ASCERTAINING FERTILITY REPLACEMENT LEVELS FOR SOUTHERN AFRICAN COUNTRIES

by

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DECLARATION - PLAGIARISM

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ABSTRACT

The study set out to investigate the level of growth of populations of Southern African Countries by estimating the fertility levels, the mortality levels as well as the replacement fertility levels so as to establish if the generation of women in these countries are replacing themselves or not. This study focused on the following select countries; South Africa, Swaziland, Lesotho, Namibia and Zimbabwe and the Demographic Health Survey Dataset (DHS) ranging between 1998 and 2007 was used for these countries in investigating the levels of growth measured by TFR. This study was a comparative analysis between countries on their fertility and mortality levels and was done by utilizing one of the most comprehensive data sources, the Demographic Health Survey Data for the individual countries.

The DHS data set that has been used for each of the Southern African Countries ranges between the years 1998 and 2007. This was done to ensure that the years at which these data sets for these Southern African Countries were collected are not too far apart so as to allow comparisons between countries and avoid bias.

The findings of this study from the analysis revealed that Southern African countries still boast high fertility rate levels between 2.9 and 3.8 and that all the five countries forming part of this study have a Net Reproduction Rate (NRR) that is above 1.1 children per woman. Finally, The Total Fertility Rate (TFR) at replacement level for all these countries in Southern Africa is above 2.1, in fact, it ranges between 2.7 and 3.3 for all these five countries. Recommendations were made that Local and National Governments in these developing countries should track the replacement fertility levels for their countries from time to time. This will assist in avoiding a situation whereby many governments targeting total fertility rates of 2.1 find their population in decline if such a target was reached whilst replacement fertility remained above 2.1. In addition to that, during population conferences, demographers should make it a point that issues surrounding replacement fertility levels for developing countries are discussed. Replacement fertility for developed countries, which is set at 2.1 children per woman, should therefore be used as a guideline for tracking and reporting of developing countries replacement fertility levels.

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LIST OF ACRONYMS

TFR   : Total Fertility Rates

GRR   : Gross Reproduction Rate

NRR   : Net Reproduction Rate

ASFR   : Age Specific Fertility Rates

ASFR (girls)   : Age Specific Fertility Rates for girls

nSx   : The Probability of Survivorship

SRB   : Sex Ratio at Birth

IMR   : Infant Mortality

STI"s   : Sexually Transmitted Infections

HIV   : Human Immunodeficiency Virus

AIDS   : Acquired Immunodeficiency Syndrome

UN   : United Nations

UNFPA   : United Nations Population Fund

UNDP   : United Nations Development Programme

UNAIDS   : Joint United Nations Program on HIV/AIDS

MDG   : Millennium Development Goals

DHS   : Demographic Health Survey

SADHS   : South Africa Demographic Health Survey

SDHS   : Swaziland Demographic Health Survey

LDHS   : Lesotho Demographic Health Survey

NDHS   : Namibia Demographic Health Survey

ZDHS   : Zimbabwe Demographic Health Survey

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<center>**CHAPTER ONE**</center>

<center>**INTRODUCTION AND BACKGROUND**</center>

1.0 Introduction

Replacement fertility is one of the concepts rarely talked about nowadays in public health and development discussions regarding whether a population is growing, declining or is heading for equilibrium, yet it is a very important demographic concept that needs to be monitored (Engelman & Leah, 2006). On the same note, Morgan & Taylor (2006) argue that in pre-historic times, *when more than half* of all children born to women failed to survive to adulthood, replacement fertility exceeded four or five children per couple. *Replacement fertility* is a very crucial demographic concept that is often *misconstrued* as a constant 2.1 children per woman, whilst in actual facts, it varies by population and over time, from as low as 2.06 children per woman to over 3 children per woman (Engelman & Leah, 2006) . This misconception in the value of replacement fertility level has been observed amongst demographers who have failed to recall that replacement fertility is a function of sex ratios at birth and the survival of children until the end of their reproductive age, it is specific to each population and is subject to changing conditions (Engelman & Leah, 2006). These conditions include the level of *fertility and mortality* within a country (Engelman & Leah, 2006). There is a great need therefore for *policy makers* in different countries, and especially in Southern African Countries, to clarify the importance of tracking and publicizing changes and variations in replacement fertility rates.

This research project sets out to investigate the replacement fertility levels in Southern African countries in order to understand whether the generation of women in these countries are replacing themselves or not. The study is guided by the perception that, Replacement Fertility Levels in Southern African Countries" is above 2.1 children per woman, due to the present high fertility and high mortality levels in these countries. This therefore means that more children need to be born per couple in these countries to ensure generational

replacement. Throughout the study, replacement fertility levels will be referring to predicted replacement levels.

The chapter starts by providing a brief background on replacement fertility levels in Section 1.1. Then in Section 1.2 the problem statement will be presented. The aim, objectives and research questions will be presented in Section 1.3. The justification of the study is found in Section 1.4. Section 1.5 presents the outline of the study whilst in Section 1.6 the conclusion for the chapter is presented.

1.1 Background of the Study

Population scientists define replacement fertility level as the average number of children born per woman at which a population exactly replaces itself from one generation to the next, (Hamilton, 2012). This rate is believed to be 2.1 children per couple (Engelman & Leah, 2006). Replacement fertility level is a very important measure to know for all Countries as it helps in understanding the growth rates of the population (UN, 2005). This therefore should help countries in planning for their future population growth.

Worldwide, there is a great *misconception* about replacement fertility level which has been widely perceived as a static value constantly set at 2.1 children per woman. The value of 2.1 children per woman is believed to be the exact value necessary for a society to be able to replace itself from one generation to the next (Engelman & Leah, 2006).This value, 2.1 could be true for some developed countries as they have successfully dealt with issues of high fertility and high mortality through urbanization and improved health care (Searchinger, White, & Leeson, 2013). However, this rate of 2.1 children per woman is not correct for most developing countries because they are still trying to deal with issues of high fertility combined with high maternal and child mortality brought about by HIV/AIDS as well as other infectious diseases. These differences have resulted in variations in the population transition between developed and developing countries and could produce differences in replacement fertility levels. If such variations in the replacement fertility levels are not

seriously observed by policy makers in these developing countries, this could result in below replacement fertility levels.

According to Wayburn (2005) the concept of replacement fertility relates to child survival, reproductive health and gender by focusing on the likelihood in each population that girls can survive all the hardships of life until they themselves can be mothers. On the other hand, Hutchinson (1967) states that replacement fertility has always been a very important concept in demography. For example, in 1821, Ravenstone used American Census data to estimate that four children per family were needed during that time to maintain a stationery United States of America (U.S.A) population based on the fact that 11 out of 20 females born survived to middle age and out of the total number of 11 women, one remained single (Jacobson, 1987).

A research that was conducted by Espenshade, Guzman, and Westoff (2003) on the global variations in replacement fertility levels revealed that there is a substantial variation in fertility among countries around the World ranging from 1.4 live births to nearly 3.5 live births. Further, this study revealed that the current replacement total fertility rates for East African regions is 2.94, and lowering fertility to 2.1 would under current mortality conditions result in a regional birth rate 29 percent below replacement. Recommendations were made that there is an urgent need for countries around the world to ensure that policy makers review their countries replacement level fertility to avoid a situation whereby fertility levels are below replacement and which in the long run will lead to population decline.

Engelman and Leah (2006) in their study on the importance of mapping out replacement fertility levels within countries revealed that the number of children a woman must have to perfectly replace herself and her partner in the next generation depends on how many of those children are female and how many of those girls reach their reproductive age. Another study on achieving replacement level fertility by Searchinger et al. (2013) revealed that whilst replacement fertility rate of 2.1 children per woman is true for some developed countries, it is not true for developing countries due to high mortality rates.

1.2 Problem Statement

Southern African Countries form part of Sub-Saharan Africa which has the highest total fertility rate (5.1 children per woman) in the world. This study focuses on a set number of countries in Southern Africa and these are South Africa, Swaziland, Lesotho, Namibia and Zimbabwe. These countries are experiencing high maternal and HIV mortality rates and there is a bulge in fertility rates, yet we still talk of 2.1 children per woman as the general replacement fertility levels for all countries. In South Africa, Swaziland, Lesotho, Namibia and Zimbabwe, the total fertility rate (TFR) ranges between 3.61 and 2.41 children per woman. In addition to that, sub-Saharan Africa has the World"s highest Infant Mortality Rate (IMR) 68/1000 (UN, 2008). In the countries which are part of this study, infants die soon after birth and mortality due to HIV/AIDS is very high which has resulted in high death rates among women of reproductive ages (UN, 2008). The brutal impact of HIV/AIDS pandemic in these countries is reshaping mortality patterns, age structures and population growth rates (UN, 2011). In these five countries forming part of the study, the population growth rates have been reduced to below 0 due to the HIV/AIDS pandemic. Further, at least one adult in five is living with HIV/AIDS in these countries and HIV prevalence is currently estimated to be 20 per cent or greater (UN,2011).

Whilst the global life expectancy at birth has increased from 67 years to 76 years for developed countries, for developing countries, mainly sub-Saharan Africa, it is set at 55 years or less (UNAIDS, 2011). So, given the current prevailing demographic and health related conditions in these countries, it is of great interest to investigate if under these prevailing conditions the replacement level fertility of 2.1 children per woman would be suitable to correctly replace their populations from one generation to the next.

1.3 Aim and Objectives of the Study

The main aim of the study is to investigate the level of growth of populations of Southern African countries by estimating the fertility levels, the mortality levels as well as the replacement fertility levels so as to establish if the generation of women in these countries are

replacing themselves or not. The focus of this study is on select Southern African countries and the countries that the study will cover are South Africa, Swaziland, Lesotho, Namibia and Zimbabwe. Based on empirical evidence, the research should recommend a way forward on tracking and publicizing individual countries" replacement fertility levels to monitor the growth rates of the population.

1.4 Research Objectives

- To explore the total fertility levels (TFR) in Southern African Countries.
- To explore the contribution of different age groups to the level of fertility in Southern African Countries.
- To explore the contribution of mortality of women and children to the levels of fertility in Southern African Countries.
- To explore the levels of replacement fertility in Southern African Countries.

1.5 Questions to be asked

1. What are the fertility levels (TFR) for Southern African countries?
2. What is the contribution of the different age groups to the level of fertility in Southern African countries?
3. What is the contribution of mortality of women and children to the levels of fertility in Southern African countries?
4. What is the level of replacement fertility in Southern African countries?

1.6 Justification of the Research

Southern African Countries which are South Africa, Swaziland, Lesotho, Namibia and Zimbabwe are still characterised by high fertility and mortality rates. These countries are part of sub-Saharan Africa and still developing. Sub-Saharan Africa has the highest total fertility

rate (5.1 children per woman) in the World and in these five countries, the total fertility rate (TFR) ranges between 3.61 and 2.41 children per woman (UNAIDS, 2011). In addition to that, sub-Saharan Africa has the World's highest Infant Mortality Rate (IMR) 68/1000. In the countries which are part of this study, infants die soon after birth and mortality due to HIV/AIDS is very high resulting in high death rates among women of reproductive ages (UNAIDS, 2011). Whilst the global life expectancy at birth has increased from 67 years to 76 years for developed countries, for developing countries, mainly sub-Saharan Africa, it is set at 55 years or less (UNAIDS, 2011). So, given the current prevailing demographic and health related conditions in these countries, it is of great significance to investigate if the replacement level fertility of 2.1 children per woman would be suitable to correctly replace their populations from one generation to the next under these prevailing conditions. This would allow for policy makers to have a better understanding of prevailing and planned fertility levels.

1.7   Outline of the Study

Chapter 1

Chapter one deals with the background and the explanation of the rationale behind the study, a discussion of the problem statement, its aims and objectives, the research questions as well as the significance of the study. Also outlined are the research methodology, research design and literature review.

Chapter 2

This chapter provides an in-depth study of the relevant literature that is used in this research with regard to replacement level fertility.

Chapter 3

Chapter three will summarise the research processes to be followed. This chapter focuses on the discussion of the research methodology with particular reference to the study design,

which is followed by an account of the sampling method and the data collection instrument used to attain the research objectives.

Chapter 4

This chapter discusses the data analysis methods for which the use of both percentages, tables and graphs will be used.

Chapter 5

Chapter 5 discusses the conclusion and the recommendation of the study. Recommendations are also made with regard to the findings made from the study.

1.8 Conclusion

The focus of the study is to investigate the level of growth of the populations of Southern African countries measured by Total Fertility Rate to ascertain if the generation of women in these countries are replacing themselves. It is perceived that, based on the demographic conditions of Southern African countries which comprise of high fertility rates, high mortality rates and low life expectancy at birth, these countries need more than 2.1 children per woman to ensure generational replacement. This study shows that tracking replacement fertility levels in these countries will help in ensuring that below replacement fertility levels are avoided. Chapter two will discuss literature related to the topic.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This study will draw knowledge from studies of previous research that have been done on replacement fertility levels around the world, with a particular focus on Southern African countries. The literature for this study will be discussed under guidance of the following concepts; Theoretical Framework, Trends in Fertility Transition, European Fertility Transition, Sub-Saharan and Southern African Fertility Transition and Issues related to replacement fertility levels in Southern Africa. Factors influencing sub-Saharan Fertility decline in the regions will also be explored.

2.1 Theoretical Framework

Figure 1: Demographic Transition Model
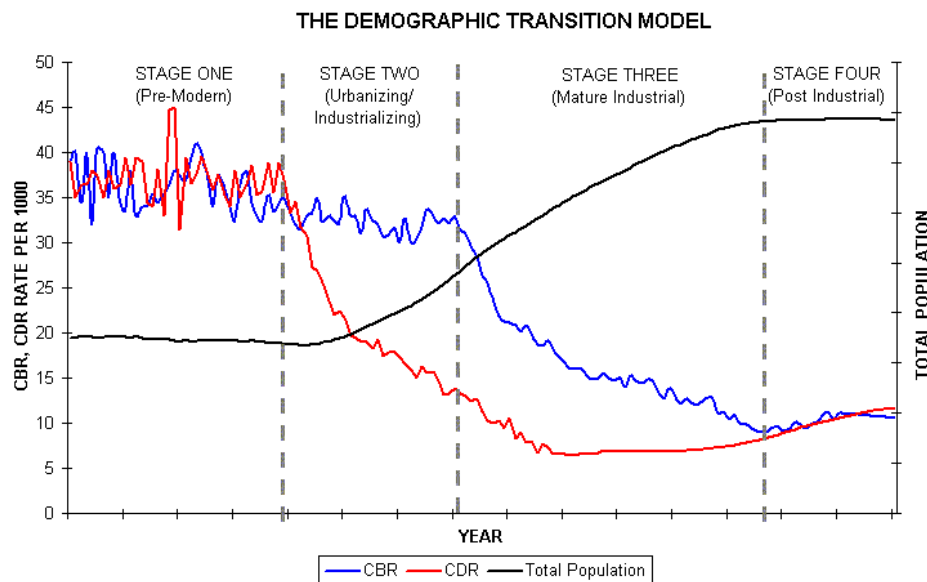
Source: (Weeks, 2008)

Figure 1 shows the demographic transition model, which is the theoretical framework that will be adopted by this study. The demographic transition theory was developed by Thompson (1930) and Notestein (1953). One assumption of the demographic transition theory is that a country will move from a *pre-industrial* (agricultural) economic base to an *urban, industrial* one, with a corresponding decrease in family size and population growth (Weeks, 2008). The demographic transition theory is comprised of four different stages, however, researchers are of the view that a fifth stage in the demographic transition model should be introduced. According to Weeks (2008), the four stages of the demographic transition theory are:

Stage 1: This is the first stage of the demographic theory and this stage comprises of high birth and high death rates. Population growth is slow in this stage.

Stage 2: In the second stage of the demographic transition theory, birth rates remain high whilst death rates *fall sharply*. This is resulting from improvement in nutrition, medicine, health care, and sanitation. During this stage, the population begins to grow rapidly.

Stage 3: In stage three, birthrates begin to drop rapidly, death rates continue to drop, but more slowly. Economic and social gains, combined with lower infant mortality which reduces the desire for large families are the causes for the decline in birth and death rates.

Stage 4: In this stage, birth and death rates are both in balance, but at a much lower rate. In this stage, if population growth exist, is minimal.

The demographic transition theory is of the idea that a decline in fertility is caused by the changes that occur in social life. According to this theory, improvements in social life result from urbanization and industrialization (Weeks, 2008). Urbanization and industrialization acts as a *catalyst* for fertility decline based on the premium that as a country develops, it becomes more urbanized and industrialized resulting in improvements in medical technology and healthcare, which therefore causes a decline in fertility because people will have better access to contraception and health care facilities (Weeks, 2008).

Further, this theory *postulates* that improvement in social lifestyle, especially with regard to health facilities, also results in a decline in mortality resulting in a decline in fertility caused by the *survival* of many children (Weeks, 2008). When parents are sure that their children will survive to adulthood, they are willing to reduce their fertility and that causes fertility decline. This theory is also of the idea that urbanization and industrialization have also created a situation whereby raising a large number of children has become expensive and this therefore has resulted in many couples opting to have a fewer number of children (Weeks, 2008).According to the Demographic Transition Theory, urbanization and industrialization have major impacts on fertility decline (Weeks, 2008). This is one of the most accepted theories by demographers to describe demographic history (Weeks,2008).

However, Coale & Watkins (1986) argue that the contributions made by this theory are considered to be of a *very limited* nature. Critics of the classical demographic transition model state that this model is a *highlight* of the experience of European countries, especially for England and Wales (Coale & Watkins, 1986).The experience of European countries might not necessarily be relevant to those of other regions, especially developing countries. One of the weaknesses *portrayed* by this theory is the assumption that all transitions have the same cause, assuming that urbanization and industrialization results in fertility decline (Coale & Watkins, 1986). In as much as this may have been true for some European countries, but not for countries such as France, whereby the transition started amongst the rural agricultural farmers, (Coale & Watkins, 1986). Further, this might not be true as well for developing countries, especially Southern African countries. To support this, (Weeks, 2008) argues that there is no evidence that the *socioeconomic progress* experienced by industrialized countries is a necessity of demographic transition.

In addition, this theory can be mainly criticized for being a *broad generalization*, which does not even portray the experiences of all Western countries. Studies like the one conducted by Teitelbaum (1975) have revealed that experiences of fertility transition of various countries in Europe were different from each other based on the fact that the sequence of the different stages are different. For example, David Glass, a British demographer has argued that English people themselves do not have adequate knowledge of their own demographic transition (Coale & Watkins, 1986). This shows a generalization of the theory even within and amongst the first European countries where transition was first observed. One of the hypothesis of this theory is that before there is a decline in fertility, mortality will decline (Weeks, 2008**).**

However, in most countries in Europe, fertility decline declined when mortality was very high (Teitelbaum, 1975). A study that was conducted by Morgan and Taylor (2006) discovered that in Spain, the decline in fertility did not follow what the demographic transition model had stated in that fertility when mortality was still high. This is an indication that experiences of one country cannot be used to predict fertility decline of another country.

Further, the demographic transition theory assumes that fertility will decline until replacement levels have been achieved, which is assumed by many population scientists to be a total fertility rate (TFR) of 2.1 children per woman (Weeks, 2008). This assumption of the demographic transition theory is also expressed by the UN (2008) in their assumption that fertility levels of countries that are in transition will continue their decline until fertility drops slightly below the replacement level.

This theory implies that the experiences of European countries would be similar to those of developing countries as well as in other parts of the World, which is a weakness in the theory because countries have different *socio-cultural and political* influences which in turn will affect fertility and mortality differently(Knodel, 1997).Indeed fertility did decline in all western countries, but the conditions with which fertility declined were very different. Demographers were not able to understand the decline in fertility in Europe because of the complexity of its nature(Demeny, 1997).

2.2 Trends in Fertility Transition

According to Weeks (2008), fertility transition is the process by which a country moves from high birth and death rates to low birth and death rates with population growth in the *interim.* To support that, Potts (1997)states that fertility transition defines a country that has experienced fertility decline of at least 10% which begins an *irreversible trend* downwards and fertility transition can be declared as completed when fertility replacement levels have been achieved. Replacement fertility level is the number of children that a couple must bear to replace themselves and normally it is slightly higher than 2.1 children per woman in developed countries whilst it is 2.5 children or higher for developing countries (UN, 2005).

Coale (1986) states that the conditions that are necessary for fertility decline involves a *setting that permits* fertility control to be part of *calculus of conscious choice*; a clear understanding of the advantages of having a smaller family size economically, as well as the availability of information about and means of fertility decline. This shows that there is no single factor that is responsible for fertility decline, but is a result of a combination of factors. For example, the ideational theory by Cleland & Marston (2003) postulate that "diffusion of knowledge about controlling fertility will control fertility", (p.20). Nevertheless, this theory does not put into consideration issues of cultural differences amongst Nations, for example, in Sub-Saharan Africa parents have a great desire for many children and thus in order for fertility to decline in a setting like that, spreading the knowledge should work together with reduced *demand* for children (Cleland, 1985). Fertility transition will therefore be discussed based on the changes that have been taking place globally, followed by sub-Saharan Africa and finally in Southern African region.

2.2.1 Global Fertility Transition

According to UN (2008), global fertility rates have declined *drastically* from an average of 5 children per woman in the 1950"s to 2.55 children per woman in 2007. Developed regions such as Europe already had the lowest fertility rates in the world in 1950, 2.65 children per woman, declining to 1.53 children per woman in 2010 which is currently below the replacement level fertility of 2.1 children per woman (UN, 2005). In a study that was conducted by Westoff (2010) with the aim of analyzing the fertility rates for countries around the world, findings from this study revealed that the most *dramatic* decline in fertility in the world history has been in Eastern Asia where there was a decline in the total fertility rate between 1950 and 2010 from 5.42 children per woman to 1.75 children per woman. Such a decline in the fertility rates has gone below the replacement level fertility which is 2.1 children per woman. According to Wilson (2001), *specifically persistent* sub-replacement fertility produces rapidly aging populations, declining workforce size and smaller overall population size. Generally, developed countries have a much lower fertility rate because of greater wealth, education and urbanization (Weeks, 2008). In these countries mortality rates are low, birth control measures are understood and easily accessible (UN, 2009). In a study

that was conducted by Potts and Campbell (2005) on global fertility transition, the results revealed that *approximately* 40 percent of the population of the world live in countries that have began their fertility transition.

Globally, regions typically experience fertility transition from high to low fertility levels, (Bongaarts, 1978). Since 1970-1975, the World Total Fertility (TFR) has declined by 37 percent and in 1995-2000, fertility declined from 4.5 children per woman to 2.8 children per woman (Moultrie & Timaeus, 2012). Worldwide, research has indicated that there are great variations in human fertility levels (Espenshade et al., 2003).Most countries in the developing world, such as Niger, still have high fertility levels which range to about 7 children per woman. On the other hand, the majority of developed countries have low fertility levels with an average of closer to one birth per woman which might later pose great challenges in terms of generational sustainability (Weeks, 2008). The challenges of high fertility as faced by many developing countries can be much easier to deal with through the use of interventions such as the introduction of high quality family planning programs. However, with regard to dealing with the challenges of below replacement fertility levels, it can be very difficult to come up with interventions (UN, 2009). On the other hand, Morgan and Taylor (2006) state that global pre-transition fertility levels were higher than the European one, ranging from 6 to 8 births per woman.

An analysis of fertility transition around the world conducted by Espenshade et al. (2003) concluded that whilst fertility transition in developed countries took around 100 years and is classically attributed to improvement in socio-economic conditions which changed child survival rate and fertility preferences, however in developing countries it occurs more rapidly than in developed countries. For example, in Bangladesh fertility transition occurred in a span 10 years and birth rates declined without simultaneous socio-economic development.

2.2.2 Fertility Transition in Europe

Europe as a region will be used broadly as a guide to differentiate fertility transition for developed countries from that of developing countries. The onset of the fertility transition in Europe started even before the Industrial Revolution contributed to an improvement in the

standard of living (Bongaarts & Casterline, 2012). In 1950, Europe had the lowest fertility levels in the world and it has now dropped to below replacement level throughout that region (Bongaarts, 1978). Between 1950-1955 Europe"s total fertility rate was 2.65 births per woman and by 2010-2015, the total fertility rate declined to 1.53 births per woman (Bongaarts, 1978).There are predictions that by 2045-2050 the total fertility rate will be 1.80 births per woman which is an increase from the total fertility rates of the years 2010-2015 (Bongaarts & Casterline, 2012). Generally, developed countries have a much lower fertility rate because of greater wealth, education and urbanization (Bongaarts & Casterline, 2012). In these countries mortality rates are low, family planning is understood and easily accessible.

During the 17th and the 18th centuries there was already a steady decline in marital fertility resulting from contraception methods such as withdrawal(Bongaarts & Casterline, 2012**)**. Another system that resulted in the decline in fertility for the Europeans is a system called *partible inheritance* which resulted in couples opting for smaller families in order to divide their inheritance amongst a few number of children, as opposed to an earlier system whereby only the first born son would take over the inheritance (UN, 2009). According to Coale (1986)**,** the onset of fertility decline in Europe took place under a wide variety of socioeconomic conditions and it took a very short period of time spread within cultural areas. Further, Coale (1986) postulates that the pattern of fertility decline witnessed in Asia and Latin America in the 1950s and 1960s was also witnessed in some other countries. Contraception had an impact in the tempo of fertility decline that happened in developing countries. This is in contrast to the decline that happened in developed countries where fertility decline started before the invention of modern contraceptives. Therefore, the faster decline in fertility observed in those countries cannot be attributed to improvements in socio-economic development but to diffusion processes which played a great role in ensuring fertility decline (Coale, 1986). European mortality decline did not always *precede* fertility decline.

In a survey that was conducted by Bongaarts and Watkins (1996) on modern fertility decline, results indicated that the level of socioeconomic development is strongly related to the pace of fertility decline even when it is unrelated to the onset of fertility decline. An earlier study of these trends by Bongaarts and Watkins (1996) concluded that the initial pace of change in fertility was not associated with the pace of development. However, the pace of initial decline was positively associated with the level of development at the time of onset.This shows that

socioeconomic factors played a crucial role in fertility decline. Another factor resulting in Europe"s fertility transition was economic conditions that resulted in inflation and job insecurity. This automatically resulted in a decline in birth rates as the people of Europe could not afford more children due to the economic conditions of the continent, delayed marriages, abstinence and coitus interrupts within marriage.

In the second part of the 19th Century, improvement in mortality through large numbers of surviving children as well as *aspirations* for higher living standards resulted in limiting fertility in the European Countries (Weeks, 2008). The rising standard of living in European countries in the 19th Century resulted in a decline in fertility. Whilst fertility decline in European Countries resulted from people"s willingness in limiting their fertility, in most developing countries fertility decline mainly resulted from high HIV/AIDS mortality rates (Weeks, 2008). Since 1964, birth rates in European Countries have resumed their downward trend which is generally supported by widespread contraceptive use, delayed marriage, delayed child bearing and the use of surgical contraception when the desired family size has been reached (Morgan & Taylor, 2006).

This therefore shows that in Europe, as far back as the 18th century contraceptives were already being used. In 1800 for example, England TFR was 5.6 children per woman and in 2013 the TFR was 1.8 which shows that there has been a transition in fertility due to the widespread use of contraception (Morgan & Taylor, 2006). One of the proximate determinants of fertility decline is induced abortion, and since abortion had been legalized by this time, this never meant that women had to delay sexual activity even though they delayed marriage. The availability of surgical contraception also means that when they decide that they already have the desired number of children, they can stop having more children permanently (Weeks, 2008).

2.2.3 Fertility Decline in sub-Saharan Africa

According to WHO (2005a) fertility levels in sub-Saharan Africa are among the highest in the world. According to Caldwell and Cadwell (1993), in all nations populations differ from one another through the following factors; proportion married, use of contraception ,

incidence of abortion and involuntary fecundity. Sub-Saharan Africa is one of the regions that boasts a wide diversity in culture, the level of social and economic development, and the degree of Government involvement in family planning activities (UN, 2009). Since the estimation of fertility levels started in the 1960s, fertility levels in most sub-Saharan Countries have remained very high compared to the rest of the world, with an average total fertility rate (TFR) of 5.48 children per woman in 2000-2005 (UN, 2009).

According to Machiyama, Silverwood, Sloggett, and Cleland (2010) , sub-Saharan Countries fertility transition began in the 1980s. As a region, sub-Saharan Africa had a very high total fertility rate of 6.22 children per woman in 1950, declining to 5.08 children per woman in 2005. One of the causes for that was the desired family size which remained very high in this region (UN, 2009). According to Weeks (2008), evidence on sustained fertility decline witnessed in most developed countries reveals that this is not the case in countries found in sub-Saharan Africa. However, recent evidence, as observed from countries such as South Africa, Zimbabwe and Botswana, has resulted in some researchers as well as policy makers arguing that demographic structure of some societies maybe on the verge of dramatic change due to the decline in fertility of these countries. To support that Cohen (1998) states that amongst the *early transition* countries in terms of fertility were Southern Africa Countries including Zimbabwe, Namibia and South Africa as these countries‟ fertility declined by more than one child per woman in the 1980s.

Sub-Saharan Africa had a very high total fertility rate of 6.22 children per woman in 1950, declining to 5.08 children per woman in 2005 (Weeks, 2008). In most developed   countries children are still regarded as a source of labor and care givers for their parents in old age Weeks (2008) and fertility rates are higher due to lack of access to contraceptives and the level of female education and employment is generally low (Weeks, 2008).These Countries are characterized by widespread poverty, largely rural population, high rates of illiteracy, minimal use of contraceptives and high rates of child mortality (UN, 2009).

Demographers are of the   opinion that lower childhood mortality coupled with higher educational levels in Eastern and Southern Africa are a contributory factor to an earlier fertility decline in this region (UN, 2009). A study that was conducted by Bongaarts and Watkins (1996) between 1960 and 1990 on fertility and development changes in 69

developing countries revealed that " socioeconomic development, through changes in the demand for children, is a strong factor, but not sufficient to account for variations in the timing of the onset of transitions or in variations in their pace, (pg.669). In recent years in sub Saharan Africa modern contraceptive use has increased seven fold especially in countries such as Malawi, Namibia, Tanzania, Zambia and Zimbabwe (Westoff, 2010). This region is also witnessing changes in the proximate determinants of fertility, including increases in the age of marriage, (Weeks, 2008).

2.2.4 Fertility Decline in Southern Africa

Southern Africa is part of four geographical regions of Africa namely; North Africa, West Africa, Central Africa as well as Southern Africa (UN, 2008). The countries that form part of Southern Africa are Angola, Namibia, Zambia, Zimbabwe, South Africa, Lesotho, Swaziland, Botswana and Mozambique (UN, 2005).Whilst the other regions of Africa obtained their independence as early as 1950, for example countries in North Africa, Southern African Countries obtained their independence a bit later. For example, South Africa got her independence in 1934, Namibia in 1990 and Zimbabwe in 1980, which negatively impacts on the fertility of the country as a whole as family planning programs were not easily available to all women (UN, 2005). The fertility trends of each country will be discussed further.

According to Morgan & Taylor (2006) fertility transition was already underway in southern Africa, with South Africa having a TFR of 4.0 children per woman; Zimbabwe with a TFR of 4.3; Botswana with one of 4.8; Swaziland, 4.9; Lesotho, 5.2; and Namibia, 5.3. These countries of Southern Africa boast amongst other things high income levels and the extent of development is also higher compared to other countries in sub-Saharan Africa (UNAIDS, 2011). In Southern African Countries fertility is also influenced by the cultural background of the different countries (Weeks, 2008). The trend of smaller families as mostly witnessed in most developed countries has not yet been adopted in most African countries as children are still highly valued in most societies of Southern African countries being regarded as an essential component of marriage (Weeks, 2008). Even where people are not married, most men and women believe that they should have children during their lifetime UN (2008)

Cohen (1998) *stipulates* that in Southern Africa, fertility declines at almost the same pace as the average rate in less developed countries compared to Eastern, Western and Middle Africa where fertility rates are much slower. A recent analysis on the total fertility rate (TFR) for the whole of sub-Saharan Africa carried out by the (UN, 2008) revealed that the average total fertility rate for the whole of Southern Africa was 5.08 children per woman in 2005-2010. This shows that Southern Africa as a region has high fertility rates. Bongaarts (1978) highlights that generally there are assumptions that once fertility decline is initiated, it would steadily continue until reaching the replacement level fertility, which is presumed to be 2.1 children per woman. This assumption that a replacement level fertility of 2.1 children per woman is necessary for generational replacement is further challenged by Engelman and Leah (2006) who reported that the pace of decline had decelerated in early 2000 in sub-Saharan Africa. This was based on the observation made from a study on sub-Saharan fertility decline conducted by (Bongaarts, 1978). This revealed that about twelve sub-Saharan countries have delayed fertility decline in the midst of transition.

According to UN (2009) the *context* of the contemporary fertility transitions especially in Southern Africa, differs from that of Europe in several ways, especially being characterized by higher pre-transition levels of fertility, fast and unprecedented rates of mortality decline and population growth, an active role of many governments and nongovernmental organizations in promoting family planning, and the recent availability of efficient methods of contraception (UN, 2009). Each of the countries that form part of the study is briefly discussed with regard to prevailing fertility levels:

2.2.5 South Africa

South Africa is one of the countries in Southern Africa that obtained independence late in 1994. This means that for a long time, the level of fertility was influenced by different socio-economic conditions existing in the colonial time. Between 1950-1955 the total fertility rate was 6.50 births per woman, declining to 4.56 births per woman in 1980-1985, 2.55 births per woman in 2005-2010 and finally 2.34 births per woman (UN, 2013). According to UN (2013) South Africa"s population currently stands at 52 981 991 with an annual growth rate of 1.34%

per annum. The current fertility rate in South Africa is 2.33 children/ woman and the infant mortality is 43.78 deaths/ 1000 births (UN, 2013).

According to Moultrie and Timæus (2003: 280), "the strong decline in fertility in South Africa is a result of different factors amongst which are population policies which advocate widespread contraception use and education on contraceptives), changing norms and institutions, improved income levels, higher educational attainment, lower child mortality and HIV/AIDS". This shows that the decline in fertility rates in South Africa results from a combination of socio-economic factors. Governments of different Southern African Countries also launched some policies aimed at promoting contraception use which also contributed greatly to fertility decline in Southern Africa (Caldwell & Cadwell, 1993). To support that, Moultrie & Timaeus (2012) argue that success of the population policies to reduce fertility levels within each country might have been enhanced by rapid urbanization that brought individuals born and raised in rural areas into contact with city dwellers that generally had more exposure to and awareness of contraceptive methods. Research shows that contraception knowledge and usage is much higher in South Africa than in other African countries (UNAIDS, 2011).

2.2.6 Swaziland

Swaziland obtained her independence from the British in 1968. Between 1950-1955, the total fertility rate was 6.70 births per woman, declining to 6.54 births per woman in 1980-1985 (UN, 2009). In 2005-2010 the total fertility rate was 3.57 births per woman which has resulted in a total population of 1 386 914 (UN, 2009). However, as of 2013, Swaziland total fertility rate was 2.88 children per woman and the infant mortality rate was 59.57 deaths per 1000 live births, whilst maternal mortality is 320 deaths per 1000 live births (UN, 2013).

About 25 percent of Swaziland population is living with HIV/AIDS of which a high percentage of deaths in Swaziland result from the HIV/AIDS virus (UNAIDS, 2012). According to a report by the United Nations (UN,2009), cultural practices in Swaziland has amongst other factors, contributed to the high HIV/AIDS prevalence in the country in that Swaziland is a male-dominated society and in the Swazi culture, decision making has

traditionally been a male *prerogative* and family planning decisions thus lie with the man. A study that was conducted by UNFPA and the Swaziland Ministry of Health and Social Welfare (2013) revealed that in Swaziland, women have reported that they have been *subjected* to continuous child-bearing by their husbands or in-laws against their will. Further, the practice of polygamy, the low rates of condom use as well as the lack of education on contraception use for some people has also resulted in increased HIV/AIDS prevalence. This has resulted in a decline life expectancy which was set at 61 years in the year 2000 and in 2014, it is 32 years (UNDP,2014). Further, the high HIV/AIDS prevalence has also resulted into higher infant mortality and deaths rates, lower population and growth rates as well as the changes in the distribution of the population by age and sex (UN, 2013).

2.2.7 Lesotho

Lesotho got her independence in 1966 and Lesotho is one of the countries in Sub-Saharan Africa that has been witnessing a fertility decline since the 1950"s. According to UN, (2013) Lesotho,,s total fertility rate (TFR) was 5.85 in the period 1950-2010, declining to 5.46 births per woman in 1980-1985. Census that were conducted in Lesotho in 1976, 1986 and 1996 documented a decline in the total fertility rate from 5.6 children per woman to 4.1 children per woman. In the period 2005-2010, the total fertility rate for Lesotho had declined to 3.37 births per woman.

One of the reasons for the decline in fertility is the population policy that was adopted by the Lesotho Government in 1994 whose aim was to achieve replacement level fertility by 2011. A major strategy of the population policy was to expand family planning program in order for contraceptive prevalence to increase from 70-75% by 2011. The policy provided a wide range of family planning methods as an integral part of health care at all service levels, equipped hospitals and clinics to provide IUDs, sterilization and inject-able contraceptives and to provide adequate information, education and communication (UN,2011). According to Tuoane, Madise and Diamond (2004), the reason for the Government to introduce the population policy was to prevent the adverse consequences of rapid population growth such as high unemployment rate, poor economic performance, high demand for social services and a decrease in resources. A research that was conducted by UN, (2011) also confirms that the

reason for the   this decline in the fertility rate in Lesotho can be attributed to the high contraception prevalence in the country.

2.2.8 Namibia

Namibia got her independence from South Africa in the year 1990. In the year 2011, the population of Namibia was 2 113 077(UN, 2011). In the year 1950-1955, the total fertility rate was 6 births per woman, increasing to 6.20 births per woman in the period 1980-1985(UN, 2013). Then for the period 2005-2010, the total fertility rate for Namibia was 3.40 births per woman (UN, 2011). The total fertility rate for Namibia is currently estimated at 2.25 children per woman and the growth rate is 0.67 percent (UN, 2013). This shows that Namibia is also undergoing a fertility decline as with other countries in sub-Saharan Africa. On the other hand, infant mortality rate in Namibia is 4.64 deaths per 1000 live births and most deaths are recorded in rural areas. In the year 1997, Namibia developed a population policy whose target was to reduce infant mortality rates from 57 to 30 per 1000 live births by 2015, (UN,2011). Life expectancy for Namibia is 51.85 and the HIV prevalence is 13.1% whilst the annual growth rate is 1.41% (UNAIDS, 2012).

2.2.9 Zimbabwe

Zimbabwe got her independence from the British in 1965 (unilateral declaration of independence) and in 1980, Zimbabwe got her independence from the minority rule. In 1950, the population of Zimbabwe was 12 571 (UN, 2011).The population of Zimbabwe has grown mostly during the twentieth century, following the model of a developing country with a high birth rates and declining death rates (UN, 2009).This has resulted in high population growth rate of around 3% and above since the 1960s (UN, 2013). Between 1950-1955, the total fertility rate for Zimbabwe was 6.80 births per woman whilst for the period of 1980-1985, the total fertility rate was 6.74 births per woman (UN, 2010). Then for the period 2005-2010, the total fertility rate was 3.47 births per woman and the annual growth rate has been

4.3% since 1980 (UN, 2011). The current total fertility rate is 3.58 births per woman (UN, 2013) and as of 2013, the population of Zimbabwe was 12 576 000 and about 38.9% of the population is under 15 years (UN, 2013). The death rate is 27 per 1000 births (UN, 2013). The high deaths rates in Zimbabwe result from HIV/AIDS. According to UN (2006), Zimbabwe has the highest HIV/AIDS infection in the World, with about 33.7 of the infected people being between the ages of 15-49. The infant mortality rate for Zimbabwe is 77 deaths per 1000 births (UN, 2013).This has resulted in a decline in the life expectancy which is currently at 37 years for men and 34 years for women. The population growth rate in Zimbabwe is 4.53%, (UN, 2012).

2.3 Replacement Level Fertility

According to Wayburn (2005) the concept of replacement fertility relates to child survival, reproductive health and gender by focusing on the likelihood that in each population girls can survive all the hardships of life until they themselves can be mothers. On the other hand, Hutchinson (1967) states that replacement fertility has always been a very important concept in demography. For example, in 1821, Ravenstone used American Census data to estimate that four children per family were needed during that time to maintain a stationery United States of America (U.S.A) population based on the fact that 11 out of 20 females born survived to middle age and out of the total number of 11 women, one remained single (Morgan & Taylor, 2006). There has been a lot of talk and discussion all around the world, especially in the media, on how a lot of countries are now experiencing below replacement fertility. This shows that quite a number of writers have the idea that replacement fertility is a constant number, exactly 2.1 children per woman.

Investigating replacement fertility level is very important in that it measures the survival of young girls and women in the population to the ages at which they can exercise their sexual and reproductive rights in good health (Engelman & Leah, 2006). In addition to that, the high HIV/AIDS mortality in most developing countries is reshaping mortality patterns, age structures and population growth rates and therefore the idea of promoting slowing down of the population by many organizations such as the United Nations, as has been done in the

past, is no longer indicative (Bongaarts & Casterline, 2012). Policy implementers and researchers should therefore differentiate between slowing of the population between decline in birth rates which shows an intention of parents and all those who are sexually active, and the slowing that is a result of rising death rates (Engelman & Leah, 2006).

According to UN (2009), two types of fertility rates indicate a country's population size and growth. First is the total fertility rate (TFR) which is defined as an estimate of the average number of children that a woman will have during her child bearing years if between the ages of 15 and 49 she bears children at the same rate women did in the present year (UN, 2009). According to Wayburn (2005), the total fertility rate (TFR) is the most powerful and useful measure in understanding the growth of a population and thus helps in planning for the future of the country. The second fertility rate that affects a country's population size and growth is replacement fertility which is the number of children a couple must bear to replace themselves (Mann, 2006). This is normally slightly higher than 2.1 children per woman in developed countries whilst it is 2.5 children or higher for developing countries (Espenshade et al., 2003).

After assessing trends in total fertility rates for 143 developing countries from 1950 to 2000, Bongaarts and Casterline (2012)concludes, "it is highly unlikely that developing countries will converge on replacement fertility of 2.1 children per woman as is often assumed in population projections" (pg.2). This shows that there is a wide variation in replacement fertility levels between developed countries and developing countries. Research conducted by Espenshade et al. (2003) on the global variations in replacement fertility levels revealed that there is a substantial variation in fertility among countries around the World ranging from 1.4 live births to nearly 3.5 live births. Further, this study revealed that the current replacement total fertility rates for East African regions is 2.94, lowering fertility to 2.10 would under current mortality conditions result in a regional birth rate 29 percent below replacement. Recommendations were made that there is an urgent need for countries around the World to ensure that policy makers review their country's replacement level fertility to avoid a situation whereby fertility levels are below replacement and which in the long run will lead to population decline (Espenshade et al., 2003) .

A study conducted byEngelman and Leah (2006) on the importance of mapping out replacement fertility levels within countries revealed that the number of children a woman

must have to perfectly replace herself and her partner in the next generation depends on how many of those children are going to be born female and how many of those girls reach their reproductive age. Another study on achieving replacement level fertility by Searchinger et al. (2013) revealed that whilst a replacement fertility rate of 2.1 children per woman is true for some developed countries, it is not true for developing countries due high mortality rates. According to Engelman and Leah (2006) it is very important to track and publicize variations and changes in replacement fertility rates as it is a good indicator of young people's health and female well-being.

According to Cleland (1994), in most early history where birth rates were very high and the majority of children born did not survive to adulthood, replacement fertility exceeded four or five children per woman. During that time, high birth rates were not a barrier to a small and stable population. According to Engelman and Leah (2006) ,replacement fertility is "a key demographic concept often misconstrued as a constant 2.1 children per woman. Actually it varies by population and over time, from as low as 2.06 children per woman to well over 3 children", (Engelman & Leah, 2006). This shows that replacement fertility as a value cannot be just a constant number but is determined by differences that exist amongst populations of different countries. Further, Espenshade et al. (2003) argue that high replacement fertility mostly is an indication of low survival of female infants to the stage where they can reproduce. High sex ratio at birth can also result in a high replacement level(Machiyama et al., 2010).Generally replacement fertility is perceived as relevant only to population equilibrium or decline (Moultrie & Timaeus, 2012). Further, replacement fertility value around the World varies greatly, from somewhat lower that 2.1 in most industrialized countries to higher than 3 children in a few countries that are among the least developed (Morgan & Taylor, 2006).

Nowadays the concept of Replacement Fertility has become a very uncommon subject to be discussed by policy makers with regard to population growth, equilibrium or decline(Engelman & Leah, 2006). The same study conducted by Engelman and Leah (2006) on the variation in replacement fertility as an indicator of child survival, revealed that the rates of replacement fertility were rising in most developing countries resulting from the rising HIV/AIDS mortality amongst young women of reproductive age who become infected at a young age. The recommendation of this study was that it is very important that countries view Replacement Fertility as a "simple yet very useful indicator of both the survival of

young people (specifically young women) and to a modern extent the valuation of daughters to parents and therefore there is a great need to have it tallied, tracked, explored and discussed on a regular basis as a National, Regional and Global marker of how development is proceeding in the public health sector"(Engelman & Leah, 2006).

2.3.1 Pre-demographic and Post-demographic Transition Replacement Fertility levels

According to Cleland (1993), in pre-demographic transition, replacement fertility was between four and six children per woman, and this high replacement fertility level was attributed to the fact that more than half of all children born failed to survive to adulthood. On the other hand post-demographic transition for most industrialized countries is 2.1 births per woman, with some countries such as Italy and South Korea having low replacement fertility level as low as 1.2 children, Japan with 1.3 children per woman as well as Northern and Southern Europe with 1.7 and 1.6 respectively. However, replacement fertility level for developing countries ranges between 2.5 to 3.3 because of higher HIV/AIDS mortality rates, (Cleland, 1993). The high replacement fertility levels found in Southern Africa are similar to pre-transitional replacement levels as they are likely to be volatile.

Whilst in some Asian and Indian countries sex-selective abortions play a role in increasing replacement fertility levels, however, in Southern African Countries, soaring death rates among reproductive age women are mostly responsible for raising replacement fertility rates in recent years, (UN, 2011).

2.4 Factors Determining the Level of Fertility Decline

According to Bongaarts (1978), fertility is influenced by two main types of variables and these are the direct (proximate) determinants as well as the indirect determinants. Direct determinants are also called biological and behavioral factors and include the following variables; contraception, marriage, abortion, postpartum in fecundity, spontaneous intra-uterine mortality as well as permanent sterility (Bongaarts, 1978). On the other hand, indirect variables, which are also called socio-economic factors, include factors such as the place of residence, level of education, occupation status, income, standard of living, religion and

culture, (Bongaarts, 1978). The indirect variable operates through the direct variables to influence fertility levels (Bongaarts, 1978).

According to Morgan and Taylor (2006) most of the debate surrounding the causes of fertility transitions has come to an agreement that fertility transition is caused by the variations in the proximate conditions that influence the timing of fertility decline and that there is agreement over long-term historical factors, especially mortality decline that have led to fertility transitions. On a different note, Morgan & Taylor (2006) state that "the driving force of fertility decline is socio-economic development in particular decline in mortality, female education and labor force participation, urbanization and family planning programs". Whilst there are demographers who believe that socio-economic factors resulted in fertility transition, there are those who mainly focus on the proximate determinants of fertility decline as the major cause of fertility decline. Each of these factors influencing fertility transition will be further discussed.

2.4.1 Direct / Proximate Factors of Fertility Decline

2.4.1.1 Contraception use

In discussing contraception use as a form of fertility control, literature will be drawn from diverse studies conducted around the world. According to Bongaarts and Potter (1983) contraceptive use is the main proximate cause of a decline in fertility. Whist in pre-transitional societies, which is countries that are in the first stage of the demographic transition model, fertility is high and contraceptive use is not common, whilst countries that are in the end of the demographic transition model have low fertility rates. This is because couples have the knowledge as well as the choice of limiting their fertility levels. For example, South Africa as a country is in the last stage of fertility transitions and contraception use is very high, actually it has the highest coverage in contraception use in sub-Saharan Africa, (Caldwell & Cadwell, 1993). This widespread use and knowledge of contraceptives in South Africa had also been witnessed in a survey conducted by the Demographic and Health Survey in 1998, which indicated that out of all women who were

interviewed in South Africa, all were aware of at least one way to prevent pregnancy, 75 percent of them had used contraceptive methods (Moultrie & Timaeus, 2012).

According to UN (2010), feasibility to health facilities determines good health and modern contraceptive use in developing countries. In a study that was undertaken in Kenya to determine the spatial variation in modern contraceptive use and unmet need for family planning across the counties of Kenya and to examine whether the spatial patterns were associated with inequalities in physical access to health facilities, the findings indicated that among the respondents who lived more than 5 km from health facilities, modern contraceptive use was significantly less likely compared to women resident 5 km or less from the nearest health facility (Rosenburg, 2008). Also, women from counties with higher health facility densities were 53% more likely to use modern contraceptives compared to women in counties with low health facility density (Rosenburg, 2008).

2.4.1.2 Marriage (Age at Marriage)

According to Weeks (2008) early marriages signify a women‟s entry into a sexual union and the beginning of exposure to child bearing. To support this, Garenne (2008) states that earlier marriages raises the number of reproductive years spent within marriage and thus the *exposure* of the risk of child bearing. Quite a number of studies, like that by Moultrie and Timaeus (2012) suggest that it was where age at marriage or the onset of a sexual relationship is delayed until the early twenties or later, that any significant reduction in fertility occurred. The longer a person takes past puberty to enter a sexual union, the fewer the total number of children she will give birth to. In South Africa this is the case currently, due to industrialization and modernization which brought along improvement in the standard of living and better access to education, the age at marriage has greatly increased in South Africa (Gows, 2011). The majority of women spend more years at school and *acquiring* education as a way of improving their standard of living and thus starting a family is not a priority for them. This in turn results in a decline in fertility. Unlike in most traditional societies around the world where marriage is *universal* and there are expectations for early

reproduction within marriage, in Southern African Countries marriage is not universal and in the cases where that happens, normally it is delayed as currently the average age at marriage is estimated at 29 years for women, (Moultrie & Timaeus, 2012).

In *traditional societies* such as least developed countries as Niger, girls marry at a very young age and that has resulted in a total fertility rate of 7 children per woman(Machiyama et al., 2010). An increase in age at marriage has significantly reduced the total fertility of women in most traditional societies around the world where marriage is universal with expectations for early reproduction within marriage. Age at marriage is an important *gauge* of women"s status as well based on the premise that the older the women is when she gets married, the higher the likelihood that she is educated or has been employed and the possibility that she has a more equal relationship with her husband, (Gows, 2011).

2.4.1.3 Abortion availability

According to Paez (2000), abortion has greatly impacted on fertility decline all over the world and as such it continues to be of very great importance with regard for low fertility rates. Whilst in most countries of Southern Africa especially in Swaziland, Lesotho, Zimbabwe and Namibia, abortion is illegal which results in high rates of teenage and unwanted pregnancies as women will be forced to keep their pregnancies until term. On the other hand, in some developed countries abortion is allowed. In countries such as South Africa, as early as in 1996, the Choice on Termination of Pregnancy Act was introduced and the policy made legal to have abortion accessible to all women in South Africa (Machiyama et al., 2010). This policy resulted in a reduction in maternal mortality especially after induced abortion whilst it increased abortion rates (legal). According to surveys conducted by the South African Health Department (2012), indications show that 30% of women aged 15-19 choose legal abortions. South Africans are aware that with the availability of legal abortions, in the event of their becoming pregnant, there is an option available should they not be willing to keep the baby. In addition, teenagers rarely use contraception during sexual activities which has resulted in higher fertility rates amongst them, with the legalization of abortion, unwanted pregnancies are now easily terminated without putting the life of the

mother at risk and in essence fertility levels have dropped. Education as well as exposure to the media such as radio and TV has ensured that women get more information and knowledge of the options available to them especially with regard to induced abortions.

2.4.2 Indirect Determinants of fertility

2.4.2.1 Level of Education

According to (Gows (2011))the level of education of women contributes more to fertility reduction than that of men. In addition to that, UN (2010) states that a reasonable level of education is a *threshold factor* that must be present before other aspects of development have a significant effect on fertility. Gows (2011) defines literacy as "the percentage of persons 13 years and older with at least a Grade 6 qualification, which is equivalent to a total of six years of schooling" (p. 5). However, it has been found that schooling on a lower primary level does not *correlate significantly* with fertility decline (Gows, 2011). To support that, UN (2009) states that evidence has been shown by the World Fertility Survey that females who have four years and below of education results with fertility levels which are much higher than females with above four years education levels.

According to the The President's Council (1983) a higher primary level education on the other hand shows a very significant fertility decline of an average of two children per family where the woman schooled till secondary education. Many studies are in support of this, for instance Jacobson (1987) and the UN (2010) state that it is only at the level of seven years of education, and preferably some secondary school education, that traditional ideas regarding the value of children begin to change enough to result in *significant reduction* in family size. According to Jacobson, " women with seven or more years of schooling on average tend to marry nearly four years later, and have about 25 percent more contraceptive use than women with no education"(1987,43). This clearly shows that family becomes the last option to focus on for educated women as they *prioritize* in building their career first. Weeks (2008) states that anywhere you go in the world, fertility levels decline with higher educational attainment. To explain this, Morgan and Taylor (2006) argue that " this is the outcome of education

which opens up new opportunities and alternative approaches to life, other than simply building a family and in so doing it delays the onset of childbearing, which is a crucial factor in setting the tone of subsequent fertility",(p.88). This shows that education is a great and a powerful weapon to be used by all countries around the world to limit fertility levels.

Studies that have been conducted around the world reveal that education also plays a vital role in reducing mortality, (UN,2010). For example, a study that was conducted by Rosenburg (2008) stresses the most important function that education plays in reducing infant mortality rates ,while climate change influence and regional effects is under control, found that if the mother of the infant is educated post primary school, the rates of infant mortality decline by 40 percent and where the mother has secondary school education, the decline can be around 70 to 80 percent. In another study by Mann (2006) it was concluded that parents education had a great impact that regarding the reduction of infant mortality. Public Health related research conducted by UNICEF (2008) reveals that the more educated the mother is, the lower the infant mortality levels would be. Researchers have concluded that countries should make education an important priority in order to help reduce child mortality rates.

In a research that was carried out between 1970 and 2009 by the University of Washington, the following facts were observed;

> "Infant mortality dropped from 16 million to 7.8 million annually, and 51 percent of the reduction can be attributed to increased education among women of reproductive age. Data was obtained from 915 censuses and national surveys around the world. Findings from the study revealed that between 1990 and 2009, countries had *improved* the average years of schooling of reproductive-age women by more than three years (2010, n.p.)"

This clearly shows, with no room for doubt, that education is a very important *key* to the development of a country, not only does it provide people with *freedom* of choice, but it also increases productivity so that the country"s economy can be at an accepted international standard as measured by the *Human Development Index.*

2.4.2.2 Parents preference for male children

In gender biased countries where there is a high preferences for a son, the fertility rates would be high (Bongaarts, 1978). This would be caused by the fact that the couple would try for a son quite for a number of times and that could result in a lot of children born in the family as witnessed amongst the Zulu traditionalists in South Africa where there is a strong belief that childlessness and giving birth to girls only is seen as the greatest of all misfortunes and no marriage is seen as permanent until a boy is born, (Khuzwayo,1994). On the same note, in India where the desire for a surviving son is very strong, the fertility levels are very high (Espenshade et al., 2003). In most societies, *desired societal goals* can only be achieved through the birth and survival of a son and therefore many families will continue to have children until they have at least one son (Weeks,2008).

2.4.2.3 Infant Mortality/ Children Survival

According to The President's Council (1983) child mortality results in high fertility levels. If babies are more likely to die, a family may have at least two sons in order to increase the likelihood of at least one surviving into adulthood. In countries such as Niger where there is a high infant mortality rate of 123 per 1000 children, the total fertility rate is 7.1 children per woman (UN, 2011). This is because parents will have more children hoping that at least a few will reach adulthood. To support this, Gows (2011) states that parents are prepared to limit their family size if they are confident that children already born to them have a fair chance of survival. In Ghana, the risk of a third baby is 32% higher amongst women who have lost their first child compared with those whose first child survived, (UN, 2011).This therefore means that women who are from societies where there is a high infant mortality rates will have many children compared to women who are from a society with low infant mortality levels.

2.4.2.4 Urban Versa Rural Residence

According to Cramer (1987), urban residence is associated with higher levels of maternal education with lower risks of death. Rural women have higher fertility than urban women. This is caused by the fact that urban women are more likely to use contraception than rural women and thus fertility levels for the urban woman would be lower compared to that of the rural woman (WHO, 2005b). Women living in rural areas tend to marry at a younger age than women living in urban areas resulting in fertility differentials between rural and urban areas (Westoff, 2010). For example, in Uganda fertility rates are amongst the highest in the World. Rural Uganda has a total fertility rate of 7.4 children per woman compared to 4.0 children per woman for urban areas (Garenne, 2008). A total of more than 85 percent of the population resides in rural areas in Uganda and the agricultural sector is the main employer as about 79 percent of the total population is employed in Agriculture (Garenne, 2008).

2.4.2.5 Religion

Religions differ in their beliefs concerning marriage, reproductive behavior and fertility control (Weeks, 2008). Religion has an *immense* socio-economic and political significance in most societies and thus plays an important role in *sanctioning* of family planning. For example, in Sudan, Muslim women are more likely to have more children than Hindu women due to lack of contraception use (Zaba, Terceira, Mason, & Gregson, 2003). Further, in India, the Hindu religion requires that a parent be buried by their sons, thus there is a strong desire for sons, (Zaba et al., 2003). Women found in this community are more likely to have more children because those who have daughters would only continue trying for a boy until they have reached that goal.

2.4.2.6 Mass Media

Mass-Media has influenced knowledge, attitudes and behavior regarding the use of contraception (Bongaarts & Potter, 1983). Mass media has an important effect on

reproductive behavior. Women more exposed to radio / TV have fewer children than those who are not exposed (Garenne, 2008). This is caused by the fact that Radio/ Television programmes transmit value and knowledge directly into the home and they have the potential to directly affect every member of the household even those with little or no schooling (Moultrie & Timaeus, 2012). Mass media has played a very significant role in influencing patterns and notion of contraception type and ideal family size.

2.4.2.7 Maternal and Child Health

The United Nations Millennium Development Goals (MDGs) include "reducing child mortality by two thirds,(MDG4), improving maternal health by 75 percent (MGD5) and reducing by half the number of people without access to drinking water and adequate sanitation (MDG7) ,all by 2015", (UN,2010:36). Most Southern African countries are quite far in achieving this goal as they are lagging behind in terms of reducing maternal and infant mortality. According to (UN, 2011), "maternal and child health care, including family planning, immunization, prevention and control of locally *endemic* diseases should be exercised effectively" (n.p.). The World Health Organization, (2005) asserts that "the utilization rate of health facilities diminishes with distance and the quality of transportation and road conditions" (p.67). This therefore requires that accessibility to health facilities for all population groups, especially for women and children should be made a high priority for all countries to ensure the good health of the nation.

In a study that was undertaken in Kenya, it was concluded that physical access facilities are an important determinant of modern contraceptive use and unmet in Kenya. The recommendation from this study was that strategies should be developed in underdeveloped countries to mitigate the challenge of distance to health facilities, such as delivering services by outreach and mobile facilities (Westoff, 2010).

2.5 The Impact of HIV/AIDS Mortality on the Population Size

According to UNAIDS (2012) estimates, 24.5 million of the 34.3 million global HIV/AIDS infections are in Africa. In the year 2000, it was calculated that 8.57 percent of African adults (defined as those 15-49 years) were infected and thus making Africa the epicenter of HIV/AIDS as it is the hardest hit by the epidemic (UNAIDS, 2012). In addition to this, UN (2013) revealed that Southern Africa accounted for 35 percent of all persons who are infected with HIV worldwide and they approximated that one third of all new infections and AIDS deaths occur in this region (UN, 2013). According to Weeks (2008), a population exposed to HIV/AIDS will experience changes in levels and patterns of mortality which are directly related to the prevalence of the infection. HIV/AIDS leads to increases in adult and child mortality rates, corresponding decrease in life expectancy at birth and decrease in the mean number of years of life in adulthood (Westoff, 2010).

Aids related deaths are altering the age and sex structure of populations in severely affected countries (UNAIDS, 2011). AIDS primarily strikes adults in their prime working ages, people who were mostly infected as adolescents or young adults which thereby shifts the usual pattern of death and distorting the age structure in most countries especially in sub-Saharan Africa (UNAIDS, 2012). AIDS deaths are concentrated in the 25-45 age groups thus communities with high rates of HIV infections lose disproportionately numbers of parents and experienced workers and thus create gaps that are difficult for society to fill, (Weeks,2008). Women"s dependence on men results in failure to negotiate safer sexual activities with their partners, (UNAIDS, 2011). Life expectancy has drastically been reduced in many African Countries due to HIV/AIDS. For example, In Lesotho, life expectancy was nearly 60 years in 1990-1995, but drastically declined to 34 years by 2010 primarily because of AIDS related mortality, (UN, 2013). Further, United Nations projected that Lesotho"s life expectancy would have improved to 69 years by 2015-2020 if not for excessive AIDS mortality. Outside Africa, countries such as Cambodia, Dominican Republic and Myanmar are expected to drop their life expectancy due to HIV/AIDS, (UN, 2013).

2.6 Conclusion

In conclusion therefore, trends in fertility transition have been discussed with reference to global fertility transition, sub-Saharan fertility transition as well as Southern African fertility transition. The past few decades have witnessed significant changes in fertility decline. Whilst developed countries have completed the fertility transition, most developing countries have only just started the fertility transition, some are mid-way in the transition whilst some countries such as South Africa are closer to replacement fertility levels. Further, fertility transition was discussed for each of the countries that are part of the study, these are South Africa, Swaziland, Zimbabwe, Namibia and Lesotho. Generally Southern African countries started the fertility transition late because they got their independence in the early 1990's which could have resulted in a delay in the onset of the fertility transition. Also, issues relating to replacement of fertility levels have been explored and finally, determinant fertility transition was also explored.

CHAPTER 3

METHODOLOGY

3.0 Introduction

This chapter presents the methodological framework of the research, focusing on the sources of data, sampling methods, sample size as well as data analysis. Wherever alternatives existed, justification is given as to why a particular alternative(s) was preferred. The main aim of the study was to investigate the level of growth of population of Southern African countries measured by Total Fertility Rate. The countries covered in this study are South Africa, Swaziland, Zimbabwe, Namibia and Lesotho. This research utilized secondary data from the Demographic Health Survey of South Africa, Swaziland, Zimbabwe, Namibia and Lesotho. The DHS data set that has been used for each of the Southern African Countries ranges between the years 1998 and 2007. This was done to ensure that the years at which these data sets for these Southern African Countries were collected are not very far from each other so as to allow comparisons between countries and avoid bias.

Data analysis techniques involved the following; The Total Fertility (TFR) for each of the countries has been estimated to determine the level of growth of the population in each country. Secondly, the Age Specific Fertility Rate has been estimated for each country to explore the contribution of different age groups to the level of fertility. Thirdly, the levels of mortality for women of reproductive age (15-49) and childhood mortality has been estimated to determine the contribution of mortality to the levels of fertility in each of these countries.. The mortality levels for Southern African Countries have been analysed based on the World Mortality levels as indicated in the female survivorship table from the United Nations (UN, 2013). When calculating the total number of women who survived in each age group (lx), mortality due to HIV/AIDS was taken into consideration. Fourthly, the Age Specific probability of surviving was estimated. Fifthly, the Net Reproduction Rate (NRR) has been estimated to determine if the generation of women in these countries are reproducing themselves. Finally, the levels of replacement fertility have been estimated.

3.1 Sources of Data

According to Mostert, Hofmeyr, Oosthuizen, and Van Zyle (1998) demographic data can be classified into traditional and non-traditional sources. The traditional sources comprise of data obtained from vital registration systems, population censuses, population registers as well as demographic health surveys. On the other hand, non -traditional sources include data collected from schools, churches as well as hospitals. These data sources provide information that relates to demographic parameters such as fertility, mortality and migration. According to Moultrie and Timaeus (2012), good quality data should portray the following attributes; representativeness, accuracy, reliability and acceptability. The data source that has been used for this particular research is from the Demographic Health Surveys (DHS). The reasons for using these demographic health surveys over other data sources is that information on fertility is best collected using surveys. In addition, demographic surveys provide valid data. Other benefits of using surveys include the fact that surveys are simple to conduct, they are flexible, they pose an administrative convenience, they are more detailed and in the post-enumeration survey, sampling is used to check the reliability of the census. Further, surveys pose less coverage and content errors.

3.1.1 Data

This study utilized secondary data. The Demographic Health Survey data for each of the five countries that are part of the study has been utilized and ranges between the years 2005 and 2007. However, for South Africa, the 1998 Demographic Health and Survey Data was used due to quite a number of challenges with the 2003 SDHS which will be discussed later in this chapter.

3.1.2 The Demographic Health Survey Data

The main aim of the study was to investigate the level of growth of population of Southern African countries measured by Total Fertility Rate. The countries that were covered in this study are Swaziland, South Africa, Zimbabwe, Namibia and Lesotho and the data that will be

used for the study is the latest Demographic Health Survey Data (DHS) for each of these countries. The Demographic Health Survey data is a statistically representative sample of over 90 countries. It is accurate and representative data of population, health, HIV/AIDS, and nutrition through more than 300 surveys in over 90 countries. The DHS monitor demographic trends, reproductive health behaviours, attitudes and outcomes as well as socio-demographic characteristics of women and men of reproductive age. The DHS data are collected in face-to-face interviews and a standard core questionnaire is included in each survey. The DHS data are also standardized because the questions that are asked in all countries are similar enabling comparisons across countries and overtime, (Micro-international, 2013). Further, the DHS include high response rates, national coverage, high quality interviewer training, standardized data collection procedures across countries and consistent content over time, allowing comparability across populations cross-sectional and over time, (Corsi, Neuman, Finlay, & Subramanian, 2012). The analysis for this study involved women in their reproductive age, women from 15 to 49 years.

3.1.3 The Demographic Health Survey Data for South Africa, Swaziland, Lesotho, Namibia and Zimbabwe

3.1.3.1 South Africa Demographic Health and Survey Data

The 1998 South Africa Demographic Health Survey (SADHS) Data is one of the data sources that will be used for the analysis in this study. There is a second survey of the DHS that was conducted in South Africa which is the 2003 Demographic Health Survey 2003 SADHS).The reason why the researcher will utilize the 1998 SDHS Data is because the 2003SADHS data poses a lot of challenges which might compromise the quality of the results for this study. One of the challenges with the 2003 SADHS is with regard to the sample response rate. Whilst a total of 10 214 households were targeted for inclusion, only 7 756 were interviewed which yielding a response rate of 85 percent (SADH,2003). Further, with regard to women interviewed in the survey, the overall response rate was 75 percent whilst the response rate for men was 67 percent. In comparison with the 1998 SADHS, the response rate for the 2003 SADHS was much lower.

Other serious issues with the 2003 SDHS have to do with the fact that when comparing the socio-demographic characteristics of the sample with the 2001 Population Census, several problems are noticed; firstly, there is an over-presentation of urban areas and the African population group as well as an under-representation of Whites and Indian females. Secondly, some of the demographic and adult health indicators show signs of poor data quality. For example, the prevalence of hypertension and the related indicators of quality of care are clearly problematic and difficult to interpret. Of more importance for this study, is that the fertility levels from 2003SADHS as well as the child mortality estimates are not consistent with other data sources, (Macro-international, 2013). Based on these challenges, the 1998 SADHS will be the one that will be utilized for this study.

This survey was the first survey of its kind to be carried out in South Africa since the 1994 democratic elections. The 1998 SADHS is a nationally representative survey of women and men (15-49) years. However, for the purpose of this study, data that have been utilized focused on women of 15-49 years. The initial sample of this analysis comprised 12,327 women who were identified as eligible for the individual women's interview. However, out of the 12,327 women that were identified, 11,735 were interviewed. The primary objective of the SADHS is to provide up-to-date information on fertility and childhood mortality levels; fertility preferences; awareness and use of contraceptive methods; breastfeeding practices; maternal and child health; awareness of HIV/AIDS; chronic health conditions among adults; dental health; and habits of lifestyle that affect the health status of adults, (SDHS,1998).

The 1998 South Africa Demographic and Health Survey (SADHS) employed a nationally-representative two-stage sample that was selected from the 1996 census data (SADHS, 1998). The first stage consisted of selecting census enumeration areas (EAs) with probability proportional to size based on the number of households residing in the EA according to the preliminary census results. Each of the nine provinces was stratified into urban and non-urban groups. A total of 972 primary sampling units were selected for the SADHS (690 in urban areas and 282 in non-urban areas). Fieldwork in three sample points was not implemented and the questionnaires for another three sample points were lost in transit, so the data file contains information for a total of 966 points, (SADHS, 1998). It was expected that the sample would yield interviews with approximately 12,000 women aged 15-49 and 13,500 adults. In total, approximately 17,500 people were interviewed. From the 12,638 households

occupied, 97 percent were successfully interviewed. In these households, 12,327 women of reproductive age (15-49) were identified as eligible for the individual women"s interview and interviews were completed with 11,735 or 95 percent of them, (SADHS, 1998).

3.1.3.2 Swaziland Demographic Health Survey Data

The 2006-07 Swaziland Demographic and Health Survey (SDHS) is a nationally representative survey of 4,843 households, 4,987 women aged 15-49, and 4,156 men aged 15-49. The 2006-07 Swaziland Demographic and Health Survey was the first survey of its kind to be undertaken in Swaziland. It was a nationwide survey aimed at generating estimates at the country level, regional level, and for urban and rural areas (SDHS, 2007). Specifically, the 2006-07 SDHS collected information on fertility levels, marriage, sexual activity, fertility preferences, awareness and use of family planning methods. Further, information on breastfeeding practices, nutritional status of women and young children, childhood and maternal mortality, care and protection of youth, and awareness and behaviour regarding HIV/AIDS and other sexually transmitted infections (STIs) was also collected (SDHS, 2007). In addition, the survey collected information on malaria, the use of mosquito nets and the prevalence of HIV in the population age two years and above. The data is intended to furnish programme managers and policymakers with detailed information on levels and trends in fertility, nuptiality, sexual activity, fertility preferences, awareness and use of family planning methods, breastfeeding practices, nutritional status of mothers and young children, early childhood mortality and maternal mortality, maternal and child health, and awareness and behaviour regarding HIV/AIDS and other sexually transmitted infections, (SDHS, 2007).

The 2006-07 Swaziland Demographic and Health Survey sample points (clusters) were selected from a list of enumeration areas (EAs) defined in the 1997 Swaziland Population and Housing Census. A total of 275 clusters were drawn from the census sample frame, 111 in the urban areas and 164 in the rural areas. CSO staff conducted an exhaustive listing of households in each of the SDHS clusters in August and September 2005. From these lists, a systematic sample of households was drawn for a total of 5,500 households. All women and men age 15-49 identified in these households were eligible for individual interview. In the SDHS households where only women and men age 15-49 were interviewed, children age 6

months to 5 years were eligible for the anaemia testing and women and men age 15-49 were eligible for anaemia and HIV/AIDS testing (SDHS,2007).

During the household listing, field staff used Global Positioning System (GPS) receivers to establish and record the geographic coordinates of each of the SDHS clusters. From a total of 5,500 households selected in the sample, 5,086 were occupied at the time of the fieldwork. This difference between the number of selected households and the number of occupied households is due to structures being vacated or destroyed. Successful interviews were conducted in 4,843 households, yielding a response rate of 95 percent. In the households interviewed in the survey, a total of 5,301 eligible women age 15-49 were identified. Interviews were completed with 4,987 of these women, yielding a 94 percent response rate. In the same households, a total of 4,675 eligible men age 15-49 were identified and interviews were completed with 4,156 of these men, yielding a male response rate of 89 percent. A total of 2,750 households were selected in the sample, of which 2,543 were occupied at the time of the fieldwork. This difference between the number of selected households and the number of occupied households is due to structures being vacated or destroyed. Successful interviews were conducted in 2,410 households, yielding a response rate of 95 percent (SDHS, 2007). However, the analysis for this study will focus on the women sample. For the analysis of this study, as its main focus is on women of reproductive ages (15-49), the sample for this analysis would be 4,987 women.

3.1.3.3 Lesotho Demographic and Health Survey Data

The 2004 Lesotho Demographic and Health Survey (2004 LDHS) is a nationally representative survey of 7,095 women aged 15-49 and 2,797 men aged 15-59 from 8,592 households covering 405 sample points (enumeration areas) throughout Lesotho. The 2004 Lesotho Demographic and Health Survey (LDHS,2004) is the first national-level population and health survey conducted as part of the global Demographic and Health Surveys (DHS) programme. The survey obtained detailed information on fertility levels, marriage, sexual

activity, fertility preferences, awareness and use of family planning methods, breastfeeding practices, nutritional status of women and young children, childhood mortality, maternal and child health, awareness and behaviour regarding HIV/AIDS, other sexually transmitted infections (STIs), and tuberculosis. In addition, the 2004 LDHS carried out anaemia testing in children and adults and HIV/AIDS testing in adults, (LDHS, 2004).

For the Lesotho Demographic and Health Survey, quantitative methods of sampling were used. The survey utilised a two-stage sample based on the 1996 Population Census and was designed to produce separate estimates for key indicators for each of the ten districts in Lesotho. Further, sampling of respondents based on probability sampling techniques was 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 (LDHS, 2004). For the purpose of this analysis, the sample will focus on the women of reproductive age (15-49) which is 7,095.

3.1.3.4 Namibia Demographic and Health Survey Data

The 2006-07 Namibia Demographic and Health Survey (NDHS) is a nationally representative survey of 9,804 women aged 15-49 and 3,915 men aged 15-49. The 2006-07 Namibia Demographic and Health Survey is the third survey of its kind to be undertaken in Namibia, others being in 1992 and 2000. The main objective of this survey was to measure levels, patterns, and trends in demographic and health indicators in Namibia. Specifically, the 2006-

07 NDHS collected information on fertility levels, marriage, sexual activity, fertility preferences, awareness and use of family planning methods, breastfeeding practices, nutritional status of women and young children, childhood and maternal mortality, maternal and child health, and awareness and behaviour regarding HIV/AIDS and other sexually transmitted infections (STIs).

Further, the survey collected information on the use of mosquito nets, women‟s empowerment and demographic and health outcomes as well as information on orphans and vulnerable children care and support. The 2006-07 NDHS differed in three aspects from the 2000 NDHS survey in that it included a module on malaria indicators, women‟s empowerment, and orphans and vulnerable children. The data are intended to provide programme managers and policymakers with detailed information on levels and trends in fertility, nuptiality, sexual activity, fertility preferences, awareness and use of family planning methods, breastfeeding practices, nutritional status of mothers and young children, early childhood mortality, adult and maternal mortality, maternal and child health, and awareness and behaviour regarding HIV/AIDS and other sexually transmitted infections. The 2006-07 NDHS is the first NDHS survey to collect information on malaria prevention and treatment, (NDHS, 2007).

For the Namibia Demographic and Health Survey, a representative probability sample of 10,000 households was selected (NDHS, 2007). The sample was selected in two stages with PSUs as the first stage and households as the second stage sampling units. A total of 500 PSUs were selected with probability proportional to size, the size being the number of households enumerated in the 2001 Population Census (NDHS, 2007). The selection of the PSUs was a systematic, one-stage operation carried out independently for each of the 13 regions. In the second stage, a complete listing of households and mapping exercise was carried out for each PSU in November 2006 to January 2007. This exercise was carried out by field staff recruited for the 2006-07 Namibia Inter-Censal Demographic Survey (NIDS) and the NDHS. The list of households obtained was used as the frame for the second stage random selection of households. In each PSU, 40 households were selected systematically and out of this sample 20 each were selected systematically for the NDHS and the NIDS, so that the two samples are independent. Although the two surveys were fielded at approximately the same time, in general the NIDS teams were ahead of the NDHS teams, allowing successful interviews with households selected for both surveys. In clusters where

the number of households was less than 40, some households were selected for both surveys and were visited by both NDHS and NIDS teams. In PSUs where the number of households was between 20 and 39, some households were visited by the NDHS and NIDS teams at different times. In PSUs with fewer than 20 households, all households were visited by both teams at different times (NDHS, 2007).

A total of 9,970 households were selected for the sample, of which 9,410 were found and eligible for interview. Of the eligible households, 9,200 were successfully interviewed yielding a response rate of 98 percent. In the interviewed households, 10,352 women aged15-49 were identified as eligible for the women's questionnaire. Interviews were completed for 9,804 (95 percent) of these women. Of the 4,446 men aged 15-49 identified as eligible for the men's questionnaire, 3,915 (88 percent) were successfully interviewed. For the purpose of this analysis, the focus will be on the women sample aged 15-49(NDHS, 2007). For this analysis, the focus is on women of reproductive age (15-49) which is women of the age groups 15-49.

3.1.3.5 Zimbabwe Demographic and Health Survey Data

The 2005-06 Zimbabwe Demographic Health Survey (ZDHS) is a nationally representative survey of 8,907 women aged 15-49 and 7,175 men aged 15-54. The 2005-06 Zimbabwe Demographic and Health Survey (ZDHS) is a follows the previous ZHDS that were conducted in 1988, 1994, and 1999 ZDHS surveys and provides updated estimates of basic demographic and health indicators covered in those surveys. The 2005-06 ZDHS collected information on fertility levels, nuptiality, sexual activity, fertility preferences, awareness and use of family planning methods, breastfeeding practices, nutritional status of mothers and young children, early childhood mortality and maternal mortality, maternal and child health, and awareness and behaviour regarding HIV/AIDS and other sexually transmitted infections. Additionally, the 2005-06 ZDHS collected data on malaria prevention and treatment and domestic violence. The 2005-06 ZDHS is also the first survey in Zimbabwe to provide population-based prevalence estimates for anaemia among men, women and young children and HIV/AIDS among women and men aged 15-49(ZDHS, 2006).

The 2005-06 ZDHS is the fourth comprehensive survey conducted in Zimbabwe as part of the Demographic and Health Surveys (DHS) programme. The data are intended to furnish programme managers and policymakers with detailed information on levels and trends in fertility, nuptiality, sexual activity, fertility preferences, awareness and use of family planning methods, breastfeeding practices, nutritional status of mothers and young children, early childhood mortality and maternal mortality, maternal and child health, and awareness and behaviour regarding HIV/ AIDS and other sexually transmitted infections. This survey is also the first survey to collect information on malaria prevention and treatment and domestic violence. The 2005-06 ZDHS is also the first survey in Zimbabwe to provide population-based prevalence estimates for anaemia and HIV, (ZDHS, 2006).

The sampling frame used for the 2005-06 Zimbabwe Demographic and Health Survey was the 2002 Zimbabwe Master Sample (ZMS02) developed by CSO after the 2002 population census. Each of the other eight provinces was stratified into four strata according to land use: communal lands, large-scale commercial farming areas (LSCFA), urban and semi-urban areas, small-scale commercial farming areas (SSCFA), and resettlement areas. Only one urban stratum was formed each for Harare and Bulawayo, providing a total of 34 strata. This stratification however excluded Harare and Bulawayo, (ZDHS, 2006). A representative probability sample of 10,800 households was selected for the 2005-06 ZDHS. The sample was selected in two stages with enumeration areas (EAs) as the first stage and households as the second stage sampling units. In total 1,200 EAs were selected with probability proportional to size (PPS), the size being the number of households enumerated in the 2002 census. The selection of the EAs was a systematic, one-stage operation carried out independently for each of the 34 strata. The 1,200 ZMS02 EAs were divided into three replicates of 400 EAs each. One of the replicates consisting of 400 EAs was used for the 2005-06 ZDHS. In the second stage, a complete listing of households and mapping exercise was carried out for each cluster in January 2005. The list of households obtained was used as the frame for the second stage random selection of households. All women aged 15-49 and all men aged 15-54 who were either permanent residents of the households in the 2005-06 ZDHS sample or visitors present in the household on the night before the survey, were eligible to be interviewed, (ZDHS,2006).

A total of 10,752 households were selected for the sample, of which 9,778 were currently occupied. The shortfall was largely due to some households no longer existing in the sampled clusters at the time of the interview. Of the 9,778 existing households, 9,285 were successfully interviewed, yielding a household response rate of 95 percent. Further, in the interviewed households, 9,870 eligible women were identified and, of these, 8,907 were interviewed, yielding a response rate of 90 percent. Of the 8,761 eligible men identified, 7,175 were successfully interviewed (82% response rate). However, the focus of this study is on the women sample aged 15-49 which is 8,907 women (ZDHS,2006).

3.2 Limitations of the Demographic Health Survey Data

According to Boerma, Somefelt, Rustein, and Rojas (1990), the Demographic Health and Survey Data (DHS) have got quite a number of limitations and such includes the following:

 Firstly, the DHS has a limitation with regard to reporting and recall biases. However, this excludes weight and height measurements and vaccination data as these are copied from the child health card.

Secondly, information such as the age of the respondent, birth dates of children, and age at marriage refers to events in the past. This inevitably causes biases, although detailed evaluation of DHS data has shown that these data are reasonably well reported. In addition , most health information in the DHS survey data is based on women's reports, for example, information on child diarrhoea and respiratory symptoms in the past two weeks, or use of maternity care, and therefore misclassification biases are known to occur. In such cases, the magnitude of the bias is often unknown and thus correcting for the bias is difficult.

Thirdly, DHS surveys are also limited to health indicators which can be measured with relatively few questions. This includes cases such as malaria, tuberculosis, and AIDS as these are illnesses for which no satisfactory questions are available. Also, the determination of economic status is limited to a short list of durable goods. To add to this, the determination of a cause of death through verbal autopsy gives a rough idea of the importance of selected

causes of death, but is not precise enough for evaluation of the impact of health interventions or assessment of trends in cause-specific mortality.

In addition, the use of a standardized questionnaire provides limited opportunities to adapt the questionnaire to be locally relevant. Additions, deletions and changes are made in every DHS survey, but the number of modifications is limited in order to maintain comparability, limit complexity of the survey, and keep the length of the questionnaire within limits. Suggestions have been made that there is a need for disaggregation to district level since a district is often the major unit of implementation of health programmes. Generally DHS surveys are not designed to yield estimates of health indicators at the district level, since this is too costly, (Boerma et al., 1990). In spite of all these limitations, the researcher finds the DHS data to be the most suitable for this study based on the nature of this research.

3.7 Methods of Data Analysis

The data analysis was done on Microsoft Excel and will be presented in the form of tables, graphs and charts. The data analysis was done under the following headings; Analysis of fertility levels, Analysis of mortality levels as well as generating the Gross Reproduction Rate (GRR) and Net Reproduction Rate (NRR). In order to achieve the objectives of the study, the following was done:

3.7.1 Analysis of Fertility Levels

In order to analyse the fertility levels of the five countries in Southern Africa, the age specific fertility rates as well as the total fertility rates of the five countries of Southern Africa were analyzed.

3.7.1.1 The Age Specific Fertility Rate (ASFR)

The Age Specific Fertility Rate (ASFR) was estimated for each country to explore the contribution of different age groups to the level of fertility. The formula for estimating the age specific fertility rate is;

$$ASFR = \frac{Birth_i}{FP_i}$$

Where Birth = The total number of children born to the female population
 i = Five-year age group interval
FP = Total female population in a specific age interval

3.7.1.2 The Total Fertility Rate

The Total Fertility (TFR) for each of the countries was estimated to determine the level of growth of the population in each country. The Total Fertility Rate (TFR) is a measure of the total number of children that each woman of reproductive age is expected to have by the end of her reproductive period, assuming fertility remains constant in the future. The TFR is calculated from the computed ASFR. The formula for estimating total fertility rate is for a 5-year age groups;

$$TFR = 5\sum ASFR_a$$

Where: $ASFR_a$ = Age Specific Fertility Rate for women in age group a

3.7.2 Analysis of Mortality

The levels of mortality of women in child bearing age (15-49) and childhood mortality (age 5 years and below) was estimated to determine the contribution of mortality to the levels of fertility in Southern Africa as a region as well as in the individual countries which are South Africa, Swaziland, Lesotho, Namibia and Zimbabwe. The United Nations women survivorship life tables for Southern African Countries were used to estimate age specific probabilities of surviving for individual countries. To develop the life tables, the United Nations Population Division under the World population Prospects used the spectrum modelling software for modelling HIV mortality, together with the input HIV data and estimates for the various countries in Southern Africa. The Spectrum modelling software is a computer program that has four modules. The module used for developing life tables is called the AIDS Impact model (AIM) and AIM projects the consequences of the HIV/AIDS epidemic, which includes the number of people living with HIV/AIDS, new infections and HIV/AIDS deaths by age and sex as well as new cases of tuberculosis and HIV/AIDS orphans. The spectrum modelling software is used by UNAIDS to make National and Regional estimates of HIV/AIDS infection, (UNAIDS, 2012). These life tables take into consideration mortality due to HIV/AIDS, (UNAIDS, 2012).

Survivorship probability describes the probability of surviving or dying through each age group (UN, 2013). The reason for employing the United Nations survivorship life tables for estimating survivorship probabilities is because life tables for Southern African Countries do not contain patterns of mortality that reflects the excessive deaths caused by HIV/AIDS, (UN, 2013). In addition, the five countries that form part of this study do not have individual life tables. Furthermore, since most of these countries in the Southern African Region have a high incidence of HIV/AIDS, which then has an abnormal influence on mortality, using life tables from the individual countries which are normally adapted from the East Asian Region would not be recommended for this study as the life tables ignore mortality due to HIV/AIDS. This therefore created the need to adapt life tables either from other regions that have similar mortality patterns or use mortality underlying the World Population Prospects which is provided by the United Nations survivorship life tables.

3.7.2.1 Mortality of women of child bearing age (15-49)

The formula for estimating the age specific probability of surviving;

Age Specific Survivorship (Sx) ;

$$Sx = \frac{lx}{Lo}$$

lx is the number in the age class

Lo is the synthetic cohort, 100 000

3.7.2.2 Childhood Mortality

Childhood mortality will also be estimated by using the United Nations (UN, 2013) female survivorship life tables whereby the probabilities of survivorship will be estimated from the life table. The following formula will be used to estimate the childhood survivorship probabilities from the life table;

$$Sx = \frac{lx}{Lo}$$

Where lx is the number in age class and

Lo is the synthetic cohort, 100 000

3.8 Generating the Gross Reproductive Rate (GRR) and Net Reproduction Rate (NRR)

3.8.1 The Gross Reproduction Rate (GRR)

The Gross Reproductive Rate (GRR) was estimated for women of reproductive age (15-44) in the five Southern African Countries. The GRR is a measure of the magnitude at which women are having female children. It is the average number of daughters that would be born to a woman during her reproduction years (15-49) and conformed to the age-specific fertility

rate of a given year. However, the GRR ignores the mortality of women, this rate ignores the fact that some women will die before they complete their child bearing years. To calculate the GRR, the following formula will be used;

GRR = 5 $\sum$ ASFR

Where ASFR is the age specific fertility rate for girls and 5 is the class interval.

3.8.2 The Net reproduction Rate (NRR)

The Net Reproduction Rate (NRR) was estimated to determine if the generation of women in these countries is reproducing themselves. The NRR is a measure of the average number of daughters that would be born to a female if she passed through her lifetime conforming to the age-specific fertility and mortality rates of a given year. In order to generate NRR, two different methods were used. The first method involved the use of GRR to approximate NRR whereby the probability of surviving till the mean age of giving birth is multiplied by GRR. The following formula was used to generate NRR:

NRR = $GRR X Probability of surviving till the mean age of giving birth$

Where GRR is the Gross Reproductive Rate and

The mean age of giving birth is the age at which women give the most births.

The second method that was used to generate NRR is adopted from a study that was conducted in (Engelman & Leah, 2006)on the variation in replacement fertility as an indicator of child survival and gender status in sub-Saharan countries. The formula for generating NRR is:

NRR (Fr) = $Rb/100 + 1/Mp$

Where:

Fr is the replacement fertility rate

Rb is the sex ratio at birth

Mp is the probability that any female new-born will survive to the midway point between her 27th birthday and 28th birthday.

3.9 Conclusion

This chapter described the research method and approach taken in the study. The quantitative research method was utilized and the survey research design used. The chapter also explained the data used, the process used in data collection, how data was processed using Microsoft excel and presentation techniques such as frequency tables, percentages, graphs and charts. Chapter 4 focuses on data presentation wherein all the collected DHS data summaries are given for the five countries that form part of this analysis, showing findings which will be the basis for drawing meanings and recommendations for the study.

CHAPTER 4

PRESENTATION OF RESULTS

4.0 Introduction

This chapter discusses data processing and analysis from the Demographic Health Survey data for South Africa, Swaziland, Lesotho, Namibia and Zimbabwe. This chapter covers the following aspects; Fertility levels for the five countries in Southern Africa as measured by Total Fertility Rate (TFR) and Age Specific Fertility Rate (ASFR), Mortality levels for Southern African countries, the Gross reproduction Rate for the Southern African countries (GRR), the Net Reproduction Rate for the Southern African countries (NRR) and the Total Fertility Rate (TFR) at replacement level fertility for the Southern African countries.

4.1 Analysing Fertility Levels for the Southern African Countries

To analyse the fertility rates for Southern African Countries, the Total Fertility Rates (TFR) and the Age Specific Fertility Rates (ASFR) were adapted by taking the exact figures as calculated from each of the country"s Demographic Health Survey Reports (DHS). The reason why these were adapted from the individual countries" DHS reports was to ensure consistency amongst the countries. Fertility levels were analysed firstly by using the Total Fertility Rates (TFR) and secondly, the Age Specific Fertility Rates (ASFR). The TFR refers to the number of children that a woman is expected to give birth to by the end of her reproductive life if she experiences the age specific fertility rates that are observed in that population group by age 50.

4.1 Total Fertility Rates for Southern African Countries

Table 4.1 Total Fertility Rate for countries in Southern Africa

Country	Total Fertility Rate (TFR)	Year
South Africa	2.9	1998
Swaziland	3.9	2006-07
Lesotho	3.5	2004
Namibia	3.6	2006-07
Zimbabwe	3.8	2005-06
Southern Africa	3.5	

Source: The Demographic Health Survey Report for South Africa, Swaziland, Lesotho, Namibia and Zimbabwe (Adapted)

As observed in table 4.1, the Total Fertility Rates (TFR) for South Africa was 2.9 children per woman in 1998. On the other hand, Swaziland has TFR of 3.9 Children/ Woman. Lesotho has a TFR of 3.5 children/ woman whilst Namibia has a TFR of 3.6 children per woman. The TFR for Zimbabwe is 3.8 children per woman. Amongst the five countries presented, Swaziland has the highest TFR (3.9) whilst South Africa has the lowest TFR (2.9). In 2006-07, Swaziland had the highest Total Fertility Rates (TFR) of 3.9 children/ woman, followed by Zimbabwe in 2005-06 with a TFR of 3.8 children / woman. The next country with a high fertility rates after Zimbabwe was Namibia in 2006-07 with a TFR of 3.6 children / woman, followed by Lesotho in 2004 with a TFR of 3.5 children / woman and the country with lowest fertility rate was South Africa in 1998 with a TFR of 2.9 children/ woman.

4.2 Age Specific Fertility Rates

Fertility levels for the countries in Southern Africa have been further analysed using the Age Specific Fertility Rates (ASFR). The ASFR the Age Specific Fertility Rates (ASFR) shows the contribution of each age group to the total fertility levels of the country. For all the five countries in Southern Africa, the ASFR are low in the 15-19 age group, rise to peak in the 20-29 age group, and then decline to moderate levels in the 30-39 age group, and to low levels in the 40-49 age group. The ASFR for South Africa, Swaziland, Lesotho, Namibia and Zimbabwe are presented below.

4.2.1 Age Specific Fertility for South Africa

Figure 4.2.1 Age Specific Fertility Rates for South Africa in 1998
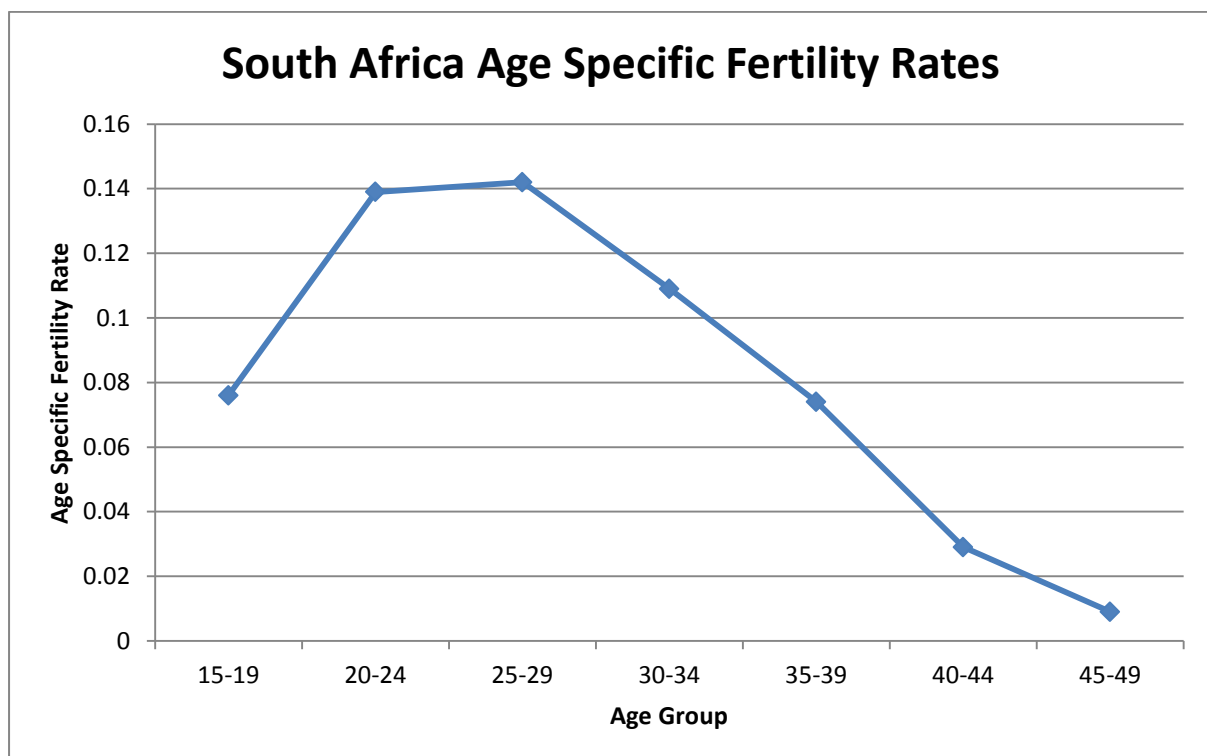
Figure 4.2.1 above shows the Age Specific Fertility Rates for South Africa in 1998. As highlighted in figure 4.2.1 above, most of the children in this population are born to the 25-29 (0.142) age group. The rates are low in the 15-19 (0.076) age group, then rise to peak in the 20-29 (0.142) age group and then decline to moderate levels in the 30-39 (0.074) age groups and finally to low levels in the 40-49 (0.009 age group. Teenage pregnancy is indeed an issue in South Africa. From appendix one as well as from this graph, figure 4.2.1, one can see that fertility peaks at age 15-19 and increases along with the age until around 20-24 years where it is at its maximal. As shown in the graph fertility is highest amongst the age groups 15-19 and 20-24, at 29-34 it begins to decline, and it declines down the age groups until age 45-49 where it reaches its minimal levels as its approaching the onset of menopause or its towards the end of the reproductive cycle.

4.2.2 Age Specific fertility Rates for Swaziland

Figure 4.2.2 Age Specific Fertility Rates for Swaziland in 2006/7
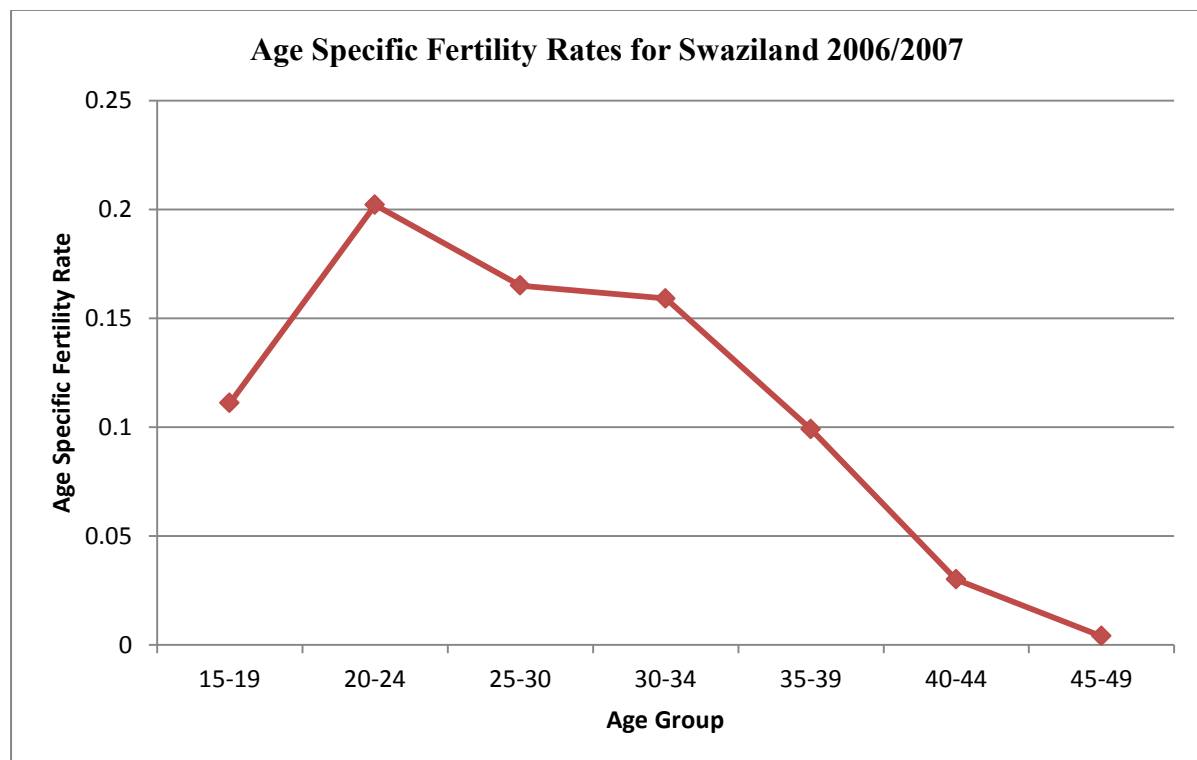
Figure 4.2.2 show the Age Specific Fertility Rates for Swaziland in 2006/7. As highlighted in appendix 1, most of the children in this population are born from the 20-24 age groups with an ASFR of 0.202. The rates are low in the 15-19 age group (0.111), then rise to peak in the 20-24 age group (0.202) and then decline in the age group 25-29 (0.165) and 30-34 (0.159). In the age group 35-39, the rates further decline (0.099), and decline again at the age group 40-44 (0.03) until it reaches its lowest levels (0.004) at the age group 45-49. Teenagers in this population start having children at an early age as the graph starts above 0.1 to show a higher level of fertility amongst the teenagers. For the age groups 25-30 and 30-35 the ASFR for Swaziland looks similar, this could be attributed to delayed fertility. On the other hand, at age group 45-49 (0.00195) the majority of women in this population would have finished having children.

4.2.3 Age Specific Fertility Rates for Lesotho

Figure 4.2.3 Age Specific Fertility Rates for Lesotho 2004
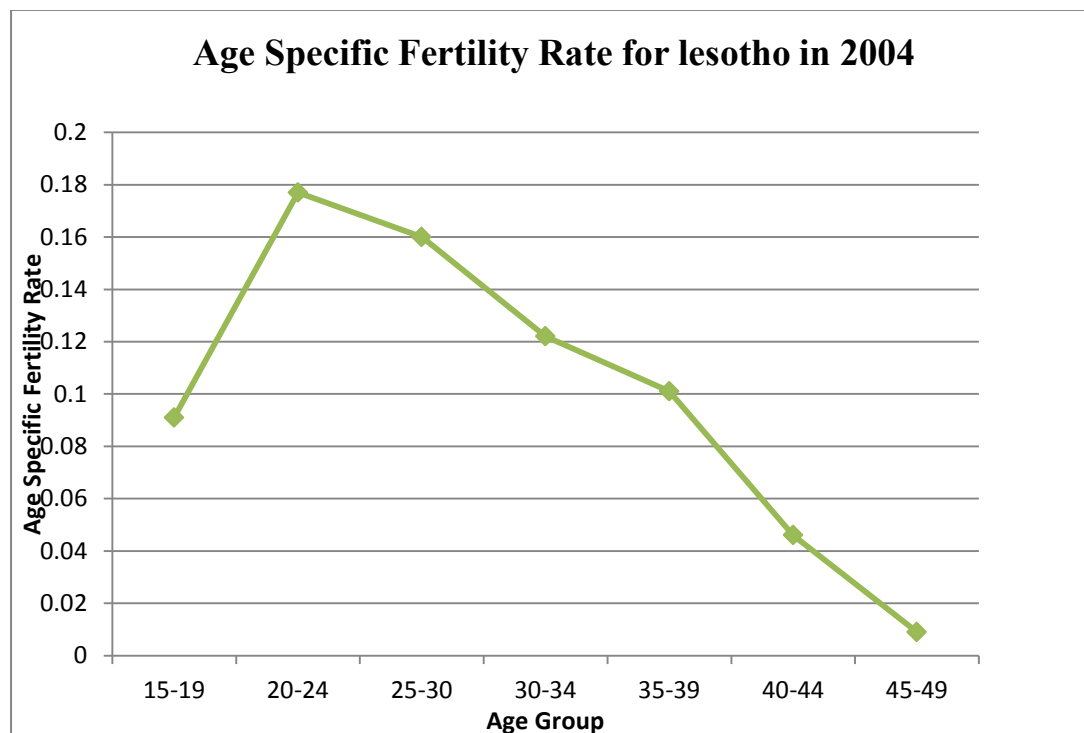
Figure 4.2.3 above show the Age Specific Fertility Rates for Lesotho in 2004. As highlighted in appendix 1 and in figure 4.2.3 above, most of the children in this population are born from the 20-24 age group with an ASFR of 0.177. The rates are low in the 15-19 age group (0.091), and then rise to peak in the 20-24 age group (0.177) and then decline in the age group 25-29 (0.160) and decline to moderate levels in the 30-34 age group (0.122). The rates further decline in the 35-39 age groups (0.101) and finally to low levels in the 40-49 age group (0.009). Teenagers in Lesotho start giving birth a bit later as the graph starts way below 0.1. On the other hand, the majority of women in the age group 45-49 are still giving birth as the graph is above 0.

4.2.4 Age Specific Fertility Rates for Namibia

Figure 4.2.4 Age Specific Fertility Rates for Namibia
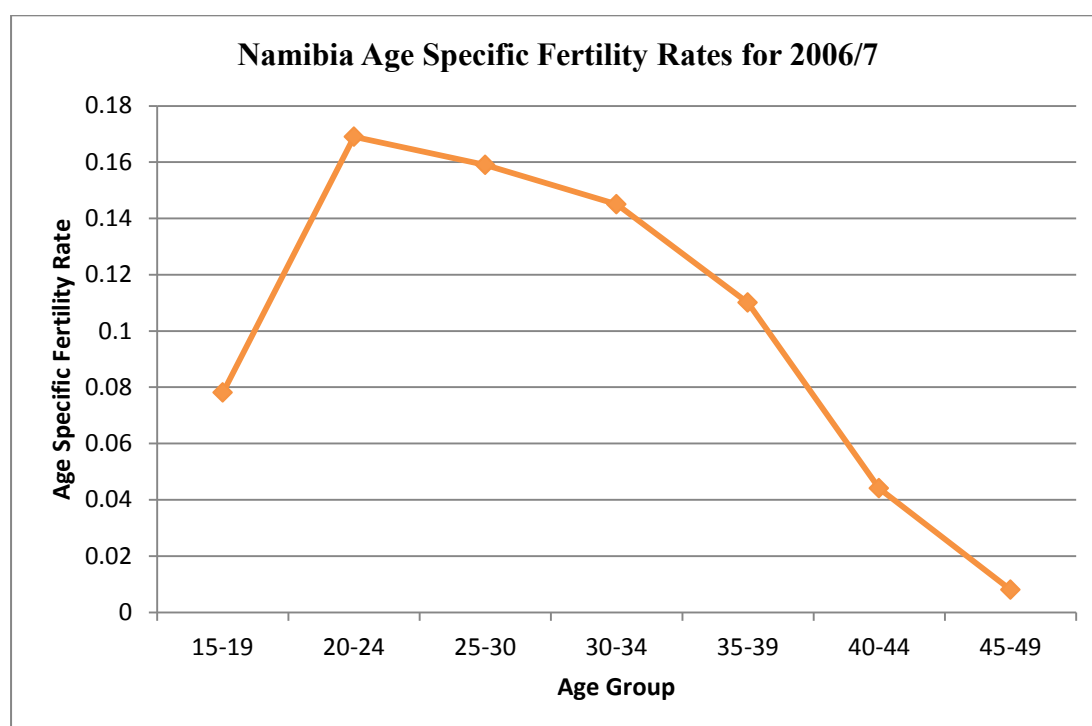
Figure 4.2.4 above show the Age Specific Fertility Rates for Namibia in 2007. As highlighted in appendix 1 as well as in figure 4.2.4 above, most of the children in this population group are born from the 20-24 age group with an ASFR of (0.169). The rates are low in the 15-19

age group (0.078), and then rise to peak in the 20-24 age group (0.169) and then decline in the age group 25-29 (0.159) and decline further to moderate levels in the 30-34 (0.145) age groups. In the age group 35-39 the rates further decline (0.110) until they finally reach the low levels in the 45-49 age group (0.008). Teenagers in Namibia start giving birth later as the graph starts way below 0.1 to show that fertility levels for teenagers is low. Women in the age group 45-49 are still having a lot of children in Namibia.

4.2.5 Age Specific Fertility Rates for Zimbabwe

Figure 4.2.5 Age Specific Fertility Rates for Zimbabwe in 2005/6
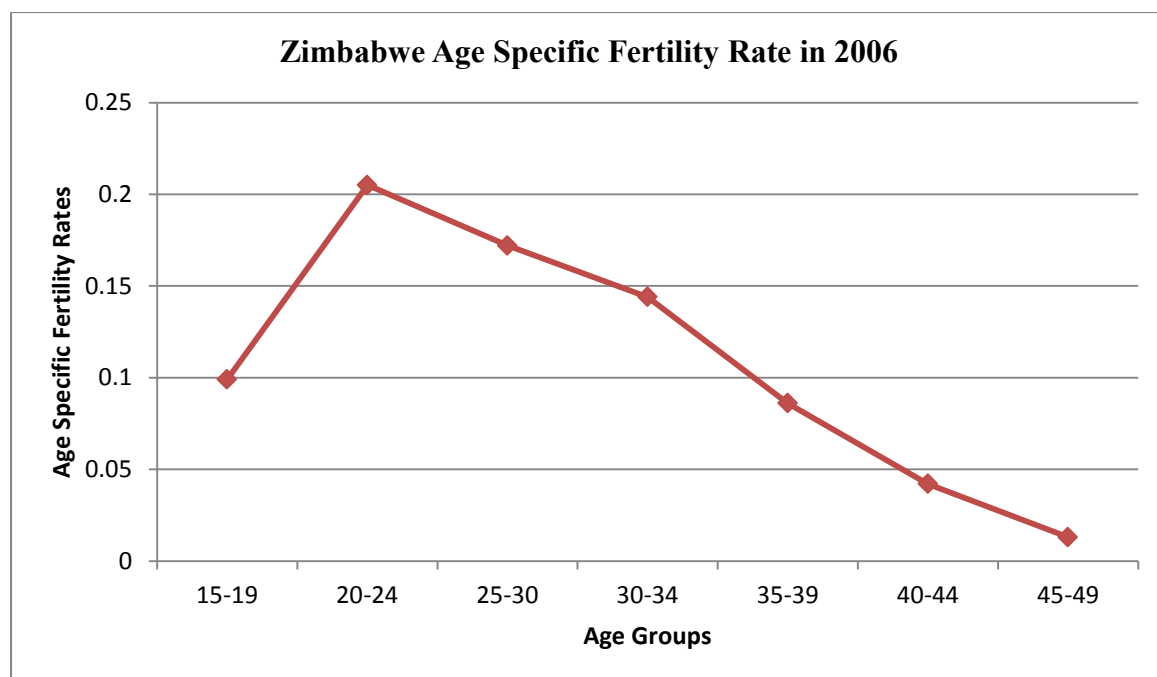
Figure 4.2.5 above show the Age Specific Fertility Rates for Zimbabwe in 2005/6. As highlighted in figure 4.2.5 above, most of the children in this population group are born from the 20-24 age group with an ASFR of 0.205. The rates are low in the 15-19 age group (0.099), then rise to peak in the 20-24 age group (0.205) and then decline in the age group 25-30 (0.172) and then further decline to moderate levels in the 30-34 age groups (0.144). The rates further decline in the 35-39 age group (0.086). In the age group 40-44, there is still a

further decline in the rates (0.042) until it reaches its lowest level with is in the age 45-49 (0.013). Teenagers in this population give birth a bit later in life as the graph starts a bit below 0.1. Women in the age group 45-49 are still giving birth.

4.2.6 Age Specific Fertility Rates for Southern African Countries

Figure 4.2.6 Age Specific Fertility Rates for Southern African Countries
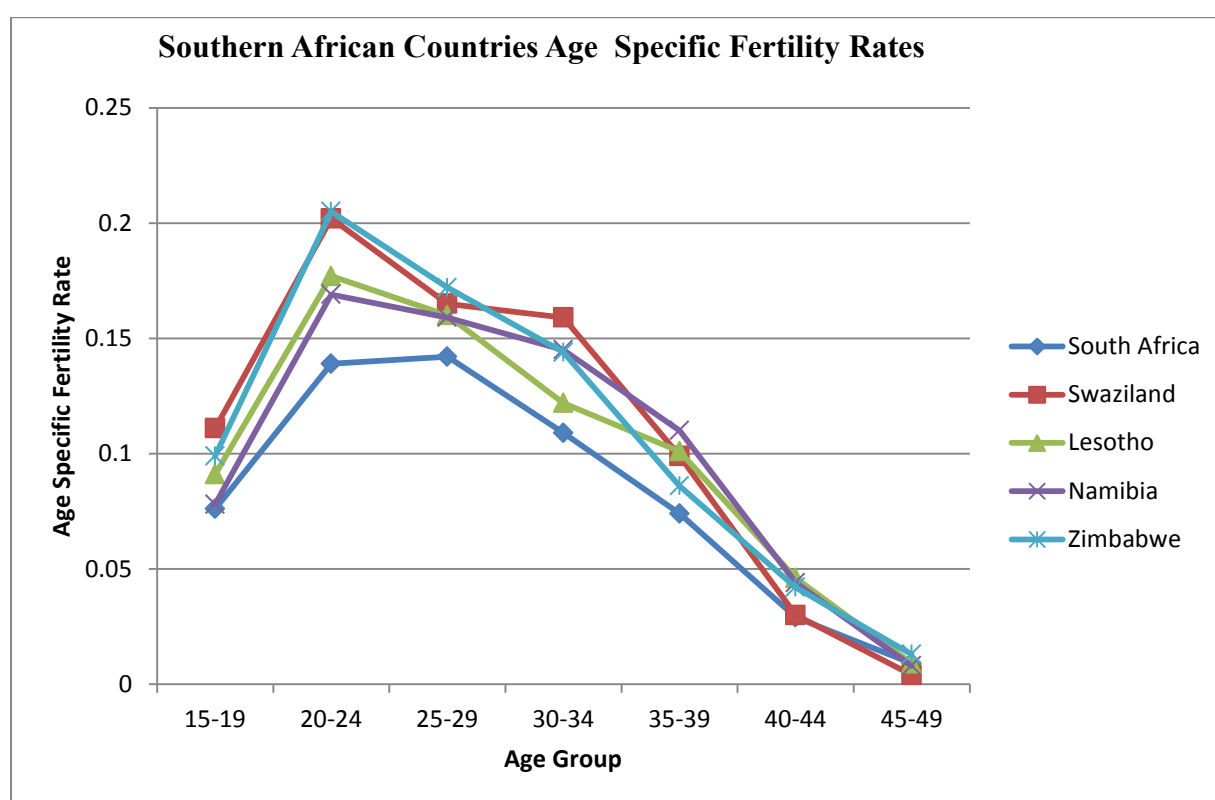
Figure 4.2.6 shows ASFR for all the five countries in Southern Africa. The rates are low in the 15-19 age group, rise to peak in the 20-29 age group, and then decline to moderate levels in the 30-39 age group, and to low levels in the 40-49 age group. For the age group 15-19 years (teenagers), Swaziland has the highest level of teenage fertility rates (0.111) in 2006-07 as shown in appendix 1, followed by Zimbabwe (0.099) in 2005-06. The third country with the next highest fertility rates is Lesotho (0.091) in 2004 followed by Namibia (0.078) in the year 2006-07 while South Africa (0.076) in 1998 had the lowest fertility rates for this age

group. The pattern of teenage fertility in Swaziland is similar to that of Zimbabwe (high levels), whilst Namibia"s fertility pattern for this age group is similar to that of South Africa (lower levels). Lesotho"s fertility level for this age group is a stand-alone between the four countries.

For the age group 20-24, in 2005-06 Zimbabwe had the highest fertility rates (0.205), followed by Swaziland (0.202) in the year 2006-07, and then Lesotho (0.177) in 2004 had the third highest fertility levels, followed by Namibia (0.169) in 2006-07 and South Africa with the lowest fertility levels (0.139) in 1998 for this age group. The pattern of fertility for this age group in Swaziland is similar to that of Zimbabwe (high levels), whilst Lesotho"s fertility pattern is similar to that of Namibia (low levels).South Africa"s fertility for this age group is even lower compared to all four countries.

For the age group 25-29, Zimbabwe (0.172) has the highest fertility levels again in the year 2005-06, followed by Swaziland (0.165) in the year 2006-07. Lesotho"s fertility rate (0.160) was the third highest level in the year 2004, followed by Namibia (0.159) in 2006-07. South Africa (0.142) had the lowest fertility rates for this age group in the year 1998. The fertility pattern at this age group for Namibia is similar to that of Lesotho. On the other hand, Zimbabwe"s fertility pattern is similar to that of Swaziland. South Africa"s fertility rate is the lowest.

In the age group 30-34, in 2006-07 Swaziland (0.159) had the highest fertility rates, followed by Namibia (0.145) in 2006-07, followed by Zimbabwe (0.144) in the year 2005-06. The country with the third highest fertility rates in this age group was Lesotho (0.122) in the year 2004 which is then followed by South Africa (0.109) in 1998. Zimbabwe and Namibia have a similar fertility level pattern in this age group whilst Lesotho and South Africa also have a similar fertility pattern at this level. Swaziland"s fertility rates at this age group are the highest compared to all the other four countries.

For the age group 35-39, Namibia (0.110) had the highest fertility rates in the year 2006-07. Following Namibia with the second highest fertility rate is Lesotho (0.101) in 2004 which is then followed by Swaziland (0.099) in 2006-07. Zimbabwe (0.086) had the fourth highest fertility levels in 2005-06, followed by South Africa (0.074) in 1998 which had the lowest fertility levels in the age group 35-39. Namibia, Lesotho and Swaziland had a similar fertility level pattern (high fertility) for this age group whilst Zimbabwe and South Africa also had a similar fertility level pattern for this age group (low fertility).

In the age group 40-44, Lesotho (0.046) has the highest fertility levels in 2004. Following Lesotho with the second highest fertility levels is Namibia (0.044) in 2006-07 which is then followed by Zimbabwe (0.042) in 2005-06. Swaziland (0.03) in 2006/07 had the fourth highest fertility levels in this age group followed by South Africa (0.029) in 1998 which had the lowest fertility levels in this age group. Namibia, Lesotho and Zimbabwe had a similar fertility level pattern (high fertility) at this age group, whilst Swaziland and South Africa also had a similar fertility level pattern (low fertility).

For the age group 45-49, Zimbabwe (0.013) had the highest levels of fertility in 2005-06, followed by South Africa (0.009) in 1998 and Lesotho (0.009) in 2004, followed by Namibia (0.008) in 2006-07 which is then followed by Swaziland (0.004) in 2006-07. Women in this age group in Zimbabwe are still having a lot of children.

In all age groups, Swaziland had the highest fertility levels (0.77) in 2006-07, followed by Zimbabwe (0.761 in 2005-06). The third country with the highest level of fertility was Namibia (0.713) in 2006-07 which was followed by Lesotho (0.706) in 2004. The country with the lowest level of fertility was South Africa (0.578) in 1998. South Africa‟s lowest fertility level could be attributed to the fact that the DHS dates back to 1998. The next section discusses the mortality levels for the different countries in Southern Africa.

4.3 Analysing Mortality Levels for Southern African Countries

The mortality levels for Southern African Countries was analysed based on the World Mortality levels as indicated in the female survivorship table from the United Nations (UN, 2013). When calculating the total number of women who survived in each age group (lx), mortality due to HIV/AIDS as well as the roll out levels of ARV"s in the different countries was taken into consideration. To develop the probability of survivorship for women (lx) for each country in Southern Africa, the United Nations Population Division (UN, 2013) under the World Population Prospects used mortality estimates, including mortality due to HIV/ AIDS from the different countries in Southern Africa to project the survivorship probabilities. In order to take HIV/AIDS into consideration when developing the UN Women Survivorship table, spectrum modelling software was used by UNAIDS to make National and Regional estimates of HIV/AIDS infection, (UNAIDS, 2012).The Spectrum modelling software is a computer program that has four modules. The module used for developing life tables is called the AIDS Impact model (AIM) and AIM projects the consequences of the HIV epidemic, which include the number of people living with HIV, new infections and AIDS deaths by age and sex as well as new cases of tuberculosis and AIDS orphans, (UNAIDS, 2012).

4.3.1 South Africa Women Survivorship Table

Table 4.3.1 Women Survivorship Probabilities for South Africa in 1998

Age group	lx	Survivorship Probabilities
15	93 403	0.93403
20	93 172	0.93172
25	92 607	0.92607
30	91 305	0.91305
35	88 696	0.88696
40	85 753	0.85753
45	82 079	0.82079
50	78 424	0.78424

Source: United Nations (2013) Women Survivorship Probabilities (Adapted)

The probability of surviving at birth for females in South Africa in 1998 at age 15 is 0.93403. From age 20 years, the probability of surviving drastically drops to 0.93172. At age 25 years, the probability of surviving declines slightly 0.92607 until it reaches age 30 with 0.91305. However, after age 30 the probability of surviving declines drastically to 0.88696 at age 35 years, further declines drastically to 0.85753 at age 40 years. Further, at age 45 years the probability of surviving continues to drastically decline to 0.82079 and declines until it reaches 0.78424 at age 50 years which has the lowest probability of surviving. As seen from the table, generally the probability of surviving between birth and 50+ declines with the age groups. The older you grow, the lower the probability of surviving.

4.3.2 Swaziland Women Survivorship Table

Table: 4.3.2 Women Survivorship Probabilities for Swaziland in 2006/7

Age group	lx	Survivorship Probabilities
15	87 996	0.87996
20	87 190	0.87190
25	86 177	0.86177
30	82 422	0.82422
35	73 628	0.73628
40	62 053	0.62053
45	52 227	0.52227
50	45 978	0.45978

Source: United Nations (2013) Women Survivorship Probabilities (Adapted)

The probability of surviving at birth for females in Swaziland in 2006/2007 at age 15 years is 0.87996. From age 20 years, the probability of surviving drastically drops to 0.87190. At age 25 years, the probability of surviving declines slightly 0.86177 until it reaches age 30 years with 0.82422. However, after age 30 the probability of surviving declines drastically to 0.73628 at age 35 years, further declines drastically to 0.62053 at age 40 years. Further, at age 45 years the probability of surviving continues to drastically decline to 0.52227 and declines until it reaches 0.45978 at age 50 years which has the lowest probability of surviving. As seen from the table, generally the probability of surviving between birth and 50+ declines with the age groups. The older you grow, the lower the probability of surviving.

4.3.3 Lesotho Women Survivorship Probabilities

Table 4.3.3 Women Survivorship Probabilities for Lesotho in 2004

Age group	lx	**Survivorship Probabilities**
15	87 837	0.87837
20	87 182	0.87182
25	86 221	0.86221
30	83 295	0.83295
35	73 972	0.73972
40	63 174	0.63174
45	51 971	0.51971
50	43 698	0.43698

Source: United Nations (2013) Women Survivorship Probabilities (Adapted)

The probability of surviving at birth for females in Lesotho in 2004 at 15 was 0.87837. From age 20 years, the probability of surviving drastically drops to 0.87182. At age 25 years, the probability of surviving declines slightly 0.86221 until it reaches age 30 years with 0.83295. However, after age 30 the probability of surviving declines drastically to 0.73972 at age 35 years, further declines drastically to 0.63174 at age 40 years. Further, at age 45 years the probability of surviving continues to drastically decline to 0.51971 and declines until it reaches 0.43698 at age 50 years which has the lowest probability of survival. As seen from the table, generally the probability of surviving between birth and 50+ declines with the age groups. The older you grow, the lower the probability of surviving.

4.3.4 Namibia Women Survivorship Probabilities

Table 4.2.4 Women Survivorship Probabilities for Namibia in 2007

Age group	Lx	Survivorship Probabilities
15	94 774	0.94774
20	94 314	0.94314
25	93 824	0.93824
30	92 670	0.92670
35	89 884	0.89884
40	86 011	0.86011
45	81 110	0.81110
50	76 861	0.76861

Source: United Nations (2013) Women Survivorship Probabilities (Adapted)

The probability of surviving at birth for females in Namibia in 2004 at 15 is 0.94774. From age 20 years, the probability of surviving drastically drops to 0.94314. At age 25 years, the probability of surviving declines slightly 0.93824 until it reaches age 30 years with 0.92670. However, after age 30 the probability of surviving declines drastically to 0.89884 at age 35 years, further declines drastically to 0.86011 at age 40 years. Further, at age 45 years the probability of surviving continues to drastically decline to 0.81110 and declines until it reaches 0.76861 at age 50 years which has the lowest probability of surviving. As seen from the table, generally the probability of surviving between birth and 50+ declines with the age groups. The older you grow, the lower the probability of surviving.

4.3.5 Zimbabwe Women Survivorship Probabilities

Table 4.2.5: Women Survivorship Probabilities for Zimbabwe 2005/6

Age group	Lx	Survivorship Probabilities
15	91 328	0.91328
20	89 445	0.89445
25	87 327	0.87327
30	85 996	0.85996
35	78 819	0.78819
40	65 585	0.65585
45	49 703	0.49703
50	39 908	0.39908

Source: United Nations (2013) Women Survivorship Probabilities (Adapted)

The probability of surviving for females in Zimbabwe in 2005/ 6 at age 15 was 0.91328. From age 20 years, the probability of surviving drastically drops to (0.89445). At age 25 years, the probability of surviving declines slightly (0.87327) until it reaches age 30 years with 0.85996. However, after age 30 the probability of surviving declines drastically to 0.78819 at age 35 years, further declines drastically to 0.65585 at age 40 years. Further, at age 45 years the probability of surviving continues to drastically decline to 0.49703 and declines until it reaches 0.39908 at age 50 years which has the lowest probability of surviving. As seen from the table, generally the probability of surviving between birth and 50+ declines with the age groups. The older you grow, the lower the probability of surviving.

Table 4.3.6 Southern Africa Women Survival Probabilities for South Africa, Swaziland, Lesotho, Namibia and Zimbabwe

Survivorship Probabilities for Southern African Countries					
Age Group	South Africa	Swaziland	Lesotho	Namibia	Zimbabwe
15	0.93403	0.87996	0.87837	0.94774	0.91328
20	0.93172	0.87190	0.87182	0.94314	0.89445
25	0.92607	0.86177	0.86221	0.93824	0.87327
30	0.91305	0.82422	0.83295	0.92670	0.85996
35	0.88696	0.73628	0.73972	0.89884	0.78819
40	0.85753	0.62053	0.63174	0.86011	0.65585
45	0.82079	0.52227	0.51971	0.81110	0.49703
50	0.78424	0.45978	0.43698	0.76861	0.39908

Source: United Nations (2013) Women Survivorship Probabilities (Adapted)

Namibia has the highest survival probabilities in all the age groups, with the exception of the age group 45 to 50 (0.81110,0.76861) years as that of South Africa (0.82079, 0.78424) is higher than that for Namibia. The second country with a high probability of survival is South Africa which is then followed by Zimbabwe. However, for the age group 45 to 50 years, Zimbabwe‟s probability of survival (0.49703 and 0.39908) declines even lower than that of Lesotho whose overall probability of survival (0.51971, 0.43698) is the lowest for all the five countries of Southern Africa. Zimbabwe‟s probability of survival is followed by Swaziland and the country with the lowest probability of survival for all the age groups is Lesotho, with the exception of the age group 45 to 50 as Zimbabwe‟s probabilities of surviving these age groups (45 to 50) are the lowest in all the Southern African Countries. Overall, whilst Namibia has

the highest probabilities of surviving, Swaziland has the lowest probabilities of surviving.

4.4 Sex Ratio at Birth for the Southern African Countries

The estimation of sex ratio at birth for all the countries in Southern Africa is a step towards estimating the Age Specific Fertility Rates for girls which is necessary for estimating the Gross Reproduction Rate. Sex ratio at birth was calculated using the following formula;

$$SRB = \frac{M}{F} \times 100$$

Where;

SRB = Sex Ratio at Birth

M   = Males

F   = Females

Table 4.4.1 shows the calculated sex ratio at birth for South Africa, Swaziland, Lesotho, Namibia and Zimbabwe.

Table 4.4.1: Sex Ratio at Birth for Southern African Countries

Country	Female Children	Male Children	Sex Ratio at Birth
South Africa	522	549	1.05
Swaziland	479	502	1.05
Lesotho	387	407	1.05
Namibia	541	568	1.05
Zimbabwe	561	588	1.05

The sex ratio at birth for each of the countries in Southern Africa is 1.05 as presented in table 4.4.1. Sex ratio is the ratio of males to females in a population. For all the Southern African countries the sex ratio at birth is 1.05, which means that there are 1.05 males for every 1 female born. This means that there are more males than females at birth in these Southern African countries. The sex ratio at birth was then used to calculate the Gross Reproduction Rate (GRR), which is a step towards calculating the Net Reproduction Rate (NRR).

4.5 Generating Gross Reproductive Rate (GRR)

The gross reproductive rate has been generated so as to be able to approximate the Net Reproductive Rate (NRR). The GRR refers to the average number of daughters that would be born to a woman if she survived at least to age 45 and conformed to the age-specific fertility rate of a given year(Weeks, 2008). The GRR for the different countries in Southern Africa is presented in table 4.5.1

Table 4.5.1 GRR for Southern African Countries

Country	GRR
South Africa	1.4
Swaziland	1.9
Lesotho	1.7
Namibia	1.7
Zimbabwe	1.9

The GRR for all the five Southern African Countries is above 1.1 which is the GRR at replacement level fertility. South Africa has the lowest GRR of 1.4 children per woman whilst Swaziland and Zimbabwe have the highest GRR of 1.9 children per woman. Namibia and Lesotho have a similar GRR of 1.7 children per woman.

4.6 Age Specific Fertility Rate for Girls for Southern African Countries

Figure 4.4.6 Age Specific Fertility Rates for Girls in Southern African Countries
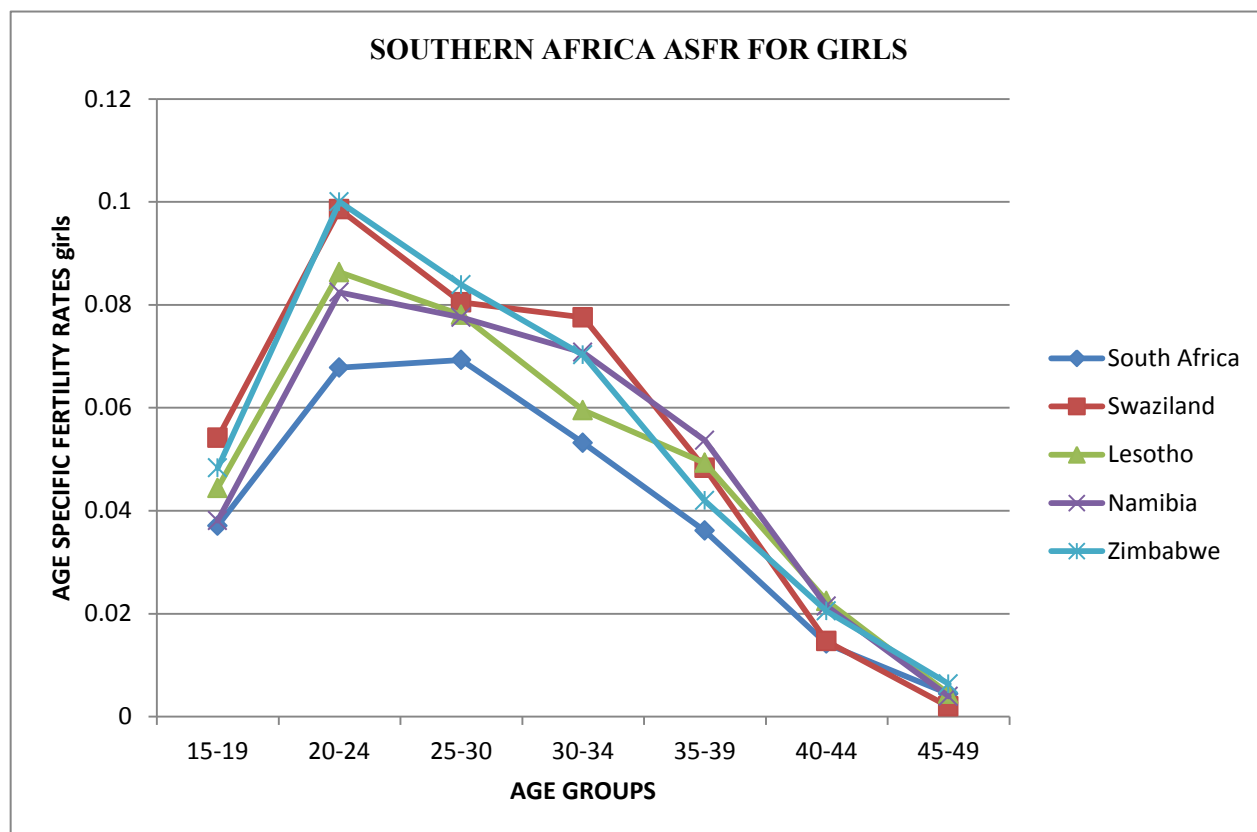
Figure 4.4.6 shows ASFR for all the five countries in Southern Africa. The rates are low in the 15-19 age groups, rise to peak in the 20-29 age group, and then decline to moderate levels in the 30-39 age group, and to low levels in the 40-49 age group. For the age group 15-19 years (teenagers), Swaziland has the highest level of teenage fertility rates (0.05415) as shown in appendix 1, followed by Zimbabwe (0.04829). The third country with the next high fertility rates is Lesotho (0.004439) followed by Namibia (0.03805) while South Africa (0.03707) has the lowest fertility rates for this age group. The pattern of teenage fertility is Swaziland is similar to that of Zimbabwe (high levels), whilst Namibia''s fertility pattern for this age group is similar to that of South Africa (lower levels). Lesotho''s fertility level for this age group is a stand-alone between

the four countries

For the age group 20-24, Zimbabwe has the highest fertility rates (0.10000), followed by Swaziland (0.98541) ,and then Lesotho (0.08634) has the third highest fertility levels, is followed by Namibia (0.08244) and South Africa has the lowest fertility levels (0.06780) for this age group. The pattern of fertility for this age group in Swaziland is similar to that of Zimbabwe (high levels), whilst Lesotho"s fertility pattern is similar to that of Namibia (low levels).South Africa"s fertility for this age group is even much lower compared to all four countries.

For the age group 25-29, Zimbabwe (0.08390) has the highest fertility levels again, followed by Swaziland (0.08049). Lesotho"s fertility rate (0.07805) is the third highest level, followed by Namibia (0.07756). South Africa (0.06927) has the lowest fertility rates for this age group. The fertility pattern at this age group for Namibia, Lesotho, Zimbabwe and Swaziland is similar (high levels). On the other hand, South Africa"s fertility rate is the lowest.

In the age group 30-34, Swaziland (0.07756) has the highest fertility rates, followed by Namibia (0.07073), which is further followed by Zimbabwe (0.07024). The country with the third highest fertility rates in this age group is Lesotho (0.05951) followed by South Africa (0.05317). Zimbabwe and Namibia have a similar fertility level pattern in this age group (high levels) whilst Lesotho and South Africa also have a similar fertility level pattern for this age group (low levels). Swaziland"s fertility rates at this age group are the highest compared to all the other four countries.

For the age group 35-39, Namibia (0.05366) has the highest fertility rates . Following Namibia with the second highest fertility rate is Lesotho (0.04927) which is then followed by Swaziland (0.04829). Zimbabwe (0.04195) has the fourth highest fertility levels, followed by South Africa (0.03610) which has the lowest fertility levels in the age group 35-39. Namibia, Lesotho and Swaziland have a similar fertility level pattern (high fertility) for this age group whilst Zimbabwe and South Africa also have a similar fertility level pattern for this age group (low fertility).

In the age group 40-44, Lesotho (0.02244) has the highest fertility levels. Following Lesotho with the second highest fertility levels is Namibia (0.02146) which is then followed by Zimbabwe (0.02049). Swaziland (0.01463) has the fourth highest fertility levels in this age group followed by South Africa (0.01415) which has the lowest fertility levels in this age group. Namibia, Lesotho and Zimbabwe have a similar fertility level pattern (high fertility) at this age group, whilst Swaziland and South Africa also have a similar fertility level pattern (low fertility).

For the age group 45-49, Zimbabwe (0.00634) has the highest levels of fertility, followed by South Africa and Lesotho (0.00439), followed by Namibia (0.00390) which is then followed by Swaziland (0.00195). South Africa, Namibia, Lesotho and Zimbabwe have the same fertility levels pattern (high) whilst Swaziland has the lowest fertility levels at this age group.

In all the age groups, Swaziland has the highest fertility levels (0.37561), followed by Zimbabwe (0.37122). The third country with the highest level of fertility is Namibia (0.34780) which is followed by Lesotho (0.34439). The country with the lowest level of fertility is South Africa (0.28195). South Africa''s lowest fertility level could be attributed to the fact that the DHS dates back to 1998. The next section discusses the Net reproduction Rate (NRR) for the different countries in Southern Africa.

4.7 Generating the Net Reproductive Rate (NRR)

The Net Reproduction Rate (NRR) was estimated by multiplying the Age Specific Fertility Rates (ASFR) for girls by the probability of survival for each age group as presented below;

4.7.1 South Africa Net Reproduction Rate (NRR)

<u>Figure 4.7.1 South Africa ASFR for girls and nSx *ASFR girls</u>

Figure 4.7.1 shows the difference between ASFR for girls in South Africa before and after the level of mortality (nSx) has been applied. Whilst the ASFR for girls before the introduction of the level of mortality for the age group 15-19 was 0.03707, once the level of mortality has been applied for this age group the fertility levels declined to 0.03462.For all the age groups in the South African Population for females, the introduction of the level of mortality has resulted in a decline to the ASFR for girls. The following decline or changes have been observed in the age groups; 15-19 (0.03707 to 0.03462), age group 20-24 (0.06780 to 0.06317), age group 25-29 declined from 0.06927 to 0.06415. This is a huge decline in the fertility levels which could be attributed to mortality due to HIV/AIDS. For the age group 30-35 fertility levels declined from 0.05317 to 0.04855 and for the age group 35-39, fertility levels declined from 0.03610 to 0.03202. For the age group 40-44, fertility levels declined from 0.01415 to 0.01213 whilst for the age group 45-49 fertility declined from 0.00439 to 0.00360.

4.7.2 Swaziland Net Reproduction Rate

Figure 4.7.2 Swaziland ASFR for girls and nSx*ASFR girls

Figure 4.7.2 shows the difference between ASFR for girls in Swaziland before and after the level of mortality (nSx) has been applied. For all the age groups in the Swaziland Population for females, the introduction of the level of mortality has resulted in a decline to the ASFR for girls. The following decline or changes have been observed in the age groups; 15-19 (0.05415 to 0.04765), age group 20-24 (0.09854 to 0.08592), age group 25-29 declined from 0.08049 to 0.06936. This is a huge decline in the fertility levels which could be attributed to mortality due to HIV/AIDS. For the age group 30-34 fertility levels declined from 0.07756 to 0.06393 and for the age group 35-39, fertility levels declined from 0.04829 to 0.03555. For the age group 40-44, fertility levels declined from 0.01463 to 0.00908 whilst for the age group 45-49 fertility declined from 0.00195 to 0.00102.

Swaziland Net Reproduction Rate (NRR) is 1.6 children per woman. This means that the generation of woman is replacing themselves and this shows that the population is growing. However, since this

replacement fertility is based on DHS data set that was collected about 8 years ago, there is a possibility that this replacement fertility has declined.

4.7.3 Lesotho Net Reproduction Rate
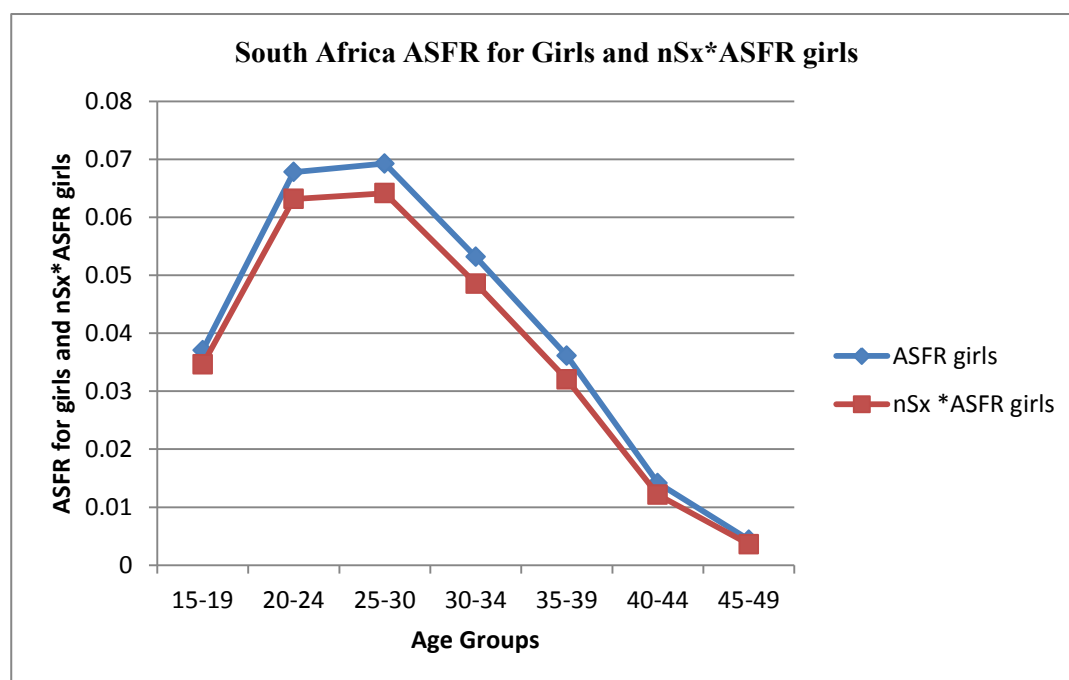
Figure 4.7.3 Lesotho ASFR and nSx *ASFR for Girls

Figure 4.7.3 shows the difference between ASFR for girls in Lesotho before and after the level of mortality (nSx) has been applied. For all the age groups in the South Lesotho Population for females, the introduction of the level of mortality has resulted in a decline to the ASFR for girls. The following decline or changes have been observed in the age groups; 15-19 (0.04439 to 0.03899), age group 20-24 (0.08634 to 0.07527), age group 25-29 declined from 0.07805 to 0.06730. This is a huge decline in the fertility levels which could be attributed to mortality due to HIV/AIDS. For the age group 30-34 fertility levels declined from 0.05951 to 0.04957 and for the age group 35-39, fertility levels declined from 0.04927 to 0.03645. For the age group 40-44, fertility levels declined from 0.02244 to 0.01418 whilst for the age group 45-49 fertility declined from 0.00439 to 0.00228. Lesotho"s Net Reproduction Rate (NRR) 1.4 children per woman. For one to say that this population is replacing itself, NRR should be 1.1

4.7.4 Namibia Net Reproduction Rate

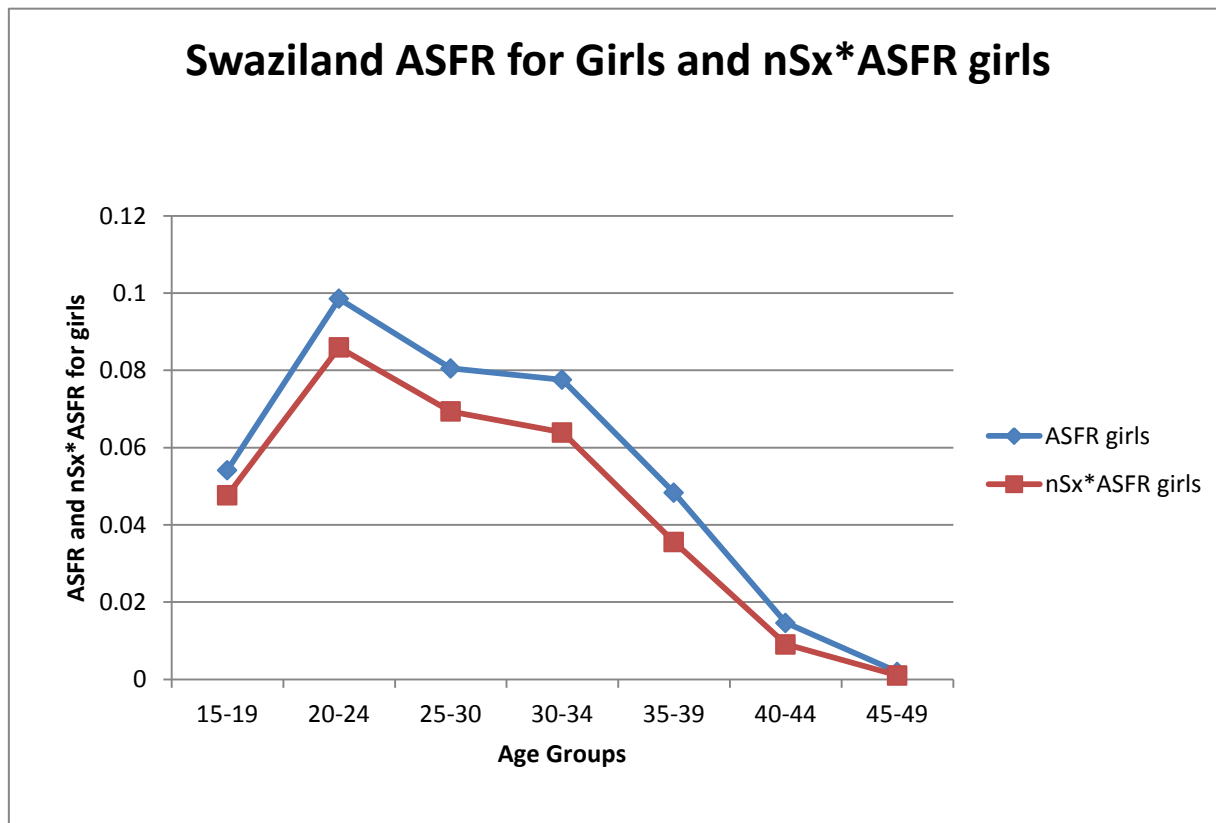### Figure 4.7.4 Namibia ASFR for girls and nSx*ASFR for girls
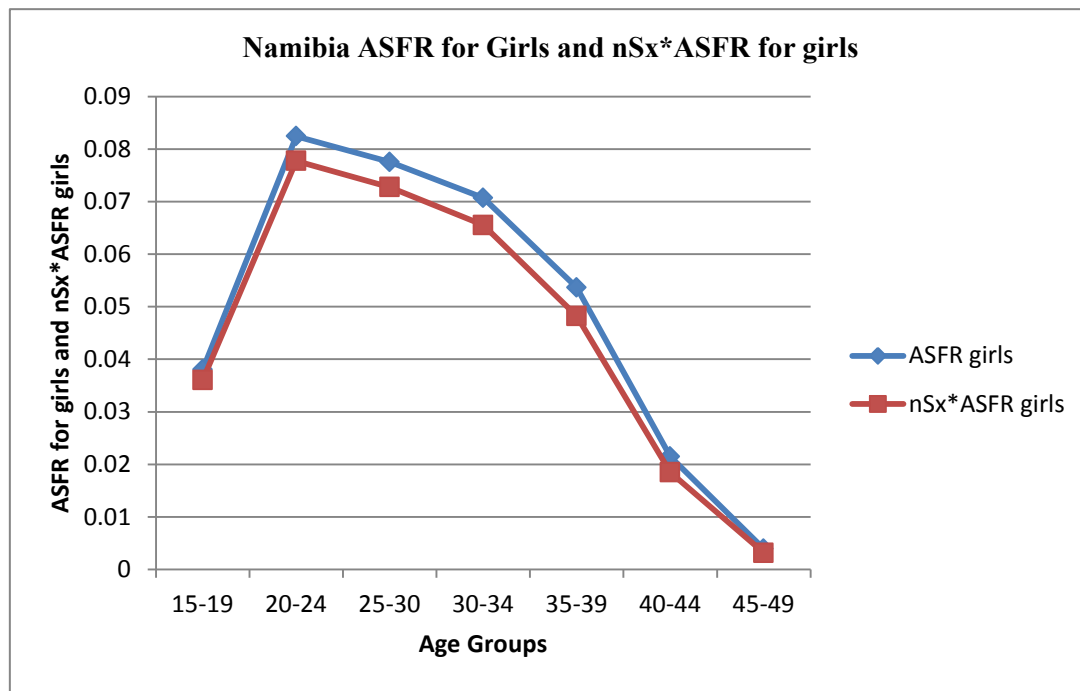
Figure 4.7.4 shows the difference between ASFR for girls in Namibia before and after the level of mortality (nSx) has been applied. For all the age groups in the Lesotho Population for females, the introduction of the level of mortality has resulted in a decline to the ASFR for girls. The following decline or changes have been observed in the age groups; 15-19 (0.03805 to 0.03606), age group 20-24 (0.08244 to 0.07277), age group 25-29 declined from 0.07756 to 0.07277. This is a huge decline in the fertility levels which could be attributed to mortality due to HIV/AIDS. For the age group 30-34 fertility levels declined from 0.07073 to 0.06555 and for the age group 35-39, fertility levels declined from 0.05366 to 0.04823. For the age group 40-44, fertility levels declined from 0.02146 to 0.01846 whilst for the age group 45-49 fertility declined from 0.0039 to 0.00316.

4.7.5 Zimbabwe Net Reproduction Rate

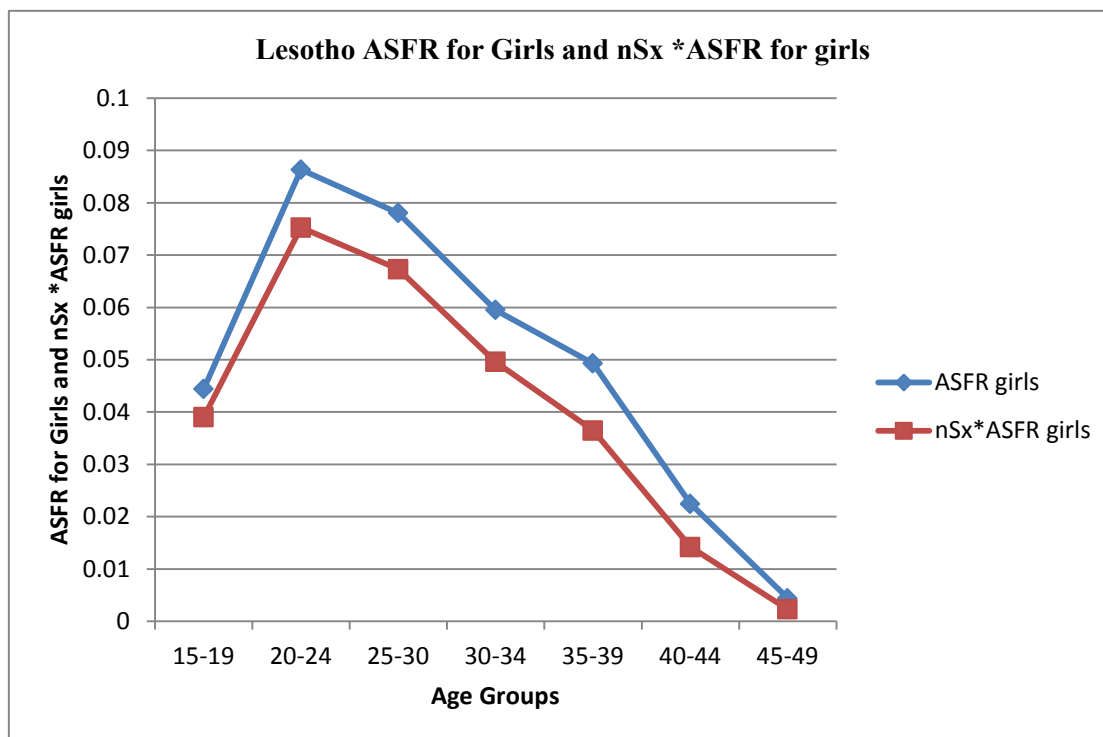### Figure 4.7.5 Zimbabwe ASFR for girls and nSx*ASFR girls
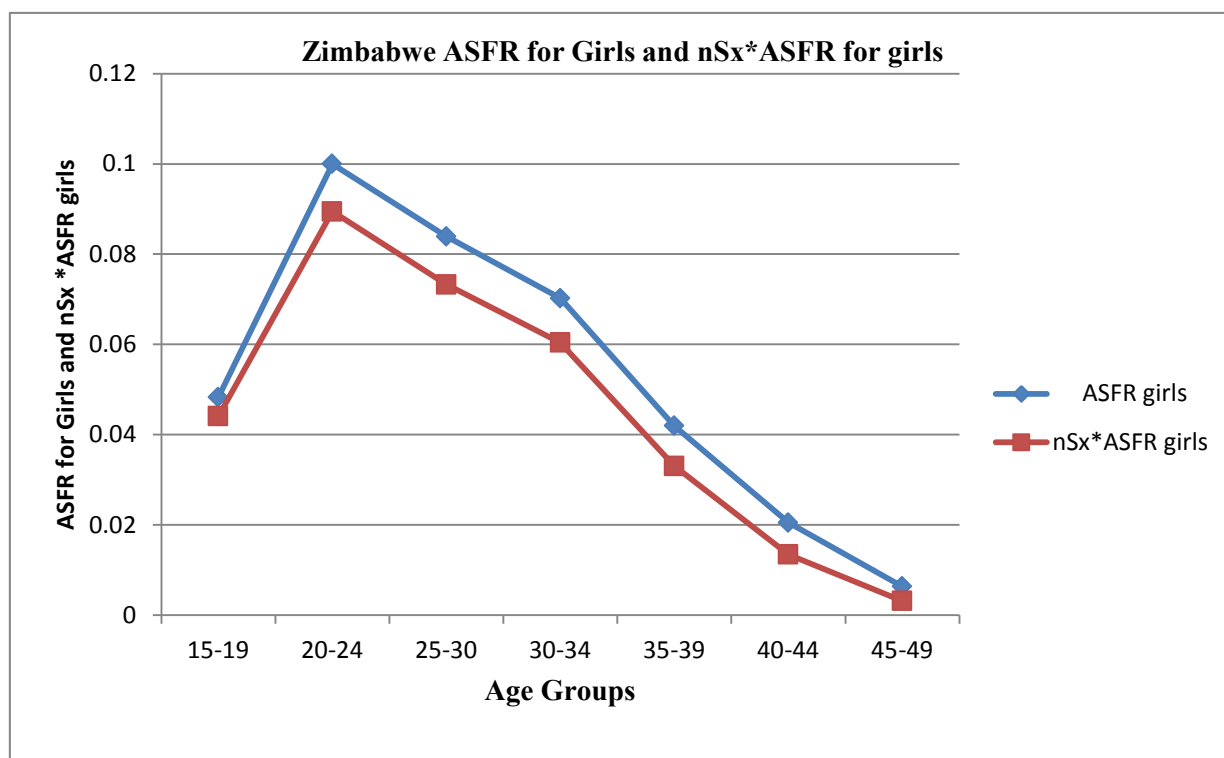
Figure 4.7.5 shows the difference between ASFR for girls in Zimbabwe before and after the level of mortality (nSx) has been applied. For all the age groups in the Zimbabwe"s Population for females, the introduction of the level of mortality has resulted in a decline to the ASFR for girls. nSx*ASFR for girls serves as a mortality reducing factor for Age Specific Fertility Rate for girls. By applying the level of mortality in Zimbabwe the following decline or changes have been observed in the ASFR for girls age groups; 15-19 (0.04829 to 0.04410),age group 20-24 (0.1 to 0.08945), age group 25-29 declined from 0.0839 to 0.07327. This is a huge decline in the fertility levels which could be attributed to mortality due to HIV/AIDS. For the age group 30-34 fertility levels declined from 0.07024 to 0.06040 and for the age group 35-39, fertility levels declined from 0.04195 to 0.03306. For the age group 40-44, fertility levels declined from 0.02049 to 0.01344 whilst for the age group 45-49 fertility declined from 0.00634 to 0.00315.

4.8 Southern Africa Replacement Level Fertility

Replacement fertility levels refers to the total number of girls that each woman should have in order to be able to replace herself and ensure the generational replacement of the population (Weeks, 2008). One of the factors that influence replacement fertility level in a country is the level of infant and child mortality and where the mortality of infants and children is high, the replacement fertility level will be high as well. In estimating replacement fertility levels for the countries in Southern Africa, the method used in this study does not allow for any adjustments for infant and child mortality and thus there have not been adjustments for infant and child mortality in the replacement fertility levels due to the limitation of the method that has been used. This lack of adjustment in infant and child mortality does not compromise the main study that (2.1) estimate for replacement fertility level in Southern African countries is far lower than the true estimate. Factoring infant and child mortality would have resulted to an even higher replacement levels. The replacement fertility levels for Southern Africa are presented below;

Table 4.8.1: Southern Africa Fertility Replacement Level

Country	Replacement Fertility Level
South Africa	2.7
Swaziland	3.3
Lesotho	2.9
Namibia	3.3
Zimbabwe	3.3
Southern Africa	3.1

South Africa replacement fertility level is 2.7 children per woman whilst that for Swaziland is 3.3 children per woman. On the other hand, the replacement fertility level for Lesotho is 2.9 children per woman whilst that for Namibia is and Zimbabwe is 3.3 children per woman. The replacement fertility level for Southern Africa as a region is 3.1 children per woman. All the countries forming part of this study have a replacement fertility that is above 2.1 children, the demographic value that is believed to be the replacement level fertility for all countries.

It is very important to mention that this replacement fertility is based on DHS data sets for the years 1998 to 2006 which is basically about eight years ago. There are very high possibilities that if recent data sets were used, there would be changes in the replacement fertility level especially brought about by mortality due to HIV/AIDS as well as the changes that have been brought about by Antiretroviral therapy (ART) for the people who are HIV positive.

Further, to compare the projected rates of current replacement fertility levels in Southern Africa, a method that was used to generate NRR is adopted from a study that was conducted in

Engelman and Leah (2006) on the variation in replacement fertility in sub-Saharan countries. The formula for generating NRR is:

NRR (Fr) = $Rb/100 + 1/Mp$

Where:

Fr is the replacement fertility rate

Rb is the sex ratio at birth

Mp is the probability that any female new-born will survive to the midway point between her 27th birthday and 28th birthday. According to (Engelman & Leah, 2006) it is always assumed for calculations to Mp is 27.5 years. Table 4.4.7 presented below shows the replacement fertility level for Southern African countries between the years 1998 and 2007.

Table 4.8.2 Replacement Fertility Levels for Southern African Countries as Approximated by Engelman and Leah (2006)

Country	Replacement Fertility Level
South Africa	5.2
Swaziland	5.6
Lesotho	5.6
Namibia	5.1
Zimbabwe	5.5
Southern Africa	**5.4**

The replacement fertility rates that Engelman and Leah (2006) proposed show some great variations within and between countries when compared with the rates that this research came up with. For instance, whilst the results of this research revealed that the replacement fertility levels for South Africa is 2.7, Engelman and Leah (2006) observed that South Africa replacement fertility level is 5.2 children per woman. Whilst this research discovered that the replacement fertility level for Zimbabwe is 3.3 children / woman, Engelman and Leah (2006) observed Zimbabwe"s replacement fertility to be 5.5 children per woman. To estimate the replacement fertility levels for Southern African countries, Engelman and Leah (2006) used approximation whereby the same age at child bearing was used and the same probabilities of survival was used for all the five countries.

4.9 Conclusion

This Chapter dealt with data presentation and analysis which was done using tables, bar charts and line graphs. First, the fertility levels of the different countries forming part of this study were presented as measured by Total Fertility Rates (TFR) and Age Specific Fertility Rates. The results from the analysis revealed that Southern African Countries still boast high fertility rate levels between 2.9 and 3.8. The ASFR from the different countries in Southern Africa was also done and the results revealed that Swaziland has a very high fertility, including teenage fertility whilst South Africa boasts low fertility levels.

Also, the probability of women''s survival for the age groups 15-50 in the countries was presented. Amongst the five countries, Swaziland has the lowest probability of surviving. The Gross Reproductive Rate (GRR) was also estimated for each of the countries in Southern Africa. Finally, the Net Reproduction Rate was estimated for each of the five countries and for Southern Africa as a region. The results for the NRR revealed that all the five countries have a NRR of more than 1.1 children per woman. The Total Fertility Rate at replacement level was also calculated. The results revealed that the TFR at replacement level for all the countries in Southern Africa is above 2.1, in fact, it ranges between 2.7 and 3.3 for all the five countries in Southern Africa. This information having been analysed was then presented in tables, bar charts and line graphs. Chapter five makes conclusions for the overall study and makes recommendations for Southern African countries regarding tracking their fertility levels to ensure that the correct replacement fertility levels is their target in terms of policy formulation to guard against depopulation in these countries.

CHAPTER 5

DISCUSSION, RECOMMENDATIONS AND CONCLUSION

5.0 Introduction

The study set out to investigate the level of growth of populations of Southern African countries by estimating the fertility levels, the mortality levels as well as the replacement fertility levels so as to establish if the generation of women in these countries are replacing themselves or not. This study is a comparative analysis between countries and thus contributes to existing literature on fertility and mortality levels for Southern African Countries by utilizing one of the most comprehensive data sources, the Demographic Health Survey Data (DHS) for the individual countries. The study sought to answer the following research questions:

1. What are the fertility levels (TFR) for Southern African countries?
2. What is the contribution of the different age groups to the level of fertility in Southern African countries?

3. What is the contribution of mortality of women and children to the levels of fertility in Southern African countries?
4. What is the level of replacement fertility in Southern African countries?

5.1 Summary of findings

5.1.1 Summary of findings from Literature Review

The findings from the literature review clearly indicate that replacement fertility as a key demographic concept is often misconstrued as a constant value of 2.1 children per woman yet

replacement fertility always varies by population and over time (Engelman and Leah, 2006). Replacement fertility level at 2.1 children per woman has been widely viewed as a standard value for all the countries around the world. Demographers and people generally perceive replacement fertility level to be the value of 2.1 children per woman .Developing countries have over the years adopted replacement fertility levels from developed countries, the value 2.1 children per woman. Assuming the value 2.1 for replacement fertility levels in Southern African countries will result in these countries reducing themselves as replacement fertility levels in developed countries cannot be similar to those of developing countries based on the variations in their fertility and mortality levels due to the existing relationship between fertility and population growth. It is important to factor in replacement fertility levels because it does have implications for stabilising population growth**.**

5.2.2 Summary of findings from Primary Study

1. **What are the fertility levels (TFR) for Southern African Countries**

Southern African Countries still boast high levels of fertility levels ranging between 2.9 children per woman to 3.9 children per woman. This high fertility levels is typical of fertility levels in developing countries as suggested by the demographic transition theory that countries in the first stage of the demographic transition have very high fertility and mortality levels. Whilst the majority of the countries in this study are in stage 3 of the demographic transition which should portray low fertility levels and declining mortality levels, these countries are still portraying stage one of the demographic transition which boasts high fertility and high mortality levels. Amongst the five countries presented, Swaziland has the highest TFR (3.9) whilst South Africa has the lowest TFR (2.9). Swaziland has the highest Total Fertility Rates of 3.9 children per woman, followed by Zimbabwe with a Total Fertility Rates of 3.8 children per woman. The next country with a high fertility rate after Zimbabwe is Namibia with a TFR of 3.6 children per woman, followed by Lesotho with a rate of 3.5 children per woman and the country with lowest fertility rate is South Africa with 2.9 children per woman. Countries in the developing world have adopted 2.1 as the replacement fertility levels which is a standard for developed countries. If a replacement fertility level was

2.1 for Southern African countries, then NRR would have been 1.1 for each of the Southern African countries. From the analysis of this study, the results have indicated that the NRR for all the five countries in Southern Africa ranges between 1.2 and 1.6 children per woman. The fact that in all the countries NRR is above 1.1 is an indication that replacement level fertility is not 2.1. This shows that as Southern African countries we need to have more children born in order to replace the current population given the current high mortality.

The results of this study are also similar to a study that was also conducted in East Africa by Espenshade et al.,(2003) that concluded that replacement fertility level for East Africa Region is 2.94. Therefore if fertility was lowered to 2.1 children per woman under the current mortality conditions, that would result in birth rates that would be 29 percent below replacement.

2. **What is the contribution of the different age groups to the level of fertility in Southern African Countries (ASFR?)**

For all the five countries in Southern Africa, the ASFR are low in the 15-19 age groups, rise to peak in the 20-29 age group, and then decline to moderate levels in the 30-39 age group, and to low levels in the 40-49 age group. In all the age groups, Swaziland has the highest fertility levels (0.77), followed by Zimbabwe (0.761). The third country with the highest level of fertility is Namibia (0.713) which is followed by Lesotho (0.706). The country with the lowest level of fertility is South Africa (0.578).

3. **What is the contribution of mortality of women and children to the level of fertility in Southern African Countries?**

Namibia has the highest survival probabilities in all the age groups, with the exception of the age group 45 to 50 (0.81110,0.76861) years as that of South Africa (0.82079, 0.78424) is higher than the one for Namibia. The country with the second highest   probability of survival

is South Africa which is then followed by Zimbabwe. However, for the age group 45 to 50 years, Zimbabwe"s probability of survival (0.49703 and 0.39908) declines even lower than that of Lesotho whose overall probability of survival (0.51971, 0.43698) is the lowest for all the five countries of Southern Africa. Zimbabwe"s probability of survival is followed by Swaziland and the country with the lowest probability of survival for all the age groups is Lesotho, with the exception of the age group 45 to 50 as Zimbabwe"s probabilities of surviving are these age groups (45 to 50) are the lowest in all the Southern African countries. Overall, whilst Namibia has the highest probabilities of surviving, Lesotho has the lowest probabilities of surviving.

4. What is the level of replacement fertility in Southern African Countries?

South Africa replacement fertility level is 2.7 children per woman whilst that for Swaziland is 3.3 children per woman. On the other hand, the replacement fertility level for Lesotho is 2.9 children per woman whilst that for Namibia is and Zimbabwe is 3.3 children per woman. The replacement fertility level for Southern Africa as a region is 3.1 children per woman. All the countries forming part of this study have a replacement fertility that is above 2.1 children, the demographic value that is believed to be the replacement level fertility for all countries. It is very important to mention that this replacement fertility is based on DHS data sets for the years 1998 to 2006 which is basically about eight years ago. There are very high possibilities that if recent data sets were to be used, there would be changes in the replacement fertility level especially brought about by mortality due to HIV/AIDS as well as the changes that have been brought about by Antiretroviral therapy (ART) for the people who are HIV positive.

The results of this study on replacement fertility levels for Southern African countries relates to a study that was conducted by Espenshade et al., (2003) on surprising global variations in replacement fertility levels. The study noted that indeed there are variations in replacement fertility levels between countries. Recommendations based on this study were made that individual countries should ensure that replacement level fertility is tracked for their own countries using current data such as census surveys and community surveys data. In addition

to this, the results from the study also relates to another study on achieving replacement level fertility by Searchinger et al., (2013) which revealed that whilst replacement fertility rate of 2.1 children per woman is true for some developed countries, it is not true for developing countries due to high mortality rates. Indeed the five countries in Southern Africa that constitute this study boast a replacement fertility rate that is above 2.1 children per woman.

This study differs in terms of the methodology from one that was conducted by Engelman and Leah (2006) on the variation in replacement fertility in sub-Saharan countries. The replacement fertility rates that Engelman and Leah (2006) proposed show great variations within and between countries when compared with the rates that this research came up with. For instance, whilst the results of this research revealed that the replacement fertility levels for South Africa is 2.7, Engelman and Leah observed that South Africa replacement fertility level is 5.2 children per woman. Whilst this research discovered that the replacement fertility level for Zimbabwe is 3.3 children per woman, Engelman and Leah observed Zimbabwe"s replacement fertility to be 5.5 children per woman. To estimate the replacement fertility levels for Southern African countries, Engelman and Leah (2006) used approximation whereby the same age at child bearing was used and the same probabilities of survival was used for all five countries. Engelman and Leah"s methodology differs from this current study in that when calculating the replacement fertility levels for the countries in Southern Africa, the researcher did not approximate because the probabilities of survival were available and thus approximation was not necessary. Doing approximation when real data is available can be very misleading especially with Southern African countries where survival probabilities vary greatly amongst individual countries. It is therefore very important to guard against using the same age at child bearing and the same probabilities of surviving when estimating replacement fertility levels because it would not give a true reflection of the current situation where countries stand regarding generational replacement.

Therefore 2.1 children is not a universal rate for replacement fertility levels. As a matter fact, using the value 2.1 as replacement fertility level is wrongly judging the level where we are supposed to be in terms of fertility levels and population growth as Southern African countries. For example, if the TFR of a country is 3.2 children per woman and replacement fertility level is 2.8, it means that this particular country is very close to replacement fertility.

Replacement fertility level at 2.1 children per woman assumes low mortality which is not the case with Southern African Countries. If we consider 2.1 to be the replacement fertility, by the time these countries are at 2.1, they will be reducing themselves. Mortality is quite high in most of these Southern African Countries.

5. <u>Policy Implication for the High Replacement Fertility Levels in Southern African Countries</u>

The findings from this study has clearly shown that the select Southern African Countries constituting this study still boast of high fertility and mortality levels which has resulted in high replacement fertility levels. High replacement fertility mostly reflects low survival of female infants to their own reproductive age. Southern African Countries should note that it is no longer advisable to promote the slowing of population growth for their countries due to the high replacement fertility levels which can result in the population of these countries shrinking. Demographic researchers and policy advocates in these countries should increasingly distinguish between the slowing that results from declines in birth rates (ideally reflecting the intentions of parents and others who are sexually active) and the slowing that sterns, in some populations from rising death rates. Therefore, the implication of this study on policy is that policy makers in these countries need to be sensitive to own country replacement rates because failure to do so will result in fertility levels that are below replacement and lead to long run population decline. It is important to factor in replacement fertility levels because it does have implications for stabilising population growth**.**

There is an urgent need that these countries monitor replacement fertility levels because high or increasing replacement fertility levels may tell us where death is replaying its ancient role of constraining the growth of humanity currently this is seen in these countries of Southern Africa. I think this study is valuable and can fit in the field of research especially if recent data were to be utilized to estimate replacement fertility levels in Southern African Countries.

5.2 Recommendations of the study

Replacement fertility level is a very crucial demographic issue to be discussed as it entails the level of fertility for different countries which further impacts on generational replacement. This has serious end results in a country"s planning for service delivery and the health of the population at large. To generate achievable policy strategies and development targets with regard to generational replacement, there is a need for more case studies to be carried out at local and national levels to allow further assessment of local dimension using current data. The following recommendations can be made;

- Local and National Governments in these developing countries should track the replacement fertility levels for their countries from time to time. This will improve avoiding a situation whereby many governments targeting total fertility rates of 2.1 find their population in decline if such a target was reached whilst replacement fertility remained above 2.1.

- During population conferences, demographers should make it a point that issues surrounding replacement fertility levels for developing countries are discussed. Replacement fertility for developed countries which is set to be 2.1 children per woman should therefore be used as a guideline for tracking and reporting of developing countries replacement fertility levels.

5.3 Limitation of the study

The study has shed light on the importance of tracking and reporting replacement fertility levels in Southern African countries. The study had one major limitation which is the age of data (Demographic Health Survey) for the five different countries ranging between the years 1998 and 2007. As fertility levels have undergone a variety of changes, there is a possibility that the levels of replacement fertility could be much lower if present-day data was used for this study given the high educational attainment and contraceptive use in most of these countries.

5.4 General Conclusion

In spite of what has been known for a very long time to be the replacement level fertility for all countries around the world, variations in replacement fertility levels between developing and developed countries have been shown. The results in this study reveal that the replacement fertility levels for Southern African countries is not 2.1 children per women but higher than that, ranging between 2.7 and 3.3 children per woman for the individual countries. Whilst replacement fertility levels for some developed countries range between 2.1 children per woman and below, most of the developing countries have their replacement level fertility well above 2.1 children per women. Results from this study have revealed that for Southern African countries, the replacement fertility levels range between 2.7 and 3.5 children per woman. It is very important that countries track their own replacement fertility levels to ensure that they avoid a situation whereby whilst they are trying to reach a target of 2.1 children as their replacement fertility levels, they find that their population is reducing itself.

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Southern African Countries Age Specific Fertility Rate (ASFR), Age Specific Fertility Rate for girls (ASFRgirls) and Age Specific Fertility Rate (ASFR)* Women survivorship Probabilities (nSx)

Age Groups	Age Specific Fertility Rate (ASFR)					Age Specific Fertility Rate (girls)					ASFR X nSx				
	South Africa	Swazi-Land	Lesotho	Nami-bia	Zimba-bwe	South Africa	Swazi-land	Lesotho	Nami-bia	Zimba--bwe	South Africa	Swazi-land	Leso-tho	Nami bia	Zimba--bwe
15-19	0.076	0.111	0.091	0.078	0.099	0.03707	0.05415	0.04439	0.03805	0.04829	0.0346	0.0477	0.0390	0.0361	0.0441
20-24	0.139	0.202	0.177	0.169	0.205	0.06780	0.09854	0.08634	0.08244	0.10000	0.0632	0.0859	0.0753	0.0778	0.0895
25-29	0.142	0.165	0.16	0.159	0.172	0.06927	0.08049	0.07805	0.07756	0.08390	0.0642	0.0694	0.0673	0.0728	0.0733
30-34	0.109	0.159	0.122	0.145	0.144	0.05317	0.07756	0.05951	0.07073	0.07024	0.0486	0.0639	0.0496	0.0656	0.0604
35-39	0.074	0.099	0.101	0.110	0.086	0.03610	0.04829	0.04927	0.05366	0.04195	0.0320	0.0356	0.0365	0.0482	0.0331
40-44	0.029	0.03	0.046	0.044	0.042	0.01415	0.01463	0.02244	0.02146	0.02049	0.0121	0.0091	0.0142	0.0185	0.0134
45-49	0.009	0.004	0.009	0.008	0.013	0.00439	0.00195	0.00439	0.00390	0.00634	0.0036	0.0010	0.0023	0.0032	0.0032
Total	0.578	0.77	0.706	0.713	0.761	0.28195	0.37561	0.34439	0.34780	0.37122	0.2583	0.3125	0.2840	0.3220	0.3169

Appendix 2

Southern African Countries Gross Reproduction Rate (GRR)

Table 2.1 : Gross Reproduction Rate for South Africa

Age Group	All Women	Children Born	Female Children	ASFR	ASFR girls
15-19	2249	171	83	0.076	0.03707
20-24	2075	288	141	0.139	0.06780
25-30	1857	264	129	0.142	0.06927
30-34	1654	180	88	0.109	0.05317
35-39	1636	121	59	0.074	0.03610
40-44	1294	38	18	0.029	0.01415
45-49	970	9	4	0.009	0.00439
Total	11735	1071	522	0.578	0.28195
TFR	**2.9**				
GRR	**1.41**				

Figure 2.1: South Africa Age Specific Fertility Rates for Girls

SOUTH AFRICA ASFR FOR GIRLS
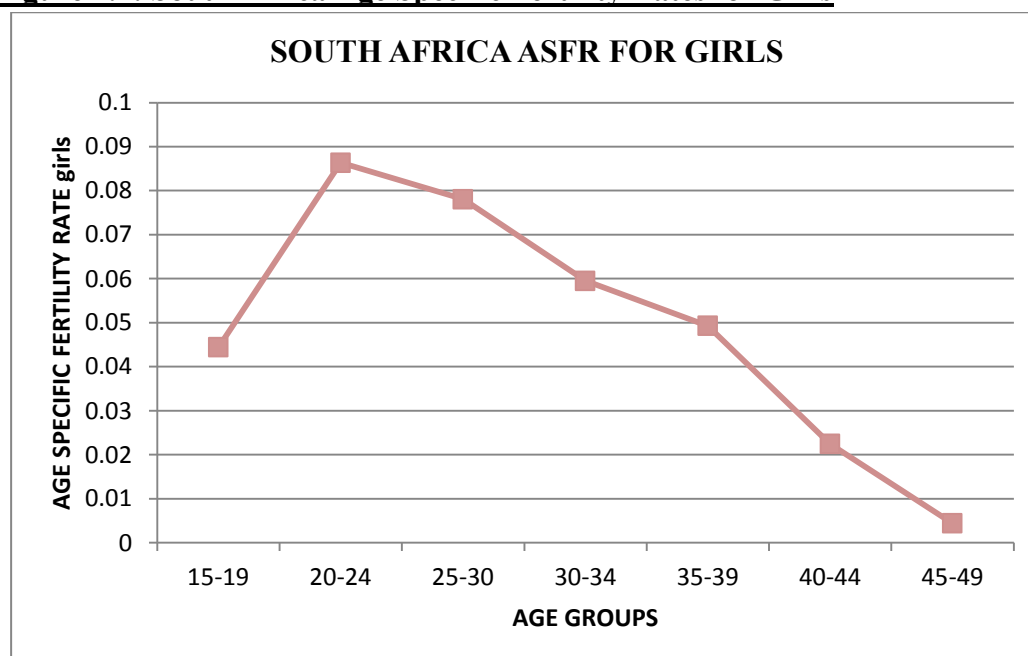
2.2 Generating Gross Reproduction Rate for Swaziland

Table 2.2 Gross Reproduction Rate for Swaziland 2006/7

Age Group	All Women	Children Born	Female Children	ASFR	ASFR girls
15-19	1274	141	69	0.111	0.05415
20-24	1274	257	126	0.202	0.09854
25-30	1274	210	103	0.165	0.08049
30-34	1274	203	99	0.159	0.07756
35-39	1274	126	62	0.099	0.04829
40-44	1274	38	19	0.03	0.01463
45-49	1274	5	2	0.004	0.00195
Total	8918	981	479	0.77	0.37561
TFR	**3.9**				
GRR	**1.9**				

Figure 2.2 Swaziland Age Specific Fertility Rates for Girls
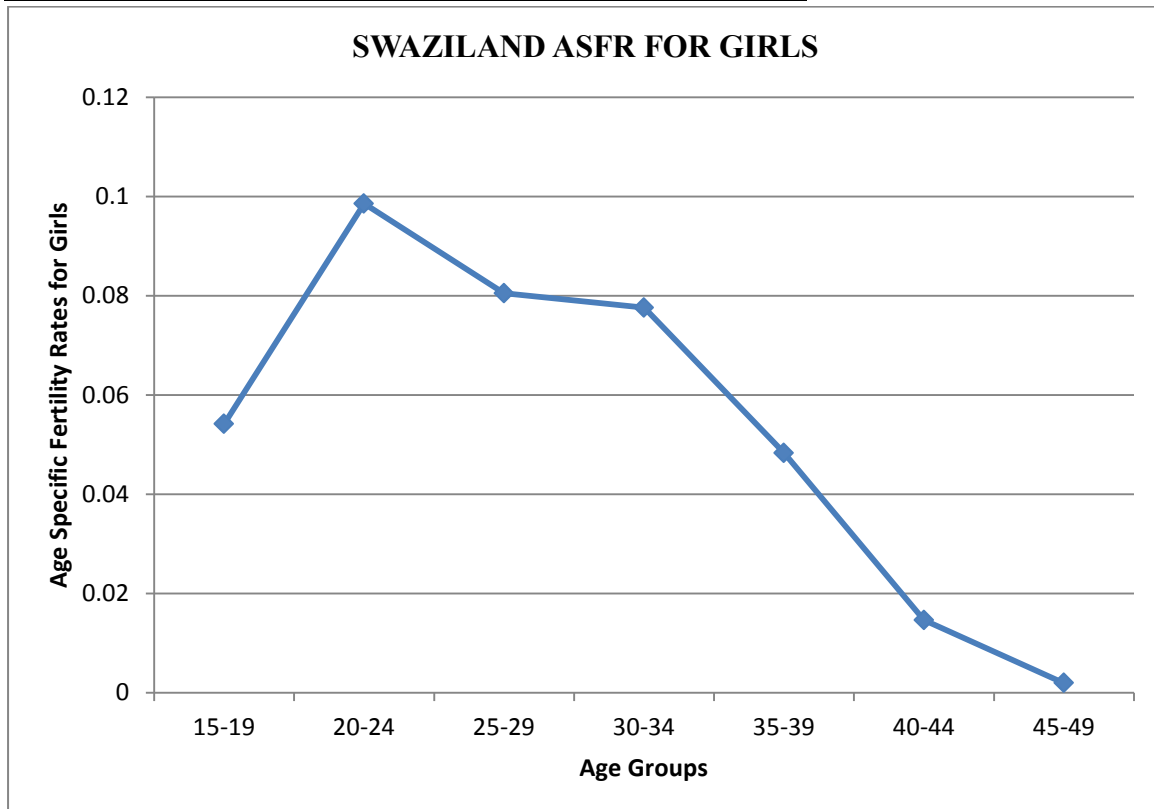
2.3 Generating Gross Reproduction Rate for Lesotho

Table 2.3 Gross Reproduction Rate for Lesotho

Age Group	All Women	Children Born	Female Children	ASFR	ASFR girls
15-19	1710	156	76	0.091	0.04439
20-24	1463	259	126	0.177	0.08634
25-30	1044	167	81	0.16	0.07805
30-34	816	100	49	0.122	0.05951
35-39	728	74	36	0.101	0.04927
40-44	741	34	17	0.046	0.02244
45-49	592	5	3	0.009	0.00439
Total	7094	794	387	0.706	0.34439
TFR	**3.5**				
GRR	**1.72**				

**Figure 2.3: Lesotho Age Specific Fertility Rates for Girls**
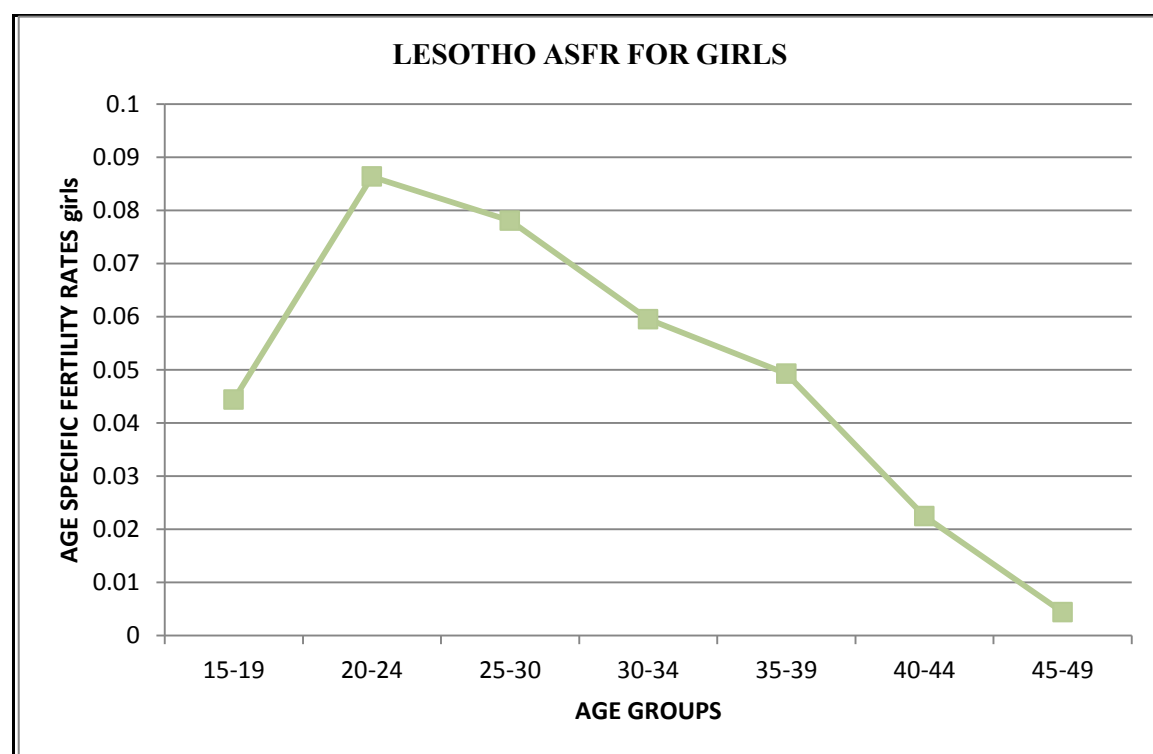
2.4 Generating Gross Reproduction Rate for Namibia

Table 2.4 Gross Reproduction Rate for Namibia

Age Group	All Women	Children Born	Female Children	ASFR	ASFR girls
15-19	2205	172	84	0.078	0.03805
20-24	1876	317	155	0.169	0.08244
25-30	1562	248	121	0.159	0.07756
30-34	1423	206	101	0.145	0.07073
35-39	1074	118	58	0.11	0.05366
40-44	951	42	20	0.044	0.02146
45-49	713	6	3	0.008	0.00390
Total	9804	1109	541	0.713	0.34780
TFR	**3.6**				
GRR	**1.7**				

Figure 2.4 Namibia Age Specific Fertility Rates for Girls
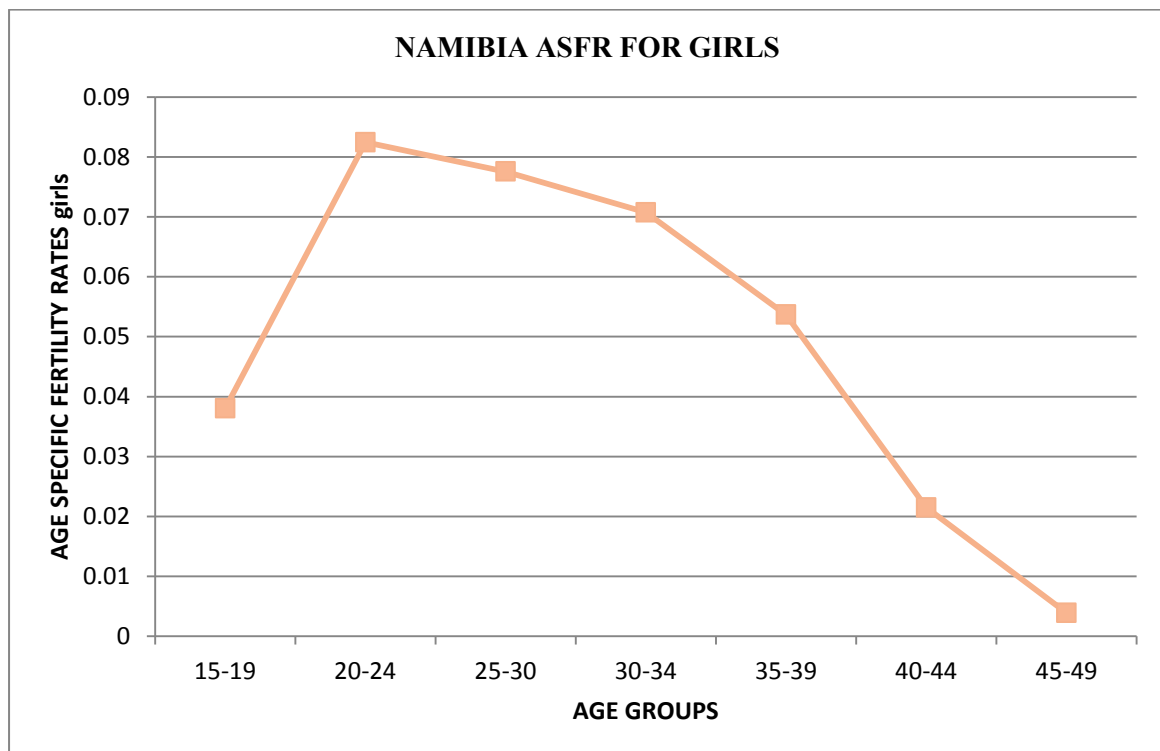
2.5 Generating Gross Reproduction Rate for Zimbabwe

Table 2.5 Gross Reproduction Rate for Zimbabwe

Age Group	All Women	Children Born	Female Children	ASFR	ASFR girls
15-19	2152	213	104	0.099	0.04829
20-24	1952	400	195	0.205	0.10000
25-30	1466	252	123	0.172	0.08390
30-34	1216	175	85	0.144	0.07024
35-39	834	72	35	0.086	0.04195
40-44	699	29	14	0.042	0.02049
45-49	589	8	4	0.013	0.00634
Total	8908	1149	561	0.761	0.37122
TFR	**3.8**				
GRR	**1.9**				

Figure 2.5: Zimbabwe Age Specific Fertility Rates for Girls
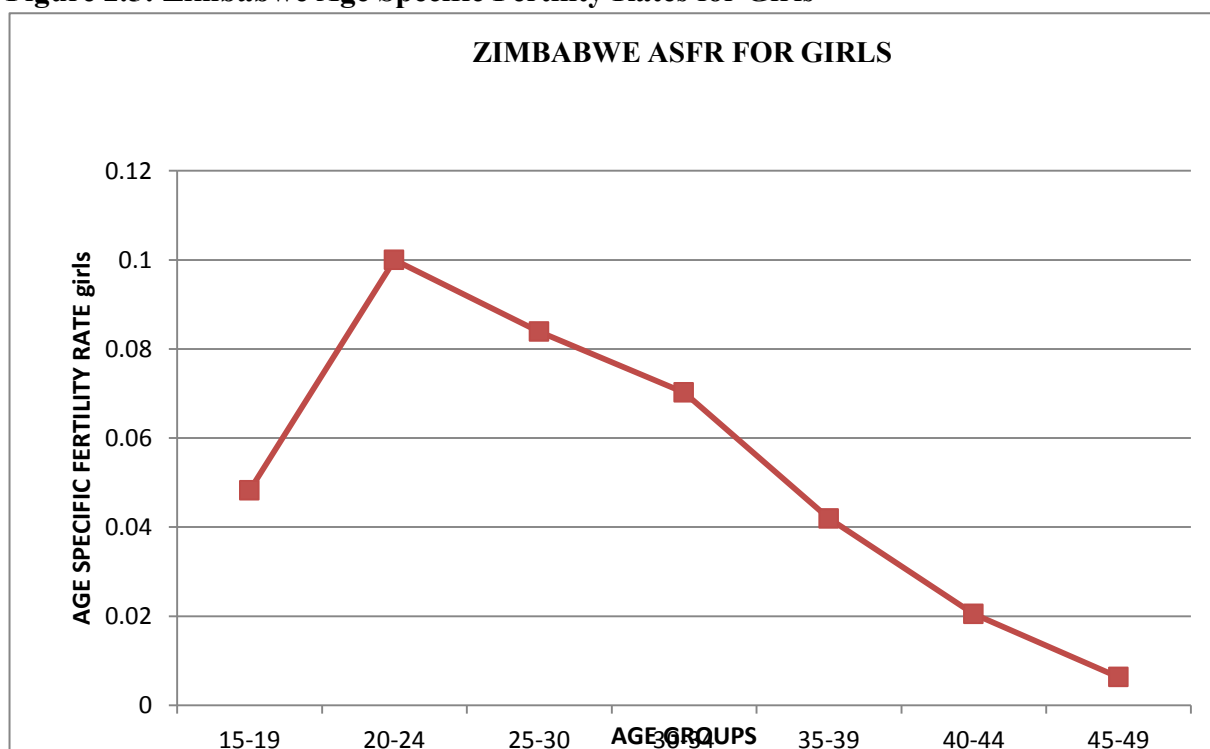
Appendix 3

Southern African Countries Net Reproduction Rate (NRR)

<u>**Table 3.1 South Africa Net Reproduction Rate**</u>

Age Group	ASFR girls	nSx	nSx *ASFR girls
15-19	0.03707	0.93403	0.03462
20-24	0.06780	0.93172	0.06317
25-29	0.06927	0.92607	0.06415
30-34	0.05317	0.91305	0.04855
35-39	0.03610	0.88696	0.03202
40-44	0.01415	0.85753	0.01213
45-49	0.00439	0.82079	0.00360
Total	0.28195	6.27015	0.25825
NRR	**1.3**		

<u>**Table 3.2 Swaziland Net Reproduction Rate**</u>

Age Group	ASFR girls	nSx	nSx*ASFR girls
15-19	0.05415	0.87996	0.04765
20-24	0.09854	0.8719	0.08592
25-30	0.08049	0.86177	0.06936
30-34	0.07756	0.82422	0.06393
35-39	0.04829	0.73628	0.03555
40-44	0.01463	0.62053	0.00908
45-49	0.00195	0.52227	0.00102
Total	0.37561	5.31693	0.31251
NRR	**1.6**		

Table 3.3 Lesotho Net Reproductive Rate

Age Group	ASFR girls	nSx	nSx*ASFR girls
15-19	0.04439	0.87837	0.03899
20-24	0.08634	0.87182	0.07527
25-30	0.07805	0.86221	0.06730
30-34	0.05951	0.83295	0.04957
35-39	0.04927	0.73972	0.03645
40-44	0.02244	0.63174	0.01418
45-49	0.00439	0.51971	0.00228
Total	0.34439	5.33652	0.28403
NRR	**1.4**		

Table 3.4 Namibia Net Reproduction Rate

Age Group	ASFR girls	nSx	nSx*ASFR girls
15-19	0.03805	0.94774	0.03606
20-24	0.08244	0.94314	0.07775
25-30	0.07756	0.93824	0.07277
30-34	0.07073	0.9267	0.06555
35-39	0.05366	0.89884	0.04823
40-44	0.02146	0.86011	0.01846
45-49	0.0039	0.8111	0.00316
Total	0.3478	6.32587	0.32198
NRR	**1.6**		

Table 3.5: Zimbabwe Net Reproduction Rate

Age Group	ASFR girls	nSx	nSx*ASFR girls
15-19	0.04829	0.91328	0.04410
20-24	0.1	0.89445	0.08945
25-30	0.0839	0.87327	0.07327
30-34	0.07024	0.85996	0.06040
35-39	0.04195	0.78819	0.03306
40-44	0.02049	0.65585	0.01344
45-49	0.00634	0.49703	0.00315
Total	0.37122	5.48203	0.31687
NRR	**1.6**		