces women to adjust their family size thus opting for less number of children born in fertility lifetime. Freedman et al., 1963 cited in Reed and Udry, 1973 established that the longer exposure of a female in the workforce since marriage, the fewer children she is likely to have.

Mortality

Mortality levels, particularly infant and childhood mortality influences the level of fertility. In populations where infant and child mortality is high, couples often will have excess number of births, to ensure that some survive to adulthood. The high fertility rates experienced in eras of very high child mortality, resulted in large family sizes (Caldwell and Caldwell, 2002). Currently, the level of mortality is gradually declining such that it no longer has a serious impact on fertility. Childhood mortality is an aspect of poverty that has significant effect on fertility (Dust, 2005). Fertility behaviour cannot be examined in isolation from child mortality, as child mortality can affect a woman's decision about the number of children to have in order to replace the children who have died-replacement effect (Garenne et al., 2000).

Labour Migration

Separation of spouses has a direct effect on fertility. The migrant labour system in Southern Africa predominantly consists of men seeking to be employed in the mines and agricultural sectors. Culturally, it is normal for men to leave their families to seek for work outside home. Literature has shown that gender is no longer important as to who remains at home or goes to look for employment (Bratti, 2003). International and internal labour migration is becoming prevalent among women as well (Lesthaeghe, 1989; Mturi

and Moerane, 2001). In Lesotho, female migration is dominating the labour migration system as women seek employment in the industrial sites of the country, an aspect of poverty that has a significant effect on fertility. In the past Basotho men would leave their wives to work in the mines and visit them occasionally (Mturi and Moerane, 2001; Makatjane, 1999). The practice has a huge impact on the frequency of sexual intercourse between the partners which is known to reduce fertility.

Place of Residence

Fertility differs across societies. Female urban dwellers experience exceptionally low fertility as compared to their rural counterparts and fertility control is practiced most evidently by married couples (Pollak and Watkins, 1993). The differentials between rural and urban fertility is mainly due to socioeconomic factors (Hirschman, 1994; Pollak and Watkins, 1993). Fertility levels are expected to be lower in urban areas than in rural areas because of exposure to varying aspects of population change. Differential patterns in reproductive behaviour that are not readily explained by socioeconomic variables can often be attributed to the influences of cultural or ideological differences (Kim, 1999). According to LDHS (2004), TFR in rural areas (4.1 births) is insignificantly higher than the rate in urban areas (1.9 births). The results also show that urban rates are higher than rural rates at the younger ages and lower than rural rates at older ages. Likewise, the results imply a precipitous decline in South Africa's fertility over the previous five years. The TFR for the three-year period prior to the 1998 SADHS was 2.9 (DOH, no date). Other recent estimates of the total fertility rate at the national level range from 2.8 to 3.3 (SSA, 2004; Udjo, 2003; SADHS, 2003).

Urban-rural fertility differences may be the most universally observed ones. It might be assumed that urban-rural differences are caused simply by the different social structure of urban and rural places, the low-fertility strata concentrated in towns and the high-fertility strata in the villages. In terms of economic theory of fertility the difference might be interpreted as a consequence of the different financial and psychological costs of rearing children.

2.8 Theoretical Framework

Fertility is a diverse phenomenon where deviations across different populations are widely in existence. The variation ranges from within those populations characterised by high contraception non-use with fertility as high as approximately 10 livebirths per woman with the minimum of 5 livebirths per woman, to populations experiencing high contraceptive use with marital fertility averaging 2.1 or below replacement (Reinis, 1992). Fertility ensues from both among and within societies.

Changes in fertility draws on many different theoretical approaches, which facilitate understanding of aspects related to fertility transition. These theories help to explain and unpack some of the reasons why fertility has been changing across various societies. Theories and models that explain transition from high to low fertility include; Demographic Transition Theory (DTT) (Notestein, 1945), intergenerational wealth flows (Caldwell, 1982), diffusion theory (Carlsson, 1966 in Watkins, 1996) and economic theory of choices in family size (Easterline, 1978). However, the research will basically draw on DTT and diffusion theory.

DTT emerged around 1929 by Warren Thompson (Weeks, 2005) and later modified by Frank Notestein (1945). Notestein outlined three stages that explained changes from high birth and death rates to low rates (Kirk and Pillet, 1998; Weeks, 2005). The idea was to model the demographic changes that occurred in different populations. As explained by the theory, the first stage signifies pre-modern societies where births and deaths are essentially high. Due to high mortality during childhood, the perception was that more children meant survival of families and that led to high birth rates. In the second stage, deaths begin to decline because of improvements in the standard of living and health care conditions, which is followed by gradual fall in birth rates. Eventually, both births and deaths drop to low levels. Mason (2001) supports the notion that DTT looks closely at mortality as a driving force for fertility decline although the theory also incorporates socioeconomic factors of fertility. In particular, the effects of factors based on modernisation such as improvements in female education are integrated in the theory.

The theory hypothesizes that the decline in mortality resulting from modernisation and health progress is followed by reductions in fertility in the closer future (Locoh and Hertrich, 1994). The model puts an emphasis on socioeconomic development and modernization as underlying forces. However, Hirschman (2001) contends that these factors are not the only influential forces in modern times but play a crucial role in influencing demographic, technological, and social change. The inability of demographic transition theory to explain some of the characteristics of fertility decline in the context of Lesotho require adoption of diffusion theory to supplement the framework particularly in relation to socioeconomic factors. Factors such as

Diffusion theory of reduction in fertility stems from an observation that, for some societies, mass industrialization and adequate levels of development were not a precursor for fertility reductions. The idea behind the theory as explained by Knodel and van de Walle (1979) is that "social interaction is a key mechanism through which the adoption of new technologies, ideas, and behaviors take place." According to Hirschman (2001), there is some indication of social change and cultural diffusion of fertility behavior within and across countries. As modernization sets in, the historic change such as family limitation within marriage was realized, occurring from major resistance to deep-rooted culture, tradition and religious norms (Hirschman, 1994; Carlsson, 1966 in Watkins, 1987). Popenoe (1995: 508) contends that "their greater independence changes the nature of the marital relationship, a change that in turn alters the character of the family." The dramatic fall in fertility with gradual declines in mortality are related to this change (Mason, 2001). Both proximate and socioeconomic determinants work hand in hand to reduce fertility (Cleland and Wilson, 1987; Hirschman, 2001). Therefore, the study utilises DTT and diffusion theory because they best explain current changes in fertility in sub-Saharan countries, particularly in the context of Lesotho. The theories focus on the combined effect of proximate and socioeconomic factors of fertility.

2.9 Summary

The chapter provides literature on documentation of the onset of fertility transition in different countries. It gives a highlight of analysis of fertility estimation and estimates tracked from as far as 1996. Different factors are discussed, both proximate determinants

and socioeconomic factors responsible for fertility decline in Lesotho. According to analysis of these factors, all of them are viewed crucial to the assumed onset of fertility reductions in Lesotho. Nevertheless, the chapter does not clearly provide, with certainty plausible estimates nor say which methodologies have been adopted to estimate fertility. Therefore, the methodology chapter will discuss certain techniques to evaluate, graduate and measure current fertility levels in Lesotho.

CHAPTER 3

METHODS AND METHODOLOGY

3.1 Introduction

This is a chapter that deals with the methodology of the research. The research utilises secondary source of data from the 2004 Lesotho Demographic and Health Survey (LDHS). Techniques of data analysis used are explicitly explained. It presents appropriate and suitable methodology for responding to the research questions. Because of a range and nature of questions solicited, the research adopts two approaches; one based on Brass P/F ratios and the other by Bongaarts' proximate determinants. The first section addresses the model initially proposed by Brass (1964) though later modified by Coale and Trussell (1974). Thereafter, the discussion includes the approach introduced by Bongaarts (1987). The approach involves identifying those proximate determinants regarded as inhibiting effects of fertility. Various steps that are undertaken to choose the sample and sample size; characteristics or attributes of the sample employed to conduct a survey are also outlined. Lastly, background characteristics of the data and their relationship to fertility change are presented.

3.2 Sources of Data

Data on vital events in any population setting is obtained from different sources. The demographic data is classified into traditional and non-traditional sources of data from which the later are the main current sources used by most populations (Mostert *et al*., 1998). Our main concern for the research is on traditional sources of information, comprising of Vital Registration Systems, Population Registers, Population Censuses, Demographic and Health Surveys, in contrast with non-traditional sources such as schools, hospitals, churches. Generally, these sources provide information on different aspects of demographic parameters that include; fertility, mortality and migration. For instance, DHSs investigate and review demographic processes as per aspect or a group of aspects that are studied collectively. The events are reported and recorded within a prescribed period of time. The surveys are carried out differently from a census exercise, particularly with respect to reduced amount of time between surveys, and reduced error

magnitude of events recording (Pollard *et al*., 1974). Censuses are usually carried out after a period of time (usually 10 years) while surveys occur after four or less years depending on the need (Pollard *et al*., 1974). It should be noted that not all births and deaths occur in health centres and hospitals, therefore, such incidences may easily go unrecorded.

Demographers strive to attain high quality data that are feasible and easy to use. For data to be considered of good quality, it has to reach both qualitative and quantitative standards either locally or otherwise (Moultrie and Timaeus, 2002). Thus, it has to bear the following attributes; representativeness, accuracy, reliability and acceptability. For the purpose of this research, the focal point is on censuses and surveys. Underlying reasons of choosing census and surveys over other sources include less coverage and content errors in terms of plausibility. Generally, information on fertility is best collected using censuses and more intuitively demographic surveys provide valid data updated from time to time.

The research is basically quantitative in nature. For the purpose of the research, secondary data are used. The 2004 LDHS is the source of data for the analysis. It is a nationally representative survey consisting of women aged 15-49 years and men aged 15-59 years. Nonetheless, data utilised will exclude men but concentrate on women 15-49 years. The initial sample in this analysis comprises 8592 households covering 405 enumeration areas throughout Lesotho (LDHS, 2004). The focus of the survey was on demographic and socioeconomic information such as age, sex, income, education and many other related issues. The survey also provides detailed information particularly on women's fertility levels (marital and non-marital fertility), marriage patterns, family planning methods, breastfeeding practices. In particular, questions on the total births each woman had at the time of the survey and the number of births in the last year were asked in order to calculate TFR. Cultural and socioeconomic factors were hypothesized to be important correlates in the variation of fertility and consequently the onset of the fertility transition in Lesotho (LDHS, 2004). Socio-economic and demographic factors include education, economic status of women, labour migration, marriage, infant and childhood mortality, family planning and contraception prevalence. These factors facilitate analysis of fertility data.

3.2.1 The 2004 Lesotho Demographic and Health Survey

The questions on fertility used in the 2004 Lesotho Demographic and Health Survey (LDHS) are similar to questions presented in previous surveys. However, the differences are identified with HIV and AIDS questions included in the later survey. Thus, the 2004 LDHS round is the most appropriate data set for examining past fertility trends since birth histories become increasingly elongated. For instance, earlier surveys collected similar information but not in a comprehensive form such that Bongaarts model could not be estimated. The question on children ever born, in particular, might have not become clear to some women, that was why they answered according to their understanding.

3.3 Methods of Data Analysis

The decision to use indirect methods of estimation is possibly vital in view of unreliability of fertility indices based on recorded data. Experience from a number of African countries has shown that recorded data tend to underestimate fertility (Tuoane, 2001). Unreliable data in the context of Lesotho (BOS, 1999), forces demographers to estimate fertility rates or rather demographic rates in general, using indirect methods of estimation. These techniques allow for identifying, correcting and smoothing errors that might have occurred in the data. When addressing a question on fertility levels and trends, the best fitting model(s) need clear cut identification.

3.3.1 Measures for Quality of Data

The initial reported ages in the survey were provided in single ages. However, for the purpose of this research, those were converted into age groups. The age ratio method is therefore used to detect errors in the Lesotho's age data. The formula adopted is called the Zelnik method and is given as;

$$\textbf{Age ratio (A)} = \frac{{}_5p_x}{\frac{1}{3}\left({}_5p_{x-5}+{}_5p_{x+5}\right)}\times 100$$

Given the age ratio formula, let ${}_5P_x$ be an age group from age x to age x+5; ${}_5P_{x+5}$ and ${}_5P_{x-5}$ be the succeeding and preceding age groups respectively, where;

A ≈ 100 shows good reporting

A < 100 shows under enumeration

A > 100 shows over enumeration

On the other hand, it is important also to actually evaluate or clean data after identifying errors. The UN Five Point Moving Average method is used to correct for distribution of age data. The principle involves taking five quinary age groups with the selected consecutive age groups designated as P_{-2}, P_{-1}, P_0, P_{+1}, P_{+2} and the graduation formula is given by;

$$\mathbf{P_0^G = 1/16 [- P_{-2} - 4 P_{-1} + 10 P_0, + 4 P_{+1} - P_{+2}}$$

where

P_{-2} and P_{-1} are the preceding age groups

P_{+1} and P_{+2} are the succeeding age groups

P_0 is the age group of interest

With respect to the method, the necessary adjustment of data is made assuming that the population follows a linear equation.

3.3.2 The Brass P/F Ratio Method:

One of the most frequently used procedures for deriving total fertility rate, and clearly age-specific fertility rates for the year preceding the survey is the P/F ratio method (Mhloyi, 1992). The procedure which was originally developed by Brass (1968) and later refined by other demographers is used to obtain estimates of current fertility by combining data on the number of children ever born (P) and cumulative age-specific fertility (F) for the past one year. The procedure involves the use of a model age-specific curve to match the ages to which both the reported parities and cumulated fertility correspond. Furthermore, the technique is applicable under a regime of essentially constant fertility. In practice, all the critical assumptions underlying the original P/F ratio method are rarely met in aggregate. Rather all the P/F ratios are affected by fertility change and are therefore poor indicators of reference period error (Gaisie, undated).

However, where birth history data are available, modified version of P/F ratio procedure can be used to assess the quality of data as well as to determine the fertility levels and trends (Zuberi *et al*, 2004). P/F ratios for different periods can be examined with the aim of determining not only levels but also trends of fertility. The procedure is, in addition, used as an analytical tool for assessing the quality of data from birth histories,

such as detection of omissions, timing errors and misplacement of events (UN, 1983). The calculation of period cumulative fertility rates (F value) involves only a summation of period-cohort rates for appropriate period. And the computation of cohort cumulative fertility rates (P values) basically involves summation of period-cohort rates for the appropriate cohort.

3.3.3 The Brass Relational Gompertz Model

The P/F ratio procedure is also modified, through intermediary of the Relational Gompertz Model (RGM), for analysis of birth histories in populations where levels and patterns of fertility rates seem to be changing (Brass, 1981). The procedure estimates Total Fertility Rate (TFR) as well as age pattern of fertility by relating the observed age pattern of fertility to a standard age pattern of fertility (Booth, 1984; Brass, 1981; Udjo, 2003; Moultrie and Dorrington, 2004). Gompertz function is fitted to average number of Children Ever Born (CEB) and cumulative fertility rates to derive successive P (i) and F (x) values and parameters α and β which are required to define a suitable model fertility schedule. The function is given as follows;

$$\mathbf{Y_x = -ln\,[-ln(F_x/F)]}$$

$$\mathbf{Y_x = a + b_x}$$

Where, Yx denotes fertility rate at age x

a and b are constants used to estimate Yx

The US Population Analysis Spreadsheet (PAS) is also used to simplify the mathematical complexities of computing estimates of TFR using formulae. PAS is applicable to many data sets from developing countries for the detection of errors inherent in demographic data yet importantly for purposes of estimating TFR (Moultrie, 2008). The software, initially produced by Arriaga (1994) but later modified by Arriaga and associates as well as other several authors, works as a standard format for estimates of TFR in developing countries where fertility falls at a slow pace. It is used as an investigative tool that analyses data given a set of Age Specific Fertility Rates (A.S.F.R) for a specific country. For purposes of the research, the model by Moultrie (2008) specifically originated the spreadsheet that best fit data for sub-Saharan countries.

Change in fertility is reflected by the P and F points. If the level of fertility has been rising, the P points will tend to lie on a steeper slope than the F points and if, on the other hand, fertility is falling, the slope of the P points bends downwards from the F points. Thus, the original P/F ratio and modified version Relational Gompertz Model are the procedures employed in this study for purposes of assessing errors and estimating TFR. The assessment spans a period of eight years, therefore, the above indirect estimation will be compared with the estimates computed for 1996 census, 2004 Lesotho Demographic and Health Survey to estimate fertility levels between these two dates.

Assumptions

The Brass' fertility methods are used to adjust the age pattern of reported fertility derived from information on recent births by the level of fertility implied by the average parity of women in the reproductive age groups (UN, 1983). They are commonly used because they require simple data on cumulative fertility, classified by age of mother, and births in the past year (current fertility), as well as by age of mother. The assumptions involved in the Brass methods are:

(i) Fertility has been constant during the recent past;

(ii) The pattern of fertility is accepted; and

(iii) Younger women report their fertility more completely than older women do.

Data Requirements

The information on children ever born is obtained through the simple questions asked of women. Out of these questions, pertinent information is extracted for the calculation of indices of TFR. Thus, data requirements for the application of P/F ratio method are as follows;

i. Number of children ever born classified by five year age group of mother, **CEB(i)**
ii. Number of births in the last year classified by five year age group of mother, **B(i)**
iii. Total female population 15-49 broken into age groups, **FP(i)**

The Methodological Procedure for Fertility Estimation

The P/F ratio method follows certain steps to calculate Total Fertility Rate (TFR). The steps are shown as follows;

$$F_i = \Sigma f_j + k_i f_i$$ where j ranges from 0 to i-1

Step 1: Estimating the reported parities in every age group

This measure is effectively an average of the cumulated fertility schedule over all age groups. The reported parities denoted, Pi is estimated by dividing the number of children ever born in each age group (CEBi) by women of each respective age group (Wi).

The formula for the reported parity is given by

$$P_i = \frac{CEB_{(i)}}{W_{(i)}}$$ where i = 15-19, 20-24, …., 45-49

Step 2: Estimating preliminary fertility schedule

This is computed through dividing the number of births (Bi) in the last year to women in each age group by the number of women in the respective age groups. The formula is as follows;

$$fi = \frac{Bi}{Wi}$$ where **i = 15-19, 20-24, …., 45-49**

Step 3: Estimating cumulated fertility schedule for a period

The preliminary fertility schedule is summed up from f1 to fn. The sum is further multiplied by five to obtain an estimate of the cumulated fertility. The schedule is mathematically expressed as;

$$\Phi(i) = 5[\sum f(i)]$$

Step 4: Estimating the average parity equivalents for a period

The period fertility rates and cumulated fertility schedules are interpolated to obtain parity equivalents. There are several ways used for interpolation. But for the purpose of the study Brass' simple polynomial model is adopted to calculate the relationship between average parity and cumulated fertility for successive age groups or a range of age locations of the fertility model. The formula is given;

$$\mathbf{F(i) = \Phi(i\text{-}1) + a(i)f(i) + b(i)f(i+1) + c(i)\,\Phi(7)}$$

However, it should be noted that for the last age group, parity equivalents are interpolated using marginally different formula and it is given as follows;

$$\mathbf{F(7) = \Phi(6) + af(6) + bf(7)}$$

The coefficients a, b and c are obtained from Table 3.1 showing values for each age group.

Table 3.1: Coefficients for Interpolating between Cumulated Fertility Rates to Estimate Parity Equivalents

Index	Age group	a(i)	b(i)	c(i)
1	15-19	2.531	-0.188	0.0024
2	20-24	3.321	-0.754	0.0161
3	25-29	3.265	-0.627	0.0145
4	30-34	3.442	-0.563	0.0029
5	35-39	3.518	-0.763	0.0006
6	40-44	3.862	-2.481	-0.0001
7	45-49	3.828	0.016	-0.0002
1-6	15-19 – 40-44	3.392	-0.392	-
7	45-49	0.392	2.608	-

Source: Coefficients adopted from Manual X, 1983

Step 5: Estimating fertility schedule for conventional five-year age groups

This is estimated by weighting factors to estimate age specific fertility rates for conventional age groups. In calculating this schedule, firstly the weighted factor, w(i) is estimated using the following equation;

$$W(i) = x(i) + \frac{y(i)f(i)}{\Phi(7)} + \frac{z(i)f(i+1)}{\Phi(7)}$$

Therefore, the adjusted age specific fertility rates are obtained through manipulating the following mathematical formula;

$$f^{+}(i) = [1-w(i-1)]\, f(i) + [w(i)f(i+1)]$$

and

$$f^{+}(7) = [1-w(6)]f(7)$$

And the values of x(i), y(i) and z(i) presented in a tabular form in Table 3.2

Table 3.2: Coefficients For Calculation of Weighting Factors

Index I	Age group	X(i)	Y(i)	Z(i)
1	15-19	0.031	2.287	0.114
2	**20-24**	**0.068**	**0.999**	**-0.233**
3	25-29	0.094	1.219	-0.977
4	30-34	0.120	1.139	-1.531
5	35-39	0.162	1.739	-3.592
6	40-44	0.270	3.454	-21.497

Source: Coefficients adopted from Manual X, 1983

Step 6: Adjustment of the estimated period fertility schedule

The ratios, P(i)/F(i) are calculated from the estimates obtained earlier for each age group. Then, the choice of an appropriate adjustment factor denoted by K is made depending on how far constant the P/F ratios are. However, recommendation is given for P(2)/F(2) in populations experiencing fertility decline because it is not likely to be affected by decline. Now, when the factor is selected, the fertility rates for conventional age groups, $f^{+}(i)$ are multiplied by K factor to yield adjusted period fertility schedule, $f^{*}(i)$. The equation follows;

$$\mathbf{f^{*}(i) = K\, f^{+}(i)}$$

Total fertility is therefore, calculated by summing up all adjusted period fertility schedule and multiplying by five. Formula is given below;

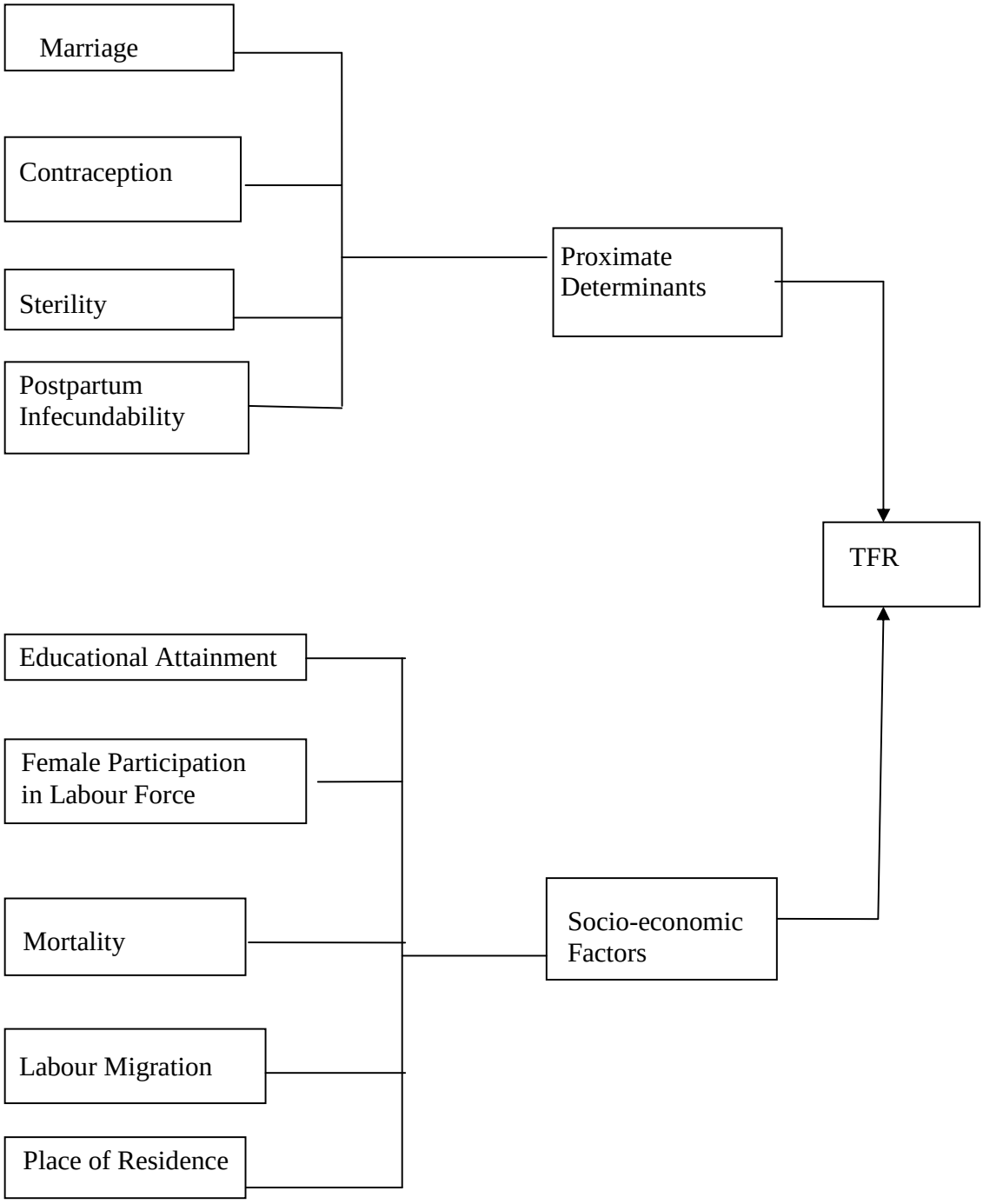
$$\mathbf{TF = 5[\sum f^{*}(i)]}$$

3.3.4 The Bongaarts Method

Bongaarts developed a framework for proximate determinants of fertility where he identified seven basic proximate determinants of fertility. The determinants are namely; marriage patterns, use and effectiveness of contraception, period of postpartum infecundability, frequency of sexual intercourse, spontaneous intrauterine mortality, induced abortion and pathological or natural sterility (Bongaarts et al, 1984). Five out of seven were termed principal factors affecting fertility differentials and trends in SSA; these were marriage, contraception, period of postpartum infecundability, induced abortion and pathological sterility.

Figure 3.1 presents the combined effect of proximate determinants and socioeconomic and cultural factors affecting fertility. These are the ideal factors responsible for the decline in fertility in Lesotho.

Figure 3.1: Conceptual Framework for Factors Affecting Fertility



Source: Devised by the author

The study analyses these five proximate determinants of fertility in Lesotho. A variety of studies use the proximate-determinants framework of fertility for different purposes. Its main use has been to ascertain and evaluate factors affecting fertility trends. Yet on the other hand, the basic use of the framework is simply to show the relationship between proximate determinants and fertility. The Bongaarts model has formulae and the corresponding indices used to compute TFR. The relative importance of formulae is its ability to determine the nature and pace of fertility change and its determinants. The fertility-inhibiting effects of the most important determinants are quantified in Bongaarts model by four indices, each assuming a value between 0 and 1. When the index is close to 1, the proximate determinant will have a negligible inhibiting effect on fertility, while when it assumes a value of 0, it will have a large inhibiting effect.

The Bongaarts model formulates that TFR is determined by TF and the indices of non-marriage (Cm), contraception (Cc)...
The model can be quantified through the following equations;

$$\mathbf{TFR = TF * C_m * C_i * C_c * C_a * I_p} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad \mathbf{(1)}$$

$$\mathbf{= C_m * C_c * C_a * TN}$$

$$\mathbf{= C_m * TM}$$

$$\mathbf{TM = TFR / C_m}$$

$$\mathbf{= Cc * Ca * C_i * TF} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad \mathbf{(2)}$$

$$\mathbf{= Cc * Ca * TN}$$

$$\mathbf{TN = TFR / \{C_m * C_i * C_c * C_a\}}$$

$$\mathbf{= TM / \{C_c * C_a\}}$$

$$\mathbf{= C_i * TF} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad \mathbf{(3)}$$

$$\mathbf{TF = TFR / \{C_m * C_i * C_c * C_a\}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad \mathbf{(4)}$$

$$\mathbf{= TM / \{C_i * C_c * C_a\}}$$

$$\mathbf{= TN / C_i}$$

Computation of TFR using fertility inhibiting effects of proximate determinants undergoes several steps. Bongaarts (1987) came up with a model that estimates TFR

through evaluating different indices of proximate determinants of fertility. When employing the model, some indices need to be noted. They are explained as follows;

The Index of Total Natural Fecundity Rate

The index denoted by TF is estimated as follows,

$$\mathbf{TF = TFR / (C_m * C_i * C_c * C_a)}$$

Where;

TFR denotes Total Fertility Rate

C_m, C_i, C_c , C_a denote index of marriage, postpartum infecundability, contraception and induced abortion respectively. All these indices assume values between 0 and 1, indicating that 0 is the complete effect of a proximate variable measured while 1 assumes no effect of intermediate variable measured on fertility.

The Index of Marriage, C_m

Cm, the index of marriage is calculated by the following given equation

$$\mathbf{Cm = \sum \{m(a) * g(a)\} / \sum g(a)}$$

where

m (a) denotes age specific proportions currently married

g (a) denotes age specific marital fertility rates

The index of marriage can also be expressed by the following equation,

$$\mathbf{Cm = TFR/TM}$$

Where

TFR denotes Total fertility rate

TM denotes Total Marital Fertility Rate

The index of Postpartum Infecundability, C_i

C_i denoting postpartum infecundability is calculated as:

$$\mathbf{C_i = 20 / (18.5 + i)}$$

Where

I = average duration (per month) of infecundability, from birth to the first postpartum ovulation (menses)

The Index of Contraception, C_c

The index of contraception denoted by C_c is computed using the following equation,

$$\mathbf{C_c = 1 - 1.08 * u * e}$$

Where

u indicates the prevalence of current contraceptive use among married women of reproductive age, 15-49

e indicates the average use-effectiveness of contraception

1.08 is the sterility correction factor

It is imperative to note that computing estimates of contraceptive effectiveness is a complex process. These estimates are seldom available; therefore, the standard method-specific values are adapted from the Phillipines data for the calculation of average effectiveness levels in Lesotho. Table 3.3 provides use-effectiveness estimates by each method.

Table 3.3: The Methods of Contraception by their Estimates

Method	Estimated use-effectiveness
Sterilization	1.0
IUD	0.95
Pill	0.90
Other	0.70

Sources: Bongaarts, 1982; Phillipines data in Laing, 1978

The index of induced abortion, C_a

Ca indicates induced abortion and it is calculated as:

$$\mathbf{C_a = TFR / \{TFR + 0.4 * (1+ U) * TA\}}$$

It should be noted that because there is no reliable data on induced abortions in Lesotho, then the index for induced abortions denoted by $\mathbf{C_a}$ is assumed to be equals **1.0**

3.3.5 Limitations of the methods

Although the models; P/F Ratio, the Relational Gompertz Model and Bongaarts determinants of fertility address a number of issues, they do not directly incorporate the impact of socio-economic factors.

3.4 Sampling Method

The sample for the study was chosen using the quantitative methods of sampling. The survey utilized the two-stage sampling procedure as the most appropriate method since the population of the study was known in advance. Furthermore, quantitative methods are employed whereby sampling of respondents based on probability sampling techniques is done. The initial sample in this analysis comprised of 8592 households covering 405 enumeration areas (broken down into 109 urban and 296 rural areas) throughout Lesotho (LDHS, 2004). In the initial stage, a random selection was performed where 405 clusters was chosen from a list of enumeration areas adopted from the 1996 population census sampling frame. In the second stage, a complete listing of households was carried out in each selected cluster. Households were then systematically selected for participation in the survey.

All women aged 15-49 who were either permanent household residents in the 2004 LDHS sample or visitors present in the household on the night before the survey were eligible to be interviewed. In addition, in every second household selected for the survey, all men 15-59 years were eligible to be interviewed if they were either permanent residents or visitors present in the household on the night before the survey. In the households selected for the men's survey, height and weight measurements were taken for eligible women and children under five years of age. Additionally, eligible men, women and children under five years were tested in the field for anaemia, and eligible women and men were asked for an additional blood sample for anonymous testing for HIV.

3.5 Sample Size

The sample for the 2004 LDHS covered the household population only. A representative probability sample of more than 9000 households was selected for the 2004 LDHS sample. The sample was constructed to allow for separate estimates for key indicators in

each of the ten districts in Lesotho, as well as for urban and rural areas separately. In fact, the sample for this research is a sub-sample of the 2004 Lesotho Demographic and Health Survey sample. The study utilizes data on women only, that is, a representative sample of 7095 women.

3.5.1 Distribution of the Sample: Descriptive Statistics

The study presents a comparison of two data sets for which women are a focal point. The 2004 LDHS consists of a sample of 7095 females. Background characteristics of women interviewed are important in the sense that they facilitate an assessment of the nature of sample. Presented in Table 3.4 is the percentage distribution of a sample of women by age in 5-year group, marital status, rural-urban residence and education.

Table 3.4: Percentage Distribution of Background Characteristics of Basotho Women from 1996 Census and 2004 Demographic and Health Survey

Background Characteristics		1996 (%)	2004 (%)
Age group	15-19	25.4	24.8
	20-24	20.4	20.5
	25-29	14.5	14.5
	30-34	12.9	11.4
	35-39	10.8	10.4
	40-44	8.9	10.1
	45-49	7.1	8.3
	Total	100.0	100.0
Marital Status	Never married	54.5	33.2
	Married	33.7	52.5
	Separated	2.2	4.6
	Divorced	0.7	0.8
	Widowed	8.5	8.9
	Total	100.0	100.0
Place of Residence	Urban	17.8	27.4
	Rural	82.2	72.6
	Total	100.0	100.0
Highest Educ. Level	No education	23.6	2.4
	Primary	56.8	60.7
	Secondary	17.3	35.5
	Higher	2.3	1.4
	Total	100.0	100.0

Sources: Computed by the author from 1996 Lesotho Population Census; 2004 LDHS

Generally, the distribution according to age is categorized into five-year intervals and presented both with population and percentages for comparison of different age groups.

For the two data sets, the distribution shows a similar pattern. An analysis of age distribution depicts that most of the women were found to belong to the age bracket 15-24. The first age group has got more females than any other age groups and the numbers decrease with each age group until the lowest which is age group 45-49. The magnitude of differences between the ages is approximately 2 percent and more for most of the age groups.

The other demographic characteristic of importance is marital status. This is mainly because most childbearing occurs within marriages. With respect to marital status, majority of females (54.5 percent) who were interviewed during the census consisted of the never married females. The reverse is true for the 2004 LDHS where women in the same category constitute a lesser number (33.2 percent) than that of the married women category (52.5 percent). For the other three statuses; separation, divorced and widowed, there were quite a lower number of women. In fact, women belonging to these categories account for less than 10 percent of the entire female population with divorced outstandingly lowest, represented by less than 1 percent for both the census and LDHS.

From Table 3.4, it is evident that majority of females who participated in both the 1996 census and 2004 LDHS resided in the rural areas. In fact, BOS (1999) alert that on the whole, Lesotho's population was concentrated in the rural areas. The difference between the two data points is slightly below 10 percent.

There were few women in the extreme low and higher educational level. It is evident from Table 3.4 that the pattern continues across the years although there is a slight improvement from 2002 Lesotho Reproductive and Health Survey (LRHS) to 2004 Lesotho Demographic and Health Survey (LDHS). Majority, that is, over 50 percent of female participants have basic education measured per completed primary level of education. This is substantiated by approximately 60.7 percent of females who indicated that at the time of the survey they had primary education completed. In comparison to the census, a considerably lower (56.8 percent) percentage is apparent among females with primary education. An insignificant number of females (2.4 percent) reported having no education at all. Further up educational level, the number of females reduced

considerably to 35.5 percent, showing that a few women progressed to the higher education.

In comparison to the two intercensal surveys; the 2001 Lesotho Demographic Survey (LDS) and 2002 LRHS which were carried out to supplement the 1996 Population Census, the distribution is generally the same, that is, the number of respondents gradually decline with age. The outstanding difference is with the broad age group 15 to 24, although the difference could be emanating from dissimilar sample sizes.

3.6 Summary

The chapter provides the methods used to assess data, estimate fertility as well as the assumptions adopted for the methods. The study used quantitative methods which are assumed to yield better estimates. The estimates obtained using these methods are assumed plausible because they allow for data to be evaluated, cleaned and graduated before use. The chapter also provides sources, sample size of data used and limitations of the study.

CHAPTER 4

INDIRECT ESTIMATION OF TOTAL FERTILITY

4.1 Introduction

On the whole, the focus of this dissertation is to draw on a data set obtained from the 2004 Lesotho Demographic and Health Survey (LDHS), provide legitimate fertility estimates, and compare them with estimates calculated in the past papers thus present the fertility levels over the period between 1996 and 2004. The estimates will be obtained using births in the past year and children ever born to mothers in the broader age group, 15-49. Conceptually, one of the basic tasks delineated to fertility estimation is to provide reliable and dependable estimates. Therefore, it is useful to be able to detect errors hence correct for those recurring in the data collection exercise. For data to be considered of good quality, it has to bear certain attributes, such as representativeness, accuracy, reliability and acceptability either locally or internationally or both. As a result, it is imperative to evaluate data prior to calculating the fertility estimates so as to reduce the deficiencies and minimize errors inherent in the data. For that reason, the chapter then encompasses the first two sections where certain steps are followed to assess quality of demographic data and smooth it before use. Thereafter, sections 4.4 and 4.5 presents different indirect methods and fertility estimates from different methods; the Relational Gompertz model and P/F ratio. These sections also address the question on examining socio-economic factors as well as proximate determinants. The last section, 4.6 present trends of fertility compared over time using different fertility estimates to determine the onset of fertility transition.

4.2 Evaluation and Adjustment of Age Data in Lesotho

The collection of any kind of data is subject to errors. Some authors suggest that unadjusted data contains highly distorted data that relate to unusual population structure with age misstatements (Cleveland, 1989; Clifford, 1998). Preston *et. al* (2005) indicates that data are less precise where population registers were previously nonexistent, particularly within populations whose births and deaths registration were not mandatory. The two typical inaccuracies prevalent in datasets are distinguishably, coverage and

content errors. More frequent than not, data suffer from content errors. These are errors characteristic of inaccuracies entailed in the data. Detection of errors in age data can be made possible through two broad approaches; technical or mathematical devices and case by case check interviews (Kpedekpo, 1982). Mathematical technique of age error detection are usually undertaken to replace re-interview evaluation with a view to estimate the extent of age heaping.

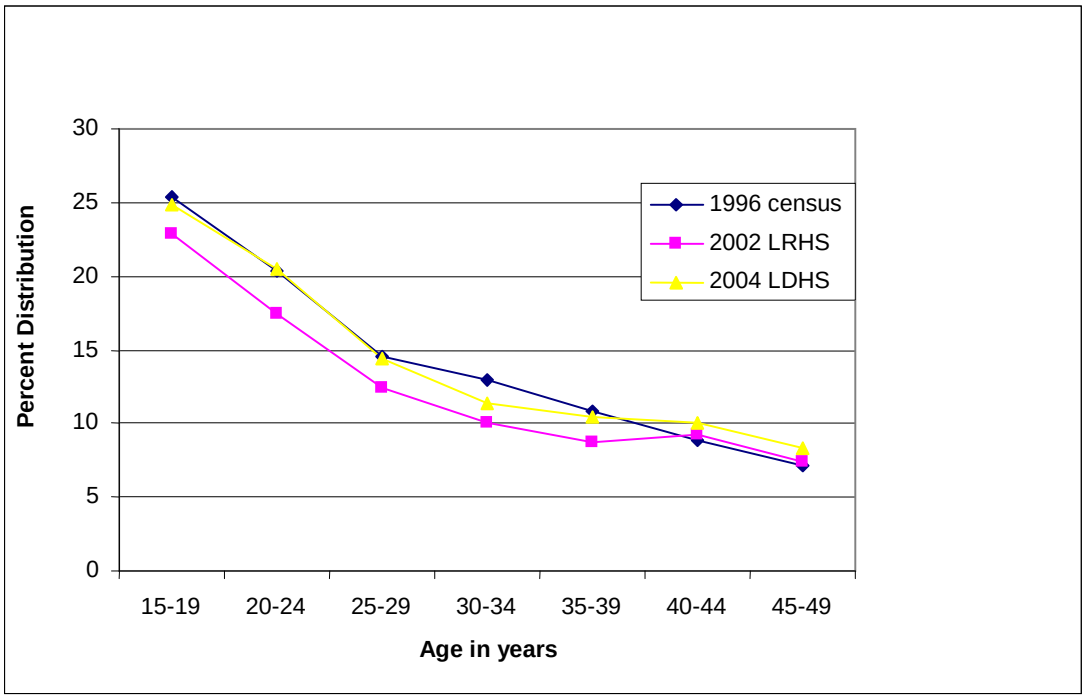
4.2.1 Data Quality Assessment for the 2004 LDHS Age Data

Previous studies show that assessing age distribution is essential since age is central to demographic analysis, although often it suffers quite a number of irregularities (Sembajwe, 1980; Preston et. al, 2001; Shryock and Siegel, 1976; Moultrie *et. al*, 2002). Ignorance and lack of interest on the side of political governments impinge on quality of data in terms of logistics and financial contribution. This has resulted in lack of data and inappropriate time intervals between the collection of data where comparison has proven to be appalling. Most importantly, research has shown that not only does data suffer from external factors but also internal factors such as inaccuracies during data collection further down to capturing of such data. Kpedekpo (1982) notes that ignorance of women to provide age in completed number of years is the most probable problem encountered in the survey and census data in Africa. In addition to that, age data is also subjected to digit preference. The common tendency is for women to shift their ages up towards central or fertile ages of reproductivity. Age shifting as it is commonly defined, involves a bias in recorded age structures and it is a feature usually exercised by women who are at their early adulthood stages where status and age are correlates (UN, 1986). Thus this subject the data to higher or lower rankings at certain ages, most of the time at even ages, which A'Hearn *et. al* (2006) term ‘attractive ages’.

On the other hand, age heaping defined as genuine lack of knowledge, inability or ignorance of respondents to provide correct age is such that some ages are clustered around certain digits commonly ‘0’ and ‘5’ and its multiples including even numbers (A'Hearn *et. al*, 2006). Some of the factors contributing to such errors particularly in developing countries are cultural variations in digital preference often dependent on estimated age cohorts in cases where age is unknown. Also, prevailing levels of illiteracy

may result in dependency on preferred ages where people are unable to state their ages. Figure 4.1 shows the extent of disparities in the age data.

Figure 4.1: The Percentage Distribution for Age of Basotho Women in the 1996 Population Census, 2002 LRHS and 2004 LDHS



Source: 1996 Population Census, 2002 LRHS and 2004 LDHS

Figure 4.1 is intended to examine whether all samples are representative of the population in each year. Evaluation of accuracy and reliability of African age distributions is facilitated by the use of standard age structure that is characterized by a considerably large proportion of young population which gradually declines with rising age until it approaches zero (Kpedekpo, 1982). As illustrated by Figure 4.1, the samples assume the same pattern of gradual declines. Females at early ages in each year have high percent distribution and decline with age until the lowest percent distribution at age group 45-49. Population in 1996 is higher followed by that of 2004 in the early ages but declines to be below the 2002 and 2004 from the age groups 40-44 and 45-49. The points are closer to each other surrounding and following a positively decreasing pattern. However, little disparities in the age distribution could be attributed to different types of errors

emanating from age misreporting and slight misrepresentation of ages. According to 1996 census, bias is detected at age 35 and above, and as stated above cultural variations and illiteracy problems might be responsible.

Research shows that errors that are inherent in the data are of age heaping nature (A'Hearn *et. al*, 2009; Siegel *et. al*, 1971). However, researchers have adopted methods of dealing with this problem. One such technique is the Historical Calendar Method that seems to have provided an answer to numerous census and surveys across different populations (Kpedekpo, 1982). The respondents are provided with historical events preferably a national schedule of events experienced within the national boundaries. Nonetheless, random fluctuations about the general pattern persist to occur between population groups of diverse phases.

There are different stages under which age data is affected by misreporting. Validity of data is measured from the initial stage until the analysis phase. Siegel *et al*. (1971) suggests that one of the ways of dealing with reducing age preferences is to look through the data and carefully apply interpolation methodologies before analyzing it. These help to identify errors which might have occurred at any stage of acquiring data. There are several indexes of digit preference which differ according to theoretical advantages over the others (Feeney, 1994). For the purpose of the research, application of age ratios is adopted to assess the quality of age data in Lesotho. Age ratios are defined as the ratios of population at each age group divided by one third of the sum of population preceding and succeeding the age group of interest (Bogue, 1969; Brass, 1968; Brass, 1975).

Table 4.1: Distribution of Age Ratios and Deviations for 2004 LDHS

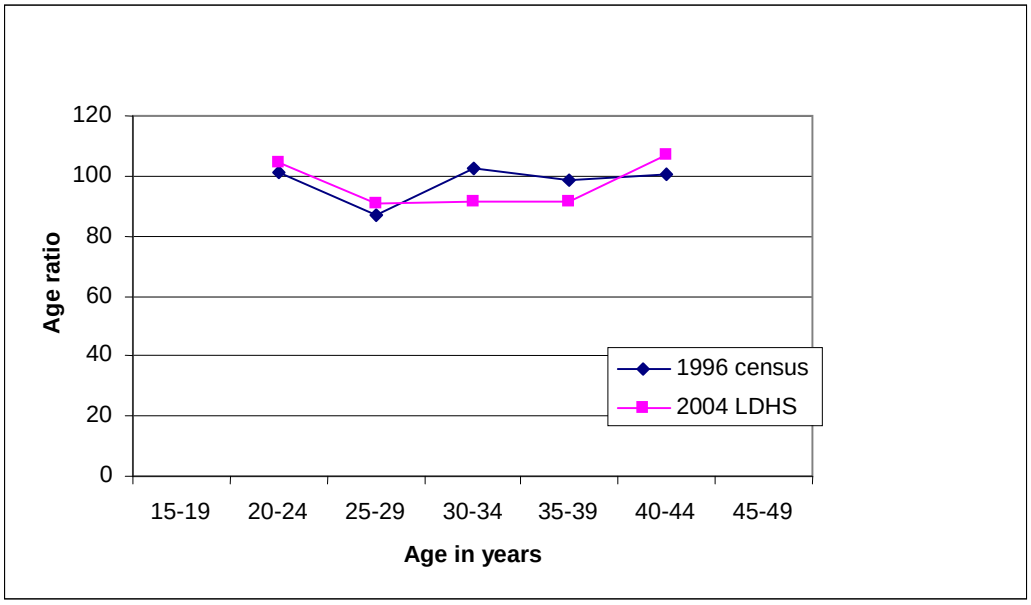
Age group	Age ratios, 2004	Deviations, 2004
15-19		
20-24	104.49	4.485
25-29	90.68	-9.324
30-34	91.39	-8.607
35-39	97.30	-2.696
40-44	107.29	7.288
45-49		
Total irrespective of sign		**32.399**

Source: Calculated by the author from 2004 LDHS

Age ratios are useful for evaluating the quality of census and surveys, particularly when ages are provided in groups. The expected standard value is usually 100.0, implying that any deviations from 100.0 at each age group explain net age misreporting (Kpedekpo, 1982; Shryock *et al*., 1976). Therefore, age ratios that approximate 100.0 assume good reporting of age. Nonetheless, Shryock and associates qualifies that at times deviations could be considerably large notwithstanding good reporting of age hence age ratios alone need not be regarded as 'valid indicators of error' for certain age groups (Shryock *et al.*, 1976: 125). But there could be different implications for 100.0. Coverage errors could be similar across all or some age groups and reporting errors in one age group affect other age groups. The age accuracy index defined as an overall measure of accuracy of age distribution is also used to evaluate quality of data. An index is a sum of the age ratios irrespective of sign for all age groups and as the index becomes low, the census/survey age data appears to be more adequate.

Table 4.1 presents age ratios as well as an accuracy index. Age misreporting is evidenced in the 2004 LDHS age data although it is minimal. An index of approximately 32.4 is far below 100.0 suggesting a higher level of accuracy in the 2004 LDHS. However, it is still important to smooth data to be at the standard level such that it may not be questionable to the users. Figure 4.2 illustrates age heaping occurring in the Lesotho 1996 and 2004 data sets.

Figure 4.2: Patterns of Age Ratios in Lesotho



Source: Computed from 1996 Census and 2004 LDHS

Note that the expected value is 100 as explained earlier; therefore, any discrepancy or deviation from 100 depicts age misreporting. The figure shows some form of spikes across all ages. The spikes represent misreporting in the age data although the disparities are minimal. As shown by Figure 4.2, both the 1996 census and 2004 LDHS data is more subjected to misreporting of age. The outstanding age group is 25-29 years where female population was under enumerated for both years. The same tendency in 2004 occurs, older females over reported their ages and the pattern is constant three age groups; 25-29, 30-34 and 35-39. It is evident from the graph that the least people to misreport age are women from the broad age group 30 to 44.

4.2.2 Smoothing of 2004 Lesotho Survey Data

There are a number of mathematical methods of graduating data. The techniques are meant to derive 5 year age grouped population figures corrected for coverage errors and provide plausible patterns of age distribution (Siegel, 2002). The procedure is to fit the original data to the selected models, basically to arrive at improved and correct population. However, with respect to age data in Lesotho, errors prevalent are age heaping (Mba, 2003). This occurs as a result of digit preference existing among respondents. Misreporting is a problem that plagues researchers that use census and

survey data. Reconciling discrepancies of age data is not easy but it can be manipulated using demographic methodologies. For the purpose of this study, data has been smoothed using the method of Moving Averages.

Table 4.2: Graduation of Female Population in 2004 LDHS by Moving Averages Method

Age group	Enumerated	Graduated
15-19	1761	1710
20-24	1456	1463
25-29	1026	1044
30-34	807	816
35-39	740	728
40-44	714	741
45-49	591	592
Totals	**7095**	**7095**

Source: Computed by the author from 2004 LDHS

The choice of moving averages depends mainly on the graduated distribution. As shown in Table 4.3, graduated distribution of female population is close to the true population. Throughout the age groups, there is a slight under and over reporting. However, the most affected, as expected, is age group is 15-19 where the population of women were exaggerated by a difference of 51 women. The preceding age groups are more for the graduated than enumerated population and the explanation could be that under enumeration was balanced.

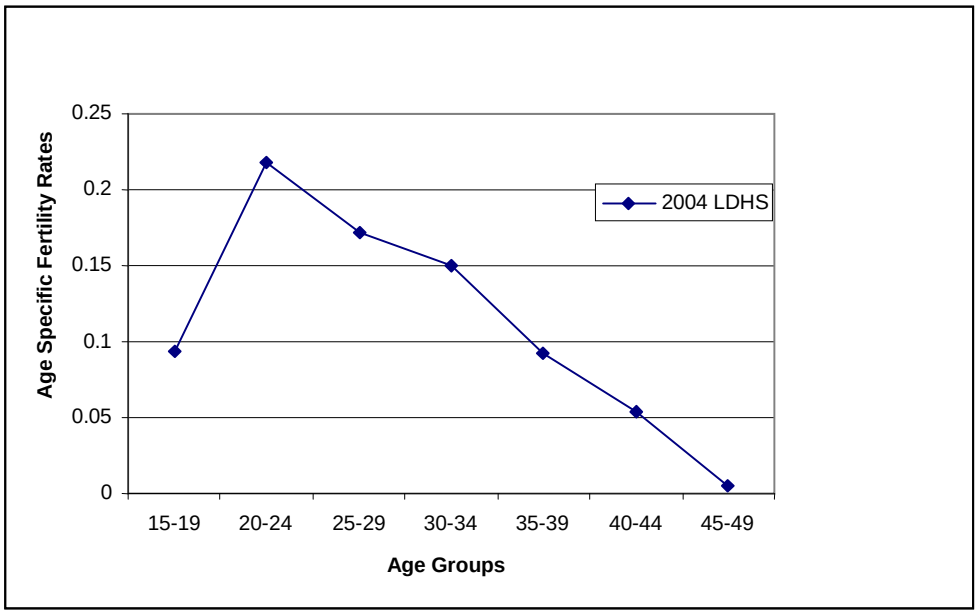
4.3 Errors Inherent in Fertility Measures

Fertility levels and trends are clearly explained using measures of current and lifetime fertility. As with other measurements such as mortality, fertility suffers errors likewise. The sections that follow discuss errors occurring in current and lifetime fertility respectively.

4.3.1 Assessment of Errors in Current Fertility

Age Specific Fertility Rates (ASFR) are a set of valuable measure of current fertility that explains the average number of live births or current childbearing performance of women. The normal curve for ASFRs is such that births are fewer among young women, reach the peak between the ages 20 to 25 and thereafter decline gradually. Figure 4.3 shows a graphical representation of age specific fertility in Lesotho for 2004.

Figure 4.3: Age Specific Fertility Rates for 2004 Lesotho Demographic and Health Survey



Source: Computed from 2004 LDHS

As shown by Figure 4.3, the age specific fertility rates are low at 15-19 age group and reach their peak at age group 20-24. Thereafter, the rates decline until the last reproductive age group. The curve for women in the 2004 LDHS assumes an expected pattern for African countries (Pollard *et al*., 1974) which is characterised by low rates in the age group 15-19, rising to a peak at ages 20-29 and gradually declines at 30-39 age group. The curve ultimately falls to low levels at age group 40-49.

The age specific fertility rate is calculated using reported births at different periods, for instance, it could be births in the last 12 months, last three years and in the last five years depending on the nature of research. Lindstrom and Woubalem (2002) asserts that the choice to use births in the last year is merely to avoid 'fluctuations' which occur within fertility, and transpiring from external factors such as political, economic and climatic situations. Current fertility is obtained from the question asked women about their live births; hence the reported births are subjected to misreporting error. This type of error occurs at different levels. The common observation has been that women tend to shift their ages towards young or older ages thus resulting in misplacement of reported births.

Moreover, another difficulty arises due to non-clarity to 'last year'. According to Lesotho Ministry of Health (2002), 'births in the last year' incorporates only those births that occurred within the period of 12 months prior the survey. The definition does not seem to be clearly understandable, when the cut off month should be from the time of surveys to a year, particularly if the survey is not conducted at the beginning or end of the calendar year. Current fertility may be distorted by a misperception of the length of the period preceding the survey, or by assumptions about the number of births in the year preceding the survey based on marriages with one or more children ever born. If the data on current fertility is roughly constant with respect to age, the age pattern of current fertility can be accepted as correct although its level may be distorted (UN, 1983). At this instant, because births do not occur only within marriage and marriage is not universal in Lesotho (Makatjane, 1999; Tuoane, 2002), the analysis utilizes the P/F ratio instead of other methods to encompass those indices that occurred outside marital boundaries. Table 4.4 presents the distribution of women and their corresponding births in the past year;

Table 4.4: The Distribution of Women by Births in the Past Year in Lesotho

	Births in the Past Year			
Age group	**0**	**1**	**2**	**Women**
15-19	1602	159	0	1761
20-24	1142	309	5	1456
25-29	849	174	3	1026
30-34	688	116	3	807
35-39	673	67	0	740
40-44	674	40	0	714
45-49	588	3	0	591
Total	**6216**	**868**	**11**	**7095**

Source: Computed by the author from 2004 LDHS Data

Generally, births in the last year ranged from zero to two. Biologically it is feasible that for any population women can have at least two births in the past year (Bongaarts, 1978; Udjo, 2005). More that 90 percent of women, who participated in the 2004 survey in Lesotho, did not have births in the year preceding the 2004 survey while less than 10 percent had between 1 and 2 births in the 12 months period before the survey date. As expected, the number of women who had a single birth are bearably large (at least 87 percent) across all the age groups but outstandingly larger from age group 20-24. In fact, of those women between age bracket 20-34 who had 1 live birth also had yet another

birth later on but within the last year extending to other groups none of the women had second births.

4.3.2 Assessment of Errors in Retrospective Fertility

It is important to obtain explicitly correct data on Children Ever Born (CEB) as it relates to the woman's reproductive life history. Mostly information on children ever borne alive is obtained from women of reproductive ages (15-49 age groups) and because there are errors such as age heaping and shifting inherent, it follows that information on CEB reported is prone to error because it is extracted from data given by age of mother. The fundamental question used to secure data on children ever born aims to obtain only life born children thus implying that all forms of foetal mortality are not incorporated. However, Moultrie and Timeaus (2002) explain that even though ways of securing data on children ever born have been improved, typical errors have been rampant and evidenced on several occasions.

One such error is omission of some children. The errors emanating from omissions are, for instance, children who died a long time ago whose existence is, most of the time ignored thus neglected (UN, 1983). Quite often women, especially those in their late ages in reproductivity, tend to forget children not currently living with them and those who have died (Arriaga, 1983; Kpedekpo, 1982; Shryock *et al*, 1976). Although it is implied that the proportion of omission increases with age, younger women commonly in the age group 15-19 also have a tendency of not reporting children ever born (Arriaga, 1983). The impact on data is that where omission of children is prevalent, average parities fail to increase as rapidly with the women's age as expected. This may occur to an extent that in some cases average parities of women in the last age groups, that is, 40-44 and 45-49 may fall as low as below those of women in ages 35-39, even when there is no reason to suggest that fertility has been rising. However, the reverse is true of the 2004 LDHS.

Table 4.5: Distribution of Number of Children Ever Born (CEB) and Mean CEB in 2004 LDHS

Age Group	Number of Children Ever Born						
	0	**1-3**	**4-6**	**7-9**	**10-12**	**Totals**	**Mean CEB**
15-19	1495	265	1	0	0	1761	0.16
20-24	514	931	11	0	0	1456	0.90
25-29	147	782	97	0	0	1026	1.78
30-34	48	494	253	12	0	807	2.77
35-39	24	370	304	41	1	740	3.57
40-44	26	229	326	127	6	714	4.35
45-49	9	145	269	146	22	591	5.15
Totals	**2263**	**3216**	**1261**	**326**	**29**	**7095**	**2.06**

Source: Computed by author from 2004 LDHS

Table 4.5 presents the number of children ever born and mean number of children ever born by age of the women. It should be noted that the number of children ever born in 2004 LDHS were provided in single births. However, the grouping was done to minimize the extent of error inherent in the CEB data by eliminating the number of zeros and insignificant numbers. However, it is important to mention that the maximum number of children ever born is twelve children with the mean of 2.06 children ever born per woman. A large proportion of women age 15-19 (85 percent) has never given birth. The proportion declines gradually to less than 5 women in the age group 45-49. The number of women who borne between 1 and 6 children is dispersed across all ages hence depicts that generally childbearing among women in Lesotho is universal.

Non-reporting of a considerable proportion of women who have actually had live births is experienced in the collection of data on children ever born (UN, 1983). As a result, considerable proportion of women, as well as their respective children is unreported. Coupled with non-reporting is the fact that some events are misclassified often due to the use of a dash (-). A dash may have different meanings to people dealing with data collection and processing hence women with zero parity, usually known as the childless are misclassified as women whose parity is not stated while a woman has declared herself otherwise. Consequently children ever born may not be recorded under corresponding mothers hence a possible effect surfacing from this may be fluctuations in average parities (Shryock and Siegel, 1976). The error compromises the quality of

information on CEB thus impacting on average parities; either over or underestimation of true parities occurs (Bucht and El-Badry, 1986).

4.4 Estimation of Fertility Levels

There are series of fertility indicators that are available to observe fertility trends and make analysis of associated determinants. The choice of Total Fertility Rate (TFR) as a period measure and fertility indicator is simply because it is uncomplicated in terms of highly demanding data requirements. Indirect methods of estimating fertility are applied starting with P/F ratio estimation and Bongaarts' proximate determinants of fertility method follows.

4.4.1 Estimating TFR using Births in the Last Year and Children Ever Born

There are two methods used to estimate the Total Fertility Rate (TFR) from Children Ever Born (CEB). One method, the P/F Ratio, employs data on CEB classified by age of the women in reproductive ages (15-19, 20-24, …, 45-49) and the number of births in the year preceding the survey (Moultrie and Dorrington, 2008). The P/P Ratio method estimates TFR using CEB classified by duration of marriage of the women. Both methods equally compare lifetime fertility with current fertility and adjust for typical errors. However, because births do not occur only within marriage, and marriage is not universal in Lesotho (Makatjane, 1999; Tuoane, 2002), the analysis utilizes the former method, P/F ratio to capture those indices that occurred outside these boundaries. Completeness of birth reporting is evaluated using the P/F ratio, a technique initiated by Brass (1968) and later advanced by Arriaga (1983) and Hobcraft *et al*. (1982).

The section addresses a question on the prospects of determining fertility change over time in Lesotho. This is obtained through information on the number of children ever born to women aged 15-49 and the number of births in the year preceding the 2004 LDHS. An estimate of the P/F ratio is obtained through a process of calculating age specific fertility schedules and average parities. The following table shows children ever born and births in the preceding year in Lesotho broken down into age group of women.

Table 4.6: Distribution of Estimated Number of Women by the Number of Children Ever Born and Number of Births in the Year Preceding 2004 LDHS

Age Group	No. of Women	No. of CEB	No. of Births Last year
15-19	1710	282	159
20-24	1463	1387	319
25-29	1044	1897	180
30-34	816	2299	122
35-39	728	2656	67
40-44	741	3129	40
45-49	592	3058	3
Totals			**7095**

Source: Computed by author, 2004 LDHS

From the information provided by Table 4.6, indices of current and lifetime fertility, consistency and accuracy of data are estimated using 2004 LDHS as shown in Table 4.7. As such, because Hlabana (unpublished 2006 dissertation) showed that there has been constant but declining fertility in Lesotho, therefore, age specific P/F ratios are used to estimate the level and analyse the trend in fertility.

Table 4.7: Estimates of Period Fertility Rates, Cumulated Fertility and P/F Ratios in 2004.

Age	P(i)	f(i)	5(∑fj)	F(i)	P(i)/F(i)	$f^{+}(i)$	$f^{*}(i)$	TF
15-19	0.1649	0.0930	0.4649	0.2038	0.8094	0.1130	0.1696	5.8867
20-24	0.9481	0.2180	1.5551	1.1222	0.8448	0.2176	0.3268	
25-29	1.8170	0.1724	2.4172	2.0812	0.8731	0.1694	0.2543	
30-34	2.8174	0.1495	3.1648	2.8914	0.9744	0.1447	0.2174	
35-39	3.6484	0.0920	3.6249	3.4497	1.0576	0.0886	0.1330	
40-44	4.2227	0.0540	3.8948	3.8204	1.1053	0.0472	0.0708	
45-49	5.1655	0.0051	3.9202	4.1015	1.2594	0.0036	0.0054	
Total	**0.7840**						**1.1774**	
TFR	**3.9202**							

Source: Computed by the author from 2004 LDHS

The formulae for calculating the indices are provided in the methodology chapter. From the computations in Table 4.7, it is evident that the mean parities increase as age increases for the population of women of Lesotho. The age specific fertility rates indicate that the shape of the fertility curve for Lesotho during 2004 has a broad peak occurring at the age of 25-29.

The P/F ratio method is used to compare the lifetime and the cumulative current fertility. P/F ratios measure the accuracy of birth reporting among women and they indicate the magnitude of error in reporting on children ever born. Average parity denoted by Pi measures the average number of children a woman has had (Hinde, 1998). The average parity for the first two age groups are below 1 implying that childbearing commences later, that is, at age group 25 to 29 for women who participated in the 2004 LDHS. Tracing way back from 1996, women used to begin having children very early (Mturi and Hlabana, 1999). The average parity of women during 1996 census was in the age group 20-24 (Hlabana, Unpublished). All the same, average parities from the 2002 LRHS suggest that childbearing starts at age group 25-29. The beginning of fertility at a later age implies that fertility could be decreasing in Lesotho.

As reiterated earlier, omission errors can be seen in the age pattern of the average parities. According to the 2004 LDHS, average parities gradually increase with age indicating that omission is low among the Basotho women. Notably, the parity for women aged 15-19 is exceptionally low signifying a high level of under reporting of children ever born from these women. But with other age groups, deviations are insignificantly reduced. The average parity for age group 45-49 is 5.1655 meaning that at the end of reproductive, women who participated in the 2004 LDHS had approximately a maximum of 5 children.

A P/F ratio has to be equal to 1 across all age groups. For the 2004 LDHS, the ratios for age groups 15-19, 20-24, 25-29 and 30-34, are slightly less than 1 meaning that the magnitude of error is negative by approximately 20 percent. Hence, there have to be measures instituted to adjust ASFRs. Beyond age 34, the P/F ratios are fairly above 1 by between 0.05 and 0.2 showing the magnitude of error is less than 25 percent. This deviation is probably due to problems with the data for this age group, possibly a large number of birth omissions, as indicated by the large sex ratio of 1.48 male to female births. Disregarding the P/F ratio for age group 25-29, we are left with P/F ratios that vary between 1.7 and 1.8. From these ratios we derive an adjustment factor K which is used to adjust the period fertility rates of various age groups in order to get estimates of age specific fertility rates. Because of the problem encountered in age group 25-29, four alternative sets of values for K are suggested, resulting in four sets of age specific fertility

rates, see Table 2.13. We see that the conventional fertility rates are adjusted upwards by a factor varying between 57.6 and 80.7 per cent.

TFR estimated using Brass P/F ratio method is 3.9. This indicates that in 2004, on average women had 3 children. This is determined through the reported births in the last year. In comparison to TFR estimated by the Bureau of Statistics Lesotho, TFR in 2004 was estimated at an average of 3.1 children per woman. The tendency for P/F Ratios is to reduce points to the fact that corresponding TFRs are also declining in years.

4.4.2 Estimating TFR Using the Relational Gompertz Model

The Relational Gompertz Model provides an insight into the nature of error existent in the data by fitting the gompertz function. Basically, the model originates from the Brass' P/F ratio and therefore analysis of this section is the continuation of the last section where the P/F ratio method could not convincingly determine the characteristics of errors (Paget and Timaeaus, 1994). Therefore, the model is used to clarify the problem by adjusting for the age pattern of fertility and estimates Total Fertility Rate (TFR). The model fits births in the last year and children ever born to the Gompertz function to obtain fertility estimates through the use of two parameters α and β. Essentially, the estimates obtained are more robust. The model is also used to describe age patterns of fertility using the function;

$$\mathbf{Y_x = -ln\,[-ln(F_x/F)] = a + b_x}$$

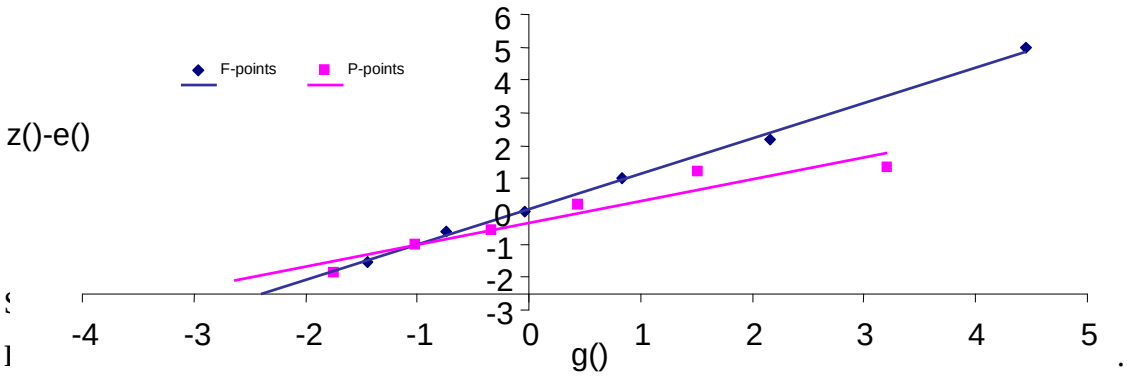
Modified model;

$$\mathbf{Z_i = -ln\,[-ln(P_i/P_i + 1)]}$$

The parameters e(i) and g(i) are standard estimates

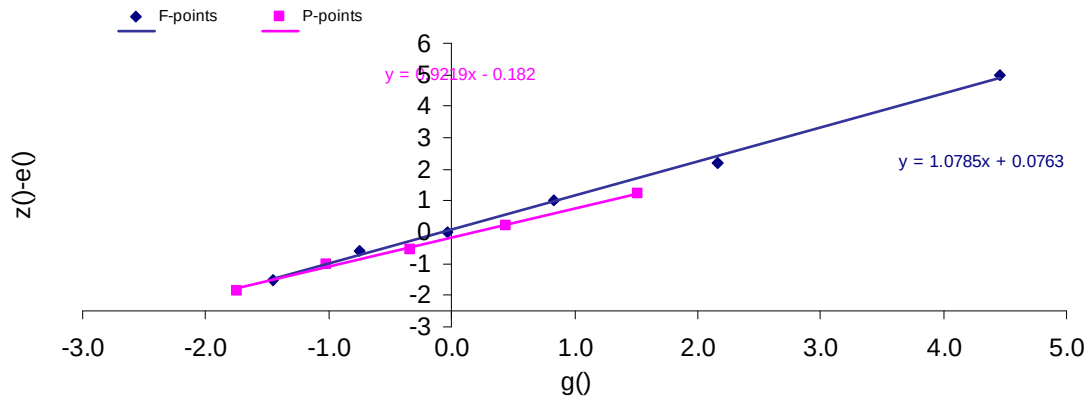
From the above functions and the computations presented in a tabular form (see Appendix 1), the plot of estimates in a graphical form is presented in Figure 4.4;

Figure 4.4: Fitting the Relational Gompertz Model to Current Births and Children Ever Born from the 2004 LDHS.



Generally, both P and F points of women from 2004 LDHS form a certain pattern implying a positive linear correlation which suggests that the data seems to have a smaller amount of error. The graphical representation shows that all the F points lie on the regression line as such predicts the best fit. On the other hand, P points seem to be scattered around the regression line though they evidence a downward curve in the older ages. The pattern suggests age overstatement existing among women in Lesotho. The F points are more pronounced while the last P point is distinct and deviates from the actual straight line, hence become an outlier. This point was discarded because it is difficult to interpret in relation to others.

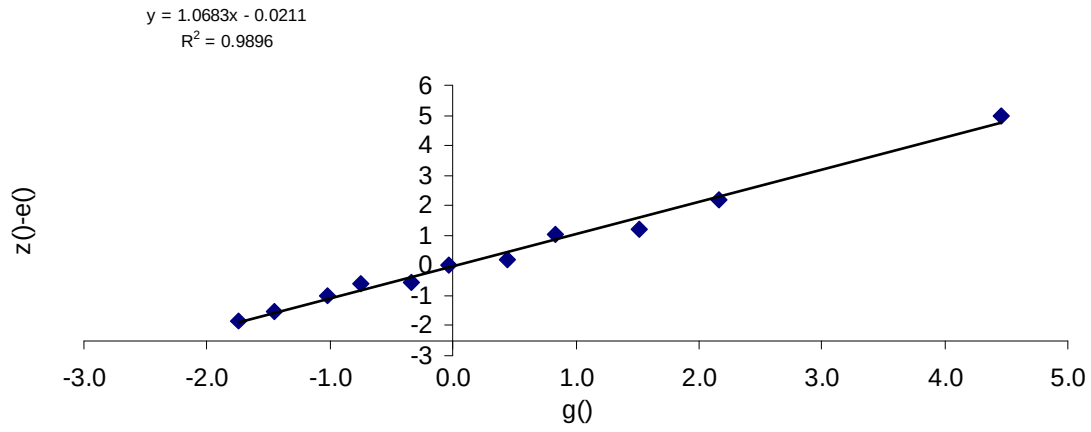
Figure 4.5: Fitting the Relational Gompertz Model to Current Births and Children Ever Born (some points discarded) from the 2004 LDHS.



Source: 2004 LDHS

As shown by Figure 4.5, when the outlier is removed, both P and F points follow a straight line presenting a better fit. From the graph, it is evident that reports from women in the younger ages are more reliable as both regression lines accommodates only F points for women aged 20-44 and P points of women aged 15-39. For both regression lines, the slope is positive. The parameters suggest a widespread childbearing across middle ages although concentration is pronounced beyond age 20 and ceases to end at age 44. Fitting both P and F points jointly yields one regression line as shown in Figure 4.6;

Figure 4.6: The 2004 LDHS, the Ratio Method P and F Plot



Source: 2004 LDHS

The combined effect of P and F points as shown by figure 4.6 produces a well-defined fitted line, Y = 1.0683x – 0.0211 with coefficient of determination $R^2 = 0.9896$. R^2 which in this case is approximately 1 indicates that the regression line fits the data perfectly. The parameters α and β have been estimated using the fertility model, Brass Relational Gompertz Model. For the 2004 LDHS data, $\alpha = 0.0211$ implying that the dispersion of the fertility distribution is acceptably good, almost all the estimates fit on to the regression line. The estimate for $\beta = 1.0683$ explains that the location of fertility distribution is such that it correlates or is closer to the standard fertility patterns generated using Coale and Trussell Model (Booth, 1984). Overall the model presupposes a better fit that is closely related to the standard fertility schedule.

In his research on parameters of Relational Gompertz Model, Booth (1984) points out that declining level of fertility is also apparent in the changing patterns of α and β. As such predicted; α decreases and β increases, therefore, fertility declines progressively. The estimates have decreased from the period 1996 to 2004. It is evident therefore, that decline in fertility is existent from the 2004 LDHS since 1996 up to thus far, as Mturi and Hlabana (1999) projected that fertility is likely to decrease further beyond 2002.

Through the computations using the Gompertz model, the combined TFR estimate is 4.02. As much as the estimate appears to be plausible as per Mturi and Hlabana (1999), the estimated TFR seems to be higher than that of the reported fertility

equaling 3.5. One of the reasons for the variation might be that the current births during 2004 were underreported or the magnitude of error making might have affected data such that it pulled the estimates. As compared to the estimates computed by Hlabana for different periods (1996 census and 2002 LRHS), fertility appears to be steady although still higher among women in Lesotho.

4.4.3 Estimating TFR Using Bongaarts' Model Indices

The section intends to ascertain the main proximate determinants that play a role in the fertility decline and the contribution or impact of these factors on fertility transition. Notably, factors of importance are changes in nuptiality patterns, increase in demand for methods of birth control, and changes in breastfeeding patterns. The section explores those proximate determinants that have a direct influence on fertility decline and their interrelationship with socioeconomic factors. The effects posed by each proximate determinant are discussed over a period from 1996 to 2004.

4.4.3.1 Estimation of Index of Marriage

In order to quantitatively assess the effect of index of marriage "C_m" on fertility in Lesotho, it is necessary to compute weighted average of the proportions currently married "m(a)" and a schedule of age specific marital fertility rates "g(a)". The use of weighted g(a) makes it possible that C_m captures reductions in fertility from women who may not have been entirely active sexually in the completed reproductive period. Table 4.8 indicates the manipulations of the never married and ever married women in Lesotho (2004 DHS) to derive at C_m using m(a) and g(a) as shown.

Table 4.8: Never and Ever Married Women, Proportions Currently Married and Marital Fertility Rates in 2004 LDHS

Age	Never married	Ever married	m(a)	g(a)	m(a) * g(a)
15-19	1439	322	0.2238	0.3354	0.0751
20-24	557	899	1.6140	0.2881	0.4650
25-29	184	842	4.5761	0.1865	0.8533
30-34	70	737	10.5286	0.1533	1.6143
35-39	56	684	12.2143	0.0980	1.1964
40-44	32	682	21.3125	0.0587	1.2500
45-49	20	571	28.5500	0.0052	0.1500
Total				**1.1252**	**5.6041**
C_m	**0.498**				

Source: Computed by the author from 2004 LDHS

As shown in Table 4.8, the index of marriage computed from the 2004 LDHS is given as 5.6. Therefore, we use the relationship provided by Bongaarts and Potter (1983);

Cm = TFR/TM to obtain TM = TFR/Cm = 5.626/0.498 = 11.297

4.4.3.2 Estimation of Index of Postpartum Insusceptability, C_i

Lactation significantly inhibits ovulation as it reduces the chances that women will have children during breastfeeding. Thus, this implies that they are unlikely to fall pregnant under normal circumstances if they do not ovulate. Ultimately, the impact is seen in the reductions in natural fertility and longer intervals between births. C_i therefore, is the ratio of average birth intervals controlled for lactation, and is computed as follows;

$i = 1.753 \exp (0.1396B - 0.001872B^2)$

$= 1.753 \exp (0.1396*15.2 - 0.001872*15.2^2)$

$= 1.753 \exp (1.6894)$

$= 9.4947$

Ci = 20 / (18.5 + 9.4947) = 20 / 27.9947 = 0.7144

4.4.3.3 Estimation of Index of Contraception, Cc

Modern contraceptive methods have been gradually becoming very effective means of reducing fertility. Estimates of contraceptive effectiveness are rarely available and difficult to obtain even though the impact of contraceptive use is essentially beneficial in the computation of fertility rates. As such, guesstimates of method-specific values were devised to be used as standard estimates (refer to the methodology chapter) to derive use-

effectiveness levels, U(m) and proportions of women using given method, e(m) for individual populations. The computations of U(m) and e(m) for the 2004 LDHS using standard estimates adapted from the Phillipines are presented in table 4.9;

Table 4.9: Estimating the Index of Contraception

Method	**U(m)**	**e(m)**	**U(m)* e(m)**
Not using	0.9692	0	0
Pill	0.1273	0.9	0.1145
IUD	0.0318	0.95	0.0302
Injections	0.1840	0.7	0.1288
Diaphragm	0.0005	0.7	0.0004
Condom	0.0537	0.7	0.0376
Female Sterilisation	0.0674	1	0.0674
Periodic Abstinence	0.0004	1	0.0004
Withdrawal	0.0142	0	0
Lactational Amenorrhoea	0.0005	0	0
Female Condom	0.0004	0.7	0.0003
Traditional Method	0.0214	0	0
Total	**1.4708**	**6.65**	**0.3796**

Source: Computed by author from 2004 LDHS

The average use-effectiveness denoted as e is estimated as the sum of method-specific use-effectiveness levels, e(m) and proportion of women using the given method divided by the proportion.

e = 0.3796/1.4708 = 0.2581

Assuming that couples using different means of contraception in Lesotho are non-sterile, the index of contraceptive use, C_c is computed as;

C_c = 1 – 1.08 * u * e = 1 – 1.08 * 1.4708 * 0.2581 = 1 – 1.08 (0.3796) = **0.5900**

Therefore, using the relationship TNMR = TM/ **C_c = 11.297/0.5900 = 19.15**

4.4.3.4 Estimation of Index of Induced Abortion

The value of Total Abortion Rate (TA) defined as the average number of occurrences of induced abortion a woman undergo in her entire life (Bongaarts and Potter, 1983; Hinde, 1998) is seldom known. The index of induced abortion is, therefore, difficult to estimate due to the complexities of reporting abortion. It should also be noted that abortion is uncommon and considered illegal in many developing countries. Hence Ca is usually

assumed to be equal to 1.0 in these countries. Ultimately, the inhibiting effect of the index of induced abortion is reasonably minimal.

Note that Total Fecundity Rate, TF = 15.3. The rate is proposed by Bongaarts and Potter (1983) who suggest that TF is significantly similar across populations and so it is reasonable to adopt the value in the case for Lesotho. However, TF computed from 2004 LDHS is given as;

TF = TFR / Cm * Cc * Ci = 5.626 / 0.498*0.590*0.714 = 5.626 / 0.2098 = 26.816

The average number of children each woman would have in Lesotho given that marriage is universal across reproductive ages, breastfeeding and postpartum susceptibility from sexual interaction are nonexistent among women and that contraception and induced abortion are not practised at all by the women is 26. TF is virtually determined by natural processes beyond human control. However, the value of TF=26 for Lesotho is extremely high which may make it unreliable to use.

We can therefore, provide a summary of the effect of the major determinants of fertility using real populations. The above computations are for 2004 LDHS summarised in a tabular form (table 4.10).

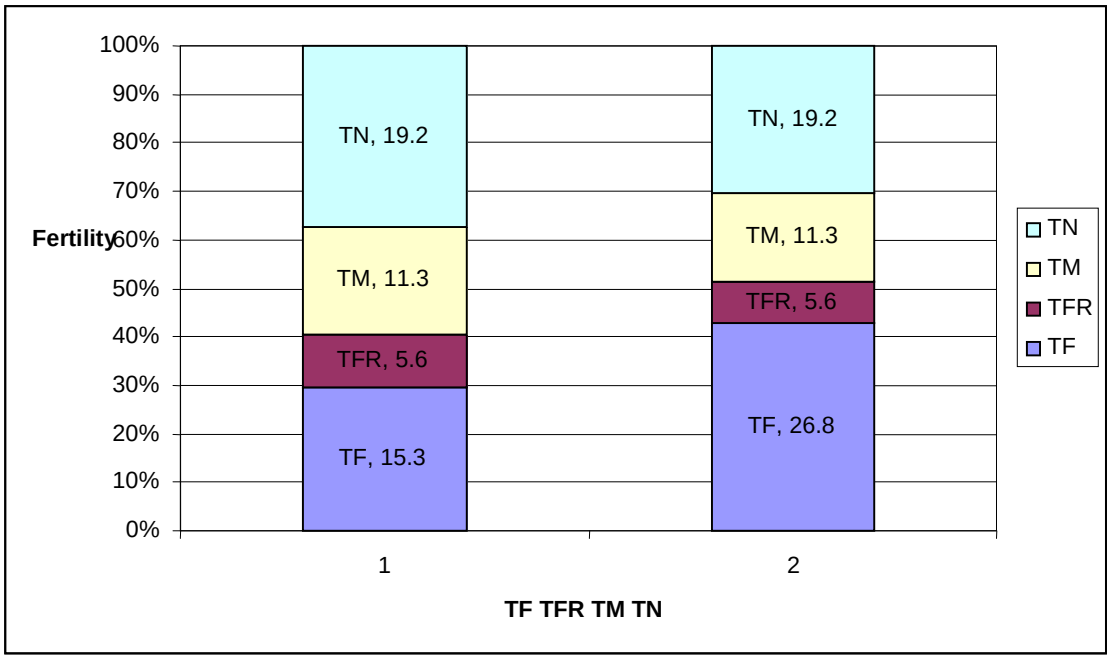
Table 4.10: Indicators of Fertility Indices and Measures by Their Estimated Values

Indicators	Estimated Values
Indices	
Proportion Married Index, C_m	0.498
Contraceptive Use, C_c	0.5935
Postpartum Insusceptability Index, C_i	0.9019
Induced Abortion Index, C_a	1.0
Fertility Measures	
Total Fecundity, TF	15.3
Total Fertility Rate, TFR	5.6
Total Marital Fertility rate, TMFR	11.3
Total Natural Marital Fertility Rate, TNMR	19.2

Source: Computed by author from 2004 LDHS

The information provided in Table 4.10 is presented by figure 4.4;

Figure 4.7: Proximate Determinants of Fertility in Lesotho, 2004



Source: Adopted from Bongaarts and Potter (1983) and modified by author using 2004 LDHS.

Figure 4.4 shows the estimates of proximate determinants in Lesotho. The computed TF is 26 although in the figure the adopted TF equaling 15.3 is used. This value is unreasonably high hence the standard rate is used. The average number of children (TFR) is estimated at 5 per woman in Lesotho. This is according to Bongaarts method of estimation of fertility where marriage, breastfeeding, contraception vary considerably unlike with TF where all the determinants are assumed constant. Fertility among married women is approximately 11.3, that is, married women in Lesotho have an average of 11 children meaning that they have higher fertility exceeding the overall fertility which 5 children. Estimated Total Natural Marital Fertility Rate (TN) achieved is 19.2. The assumed average number of children born among Lesotho women in the absence of contraception and induced abortion is 19.

4.5 Levels and Differentials of Fertility in Lesotho

There are series of fertility indicators that are available to observe fertility trends and make analysis of their determinants. The choice of Total Fertility Rate (TFR) as a period

measure and fertility indicator is simply because it is uncomplicated in terms of highly demanding data requirements which sometimes result in too many errors naturally. This section mainly provides levels of estimated fertility. Then differential of those estimates of fertility are presented.

4.5.1 Fertility Differentials by Marital Status

Marriage is an important determinant in the analysis of fertility. In many societies, childbearing occurs mainly within marriages. For this reason, married women stand out as the most significant factor in fertility assessment as compared to all other marital statuses. Fertility, duration and type of marriage therefore are strong correlates on the overall irrespective of statuses. For purposes of the research, marital status is grouped into 'ever married' and 'never married' categories. Table 4.11 presents the patterns of fertility across marriage;

Table 4.11: Fertility Differentials by Marital Status of Women

Age group	Never Married	Ever Married
15-19	0.0354	0.3354
20-24	0.0987	0.2881
25-29	0.1087	0.1865
30-34	0.0857	0.1533
35-39	0.0000	0.0980
40-44	0.0000	0.0587
45-49	0.0000	0.0053
TFR	**1.6430**	**5.6257**

Source: Computed from 2004 LDHS

According to analysis, never married women in Lesotho have considerably fewer children with TFR of 1.6 in contrast with women of comparable ages. Childbearing outside of marriage is negligible in Lesotho and it is practised only among women in the age range 15-34. Women who are not married but aged from 35 and above, do not have births at all. Table 4.11 shows that women have an average of 1 child before marriage in Lesotho. There are quite a number of reasons underlying lower fertility among never married women. One important factor is reasonably less risk of becoming pregnant due to reduced exposure to sexual activities. Kpekdepo (1982) asserts that coital frequency varies between the ever and never married populations simply because the ever married are more exposed comparably. The ever married women in Lesotho are reported to have 5 children on average over their reproductive ages. Therefore, based on the high rates of

marital fertility and concurrent low non-marital fertility rates, it is true that delayed marriage can significantly play a major role in reducing fertility levels in Lesotho.

4.5.2 Fertility Differentials by Rural or Urban Areas of Residence

Fertility differentials are considered imperative in terms of place of residence. The influence of place of residence on fertility is measured by fertility rates in rural and urban areas. The differentials are presented in Table 4.12;

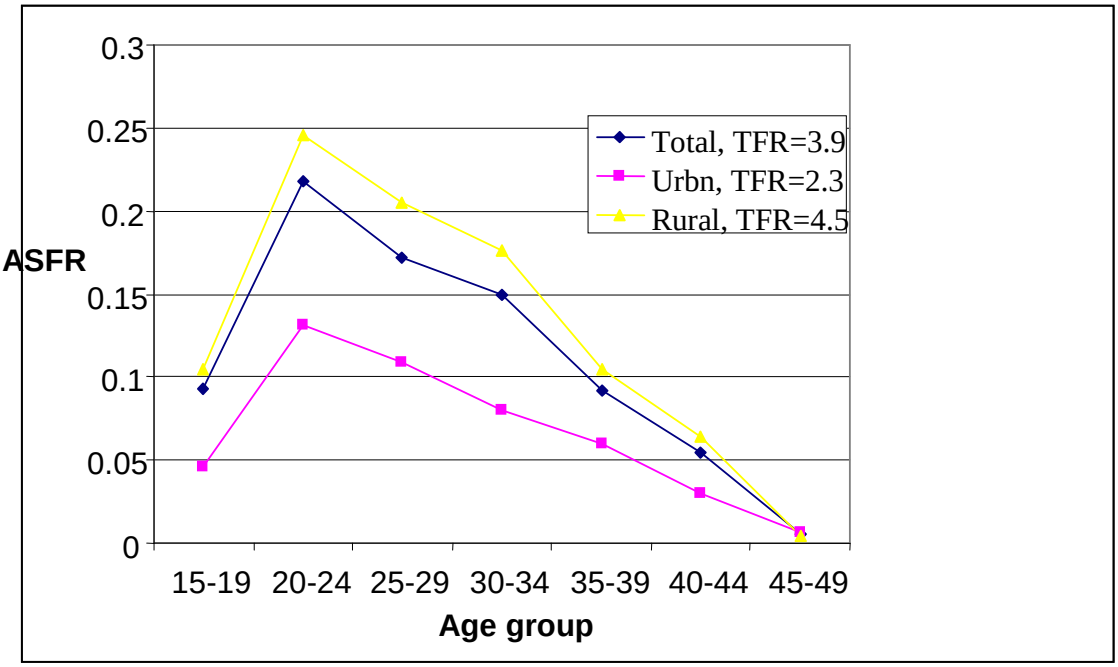
Table 4.12: Fertility Differentials by Place of Residence

	Age Specific Fertility Rates	
Age group	Urban	Rural
15-19	0.0455	0.3354
20-24	0.1318	0.2881
25-29	0.1092	0.1865
30-34	0.0798	0.1533
35-39	0.0596	0.0980
40-44	0.0303	0.0587
45-49	0.0065	0.0053
TFR	**2.3132**	**5.6257**

Source: Computed from 2004

Lower fertility levels are found among women in urban areas. The rate of fertility is 2 children per woman on average. Mturi and Hlabana explain that urban areas are significantly associated with low fertility. That is, high levels of urbanisation are characterised by low levels of fertility. The authors explain that the reason behind these patterns is female involvement in economic activities hence women deliberately control for natural fertility. Comparatively, women based in the rural areas have considerably high levels of fertility estimated at an average of 5 children per woman. The fertility rates are much higher contributing to generally high overall fertility levels of women in Lesotho compared to other sub-Saharan African countries such as South Africa, 2.3 in 2004.

Figure 4.8: Overall Age Specific fertility Rates by Rural-urban Residence, Lesotho, 2004



Source: Computed from 2004 LDHS

Figure 4.8 presents the overall age specific fertility rates by place of residence. Comparison between urban and rural is made to see how far the rates are from the overall fertility for Lesotho. Total Fertility Rate of women residing in the rural areas is high (4.5). It exceeds that of the overall fertility in Lesotho by a proportion of 0.6.

4.5.3 Fertility Differentials by Education

Education has a significant effect on disparities in fertility. From a pull of indicators of socio-economic status, the length of schooling has been widely used and found to be the most powerful predictor of women's current behaviour (Cleland and Jejeebhoy, 1995). The analysis suggests that an improvement in the levels of education among women is relatively the driving force for fertility reductions in Lesotho. The TFR for women with highest education is lower (an average of 2.7 children per woman) than other levels. Fertility and education have an inverse relationship where fertility reduces as education increases other factors assumed constant. The *Basotho* women whose level of education is low (complete and incomplete primary) and/or those who have not attended schooling at all, have the highest TFR estimated at 4.9. This is not surprising for Lesotho as Mturi

and Hlabana (1999) indicated that women whose TFR is high are mostly from rural areas and patterns are apparent from those who have less education. The explanation cited for low fertility among educated women in Lesotho suggest that because childbearing outside marriage is prohibited in Lesotho, therefore young women decide to wait until schooling is completed to get married and have children. This implies that as they complete their intended levels of education, their reproductive ages would be limiting them to a certain number of children. Additionally, with their advanced levels of education the choices to have more children depend on what women want to achieve in the working environment and the kind of life they would want their children to live. For instance, the changing perceptions of women about the number of children after their own schooling depend among others on whether women can afford to maintain certain positions at work and educate children in 'model C' schools, (Axinn, 1993).

4.6 Trends of Fertility in Lesotho

Fluctuations in fertility due to time and methods compel researchers to analyse changes occurring to fertility. Temporal comparisons draw on the disparities that exist in fertility levels and its determinants. Age Specific Fertility Rates (ASFR) and Total Fertility Rates (TFR) are computed to compare variations between subgroups such as women of different marital status, place of residence, education and so on. The sections that follow illustrate the variations of fertility at different times.

Table 4.13: Total Fertility Rate (TFR) Using Brass P/F ratios Method Based on Reported Age Specific Fertility Rates (ASFR), Average Parities and P/F Ratios.

	1996 Census			2002 LRHS			2004 LDHS		
Age	ASFR	Parity	P/F ratio	ASFR	Parity	P/F ratio	ASFR	Parity	P/F ratio
15-19	0.038	0.081	1.463	0.098	0.144	0.835	0.093	0.165	0.809
20-24	0.143	0.779	1.444	0.223	0.953	0.954	0.218	0.950	0.845
25-29	0.147	1.840	1.439	0.229	1.997	0.922	0.172	1.817	0.873
30-34	0.127	3.028	1.540	0.187	3.036	0.941	0.150	2.817	0.974
35-39	0.102	4.043	1.993	0.146	3.927	0.963	0.092	3.648	1.058
40-44	0.064	4.782	1.976	0.064	4.621	1.0146	0.054	4.223	1.105
45-49	0.027	5.084	1.799	0.027	5.402	1.089	0.005	5.166	1.259
Totals	**0.65**			**0.97**			**0.78**		
TFR	**3.24**			**4.87**			**3.92**		

***Sources*:** Hlabana (2006 dissertation) calculations based on 1996 Lesotho Census and 2002 Lesotho
Reproductive and Health Survey
Author's calculations based on 2004 Lesotho Demographic and Health Survey

The results presented in Table 4.13 are obtained through application of P/F ratio method on current and retrospective fertility. The P/F ratios for the three data sets vary between years. For the 1996 census (computed by Hlabana, unpublished dissertation), the ratios are greater than one across all age groups and they do not follow any pattern. Comparatively, the two surveys follow a similar pattern although different from the 1996 data set. The P/F ratios are not entirely greater than 1 but both increase with the age of mother. The patterns of P/F ratios could imply varying types of error inherent in the data sets whilst on the other hand one could be explained by fertility decline as it has been suspected for Lesotho. But with the case for census, it becomes difficult to explain varying P/F ratios because it begins with a rather higher P/F ratios, declines though to age group 25-29 and picks up from 30-34 until when it declines again in the last age group 45-49.

Fertility changes are also measured between a group of variables over time. A variety of indices facilitate comparisons of fertility of women for different categories. Regarding place of residence, fertility estimates differ considerably by residence. Women residing in the rural areas have much higher fertility (an average 4.1 children) as compared to 1.9 children born from women in the urban areas. The difference is huge, hence the overall has been pushed high owing to fertility of women from the rural areas.

This pattern has been in existence from 2002 survey and 1996 census carried out by Hlabana (unpublished dissertation).

In contrast, Mturi and Hlabana (1999) obtained slightly different estimates for the 1996 census and 2002 LRHS. In as much as the same methods could be used to compute indicators of fertility, the estimates may differ. Mturi and Hlabana (1999) estimated fertility at 4.1 children for 1996 which is quite plausible for Lesotho fertility as opposed to 3.2 children computed by Hlabana (unpublished dissertation). It may be true that this estimate is close to the reported estimate, which is 3.3 but this does not necessarily imply that it is correct. Implications could be that there were errors which could not be controlled for.

4.6.1 Overall Fertility and Trends Given By Different Techniques

As reiterated earlier, trends can be followed using different methods of fertility estimation. The computed fertility rates are compared with those that are reported in Lesotho as presented in Table 4.14;

Table 4.14: Overall Total Fertility Rates Computed by Different Techniques 1996, 2002, 2004 in Lesotho

Technique of estimation	Estimated TFR			Reported TFR		
	1996	2002	2004	1996	2002	2004
Brass P/F Ratio	3.2	4.8	3.9	4.4	4.1	3.6
Relational Gompertz	3.7	4.3	4.0	4.9	4.2	3.5
Bongaarts	-	4.5	5.6	-	4.6	-

Source: Computed from 2004 LDHS; BOS, 1996, 2002, 2004

Table 4.14 presents computed and reported total fertility rates from the 1996 Population Census, 2002 Lesotho Reproductive and Health Survey and 2004 Lesotho Demographic and Health Survey given by three different techniques. It is however, evident that fertility varies considerably between methods and time in terms of years. The TFR in Lesotho ranges from 3.2 to 5.6 average children per woman depending on the methodology adopted for estimation. The trends over time reveal that fertility has been declining and there are various reasons responsible for the declines. However, it is worth noting that Bongaarts model is not convincingly providing the reliable estimate of fertility. Notably, the continuous declines in fertility levels in Lesotho assures that the onset of fertility

transition has begun in Lesotho thus predicts that fertility will reach replacement level in the near future given that all factors responsible for the decline continue to improve.

4.7 Summary

The chapter presented an examination of 2004 LDHS in order to estimate TFR. Subsequent to presentation of distribution of the data, were irregularities emanating from data errors ascertained. Data was then cleaned and corrected for the inaccuracies pertaining to misreporting of any sought. The procedures used for data evaluation including cleaning and graduation were Age Ratios, Brass P/F ratios and Brass Relational Gompertz model techniques. Estimates of TFR were computed using different methods specifically; P/F ratios, Relational gompertz model and Bongaarts' proximate determinants. The estimates differ considerably; however, the gompertz was concluded to have the most reliable TFR estimate. Therefore, the conclusion drawn from this is that fertility is declining over time although at a slower pace and it is evident that the onset of fertility transition has therefore commenced in Lesotho.

CHAPTER 5

DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

Estimation of fertility based on indirect methods of fertility is important where collection of statistics is complex and undergoes major hiccups. The study explored different techniques used to estimate fertility using the 2004 Lesotho Demographic and Health Survey (LDHS). Data were then compared to the estimates calculated by Mturi and Hlabana (1999) dated from as far back as 1996 through to 2002. The comparison was carried out so as to establish fertility differentials and trends in Lesotho up to thus far. The study was motivated by studies on the onset of fertility transition in many other sub-Saharan African countries. The chapter entails a brief summary of discussions, conclusions drawn and finally implications and recommendations.

5.2 Discussions

5.2.1 Data Quality and Assessment

Assessment of data for quality is imperative before estimating Total Fertility Rate (TFR). Presentation of data displays defectiveness of fertility records, evidently indicating the usefulness of indirect methods of estimating fertility. There are different methods used in the research to evaluate accuracy of data. However, there is a need to point out that various steps need to be followed to arrive at providing robust estimates. The initial step is to investigate the correctness of data in order to minimise errors which are inherent in our statistics.

The quality of data is a major concern in fertility studies since the indispensable measurement adopted is age, even though it has potential to be inappropriately reported (Cleveland, 1989). Suspicions are usually raised that the age data in developing countries do not follow a normal age structure; partially because of ‘systematic biases’ but also data are incomplete, therefore, it becomes apparent that inspection take charge to uncover the types of distortion (Udjo, 1998; Cleveland, 1989). Lesotho data sets are no different hence the research’s initial step was to essentially go through the same inspection process. There have been newly formulated complicated techniques of detecting, cleaning

and refining reported data. None of them whatsoever is considered perfect for carrying out the smoothing procedure. Rather, the most reliable method would be one that minimises errors efficiently and smoothes data such that its distribution is closer to the true data and it follows a certain standard pattern (Kpekdepo, 1982).

The frequencies were used to examine the distribution of age of women in Lesotho. Analysis of frequencies showed that relatively large numbers of women were reported in the lower age group (15-19) and declined sharply in the following ages until the lowest age 45-49. This pattern of declines in the number of women as age increases is similar to that of women in other African countries; however, the feature is not satisfactorily convincing to determine accuracy given the assumed standard patterns. Essentially, further consideration to adopt demographically devised approaches is needed to identify possible errors in age data. Age ratios for instance, were used to measure the quality of age data for the 2004 LDHS. Discrepancies were identified although they were minimal.

Usually, errors are detected through the use of indirect methods. For the purpose of this paper, Brass P/F ratio method sought to evaluate quality of data as well as the modified version, the Relational Gompertz Model (RGM) for analysing birth history data. Our measure of effectiveness emanates from the use of parities and current fertility to check for consistency in the P/F ratios while the RGM was designed to measure fertility of women in Lesotho. The function was applied to fertility data presented by the 2004 LDHS. The findings evidenced age misreporting hence the data was smoothed.

5.2.2 Total Fertility Estimation and Examination of Factors associated its variation

Total fertility rate estimation is essential to observe the levels, differentials and trends of fertility in a population. Fertility estimates are computed using different techniques that are best suitable to the population in question. In particular, the study employed Brass P/F ratio and Relational Gompertz to arrive at fertility estimates. It is also necessary to examine the factors associated with fertility change over time. Bongaarts' proximate determinants of fertility model was used to examine the factors associated with fertility change.

The results document constant reductions in TFR in Lesotho in the recent past, although the pace of declines is slow. The study suggests that fertility fell from as high as 4.1 in 1996 to an estimated 3.9 in 2004. However, the estimates differ with techniques used and different studies from which estimates were adopted. Therefore, comparison is a little complicated because of the wide range of available estimates. Although Mturi and Hlabana (1999) estimated the 1996 TFR as 4.1, the reported estimate is 3.3 which also differ from that obtained by Hlabana (unpublished dissertation), 3.2. All these findings were obtained using one method, the P/F ratio. Regarding the level of fertility, TFR as reported by 2004 LDHS was 3.6 and 3.5 from Brass P/F ratio and Relational Gompertz respectively. The findings of this study reveal TFR of 3.9 using P/F ratio while Relational Gompertz yielded TFR estimate of 3.8. These estimates are closer although higher than those for the reported fertility which implies accuracy in the computations carried in the study.

The analysis of different models revealed an important understanding of differentials of fertility by population groups. Behind a long drag of declines in fertility coupled with a slow pace, though visibly present, are differentials within population groups extending to determinants of fertility. The transition is mainly associated to place of residence, marital status and education, more especially that of mothers. The differentials are therefore explained by increasing economic inequalities among the socioeconomic groups of the population and administrative regions. The shape of the fertility curve for Lesotho assumes late peak happening beyond the age 25 years even though it spreads across all ages recently owing to continuously increasing levels of education and late marriages occurring within the population. Significant also is little teenage fertility experienced by the *Sotho* women.

Social scientists principally acknowledged the fact that fertility levels in Africa as a whole are high yet would be outsized in the 20th century owing to various factors (Thomas and Muvandi, 1994). Analysis proved that fertility reductions are occurring and reoccurring in Lesotho although declines occur at a slower pace. Regardless of place of residence, increases in woman's education are associated with lower fertility. The data for Lesotho indicate that having even some education in comparison to no education can reduce fertility.

Postponement of marriage and childbearing has been found to be fundamental to fertility declines. Many studies evidence high levels of education in Lesotho which many a times are coupled with delays in marriage. This has a bearing on the commencement of childbearing which is duly to start very late. Consequently, majority of births occur beyond age 20 with 28 being the most common age to commence childbearing among the *Basotho* women. Despite a general tendency to shift from early to late childbearing among women, there are differences with respect to fertility levels between educated women and those that do not have education at all. Contraceptive practises play a critical role in the regulation of fertility. The substantial change in fertility limitation in Lesotho through a declining trend evidenced in the study transpired over nearly a decade ago. The prevalence of contraceptive use took a positive turn among women of childbearing by increasing from low use to moderate levels. The effectiveness of contraception in reducing fertility levels is evident in Lesotho. However, variation is fairly large between rural and urban women with young women in the reproductive ages reluctant to use contraception.

5.2.3 Onset of Fertility Transition

The onset of fertility transition is measured by continuous fertility decline on a long term basis in a population. Trends of fertility which show consistent reductions in fertility levels were adopted to observe whether fertility levels follow a transition pattern. A comparison was therefore made for a period between 1996 and 2004. The fertility estimates for 1996 Population Census, 2002 Lesotho Reproductive and Health Survey and 2004 Lesotho Demographic and Health Survey were compared. The findings reveal that although fertility has been falling in Lesotho, the pattern is not convincing to conclude the onset of fertility as yet. However, if the levels continue to fall at the consistent rate, fertility transition may be experienced in the near future.

5.3 Conclusions

The main aim of the dissertation was to examine the decline in Total Fertility Rate (TFR) over a period of approximately eight years, 1996 to 2004, with the focus on 2004. The nature of errors in the 2004 fertility data are such that the data should be used cautiously by people who are able to make good judgment on the implications of their choices,

decisions and methods on any resulting estimates of fertility. Importantly, the estimates based on the 2004 LDHS and previous studies in Lesotho; show that fertility is declining at an increasing rate. Both urban and rural fertility estimates are following the same trend although rural estimates decline at a slower pace.

In essence, the factors contributing to fertility decline in Lesotho are contraceptive use, breastfeeding and marriage. Although these factors have contributed significantly to the reductions in fertility in Lesotho, more effort need to be emphasised on the use of contraception. The role that was played by marriage on reducing fertility seems to be declining. Evidence from the 2004 LDHS and previous studies conducted in Lesotho reveal that fertility transition has not commenced. However, the trends show a slowing pace of fertility decline.

5.4 Recommendations

Subsequent to the research findings, recommendations are drawn for 2004 LDHS. In order to successfully obtain robust estimates of fertility, data have to be detected for errors so that fairly reliable data are used to compute fertility rates. This is ensured so that comparability is maintained at all levels. Methodologies that are used have to meet international standards for purposes of comparison. Apart from that, data collection, processing has to be carefully monitored at all times to reduce the extent of error making at all levels. As it was indicated, some of the errors seemed to have occurred during collection. Therefore, data collectors need to train their staff thoroughly. But also, data have to be assessed extensively even before use to ensure quality.

The government has to work towards breaking the disparities existing within population groups and regions with regards to fertility aspect, through universal policy implementation and not only policy formulation. While implementation of reproductive health or family planning programmes will have to be continued, even as the level of unmet need for contraception is still high in the population, socioeconomic development goals that seek to address such population problems must be first priorities and also be at the centre of population programmes in the country. In addition, universal family planning programs and supply should be ensured particularly in the rural areas and target

must also be extended to women in the early reproductive ages to keep up with adherence to contraceptive use.

Existing levels of fertility in Lesotho imply that if the decline in fertility maintains its current pace, then the population would remain high and probably double in the next 20 years. This however, has a bearing on future planning for the coming generations in relation to service provision such as employment or job creation, education and health services. Hence the government has to focus on reducing fertility in rural parts of the country by ensuring that importance of having average children is realised.

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