FERTILITY IN RWANDA: IMPACT OF GENOCIDE

"An analysis of fertility before, during and after the 1994 genocide"

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Abstract

The 20th century has witnessed several wars and genocides worldwide. Notable examples include the Armenian and Jews genocides which took place during World War I and World War II respectively. The Rwandan genocide of 1994 is a more recent example. These wars and genocides have impacted on the socio-economic and demographic transition with resounding crisis. The present study focuses on the Rwandan genocide which affected households and families by reducing the fertility rate. Hence the fertility transition in Rwanda was analyzed for the period before, during and after genocide.

This study discusses the analysis of trends in monthly distribution of births, monthly fertility rates and total fertility rates and using cross-sectional analysis. In this regard this study examines the impact of the genocide on fertility through determinants of fertility and socio-economic factors. The study also uses the logistic regression model to assess the effect of age, calendar year and marital status on giving birth per year. Using the Demographic and Health Survey in Rwanda named 'Enquête Démographique et de Santé au Rwanda' (EDSR) in 1992 and 2000 data, the analysis reveals that there has been a decline in fertility growth in Rwanda since 1991. The decline can be attributed to the civil war and economic crisis that hit the country in the beginning of the 1990s.

The fertility growth rate was also affected by the genocide in 1994. From the evidence adduced in the data, this study concludes that the Rwanda genocide contributed to the reduction of the proportion of married women and increased the proportion of the widows and the divorced. Therefore genocide contributed to reduction in fertility as one of the factors among others. Due to the inadequacies of the data sets used, the study could not estimate or quantify the proportion by which the genocide contributed to the reduction of fertility.

November 2006

Declaration

I declare that: ***FERTILITY IN RWANDA : IMPACT OF GENOCIDE*** is my own work, that it has not been submitted for any degree or examination in any other university, and that all the sources I have used or quoted been indicated and acknowledged by complete references.

Basuayi Bula Clement November 2006

Signed:

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List of abbreviations

ASFR: Age specific fertility rate

CBR: Crude birth rate

CDR: Crude death rate

DTT: Demographic transition theory

DV: Dependent variable

EDSR-I : Enquête Démographique et de Santé au Rwanda en 1992

EDSR-II: Enquête Démographique et de Santé au Rwanda en 2000

ENF : Enquête nationale sur la fécondité

IDV: Independent variable

IMR: Infant mortality rate

ONAPO : Office national de la population

PRB: Population Bureau Reference

RGHP-III: 3rd Rwanda General Census of Population and Housing in August 2002

TFR: Total fertility rate

Chapter one

1. Introduction

1.1 Background

Rwanda is a small mountainous, situated in central Africa and landlocked country within the coordinates 1˚4' and 2˚51' latitude South and 28˚51' longitude East (EDSR-I, 1992; EDSR-II, 2000). The capital city of Rwanda is Kigali and the country is bordered to the south by Burundi, which shares a similarly troubled and violent history; and to the west by the Kivu region of the Democratic Republic of Congo (DRC). Kivu has a large "ethnic" Rwandese population. To the north it is bordered by Uganda while Tanzania is in the East. The north-western region of Tanzania and north of Uganda has hosted many Rwandese immigrants in search of farming land and food production in times of hunger.

Rwanda relief is characterized by the mountainous terrain hence the term 'mille collines' in reference to the country. Cool climates and few tropical diseases make much of Rwanda highly habitable. High rainfall that is well distributed accross the country and good soil, especially in the volcanic regions, permit the sustenance of large populations.

According to EDSR-II (2000), Rwanda has very few natural and mineral resources. Although the agriculture sector contributes 41% to the Gross Domestic Product (EDSR-II, 2000), the country cannot satisfy the basic food needs of its population. The Rwandan agriculture is based on the need of family plots which are shrinking in size because of demographic pressure and inheritance customs (all male offspring receive a parcel of their father's farm). Other economic prospects are modest as well, whether in regard to export crops (coffee, tea, pyrethrum), crafts or light industry (EDSR-II, 2000).

Rwanda is minimally urbanized. Thus, while the agricultural economy has faltered, the possibility of utilizing the surplus workforce in other areas, or of diversifying into industry and commerce, remains remote.

Since its independence in 1962, the country had three censuses in 1978, 1991 and 2002. The polls revealed a growing population size from 4,831,527 in 1978; 7,157,551 in 1991 and 8,162,715 in 2002. The estimated growth rate during this period was 3.7%; 3.2% and 2.8 % per year respectively (EDSR-I, 1992; EDSR-II, 2000 and Rwanda census 2002). The population increased by 2,326,024 inhabitants in 1991. Between 1992 and 2000, it increased around 1,005,164 inhabitants with an estimated growth rate of 1.2%. The difference in growth rate in population between 1978 and 1991 and between 1991 and 2002 are not significant. The country had high density of 183, 272 and 322 inhabitants per square kilometer in 1978-83, 1991-92 and 2002 respectively (RGHP-III, 2002).
The total fertility rate (TFR) per woman aged between 15 and 49 was 8.3, 6.2 and 5.8 respectively in 1983, 1992 and 2000 (EDSR-II, 2000).

There are three official languages namely Kinyarwranda, French and English. Kinyarwanda is the mother tongue in Rwanda.

Most Rwandese believes in God. As at 1991 the majority were Christians distributed as follows: Catholic (62, 6%), Protestant (18, 8%), and Adventist (8.4%). There is also a small population of Muslims (1.2%) and others (1%) who are either animists or atheist (RGHP-III, 2002).

Table 1.1 indicates the trends of populations in size, growth rate and TFR between 1983 and 2000. It is worth noting that while the population size increases the growth rate and TFR decreases.

Table 1.1: Trends of population from 1983-2002

Surveys or census	Year	Estimated population size	Growth rate	TFR
Enquête Nationale sur la fécondité (ENF)	1983	4,831,527	3.7	8.5
Recensement général de la population et de l'habitat au Rwanda en 1991 (RGPH-II)	1991	7,157,551	3.2	6.2
Enquête démographique et de la santé au Rwanda (EDSR)	1992	7,157,551	3.2	6.2
Enquête Socio-démographique au Rwanda (ESDR)	1996	7,666,000	2.8	6.5
Enquête démographique et de la santé au Rwanda (EDSR)	2000	-	2.8	5.8
Recensement général de la population et de l'habitat au Rwanda en 2002 (RGPH-III)	2002	8,162,715	3	5.9

Source: EDSR-1992 and EDSR-2000 and *RGHP-III, 2002*

Rwanda, like many African countries was colonised. From the international conference of Berlin (1884-1885), Rwanda was given to the German territories under the name of Rwanda-Urundi (EDSR-I, 1992; EDSR-II, 2000**).** Passing from German to Belgian control in 1916, the country was called Rwanda few days before independence in 1962 (Prunier, 1995 in Hintjens, 1999).

During the Belgian rule, the colonial administrators divided the Rwandese people along ethnic lines, hence the three ethnic groups; the Hutu (Bahutu), Tutsi (Batutsi) and Twa (Batwa). Bayart (1994) and Destexhe (1995) in Hintjens (1999) have argued that Belgians introduced the identity cards in 1933 and created further identification problems because the criteria used to issue the cards was arbitrary and it became impossible to know who belonged to which 'racial' group. The classification was based on the number of cattle someone owned and their profession. Thus, any man who had more than ten heads of cattle was permanently classified as Tutsi, and any man with fewer than ten cattle was classified as Hutu or Twa (Destexhe, 1995 and Vander Meeren, 1996 in Hintjens (1999)).

Hintjens (1999) argued that Belgian colonial administration introduced Christianity slowly in Rwanda. From religious belief they did get a peaceful way to cut across mechanism of social cohesion. They arrived to institute the colonial system administration which was based on superiority of the Batutsi ethnicity in church, school, administration and army leading to an undermining of the ethnic Bahutu. This situation did not go well with the Bahutu ethnic group. The consequences were observed in 1959 when they ended the dominance of the Batutsi.

Before the Rwandan independence in 1962, the Hutu had ended the dominance of Tutsis in 1959. During this time, thousands of Tutsis were killed, and some 150,000 driven into exile in neighbouring countries (World Factbook, 1999).

Verwimp and Van Bavel (2005) point out that the Rwandan Patriotic Front; an organization formed outside the country took care of the children of these exiles. Those children later formed a rebel group and attacked the Kigali regime in 1990. The civil war started in 1990 with several political and economic upheavals which exacerbated ethnic tensions. The culminating point started on 6th April 1994 at night when the airplane of President of Rwanda, Habyarimana, crashed, killing him and all the others on board. The genocide continued until July 1994.

Chretien (1995), Prunier (1995) and Reyntjens (1995) in Hintjens (1999) argue that the factors that could be responsible for the Rwandan genocide were firstly a focus on external influences, both colonial and neo-colonial; secondly, a focus on domestic causes, including demographic factors and ethnic conflict, and thirdly, a psychosocial account based on the presumed social conformism and obedience of Rwandans. This genocide claimed roughly over 800,000 people (Human Rights Watch Africa, 1996).

The Tutsi rebels defeated the Hutu regime and the genocide ended in July 1994. But, approximately 2 million Hutus in fear of Tutsi retribution fled to neighbouring Burundi, Tanzania, Uganda, and Zaire, now the DRC (World Factbook, 1999).
During the Rwandan genocide, Human Rights Watch/Africa (1996) noted that thousands of women were targeted by Hutu militiamen and soldiers of the Government of Rwanda. In particular, Tutsi women were individually raped, gang-raped with objects such as sticks and gun barrels, held in sexual slavery or sexually mutilated (Human Rights Watch/Africa, 1996:36).

Since independence in 1962, the Rwandan population has undergone a demographic transition that began with a decline in the death rate, probably beginning after the Second World War. This decline has accelerated over the last 30 years, especially for infants and children. The Rwandan fertility remained very high during the same period, 7.7 children per woman in 1970 and even increased to 8.5 by 1983, (EDSR-I, 1992) due to a decline in the use of traditional methods of fertility regulation, in particular, periods of prolonged breastfeeding.

However, in 1982 the EDSR-II (2000) reports that there was an action plan initiated through the Ministry of Health (ONAPO) to control growth rate. The aim was to reduce fertility rate by using family planning. The use of contraceptives was the main method proposed to realize this objective. As a result of this intervention, there was a significant decline in fertility rate from 8.5 children per woman in 1983 to 6.2 children per woman in 1992. Even though the trend continued in 2000 with a rate of 5.8 children per woman, it does not follow that this reduction was as a result of the use of contraceptives and the same report states that there was low use of contraception. This point shows that there may have been another factor responsible for the decrease.

Therefore, this study sets out to investigate the impact of the genocide on the TFR in light of the continued falling rate from 6.2 to 5.8 children per woman, between 1992 and 2000. Thus, the Rwandan genocide offers an appropriate opportunity for an examination of the effects of war on demographic transition, especially on the proximate determinants of fertility in Rwanda.

1.2 Problem statement

The prediction of fertility increase (or decrease) is supported by an assessment of childbearing implications for a variety of conditions, ranging from the anticipated rewards people associate with having children to interests perceived to be served by participation in labour force.

The labour force in a country relies on the population of that country and if there is a significant decline in fertility, there is a risk of declining labor force supply. This poses a problem for the future since the Rwandan economy is driven by local people. Rwanda has few minerals resources and therefore the declining fertility rate may have a negative effect in the future of the Rwandan economy. Rwanda is a country where the technology is not yet available to extent that one person can apply technology to produce enough food for a big population, as such it needs a good supply of human resources.

Secondly, without skilled labor force the country will be forced to import human resource and this can cost the country large sums of money.

This study examines how the genocide affected fertility rate in Rwanda and determines the impact of the genocide through an analysis based on the four proximate determinants of fertility, that is, marriage, use of contraception, postpartum breastfeeding abstinence and abortion.

1.3 Research questions

The study attempts to answer the following research questions:

1. Which were the key determinants of fertility affected by the genocide?
2. How did the affected determinants impact fertility?

1.4 Research Objectives

The objectives of this study are:

To investigate if genocide affected fertility;

To analyze these effects of genocide through the determinants of fertility;

To analyze the effects of genocide caused by socio-economic factors on the determinants of fertility.

1.5 Data Collection

The Rwandan genocide occurred in 1994 and this means that the possible fertility effect would only manifest from January to April 1995 due to the assumed 9 months gestation period for humans beings. So there was need to determine a special survey because of time the study used the data from DHS named "Enquête Démographic et de Santé au Rwanda (EDSR)" in 1992 and 2000). The period of study was fixed to 10 years from 1990 to 2000.

1.6 Definitions

1.6.1 Genocide

According to the United Nations (1948) in Convention on the Prevention and Punishment of the Crime of Genocide article 2, the term genocide is defined as: "Any of the following acts committed with intent to destroy, in whole or in part, a national, ethnic, racial or religious group: (a) Killing members of the group; (b) Causing serious bodily or mental harm to members of the group; (c) Deliberately inflicting on the group conditions of life calculated to bring about its physical destruction in whole or in part; (d) Imposing measures" (UNTS, 1951:277)

According to African Rights (1996:45) "… the Rwandan genocide as other genocide was characterized by physical killing of people firstly according the ethnic by expects the features such as 'a long nose, fingers or height (were) considered a sufficient basis for sentence of death' and secondly by political appurtenance."

Uvin (1997) in Hintjens (1999) argued that in 1994 the Tutsis in Rwanda, much like Jews

in Nazi Germany, were 'socially dead' people, whose murder was as acceptable as it became common. Three principal factors could explain the Rwandan genocide such as externals factors both colonial and neo-colonial, factors demographic and ethnic, and psychological based on the on the presumed social conformism and obedience of Rwanda (Hintjens, 1999).

1.6.2 Others Definitions

1.6.2.1 Crude birth rate

Crude birth rate is the number of live births occurring during the year, per 1,000 population estimated at midyear (PBR, 2005; World Bank, 2006).

1.6.2.2 Crude death rate

Crude birth rate is the number of deaths occurring during the year, per 1,000 population estimated at midyear (PBR, 2005; World Bank, 2006).

1.6.2.3 Total fertility rate

Total fertility is defined as the average number of children that would born to woman over her lifetime if she were to experience the current age-specific fertility rates (ASFR) through her lifetime. It is obtained by summing the ASFR for a given time-point. The TFR is a synthetic rate, a imaginary measurement of fertility of woman who passes through her reproductive life and is subject to all the ASFR for ages 15-49, that were recorded for a given population in a given year (PBR, 2005; World Bank, 2006).

1.6.2.4 Maslow perspective

The Maslovian perspective is judged controversial and his is based on the needs of full human. For Maslow the needs is the assumption that individuals do not seek the satisfaction of needs at one level until those at lower levels have been met (Physiological Needs, Safety Needs, Love/Belonging, Self-Esteem, and Self-Actualization).

1.6.2.5 Ideational

Ideation is the process of forming and relating ideas. It is a concept utilized in the study of behavior, creativity, innovation, design thinking and concept development. (http://en.wikipedia.org/wiki/Ideation)

1.6.2.6 Juridical

Juridcal is relating to the law or jurisprudence in this case we talk about juridical days and it can be related to the administration or function of judge in this case it is called juridical system (http://www.thefreedictionary.com/juridical)

1.7 Significance of the study

Since the 1900s the sub-Saharan African countries have experienced the fertility from an average of 6.03 children per woman in 1960-1965 to about 3.11 children per woman in 1995-2000 (United Nations, 2002a). Some of the factors in the recent decline are mainly caused by policies aimed at increasing contraceptive use and improving educational attainment of women. In Rwanda, fertility has declined from 8.5 to 6.2 between 1983 and 1992, and 6.2 to 5.8 children per woman between 1992 and 2000 (EDSR, 1992, 2000). The decline in fertility between 1983 and 1992 was 2.3 children per woman. This decline was attributed mainly to the 1983 policy on family planning. In 1992 and 2000 the difference of TFR was estimated to 0.4 children per woman and the contraceptive use was low. Although the difference between 1992 and 2000 was not higher than the preceding period (1983 and 1992); hence it could be noted that during the period 1992 and 2000, the Rwandan household was affected by genocide.

In addition, it can be noted that the infant mortality rate (IMR) decline from 120 deaths per 1,000 live births in 1983 to 85 deaths per 1,000 live births in 1992. However, there was an increase in the IMR to 129 deaths per 1,000 live births in 1994 and 117 deaths per 1000 live births in 1995. The IMR declined to 107 deaths per 1,000 live births in 2000 (EDSR, 1992, 2000; PBR, 1995).

Even though the use of contraceptives was low especially in the EDSR-II survey and one would expect an increase in fertility rate in such cases, this was not the case in the period under study. This implies that there were other factors which contributed to the observed decline. This study has argued that one such factor was the genocide.

Effects of war on demographic changes have not been widely studied; especially the relationship between genocide and fertility. Consequently, literature on demographic effects of war is relatively scarce. Developing countries are specifically affected in this aspect. Rwanda, after the genocide, must have had its fertility affected. So, there was a need to carry out a study to ascertain the effect it caused on fertility.

In view of this, the study investigated if the observed transition in fertility was related to the effects of genocide or it was part of a normal transition. Thus, the study will contribute to the demographic effect of war on fertility.

1.8 Thesis outline

This study is subdivided into four chapters. Chapter one provides the background to the study such as problem statement, objectives, research questions, data collection, definitions, significant of study and thesis outline. In chapter two, reviews of literature related to the demographic transition and specific aspects of fertility in Rwanda are provided. Chapter three explains the research design, methodology and data collection. Lastly, the fourth chapter provides the results and discussion, conclusion and recommendations

Chapter two

The demographic transition theory

2.1 Introduction

It has been observed that modern societies experience low fertility and mortality as compared to the traditional societies which experience high fertility and mortality rates. The change from very high fertility and mortality is referred to as demographic transition (Demeny, 1972; Thompson ,1929).

Beaver (1975) in de Bruijn (1999), Van de Kaa (1996) in de Bruijn (1999) and Kirk (1996) argued that the demographic transition theory (DTT) offers the framework which a demographer needs for theoretical causal models. For instance in Europe the DTT was used to describe and explain the observed changes, over time, in fertility and mortality and to predict demographic phenomenon (Kirk, 1996). According to Thompson (1929) and Wikipedia (http://en.wikipedia.org/wiki/Demographic_transition), the term demographic transition is a theory which describe a possible transition from high birth rates and death rates to low birth and death rates as part of the economic development of a country from a pre-industrial to an industrialized economy.

Table 2.1 presents information on the crude birth and death rates for Rwanda from 1960 to 2000 and shows the variation in crude birth and death rates. This explains the Rwanda demographic transition.

Table 2.1: Crude birth and deaths rates, Rwanda, 1960-2000

Years	1960	1970	1980	1990	2000
Crude birth rate (CBR) per 1,000	53	54	47	42	34.5
Crude death rate (CDR) per 1,000	22	20	34	31	21.6

Source: The World Bank (2006) and World Factbook (2006).

In order to explain the eventual causes of the observed changes in the demography of Rwanda from high to low mortality and fertility and to verify if the decline in fertility could be attributed to genocide or to normal dynamics, a demographic transition model which offers a theoretical framework to describe those causes is applied. In line with this, following section will discuss the early DTT, statement of DTT and demographic transition in Rwanda especially on whether fertility rate can be related to the 1994

genocide.

2.2 Literature review

The DTT was developed from the works of Landry (1909, 1934), Thompson (1929) and Notestein (1945). The development of theory has also benefited from the contribution of other scholars from socio-economic, institutional, cultural, ideational, psychological fields. In their work Landry and Thompson did mentioned the word 'demographic transition' and classified the countries into three stages or groups which translated the demographic transition. In his classification Landry called the three stages primitive, intermediate and modern, while Thompson named the three stages as group A, group B and group C (See section 2.4).

However, as noted by Kirk (1996) the DTT was later formulated properly by Notestein (1945) who was apparently unaware of the work by Landry and Thompson. In Notestein formulation, he particularly paid more attention to socio-economic factors as causes of the decline in fertility rates. It is worth mentioning that cultural factors which are equally important in influencing fertility rates received insufficient attention in his work. Later, during the 1980s, the DTT was enriched by experiences of developing countries and some European countries.

Since 1980s, it was noted that any country in the world especially European countries who claimed to be modern was supposed to be experiencing those three stages. In this way the notion of demographic transition was considered as predictive and universal theory that as Kirk (1996) observes that neither Notestein nor Thompson initially thought of their ideas as a theory.

Coale (1973) criticized the concept of three stages as being weak and disputed the fact that the demographic transition remained the force of generalization. He argued that the power of the demographic transition concept lies in the undeniable facts that with sufficient modernization fertility and mortality change in a predictable manner. This point is supported by Chesnais (1996) in de Bruijn (1999) who phrased the strengths and limitations of the theory in almost identical terms.

Witkins (1986) noted that Coale and his associates did a large-scale survey to identify the

crucial variables that had determined the onset and pace of Europe's fertility transition, but their attempt failed. They did not find any socio-economic indicators of modernization which could explain fertility decline in Europe.

de Bruijn (1999), argued that sometimes fertility decline was observed to be following a fall in infant mortality although it preceded it, and often they also dropped simultaneously. Although establishing exact causal relationships between decline in mortality and fertility as out by Van de Kaa (1996) de Bruijn (1999) remains difficult.
Kirk (1996: 375) emphasized that "…the role played by government is manifestly of great importance in decline of mortality and fertility." This influence could be observed during the provision of good living conditions and public health. It could be noted that the government contributed to the decline of fertility by promoting good governance and gender equality. For instance, the education and suitable jobs for women could reduce fertility.

However, there was need to re-organize review of theories and models of fertility to incorporate emerging areas that were not included in the three stages above. Bruijn (1999) pointed out that one dimension that may be used is the relevance of these theories for the explanation of fertility in the different stages identified in the perspective of demographic transition. Thus, the model of proximate determinants and its underlying concept of natural fertility bear particular relevance for the situation in (pre-transition) historic populations and in many contemporary developing countries. The other model is the psychological choice models which are fairly limited to the explanation of fertility in (post-transition) developed countries. Lastly, diffusion approaches seem to apply only to the transition stage

The subsequent section will provide the discussion on selected factors affecting fertility such as biology and proximate determinants and socio-economic factors.

2.3 Selected Factors Affecting Fertility

2.3.1 Biology and proximate determinants factors

According to de Bruijn (1999) transition from high to low fertility is usually associated with the idea that in post-transition stage, couples and individuals are completely in control of fertility, although in the pre-transition stage, it is mainly left to biological principles, which are usually constrained by socially constructed bounds**.** Landry (1934) conceived the notion of natural fertility but the fertility analysis in pre-transition stage had immensely been improved by Louis Henry (1953) who developed the concept of natural fertility.

Henry defined his concept of natural fertility as fertility that existed in the absence of deliberate control through abortion or contraceptive practice (Henry, 1953). This meant that reproductive behavior is not dependent on how many children a couple already has. In natural fertility situations, reproduction is usually determined by biologic principles, involving age at marriage, fecundability (the monthly probability of conception), and time required for gestation, intrauterine mortality, and postpartum amenorrhoea (Henry, 1953).

Fertility also depends on a number of social and behavioral factors. From the point of view held by couples, these were not intended to restrict childbearing. These factors could include marriage patterns especially in relation to the marital duration, spousal separation, and religious rules imposing sexual abstinence at certain times such as during breast-feeding. Increased breast-feeding time has effects on the period of postpartum amenorrhoea. Levels of natural fertility are observed to differ widely between societies especially because of their differentiation in social mechanisms (Blake, 1985). Establishing whether behaviors are socially or individually determined and whether birth control considerations are involved is usually not easy. The implication is that, although people may be willing to abstain from sexual intercourse on the basis of normative rules, the effectiveness of this method may depend on motives of child health, birth spacing, and, for that matter, limitation of offspring (Caldwell et al., 1982; Kakar, 1989; Knodel, 1983).

Earlier, Davis and Blake (1956) provided a seminal contribution with the development of an analytical framework of intermediate determinants of fertility that affected either the exposure to intercourse or the exposure to conception or gestation and successful parturition. Divided over these three categories, 11 behavioral and biological factors can be identified through which, any social, economic and environmental variable can influence fertility (Davis and Blake, 1956). Bongaarts (1978) and Bongaarts and Potter (1983), finally developed the proximate determinants model to its highest point. Bongaarts developed this framework by quantifying the effect of Davis and Blake's intermediate variables. He summarized the 11 factors into eight, and later seven, which he still reduced to four proximate determinants of fertility. This was then a simple but powerful model for analyzing trends of fertility changes over time or in different groups.

Bongaarts (1978) points out that any fertility level in any given population can be traced to variations in one or more of the determinants which he outlined as follows:

1. The proportion of women of reproductive age that are married (as a measure of the proportion exposed to sexual intercourse),
2. The use and effectiveness of contraception, induced abortion, postpartum infecundability (as primarily determined by the duration and intensity of breast-feeding),
3. The frequency of intercourse (including the effect of temporary separation and abstinence practices), and
4. The onset of permanent sterility (particularly as related to menopause), spontaneous intrauterine mortality.

According to Bongaarts (1978) each of these factors can contribute to a reduction of children to approximately 15 in a woman during her reproductive life. The empirical evidence showed that marriage, contraceptive practices, abortion, and postpartum infecundability have by far the strongest effect on levels and differentials of fertility

(Bongaarts, 1993; Bongaarts and Potter, 1983).

Research does not look at fertility itself in entity, but there is need to look for the institutional and behavioral backgrounds, most especially; of marriage, contraceptive use, breast-feeding, abstinence practices, among others. Freedman (1986) just like others, (Hull, in de Bruijn 1999 and Leridon in de Bruijn, 1999), noted that we are faced with, the challenge of specifying the determinants of the proximate determinants.

Bongaarts (1978), Davis and Blake (1956), concentrated on explaining fertility by using the comparative analysis of social organization but didn't attend to institutional factors affecting fertility. This has been explained by authors such as Hobcraft and Little (1984), who determined fecundity and fertility as a result of the fecundity-reducing effects associated with specific set of states. These states related to pregnancy, abstinence from sexual relations, contraceptive use and post-pregnancy infecundity that describe women's positions in their reproductive career. Adolescent fertility model, developed by Becker (1993) specifies conditional probabilities of live birth, conception, and coitus on the basis of individual data. Probabilities of live births normally differ with age, while coitus and contraception will affect individuals' fertilities. Hull (1983) and de Bruijn (1999) explicitly incorporate the proximate determinants in a decision-making approach. In this integration, fertility is not seen as the product of any one single decision but a combined effect of numerous decisions. For instance, in behavioral-proximate determinants; marriage and divorce, contraceptive use, abortion, frequency and patterns of sexual intercourse, and breast-feeding practices. This reformulation increases the relevance of the concept of individual choice for situations under conditions of natural fertility.

Although in Western countries fertility is considered to be under volitional control and childbirth to be a matter of demand rather than supply, it is worthwhile recognizing that fertility does not only depend on behavioral factors, but also on biologic processes. Until recently, the main problem of fertility was the control of unwanted children and the attainment of a perfect contraceptive population (Bumpass and Westoff in de Bruijn, 1999). Menken et al. then reflected that with great effort, fertility has been "turned off": People believed that controlling fertility was the real problem and to that having children was easy.

2.3.2 Socio-economic factors

According to van de Walle and Meeker (1992), the demographers investigated the socioeconomic factors in a way to expect the possible change on national birth rates and to indicate the theories and relationships between the explanatory variables by paying attention to institution and policies on fertility transition. The cultural factors were also noted as major independent determinants of fertility levels and onset of fertility decline (Cleland and Wilson, 1987; Anderson, 1986; Knodel and van de Walle, 1979; Watkins, 1986).

Studies on socio economic factors, however, did not elaborate what culture exactly meant. Greenhalgh (1994) and Hammel (1990), accuse demographers of a widespread incompetence in conceptualization of culture meaningfully. Much as some few researchers have done some work on it, culture has hardly gained any depth; it is usually only grasped in terms of language, ethnicity, or geographic region.

Incorporating culture into theory, however, should not be restricted to demographers alone: all social sciences consider culture a notoriously difficult concept, perhaps even more than the concept of social structure (Archer, 1996). Culture is usually claimed to stand for the shared and transmitted beliefs and values, between generations, about the world and people's place in it. The role of culture in fertility change is presumed to be particularly located in this feature of transferring values and information within a culturally identifiable group (Lesthaeghe, 1977). But apart from this communicative feature, culture provides the normative and interpretive or meaning-giving rules with which people consider fertility and its proximate and ultimate determinants. The link between culture as an ideational or meanings system and social organization lies in the common order it provides for the definitions of social relationships and evaluation of individual behavior. Modes of production, intergenerational and gender relations, marriage systems, and so forth are reflected in culture.

However, by providing social structure with a meaning, culture also legitimizes and, therefore, (re)produces society. This dualist manifestation has been acknowledged in demographic literature by several exponents of a cultural approach to fertility theory such as Greenhalgh (1989); Hammel (1990); Lesthaeghe and Surkyn (1988a) In the social, political, and anthropologic analysis of fertility, the family is the dominant institution: It is the locus of demand and supply of children, by and large it retains the function of socialization base, and often it constitutes the prime avenue to achieve things that are important in life, such as economic assistance, security, social interaction and status, information, and emotional and political support (Davis and Blake, 1956; Dyson and Moore, 1983; Freedman, 1987; McNicoll 1994 in de Bruijn 1999).

The impact of cultural context can be situated on two levels especially the supply factors and demand factors. To elaborate on this, firstly the impact of cultural context on supply factors, describe the social context of reproduction which consists of the characteristics of the community in which the individual woman is found. This may influence her behavior with respect to the proximate determinants of fertility and her demand for children. The effect of urban versus rural residence, which is usually highly significant (although its significance is typically decreased when the effects of education and income are controlled: rich and educated people tend to live in cities)

For example a high proportion of educated people change the general character of a community, even for those who are not educated, and could affect its reproductive practices. Lesthaeghe et al. (1989) found that the illiterate women reduce breastfeeding and abstinence when living in the more developed regions to a striking degree.

Secondly the impact of cultural Context on demand factors, describe how for example, that the traditional systems of beliefs and of social organization shape the status of women and in particular their autonomy in reproductive matters. The system of production implies a certain division of labor and of rights, and this affects the social position of women (in the family, and in society), a fact which in turn has implications for the demand for children. The normative system that regulates reproduction and

demand for children has been the object of much speculation, and we shall review some of these theories presently.

The study of cultural context and its relation with demand for children is probably highly complex because it looks like that the beliefs and social organization in traditional systems shaped the status of women and in particular their autonomy in reproductive matters (de van Walle, 1992).

Underlying this cultural context there is a flow of the idea of psychological factors on fertility. Psychology factors on fertility refer to the value of children which forms the basis of approach and the applications of psychological value-expectancy models. The value of children was based on Maslow perspective on motivation. Hoffman (1973) in de Bruijn (1999) constructed a conceptual framework that depicted the way in which children could contribute to satisfying a number of material, social, and intrinsic needs. According to this framework, childbearing motivation depends on the evaluation of these satisfactions and the economic and no economic costs of children. The associated perceived value of children appears as an intermediate variable in the explanation of the relation between socioeconomic, cultural and gender aspects, and fertility behavior.

The applications psychological value-expectancy take in consideration an evolution during socioeconomic development from economic and material points with regard to children, to more emotional rewards and psychological appreciation, which induced the introduction of the concept of the transition in the value of children (Fawcett, 1983; Bulatao, 1982).

Individuals' influences on supply factors, determine the relationship between individual socioeconomic characteristics of mothers and couples, and the proximate determinants of fertility.

The individual socioeconomic status is a factor which influences the demand for children and is linked to the strength of family relationships and to the relative position of women. In Africa particularly in Rwanda fertility decision-making is controlled by the husbands,

who often do not experience the burdens of high fertility because their wives are responsible for the care of their children. Women also depend on children for assistance in agricultural production, for social status, and for support in old age.

The individual socioeconomic influences on demand factors refers to investigation of the relations between individual socioeconomic characteristics and the demand for children or childbearing intentions as response to various questions on ideal family size (Westoff, 1991; Westoff and Ochoa, 1991). With the level of education and urban residence, the ideal number of children decreases, and the proportion of women who want no more children increases according to the level of education of women, place of residence (rural and urban) and regions.

In guise of conclusion, we use the comments of Kirk (1996:386), who said that "No two countries have followed identical paths to transition, because there are so many combinations of nuptiality, fertility, mortality and migration at each stage of the transition." However, this diversity is not irreconcilable with the universality of the transition (Kirk, 1996).

2.4 Statement of demographic transition theory

2.4.1 Introduction

The DTT was developed by Thompson (1929) to explain the relationship between high fertility and mortality rate and low fertility and mortality rate. According to Kirk (1996) Thompson identified three stages to explain demographic transition, that is, Pre-transition stage or pre-industrial society, stage two and stage three. These stages are explained below (see Figure 2.1 below indicates the possible five stages) and note that today there are five stages.

Figure 2.1 Stages of DTT

Source : ***http://en.wikipedia.org/wiki/Demographic_transition***

2.4.2 Pre-transition stage or pre-industrial society

The Pre-transition stage or pre-industrial society is the stage in which death and birth rates are both high and fluctuating slightly at levels as, according to natural event, such as drought and disease, to produce a relatively constant and young population. Death and birth rates are high as 30-40 per thousand and slight population growth (Zarnoun and Tabutin, 1994; Ziehl 2002; Hassan, 1980).

2.4.3 Stage two

Stage two is the time during which a steady decline of mortality begins while birth rates remain high resulting in high natural population growth. The death rates drop rapidly due to improvements in food supply and sanitation. This increase life spans and reduces disease. These changes usually come about due to improvements in farming techniques, access to technology, basic healthcare, and education. Without a corresponding fall in birth rates this produces an imbalance. The countries in this stage experience a large increase in population (Zarnoun and Tabutin, 1994; Ziehl 2002; Hassan, 1980).

2.4.4 Stage three

In Stage three, there is the beginning of a more or less rapid reduction in the birth rate lagging, while mortality is ahead. This is a time when the population growth rate is beginning to slow down. The birth rates also fall due to access to contraception and modern and improved livelihood like increase in wages, urbanization, and a reduction in subsistence agriculture, an increase in education of women, and other social changes. Population growth begins to level off (Zarnoun and Tabutin, 1994).

2.4.5 Stage four

Stage four, also called Post-transitional is the stage during which death and birth rates stabilize at levels as low as 10 people per thousand with the latter remaining slightly, higher than the former and leading to slow population growth. Birth rates may drop to well below replacement level as it has happened in countries like Italy, Spain and Japan, leading to a shrinking population and a threat to many industries that rely on population growth. A large group born during stage two natures and creates an economic burden on the shrinking working population. Death rates may remain consistently low or increase slightly due to increases in lifestyle diseases which normally set in as a result of low exercise levels and high obesity and an aging population in developed countries.

Unlike the other three models mentioned earlier, this is an idealized picture of population change in these countries as a group and may not accurately describe all individual cases. The extent to which it applies to less-developed societies today remains to be seen. Countries such as the East Asian, China, Brazil and India passed through the demographic transition model very quickly because of their fast social and economic changes. In the majority of African countries, the situation appears to have stalled in the second stage due to negligible development and the effect of AIDS.

Although it has been noted that the demographic transitional model had only four stages, it is widely accepted that a fifth stage can be added to represent countries that have

undergone the economic transition from manufacturing based industries to service and information based industries. Countries such as Germany, Sweden, Italy, and especially Japan, now have populations below replacement levels. This signifies that there is a natural decrease in the population following a fall in birth rates below the death rate.

The majority of the developed countries are already in stage four of the model, while the majority of developing countries are in stage 2 or stage 3. Today there is no country which is anymore in stage 1.

2.5 Demographic transition in Rwanda

2.5.1 Fertility transition in Rwanda

Since the 1980s, fertility in Rwanda had been declining while there has been an increase in mortality rate. (World Bank, 2005; World Factbook, 2006; also see Table 2.2 and Figure 2.2). The demographic transition was expected in Rwanda since 1987 especially in fertility while in mortality it reminds no change. In this section, we discuss the stages with emphasis on the fertility transition.

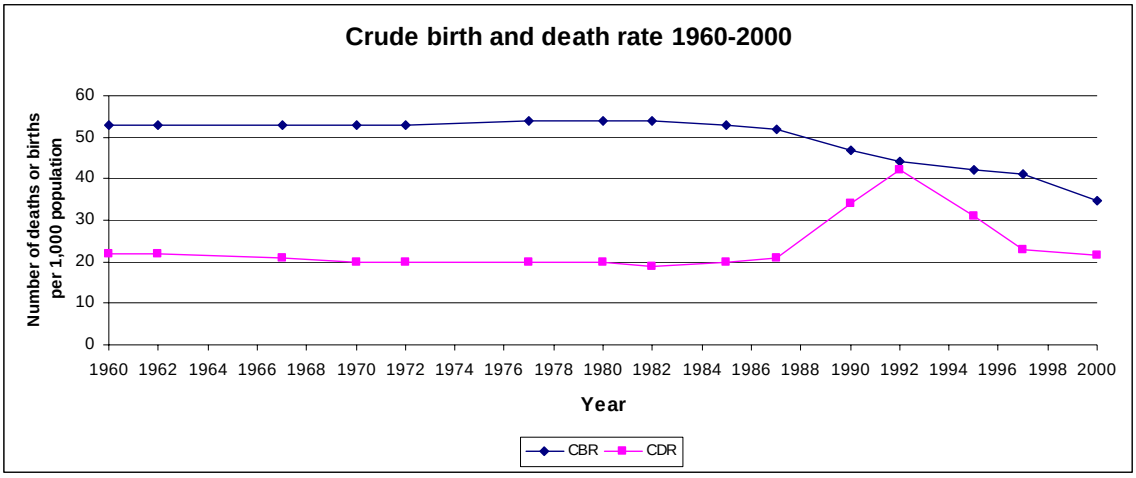
Table 2.2 Crude birth rate and crude death rate from 1960 to 2000

Year	1960	1962	1967	1970	1972	1977	1980	1982	1985	1987	1990	1992	1995	1997	2000
CBR[a]	53	53	53	53	53	54	54	54	53	52	47	44	42	41	34.8
CDR[b]	22	22	21	20	20	20	20	19	20	21	34	42	31	23	21.6

Source*:* The World Bank (2005) and World Factbook (2006) (per 1,000 persons*)*

a= crude birth rate and b= crude death rate

Figure 2.2 Crude birth and death rate from 1960 to 2000



Source: The World Bank (2006) and World factbook (2006) (per 1,000 persons)

Stage 1 (Pre-transition)

As defined in section 2.4.2, during this stage both crude death rate and birth rates are high. Thus, Rwanda was in pre-transition from 1960 to 1986-1987. The level of this high crude birth rate and death rate could be attributed to natural occurrences, such as drought and disease. In Rwanda the inability to feed the population in the face of abundant natural capital, natural stocks that yield flows of natural resources and services, land and labour being the crucial ones in food production is the biggest challenge to the crude death rate (World Bank, 1992).

Some major food crises have been experienced in sub-Saharan Africa since the late 1960s. The Sahel drought, 1968-1972; the 1984-1985 food emergency in Burkina Faso, Cape Verde, Chad, Mali, Mauritania, Niger, Senegal, Burundi, Ethiopia, Kenya, Rwanda, Somalia, Sudan, Tanzania, Angola, Botswana, Lesotho, Mozambique, Zambia and Zimbabwe. These emergencies highlight Africa's precarious agricultural situation. For instance, the levels of fertility rate in pre-transition were high probably because of high rate of infant mortality that is 150 deaths per 1,000 live births in 1983 (EDSR, 1992).

Stage 2

Normally this stage is characterized by the beginning of the decline of mortality while the birth rate goes high resulting in high natural population growth. In Rwanda, the death rate started to decline in 1992 where it was very high and birth rate in 1988.

Valler (1996) in Hintjens (1999) noted that as earlier the economy was on the whole well managed in Rwanda. The money was stable and levels of inflation, foreign debt and corruption were low. As early as 1990s, 70% of the population had access to clean drinking water, there was a good road network in all regions, and local schools operated in the main towns in each district. Rwanda accepted to adapt to the Structural Adjustment Program in 1990 among elements of reform that was accepted which could involve land was commercialization of agriculture. Chossudovsky (1994) in Hintjens (1999) argues that the political collapse that followed the 1990-1993 periods can be attributed to adjustment.

The death rates drop rapidly due to improvements in food supply and sanitation. These increased life spans and reduced diseases. These changes usually come about due to improvements in farming techniques, access to technology, basic healthcare, and education. Without a corresponding fall in birth rates this produces an imbalance. The countries in this stage experience a large increase in population.

Stage 3

The birth rate during this period became more or less rapid reduction lagging while mortality is ahead. In this stage the population growth rate began to decline. This period was observed in Rwanda from 1992 to 2000. The birth rates also fall due to access to traditional and modern contraception and improved livelihood like increase in wages, urbanization, and a reduction in subsistence agriculture, an increase in education of women, and other social changes. However, during the period 1992 to 2000 it was noted Rwandan genocide and the contraceptive use was low (EDSR-I, 1992; EDSR-II, 2000).
EDSR 'Enquête Démographique et de la Santé au Rwanda' (EDSR-I, 1992; EDSR-II,

2000), observes that there was high fertility rate of 8.5 children per woman and infant mortality of 150 deaths per 1,000 live births in 1983. In 1992, it was noted low fertility rate and infant mortality rate at 6.2 and 85 deaths per 1,000 live births respectively while in 2000 fertility rate was estimated at 5.8 and infant mortality rate 107 deaths per 1,000 live births for fertility rate respectively. Due to genocide in 1994, it is estimated between 1992 and 2000 the value of fertility rate was 5.8 and infant mortality was 129 deaths per 1,000 live births (EDS, 1996; PBR, 1995). From the those estimated values of fertility rate and infant mortality rate from 1983 to 2000, we could say that in 1983 both fertility and mortality were high, as compared to 1992 where both were low. We can drop in fertility rate by 2000.

As early as 1983, the TFR of Rwanda was estimated at 8.5 children per woman (EDSR-I, 1992). The TFR was quite high, in comparison to the neighboring countries, such as Uganda, Tanzania, Burundi and Democratic Republic of Congo where TFR was 6.9; 6.3; 6.8; and 6.6 respectively (Population Bureau Reference, 1995). The Infant mortality had reduced from 150 deaths per 1,000 live births in 1983 to 85 deaths per 1,000 live births in 1992. In 2000, it increased to 107 deaths per 1,000 live births (EDSR-I, 1992; EDSR-II, 2000).

In additional Africa Watch (1995), estimated that approximately one million of people (Tutsi and moderate Hutu) were killed during the Rwandan genocide and two million were forced to migrate. Mortality differentials within countries are strong indicators of the prevailing inequalities in health status between urban and rural residence and among socio-economic groups.

In the period 1983-1992 there was a noted, decline in fertility rate, of 2.3 children per woman. This decline was attributed mainly to the 1983 policy on family planning. In 1992 and 2000 the difference was estimated to 0.4 children per woman and the contraceptive use was low. Although the difference between 1992 and 2000 was not high compared to the preceding period 1983 and 1992, it was noted that the genocide occurred during the period 1992 and 2000. The transition in fertility could be attributed to the genocide.

The fertility decline in Rwanda could be related to the proximate determinants influenced

by civil war and genocide. As argued by Agadjanian and Prata (2002) war and conflict, whether internal or international, affect mostly the change in the countries on most plans like the population size (mortality, fertility and migration and socio-economic). The following section discusses proximate determinants of fertility and socio-economic factors in Rwanda.

2.5.2 Proximate determinants of fertility in Rwanda

2.5.2.1 Marriage

The Rwandese civil code (art 169 et 170 du code civil, livre Ier) defined the marriage as the volunteer union from man and woman (Rwandan Code Civil, 1988). In comparison to other eastern African countries, women in Rwanda married late. The average age for marriage was 20.0 and 20.1 in 1992 and 2000 respectively (EDSR-I, 1992; EDSR-II, 2000).The Rwandese civil code stipulates that the marriage is the institution which refers to social and juridical and the Presidential decree no 102/05 of March 13, 1992 executed Law no 42/1988, provide 21 years, as age of marriage. The same decree also recognizes only the monogamous civil marriages.

In the past, by tradition the marriage was an obligation step every man and woman and during this time the divorce was an accident. Although the polygamy was considered a source of hatred, a woman who did not have children looked for another woman for her husband. A woman was attached to her husband whom she respected as the head of family (umutware urugo) for all life only death was the factor which could separated both. The children were considered as richness and labor force.

Bachelors and spinsters were not highly recognized in Rwandese society. In Rwanda traditional society marriage occurred very early and the long duration in marriage result many children in family. Death in Rwanda society was considered a loss; thus killing someone was strictly unaccepted. If a man died the relatives of the dead man institute an

heir for the widow. For this reason even educated women in Rwanda continue to respect the traditional culture and their behaviour is shaped by society (Ilinimugabo, 1989 in May, Mukamfuzi and Vekemans 1990; Mukamfuzi, 1985 in May, Mukamfuzi and Vekemans 1990).

In addition in Rwanda like other in Sub-Saharan Africa countries, it is generally established that maternal morbidity and infant mortality risks increase for mothers from parity 4 and up (ONAPO, 1985c in May, Mukamfuzi and Vekemans, 1990). As a rule in constitution, both for women and men marry fairly late marriage in Rwanda (ONAPO, 1985c in May, Mukamfuzi and Vekemans, 1990) and the woman is expected to be virgin at marriage because, traditionally, virginity guarantees subsequent fertility. In the olden days, if a woman got pregnant before marriage, she or the child or both would be killed (Ilinimugabo, 1989 in May, Mukamfuzi and Vekemans 1990; Mukamfuzi, 1985 in May, Mukamfuzi and Vekemans 1990).

The age at the time of first marriage has been recognized as a crucial determinant of fertility because it marks the beginning of exposure to the risk of childbearing in societies where pre-marital sex is uncommon and where there is little deliberate effort to control fertility (Blanc and Rutenberg, 1990). Rising age at first marriage has a lowering effect on low level of fertility (Hinde and Mturi, 2000; Odimegwu, 1996 in Woldemicael, 2005).

2.5.2.2 Abortion

Abortion is a crime in Rwanda. The interdiction, procedures and punishment for abortion are stipulated in the Rwandese Penal Code in his article 325 alinea 3, D/L. No 21/77 (Rwandan Code Penal, 1977). However, where the mother's life is at risk a doctor can authorize an abortion. All the same the relevant cases on abortion present low percentage which is not significant.

2.5.2.3 Contraceptive practices

The main objective of the contraceptive use is to reduce fertility rate (Kirk, 1996). In 1983 the policy on contraceptive was implemented and evaluated by EDSR-I in 1992; the result was positive because the TFR which was 8.5 children per woman in 1983 decreased to 6.2 children per woman in 1992 (EDSR-I, 1992). Although the TFR in 2000 was 5.8 the estimated contraceptive use was low (EDSR-II, 2000).

2.5.2.4 Postpartum infecundability

In Rwanda, breafeeding is almost universal and long. The median duration of breastfeeding has remained at 25.9 months in 1992 and at 29.9 months in 2000 (EDSR-I, 1992; EDSR-II, 2000). This change can not explain the influence of genocide on fertility.

2.5.3 Socio-economic

According to Freedman (1987) the socio-cultural beliefs can influence decision-making, policymakers, politicians, and the highest authorities. In this way in Rwanda the women or couples do not use modern contraceptive methods do not use them because of her husbands opposition, desire to have boys, social pressures, fatalism, religious hierarchical bans (especially by the catholic church), and / or traditional values (May, Mukamanzi, and Vekemans, 1990). The Rwandan woman was shaped and she is still shaped by the socio-cultural belief.

Based on the macroeconomic terms, Rwandan is classified as a poor country whose economy is based on agricultural sector which represented 41% of GDP (EDSR-II, 2000). Moreover, some progress has been made since independence in enrolment rates in primary and secondary education and health services.

The deterioration of this situation of macroeconomic started when coffee prices fell in 1986-1987; receipts from coffee sales tumbled from 14 billion to 5 billion Rwanda francs in single year (ACR, 1989 in Hintjens, 1999); Chossudovky, 1997 in Hintjens, 1999); Prunier, 1995 in Hintjens, 1999). The immediate consequence was the no payment of external debt.

Although, in June 1990 the Rwandan government finally yielded to World Bank/IMF pressure to implement a package of structural adjustment, the Rwandan Francs currency devaluated by two-thirds (Valler, 1996 in Hintjens, 1999). Valler (1996) in Hintjens (1999) said that there was famine in south of the country, and farmers' real incomes, which had already been slashed in 1986-1987, were further eroded and the Budgetary shortages and high import costs meant that health services could not be maintained and maternal and infant mortality levels rose sharply. In the immediate prelude to the genocide, there was a dramatic increase in malaria, combined with severe food shortages and an influx of refugees from Burundi.

During the war the people were onset occupied by the politics propaganda and were not cultivating (Ndikumana, 2001). Ndikumana (2001) argued that the ethnic crisis of the early 1990s has resulted in the collapse of economy and weakened administrative capacity. It's appeared also that the high military expenditures also had important implications for discrimination with regard to access to national resources. In Rwanda and Burundi, like in other labor-surplus countries, the military constituted a source of lucrative employment. From starting of the war in October 1990, the number of government military increased from 7,000 troops 1989 to 30,000 troops in 1994 (Lemarchand, 1994 and Chossudovsky, 1997 in Hintjens, 1999).This implied an increase in military budget hence a decrease in the GDP passed from $364 in 1990 to $144 in 1994 (World Bank 2002).

Chapter three

Research design and methodology

3.1 Introduction

This chapter discusses the research design, methods, data collection and how data were analyzed.

3.2 Research design and data collection

This study uses secondary data publicly available from Measure DHS (www.measuredhs.com) which conducted the Rwanda Demographic and Health Survey (RDHS). In Rwanda, the DHS is referred to as *Enquête Démographique et de Santé au Rwanda (EDSR)*. Hence, EDSR-I will be used to refer to the survey conducted in 1992 and EDSR-II for the survey conducted in 2000.

A study of this nature requires extensive surveys which the scope and time for this study did not allow. Secondly, the events that this study seeks to explain occurred in the early 1990s as such, it was necessary to seek data from an existing data base. In this regard, data were taken from the RDHS which provide information on population and health. The questionnaire provided in the final report was written in French although during the interview the questionnaire was translated in Kinyarwanda, the national language. Three types of questionnaires were used in 1992 and 2000 survey of RDHS notably household questionnaire, individual questionnaire for women, and individual questionnaire for man.

In both surveys data were gathered from women aged 15-49. The 1992 survey which was conducted between June and October 1992 used a sample of 6,551 women, while the 2000 survey conducted between June 26 and November 30 used a sample of 10,421 women. It is worth noting that during the surveys data were also gathered from men aged between 15 and 49 years with the sample size 598 men in 1992 and 2,717 in 2000. However, this study used only data on women.

A nationally representative sample of women aged 15-49 years as described earlier was interviewed on: household, demographic and health behavior and intentions. The two

surveys were found reliable and appropriate because they are highly regarded worldwide. Further, they collect information on variables such as age, marital status, education, employment, place of residence, dates and survival status of all births and pregnancies, current pregnancy status, fertility preferences, contraception, antenatal, delivery and postpartum care, breastfeeding and nutrition, children's health and mother, status of women and AIDS and other sexually transmitted infections. These data were collected for a wide range of monitoring and impact evaluation indicators in the areas of population, health, and nutrition.

To achieve the goal of the study which is investigation of possible effects of the 1994 genocide on the fertility decline in Rwanda in 2000, it was necessary to fix the period of study from 1990 to 2000. The data used in this study were extracted from the 2000 survey ranging from 1990 to 2000. In order to explain the fertility decline due to the genocide, the analysis included 4 years before genocide (1990-1993) and all years after genocide (from 1994 up to 2000). Hence the period of study covered 10 years from 1990 to 2000.

3.3 Methods and data analysis

The analysis of the monthly distribution of birth, monthly fertility rate and estimates total fertility rate (TFR), were used to observe the trends of fertility rate. This trend was observed for the period of study from 1990-2000.

The Rwandan genocide occurred between April and July 1994. Therefore, if we assume that the probable length of gestation was 9 months for all conceptions, the effects of genocide could have been expected from January to April of 1995 considering the period corresponding to the events of genocide during the years 1990 to 2000. Fertility consequences of Rwandan genocide were considered with a focus on fertility rate from January to April 1995. Hence, most of the discussion in the study is drawn from January to April for comparison in 1995. It was taken in account during the analysis, the determinants of fertility and socio-economics factors.

The trend analysis of monthly distribution determines the shape of distribution of births per month for a given year, while monthly fertility rate shows the seasonal variations of number of birth per women per month in a year. Hence, the estimated TFR shows the trend of fertility rate. The cross-section study was used to investigate fertility decline linked to the genocide and changes in other fertility determinants. In the trends analysis, the monthly rates, annual TFR were estimated and plotted over a period of 10 years before the 2000 survey. In this regard the researcher assumed that the ESDR-I data were not affected by the genocide while EDSR-II data conducted after the genocide would show evidence of the effects of genocide.

From the ESDR-II data, several variables were identified. These included: year of birth of children, month of birth of children, age of women, and marital status. The number of children per year and month was computed using SAS. This information is presented in Table 3.1.

Table 3.1 Distribution by year and month of birth among women surveyed in 2000

	Number of children per month and year										
Months	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
January	138	91	128	124	151	104	150	125	93	99	186
February	117	81	113	94	143	92	119	125	88	90	138
March	114	97	111	139	148	124	132	128	105	138	150
April	148	102	129	140	158	121	157	148	129	149	167
May	134	93	129	110	153	126	130	131	135	148	156
June	138	118	136	128	177	105	174	135	139	160	159
July	143	94	144	135	171	116	176	147	123	139	130
August	101	90	123	111	133	130	133	111	122	141	103
September	117	86	108	118	153	114	154	130	110	162	70
October	106	79	100	89	117	118	118	125	103	148	42
November	74	69	92	88	109	107	134	132	90	186	12
December	85	71	90	92	104	105	111	110	94	121	0
Total	1415	1071	1403	1368	1717	1362	1688	1547	1331	1681	1313

Source: Data computed from EDSR-II-2000

From the variable age of mother of EDSR-II we run the frequencies of women who gave birth from 1949 to 1985 or women whose ages range from 15 to 49 years. The monthly

distribution was computed by dividing the number of children per month per the total number of children per year and expressed as a percentage. While fertility rates were obtained by dividing the number of children per number of women exposure in year times per 1,000. The estimated TFR per year was computed from the age specific rate.

The study use also the logistic regression model to investigate the effects of age of women to give birth knowing her year in calendar year and she is being married. Logistic regression is statistical regression model for binary or dichotomous dependent variables. The model allows one predict a discrete outcome, such as group membership, from a set of variables that maybe continuous, discrete, dichotomous, or a combination of these. The goal of the logistic regression is to correctly predict the category of the output for individual cases. Mathematically the model is expressed as:

$$\log \frac{P}{1-P} = \alpha + \beta_1 x_1 + \beta_2 x_2 + ... + \beta_n x_n$$

Where $P = \Pr[Y = 1/X] = \frac{e^{\alpha+\beta_1 x_1+\beta_2 x_2+....+\beta_n x_n}}{1+e^{\alpha+\beta_1 x_1+\beta_2 x_2+....+\beta_n x_n}}$

α is the intercept parameter

β_i parameter estimates (coefficients)

X is a vector matrix which express the independent variable (IDV)

Y is a dependent variable (DV)

The logarithm of odds (probability divided by one minus the probability) of the outcome is modeled as linear function of the explanatory variables, x_1, x_2, …, x_n .

$$Odds = \frac{P}{1-P}$$

The logistic regression calculates changes in log odds of the dependent, not changes in the dependent itself as ordinary least squares regression does. The parameter estimates (coefficients) are logits of explanatory variables used in the logistic regression equation to estimate the log odds that the dependent equals 1.

The independent variable (IDV) X where defined by age of woman, calendar year and married while the dependent variable (DV) Y is an indicator variable for the woman giving birth in the calendar year. Thus x_1 is the age of a woman in a calendar year, x_2 is calendar year, x_3 is an indicator of being married in that year. The model expresses the estimated probability, for a given woman to give birth. The probability is based on the year of first marriage, age and calendar year, once a woman stayed married. Thus the variables x_1, x_2 and x_3 were used as categorical variables and represented a number of indicator variables. The study considered i as number of year and i varying between 1 to10, thus the following variables were defined as: x_2 the calendar year, which was determined by taking the year of survey 2000 minus i, the variable x_1 was called the age of woman in the calendar year from the age of woman in 2000 and x_3 represent a new variable called married which variable derive to the variables: marital status and age at first marriage. It was expressed by two symbols 0 and 1. (0 symbolize not married and 1 symbolizes being married since first year of marriage). Mathematically the model used is expressed as:

$$\log it\frac{P}{1-P} = \alpha + \beta_1 age + \beta_2 calendaryear + \beta_3 married \quad (1)$$

Where $$P = \Pr[Y = 1/X] = \frac{e^{\alpha+\beta_1 age+\beta_2 calendaryear+\beta_3 married}}{1+e^{\alpha+\beta_1 age+\beta_2 calendaryear+\beta_3 married}}$$

In the model the variable with n levels has n-1 indicator variables. Therefore age has 33, calendar year has 10 and married has only 1. In this order, the corresponding parameters were 33 for age, 10 for calendar year and 1 for married. It should be noted that the age 49 was negligible in model because it presents the low probability.

Furthermore the DV, birth is expressed by 1 and 0 values where 1 indicates having a child in a given calendar year and 0 expresses did not give birth in the particular calendar year. In total the subject effect cases were 9875 women from the sample of 10421 women surveyed in EDSR-II (2000).

In the study some major problems were been noted during the analysis. First, the problem of the number of women which must been used at denominator in calculation of age-

specific fertility rates (ASFR) and second, the problem of comparison of age groups correspondence of age of women. To determine the number of women we assumed that there was homogeneity between the women aged 49 years in 2000 and their peers in 1990 while the problem of correspondence for instance age group 15-19 in 1992 were not in the same age group by the year 2000. Instead, they belonged to two age groups 20-24 and 25-29. To solve this problem, a semi interval to represent the age group of the mothers was created. The middle points of the normal age group were taken as the limits and these were open to the left and closed to right hence the semi intervals of the [15,19] group in 1992 was [22,27] in 2000.

Another limitation on the study was that the data had some missing of variables which could have enabled measurement of an exhaustive different aspects of effects of genocide on fertility such as ethnicity, psychological, technologic and anthropologic and proportion of HIV/AIDS and migration.

Chapter 4

Genocide and Fertility

4.2 Introduction

This chapter is divided into two sections. Section one deals with the analysis of data and discussion and explores the results and discussion on monthly distributions of births, monthly fertility rates, estimated total fertility rate (TFR) and the proximate determinants of fertility and socio-economic factors. The second section deals with conclusion and recommendations. In order to investigate the implications of genocide on decline of fertility during the period 1990-2000, this study explored the following questions:

1. Which determinants of fertility did genocide affect?
2. How did the affected determinants affect fertility?

4.2 Results and Discussion

4.2.1 Monthly distributions of births

Fellman and Eriksson (1999b) argued that the seasonal variation during normal years is of fundamental importance in studying the effects of wars, famines, epidemics, or similar privations on populations. These factors are important and must be considered when doing an evaluation of the possible effect of civil war and genocide in Rwanda.

As defined in Section 3.3, Table 3.1 shows the number of children per month for each year from 1992 to 2000. From Table 3.1, during the period 1990-1994, the number was increasing while for the period 1995-1999, an increase was only observed in 1996. The year 2000 was excluded because the number of birth in December 2000 was incomplete. With the exception of 1992, when comparing the number of children per month for each year prior to 1995 during the months of January, February, March and April, it looks like that the number of children in 1995 is the lowest. Hence from January to April, 1995, the low number of children born corresponds to the affect of genocide. The monthly

distribution of births for each year will determine the proportion of births per month for each year. Thus to determine the monthly distribution of births the researcher computed the children born per month to the total number of children born in the same year and times per 100. The proportion of children who were born between January and April in the period 1990-1995 were compared with those born in year 1995 (Table 4.1 below).

Table 4.1 Monthly distributions of births per 100 births from 1990 to 2000.

Months	Years										
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
January	9.8	8.5	9.1	9.1	8.8	7.6	8.9	8.1	7.0	5.9	14.2
February	8.3	7.6	8.1	6.9	8.3	6.8	7.0	8.1	6.6	5.4	10.5
March	8.1	9.1	7.9	10.2	8.6	9.1	7.8	8.3	7.9	8.2	11.4
April	10.5	9.5	9.2	10.2	9.2	8.9	9.3	9.6	9.7	8.9	12.7
May	9.5	8.7	9.2	8.0	8.9	9.3	7.7	8.5	10.1	8.8	11.9
June	9.8	11.0	9.7	9.4	10.3	7.7	10.3	8.7	10.4	9.5	12.1
July	10.1	8.8	10.3	9.9	10.0	8.5	10.4	9.5	9.2	8.3	9.9
August	7.1	8.4	8.8	8.1	7.7	9.5	7.9	7.2	9.2	8.4	7.8
September	8.3	8.0	7.7	8.6	8.9	8.4	9.1	8.4	8.3	9.6	5.3
October	7.5	7.4	7.1	6.5	6.8	8.7	7.0	8.1	7.7	8.8	3.2
November	5.2	6.4	6.6	6.4	6.3	7.9	7.9	8.5	6.8	11.1	0.9
December	6.0	6.6	6.4	6.7	6.1	7.7	6.6	7.1	7.1	7.2	0.0
Total	100	100	100	100	100	100	100	100	100	100	100

Source: Data computed from EDSR-II-2000

From Table 4.1, it can be seen that there was a general decline in the proportion of live births per month between January and April during the period 1990-1999 especially in years 1991, 1995 and 1998. During the period 1990-1995 the distribution of births declined in 1991 and 1995.The decline in 1995 else in March during the following months January, February and April could be attributed to the 1994 Rwandan genocide.

4.2.2 Monthly fertility rates for each year

Table 4.2 shows the monthly fertility rates which describe the number of birth per 1,000 women per month and per year.

Table 4.2 Monthly fertility rate for each year for 1,000 women from 1990 to 2000

Months	Years										
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
January	19.3	12.2	16.6	15.7	18.5	12.2	17.0	13.5	9.7	9.9	17.9
February	16.4	10.8	14.6	11.9	17.5	10.8	13.5	13.5	9.1	9.0	13.3
March	15.9	13.0	14.4	17.5	18.1	14.5	14.9	13.8	10.9	13.8	14.4
April	20.7	13.7	16.7	17.7	19.4	14.2	17.8	15.9	13.4	14.9	16.1
May	18.7	12.4	16.7	13.9	18.7	14.8	14.7	14.1	14.0	14.8	15.0
June	19.3	15.8	17.6	16.2	21.7	12.3	19.7	14.5	14.4	16.0	15.3
July	20.0	12.6	18.6	17.0	21.0	13.6	19.9	15.8	12.8	13.9	12.5
August	14.1	12.0	15.9	14.0	16.3	15.2	15.0	12.0	12.7	14.1	9.9
September	16.4	11.5	14.0	14.9	18.7	13.4	17.4	14.0	11.4	16.2	6.7
October	14.8	10.6	13.0	11.2	14.3	13.8	13.3	13.5	10.7	14.8	4.0
November	10.3	9.2	11.9	11.1	13.4	12.5	15.1	14.2	9.4	18.6	1.2
December	11.9	9.5	11.7	11.6	12.7	12.3	12.5	11.9	9.8	12.1	0.0
Total	197.8	143.3	181.7	172.7	210.4	159.5	190.8	166.7	138.3	168.0	126.3

Source: Data computed from EDSR-II-2000

When comparing the monthly fertility rates of 1995 for the months January to April with those of corresponding months for the years 1990 to 1994, the monthly fertility rate is low only in January 1995. Hence the monthly fertility rate per 1,000 women can't explain the effects of genocide on fertility.

4.2.3 Analysis of estimates age specific rate and total fertility rate per year.

According to Demographic Health and Survey (DHS) in Rwanda, the total fertility rate (TFR) was 6.2 children per woman during the year 1992. In the year 2000 it was 5.8 children per woman. The decline in fertility between the periods 1992 to 2000 was estimated to be at 6.5 %.

Table 4.2 shows the annual trend of estimated TFR from 1990 to 2000. During this period there was a notable undulating trend in TFR. Finally the TFR was 4.4 children per woman. In comparison to the fertility rate in 1994, the fertility rate as at 2000 had declined by about 50%. By 1993, there was an overall decline to 7.5 children per woman. In 1994 there was an increase of TFR to 9.2 children per woman from 7.5 in 1993, representing an increase of 2.2%. In 1995, there was another drop of 30%, then another rise to 7.5 children per woman the following year. There after, there was a fall to a final figure of 4.4 children per woman.

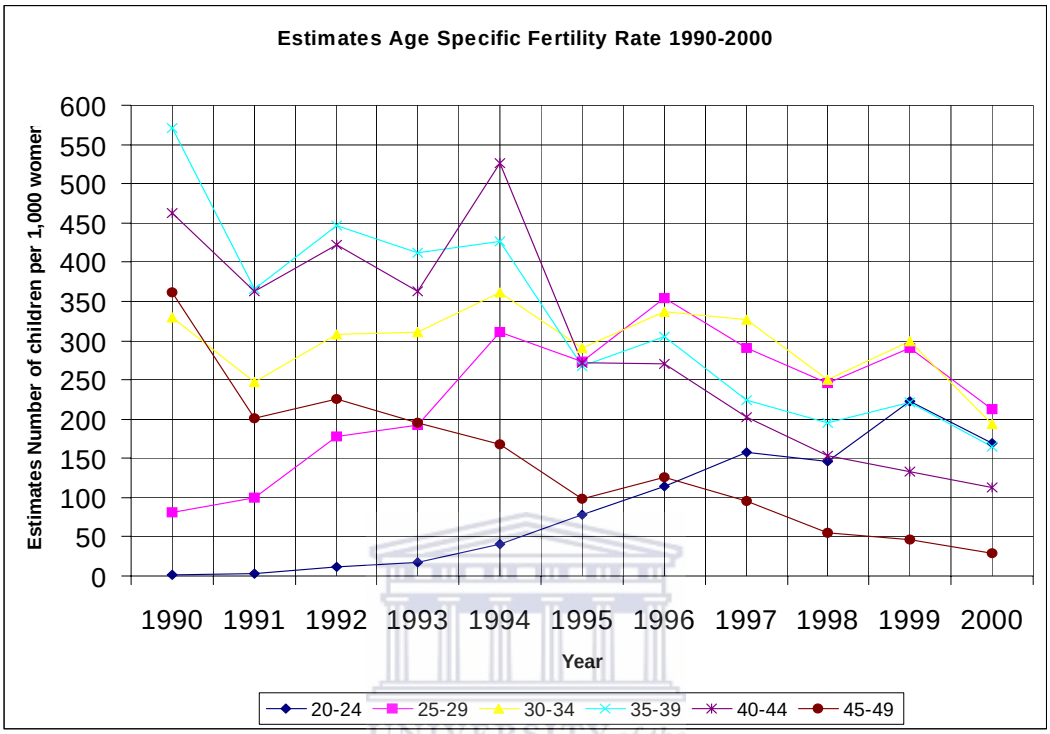
Table 4.3 Estimates Age Specific Rate (ASFR) and TFR per year

Year	Age group						Tot ASFR	TFR
	20-24	25-29	30-34	35-39	40-44	45-49		
1990	1.55	80.59	329.78	571.23	462.86	362.10	1808.11	9.0
1991	2.27	99.24	247.86	366.46	362.45	201.37	1279.63	6.4
1992	11.08	177.86	307.43	446.10	422.74	224.84	1590.05	8.0
1993	17.37	192.61	310.23	411.56	363.22	195.79	1490.77	7.5
1994	41.09	310.72	361.63	426.72	526.23	167.80	1834.19	9.2
1995	77.40	273.64	290.29	267.70	271.23	98.14	1278.42	6.4
1996	114.18	354.50	337.57	305.05	270.81	125.18	1507.30	7.5
1997	157.00	290.86	326.68	224.59	201.98	94.75	1295.87	6.5
1998	146.59	246.49	250.21	194.97	153.06	54.71	1046.05	5.2
1999	222.59	290.77	299.83	220.71	132.54	45.69	1212.14	6.1
2000	169.03	212.23	193.80	164.64	113.48	28.77	881.96	4.4

Source: Data computed from EDSR-II-2000

In 2000, the women aged 15-19 in 1994 were still children, this why in this study we did not include this age group. From Table 4.3, the age specific fertility rate is low for women aged 20-24 and 25-29 in 1990. It increase in the same age group 20-24 and 25-29 for the rest of years up to 2000 while for age group 30-34, 35-39, 40-44 and 45-49 it is undulated from 1990 and finish to be lowest in 2000. The decline in TFR between the years 1990 to 1993 can be explained by the economic crisis and civil war while the decline in 1995 could be linked to the genocide whilst the decline in TFR during the other periods, 1996 to 2000, is not easily attributable to genocide maybe to the factor as psychological may have resulted from genocide could be considered.

Figure 4.1 Estimates age specific fertility rate from 1990 to 2000.



Source: Data extract EDSR-II-2000

Figure 4.1 shows that fertility is linked with the age of the mother; it is low during the early years, and increases from age group 20-24 to 45-49 when it falls. This can be explained by the fact that after the age group 45-49 women enter menopause and thus are less likely to be productive as far as child bearing is concerned. This evidently causes the TFR to fall. By the year 1995, all the age groups except age group 20-24 showed a decline in fertility rates. This can only be attributed to possible effect of genocide.

The next section will explain the trend of changes in TFR by looking at some of the factors which could have been affected by genocide.

4.2.4 Analysis of determinants of fertility

4.2.4.1 Introduction

According to the Bongaarts' (1978) classification there are four proximate determinants of fertility and these can be evaluated by indices of marriage, contraceptive use, induced abortion and postpartum infecundability. Any change in a population fertility level can be the result of a change in any one or more of the proximate determinants. Thus, it is possible to say that the decomposition of a trend in the TFR was based on the fertility-inhibiting effects of the four principal proximate variables.

Agadjanian and Prata (2002) argued that war affects fertility through changes in its proximate determinants. Such determinants include factors such as delayed marriage, increased incidence and duration of marital separation such as found in cases of imprisonment, lower frequency of intercourse, and impaired fecundity and gestation owing to a general deterioration of health such rape of women**.** The conditions in warfare and the atmosphere of uncertainty they generate also may discourage individuals from having children or, at least, make them postpone the next birth by means of either traditional or modern contraception. Therefore, there was a need to investigate the four determinants of fertility in Rwanda.

4.2.4.2 Marriage

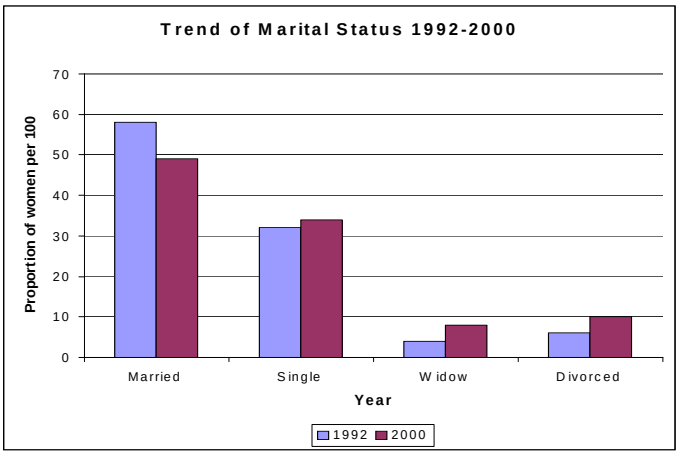
In Rwanda marriage offers the only accepted relationship in which most women have sex. Table 4.5 and Figure 4.2 below show the trend in marital status during two surveys.

Table 4.4 Marital status in 1992 and 2000 for 100 women aged 15-49 years old.

Year	Married	Single	Widow	Divorced	Total
1992	58	32	4	6	100
2000	48.5	34.1	7.9	9.5	100

Source: EDSR-I (1992) and EDSR-II (2000)

Figure 4.2 Marital status in 1992 and 2000 for 100 women aged 15-49 years old.



Source: EDSR-I (1992) and EDSR-II (2000)

Table 4.4 and Figure 4.2 shows that between the two surveys there was decrease of 9% in marriage while there was an increased of 2.1% of single, 3.9% widows and 3.5% divorcees The number of widows doubled which implies there was a high rate of male mortality during the war and genocide. These observations are supported by Hintjens (1999: 272) who observed that "…Bahutu who had married Batutsi partners were sometimes also killed to punish them for marrying the enemy".

According to the United Nations (2006), the women were deliberately raped and the survivors did spread HIV/AIDS to the general population/ or their spouses. This was often deliberate and not limited to women. At times, men were forced to have sex with women known to be HIV-positive. In this regard after genocide, many women lost trust in men and many opted for divorce. The RGPH (2002) noted that most of the households were destroyed and the mortality of men was remarkable. This mortality of men influenced an increased in later marriages as well as an increase in the proportion of single women. This change of attitude towards marriage, the increase of widows, single women and divorcees are all evidence of genocide effects of genocide. Thus genocide reduced the number of women who were able to conceive and bear children (Table 4.5).

Table 4.5 Number of women per status marital in 1992 and 2000 for 100 women aged 15-49 years old

Year	Married	Single	Widow	Divorced	Total
1992	3800	2096	262	393	6551
2000	5054	3554	823	990	10421

Source: EDSR-I (1992) and EDSR-II (2000)

However, statistically the affects of genocide on marital status were significant because the Chi-square test computed from Table 4.5 at level of significant 0.05 showed that chi-square value is 231.19 with p value equal $p<0.001$ which is significant.

The trend in age at first marriage can be assessed by computing the median age at marriage. Overally, the median age at first marriage for women aged 25-49 was estimated to be at 20 years in 1992 and 20.7 years in 2000 surveys thus posting an increase of 0.7 years (EDSR-I, 1992; EDSR-II, 2000). From these figures, one can deduce that delayed marriages may not have contributed to the recent fertility decline in Rwanda.

4.2.4.3 Abortion

Statistics on abortion in Rwanda are scarce and unreliable because abortion is illegal, unless it is intended to save the mother's life. Some information on abortion could be obtained from women who were admitted in hospitals for post-abortion complications, but such data is too small/limited to be used as indicators at the national level. Thus, it is difficult to make an evaluation or do an analysis of the contribution of abortion to the fertility decline in Rwanda.

However, it is not likely that this factor could have had any major impact on the aggregate fertility trends. The other factor that can explain the lack of data on abortion is that since it is illegal no woman is willing to declare that they have been willing victims. During the genocide it was not easy to determine the case of abortion.

4.2.4.4 Contraception practices

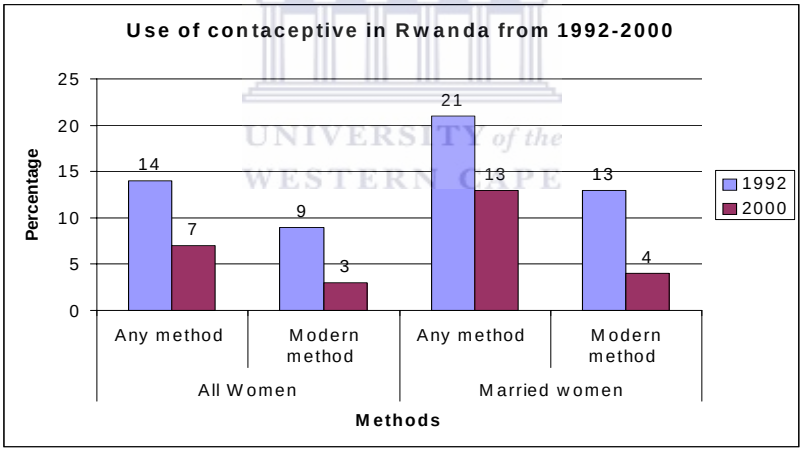
Table 4.6 and Figure 4.3 show the number of women who use the contraception in 1992 and 2000.

Table 4.6 Number of women aged 15-49 who use contraceptive in 1992 and 2000

Year	All Women		Married women		Total
	Any Method	Modern Method	Any. Method	Modern. Method	
1992	917	590	1376	852	6551
2000	729	313	1355	417	10421

Source: EDSR-I (1992) and EDSR-II (2000)

Figure 4.3 Use of contraception per methods, for 100 women aged 15-49 in 1992 and 2000.



Source: EDSR-I (1992) and EDSR-II (2000)

It is clear from Figure 4.3 that there was a decline of 7% in contraception use among all women during the two surveys while among married women it can be observed that contraception use declined by 8%. Moreover there was a decline of 3% for all women and 9% for married women in the use of modern contraceptive methods. Because the use of contraceptives was shown to be generally low during the survey period, contraceptive practices would therefore not account for the reported decline in fertility.

From Figure 4.3 one can see that the use of contraceptives declined in 2000 survey. This decline can be attributed to the disruption and destruction of available health services especially the health personnel who educated the public on family planning methods.

The RGPH (2002) noted that a large part of health infrastructure was destroyed and most of the health workers also either died in the war or were rendered functionally irrelevant hence poor delivery of health services. The immediate consequence was an expected increase in infant mortality rate which rose to 129 children per 1,000 in 1994. Thus it can be argued that the genocide contributed to the destruction health infrastructure as well as death and disruption of human resource personnel responsible for educating the general public on the best contraceptive practices and this affected the rate of fertility. From Table 4.6 at level of significant 5%, the chi-square test value is 22.36 with degree of freedom (df) is 1 and $p<0.0001$ for all women. The test is significant and for married women the chi-square value is 98.57 with degree of freedom (df) is 1 and $p<0.001$ which is also significant.

4.2.4.5 Postpartum infecundability

Breastfeeding is common in Rwanda and the estimated median duration of breastfeeding was 25.9 months in 1992 and at 29.9 months in 2000 (EDSR-I, 1992; EDSR-II, 2000). Rwandan women are not susceptible to another conception when amenorrhoea (which is primarily determined by the length and intensity of breastfeeding) and/or are abstaining from sexual relations.

This suggests that in societies where there is very little use of contraceptives, breastfeeding, sometimes in conjunction with postpartum sexual abstinence, is important as a method of birth spacing. The EDSR-II (2000) revealed that the median duration of amenorrhoea, sexual abstinence and insusceptibility were on average, 14.3; 0.6; 15.3 months respectively, whereas the corresponding figures in 1992 were 16.6; 0.6; 17.1 months respectively (EDSR-I, 1992; EDSR-II, 2000). It appears that the median duration of insusceptibility during the year 2000 was 17.1 months and 29.9 months of breastfeeding. There was an increase of 1.8 months to 4 months of insusceptibility and breastfeeding in 2000 in comparison to 1992 where it was 15.3 months and 25.9 months insusceptibility and breastfeeding respectively The changes in duration of postpartum insusceptibility and breastfeeding are, therefore, not likely to be an important factor in the

recent fertility decline.

4.2.5 Socio-economic

Lindstrom and Berhanu (1999) argued that war and economic crisis may result in significantly lower fertility. The interactions between child mortality and fertility play a central role in explaining demographic transitions (Legrand and Philips, 1996). The trend of change in child mortality was estimated at 150.3 deaths per 1,000 in 1992 and 196.2 deaths per 1,000 in 2000 (EDSR-I, 1992 and EDSR-II, 2000). This trend showed that there was an increase in child mortality in 2000.

Economically, agriculture is the principal source of income in Rwanda since the country has few natural and mineral resources. Agriculture contributed at 41% to gross domestic product (EDSR-II, 2000). A combination of the factors such as the decline of the price of coffee in international market from 1989, the structural adjustment programmes and civil war in 1990, contributed to the low gross domestic product (Lemarchand and Chossudovsky in Hintjens, 1999).

The GDP per capita (constant 2000 US $) increased from $251 in 1990 to $152 in 1994 (World Bank 2006). During this period Lemarchand and Chossudovsky in Hintjens (1999) argued that the military budget increased because of the increase in the number of soldiers which grew from 7,000 troops in 1989 to more than 30,000 by 1994. Furthermore, in 1992 the emergency financial assistance provided to the government to pay for essential food and drug imports was reportedly diverted into arms purchases (see Hintjens, 1999).

Tardif-Douglin in Hintjens (1999) and Nteziliyo in Hintjens (1999) noted that the implications of genocide on the economy were catastrophic and the 1994, harvest was less than half of what was produced in 1993. Furthermore they report that by June 1994, almost all the cattle in Rwanda were dead. All these factors contributed to the recent reduction of fertility.

Woldemicael (2005) argued that no single factor can explain the onset of fertility decline

and fertility decline may have been due to the impacts of the border conflict, which increased the proportion of spousal separation. Although the period of study was not sufficient to measure the onset of fertility decline, the study showed that Rwanda has undergone fertility transition since the 1990s. According to RGPH (2002) the proportions of divorced and separated women increased in proportion of eight widows to one man. Specifically in age group 35-55 the proportion was 10 to 14 widows to one widower. Most of those women were victims of war, who had lost their husbands during the war and genocide in 1990-1994.

The situation was not made any easier for human beings as they were not only physically in danger but also psychological insecure. Furthermore, there was not enough food hence the normal nutritional circle was interfered with during this period. Scholars have argued that psychological stress and declines in nutritional status associated with famine tend to reduce fecundity and the frequency of intercourse (Bongaarts and Cain in Lindstrom and Berhanu, 1999; Caldwell and Caldwell in Lindstrom and Berhanu, 1999; Kidane in Lindstrom and Berhanu (1999). In addition they point out that in such conditions couples are separated due to forced migration, imprisonment, physical handicaps and even death, and such conditions contribute to a reduction of fertility.

4.2.6 Logistic Regression

In this study, the model of logistic regression as defined in section 3.3 was used to investigate the effect of the independent variable (IDV) X on the dependent variable (DV) Y. Where X is age of woman, calendar year and married and Y is an indicator variable for the woman giving birth in the calendar year. x_1 is the age of a woman in a calendar year, x_2 is calendar year, x_3 is an indicator of being married in that year. The model expresses the estimated probability, for a given woman to give birth. The probability is based on the year of first marriage, age and calendar year, once a woman stayed married. Thus the variables x_1, x_2 and x_3 were used as categorical variables and represented a number of indicator variables. Mathematically the model used is expressed as:

$$\log it\frac{P}{1-P} = \alpha + \beta_1 age + \beta_2 calendaryear + \beta_3 married \quad (1)$$

Where $$P = \Pr[Y = 1/X] = \frac{e^{\alpha+\beta_1 age+\beta_2 calendaryear+\beta_3 married}}{1+e^{\alpha+\beta_1 age+\beta_2 calendaryear+\beta_3 married}}$$

Through logistic regression, the investigation was done to verify the effect of the IDV, age, calendar year and married on the DV have given birth (see Table 4.8). To compare the pairwise years, the differences of least squares means were used in Table 4.9. Table 4.10 and Figure 4.4 show the estimated probability of married women of given age to give birth in a given year.

Table 4.7 Odds Ratio of having a birth in given year knowing age, calendar year and married (Married=1 and never married=0)

Age	Odds	Confidence limits	
48 (Ref)			
15	5.241***	1.242	22.112
16	6.504***	1.563	27.069
17	11.963***	2.914	49.118
18	18.369***	4.493	75.101
19	22.782***	5.582	92.974
20	21.118***	5.177	86.141
21	23.863***	5.853	97.285
22	24.131***	5.921	98.344
23	23.836***	5.849	97.134
24	23.294***	5.717	94.917
25	22.721***	5.576	92.589
26	20.950***	5.141	85.380
27	20.999***	5.153	85.575
28	20.416***	5.009	83.209
29	18.511***	4.542	75.445
30	18.802***	4.612	76.645
31	17.718***	4.347	72.227
32	17.537***	4.301	71.496
33	15.946***	3.911	65.026
34	15.386***	3.773	62.743
35	13.976***	3.426	57.014
36	13.671***	3.351	55.774
37	12.911**	3.164	52.685

38	11.171***	2.736	45.618
39	10.652***	2.608	43.510
40	9.796***	2.395	40.072
41	7.742***	1.889	31.730
42	6.238***	1.516	25.661
43	4.107 (NS)	0.990	17.034
44	4.040(NS)	0.969	16.848
45	2.719(NS)	0.638	11.586
46	2.055(NS)	0.464	9.105
47	1.205(NS)	0.239	6.080
Year			
1999 (Ref)			
1990	1.381***	1.266	1.506
1991	0.868***	0.793	0.950
1992	1.165***	1.069	1.269
1993	1.059(NS)	0.972	1.153
1994	1.328***	1.224	1.441
1995	0.884***	0.812	0.961
1996	1.138***	1.049	1.234
1997	0.964(NS)	0.889	1.046
1998	0.767(NS)	0.706	0.834
Married (Ref)			
Not married	0.053***	0.048	0.059

NS: no significant; * significant at 10%; ** significant at 5%; *** significant at 1%, ref= reference

In Table 4.7, the reference age is 48 years; the year 1999 is the reference of calendar year and married. From the women aged 43 to 47, the odds are not significant than for women aged 48. The odds of woman increase from the age of 15 years reaching a maximum at 28 years, then starts declining up to the age of 47 years. For instance, the odds of women of 15 years of age are 5.241 times to give birth than the odds of women 48 ages. Those odds rest significant from 15 years of age to 42 years and not significant from 43 years to 47 years. This may be that these women are no longer productive. The odds of the years 1993, 1997 and 1998 are not significant. The odds of women who are not married are significant. The odds of women in 1991 and 1995 were low compared to 1999. The reduction in odds in the year 1995 could have been contributed by the effects of the genocide in 1994.

Table 4.8 Differences of Least Squares Means: Comparison of having birth between paiyears

year	_year	Estimate
1990	1991	0.4637***
1990	1992	0.1704***
1990	1993	0.2655***
1990	1994	0.0388 (NS)
1990	1995	0.4454***
1990	1996	0.1919***
1990	1997	0.3562 ***
1990	1998	0.5842***
1990	1999	0.3207 ***
1991	1992	-0.2933 ***
1991	1993	-0.1981***
1991	1994	-0.4248***
1991	1995	-0.0183 (NS)
1991	1996	-0.2718***
1991	1997	-0.1075**
1991	1998	0.1206**
1991	1999	-0.1430***
1992	1993	0.0951*
1992	1994	-0.1316***
1992	1995	0.2750***
1992	1996	0.0215 (NS)
1992	1997	0.1857***
1992	1998	0.4138***
1992	1999	0.1503***
1993	1994	-0.2267***
1993	1995	0.1799***
1993	1996	-0.0736*
1993	1997	0.0906*
1993	1998	0.3187***
1993	1999	0.0551 (NS)
1994	1995	0.4066***
1994	1996	0.1531***
1994	1997	0.3173***
1994	1998	0.5454***
1994	1999	0.2818***
1995	1996	-0.2535***
1995	1997	-0.0893**
1995	1998	0.1388***
1995	1999	-0.1247***
1996	1997	0.1643***
1996	1998	0.3923***
1996	1999	0.1288***

1997	1998	0.2281***
1997	1999	-0.0355 (NS)
1998	1999	-0.2636***

NS: no significant; * significant at 10%; ** significant at 5%; *** significant at 1%

The comparison between pairwise years (Table 4.8) shows that the difference was significant. Whereas during the following years: 1990 and 1994; 1991 and 1995; 1992 and 1996; 1993 and 1999; 1997 and 1999; the difference was not significant. It could also be that the variations in each year were different from the other. The pairwise years 1995 and others were significant. This could be because of the effects of the war that took place in 1994.

Table 4.9 Estimated probability of woman to have birth knowing age, calendar year and being married (Married=1 and never married=0) for selected age.

Age	Year	Probability (Married=0)	Probability (Married=1)
15	1990	0.0085158118	0.1388040621
15	1991	0.0053731199	0.0920431524
15	1992	0.0071910561	0.1196571801
15	1993	0.0065428979	0.1099951047
15	1994	0.008194103	0.1342266858
15	1995	0.0054716085	0.093580821
15	1996	0.0070393888	0.1174140049
15	1997	0.0059794175	0.1014318735
15	1998	0.0047657842	0.0824514097
15	1999	0.0061940371	0.1047116651
20	1990	0.0333002922	0.3926224512
20	1991	0.0212067203	0.2890540473
20	1992	0.0282297347	0.3528068672
20	1993	0.025734431	0.3314056236
20	1994	0.0320725672	0.3834012388
20	1995	0.0215891371	0.2928215213
20	1996	0.0276466948	0.3479202861
20	1997	0.0235573499	0.3116410175
20	1998	0.0188435843	0.2649222715
20	1999	0.024387416	0.3193025845
25	1990	0.0355549101	0.4089143954
25	1991	0.0226617298	0.3031936932
25	1992	0.0301517551	0.3684488908
25	1993	0.027491365	0.3466069604
25	1994	0.034247006	0.3995622635
25	1995	0.0230697661	0.3070658621
25	1996	0.0295302252	0.3634673311
25	1997	0.0251694906	0.3263783225
25	1998	0.0201397933	0.2783436253
25	1999	0.0260548463	0.3342262836
30	1990	0.029654484	0.3644690273
30	1991	0.0188591195	0.2650858694
30	1992	0.0251246371	0.3259761899
30	1993	0.0228973343	0.3054343938
30	1994	0.028557203	0.3555219956
30	1995	0.0192000329	0.2686589982
30	1996	0.0246041043	0.3212767512
30	1997	0.0209551035	0.2865548349
30	1998	0.016753107	0.2422731955
30	1999	0.0216955143	0.2938629541

35	1990	0.0222274452	0.2990282216
35	1991	0.0140965285	0.2115495566
35	1992	0.0188101172	0.2645696071
35	1993	0.0171327597	0.246482353
35	1994	0.0213989205	0.2909521912
35	1995	0.0143526087	0.2146117927
35	1996	0.0184179371	0.2604134078
35	1997	0.0156716575	0.230039871
35	1998	0.012515574	0.1921395616
35	1999	0.0162284816	0.2363842176
40	1991		0.1590559559
40	1992	0.0133337962	0.2022952465
40	1993	0.012138738	0.1873806294
40	1994	0.0151805639	0.2243624037
40	1995	0.0101605947	0.1615139902
40	1996	0.0130542752	0.1988528145
40	1997	0.0110987226	0.1739704815
40	1998	0.0088552883	0.1435852171
40	1999	0.0114949649	0.1791282254

Figure 4.4 Estimated probabilities for woman to give birth knowing age, Calendar year and being married

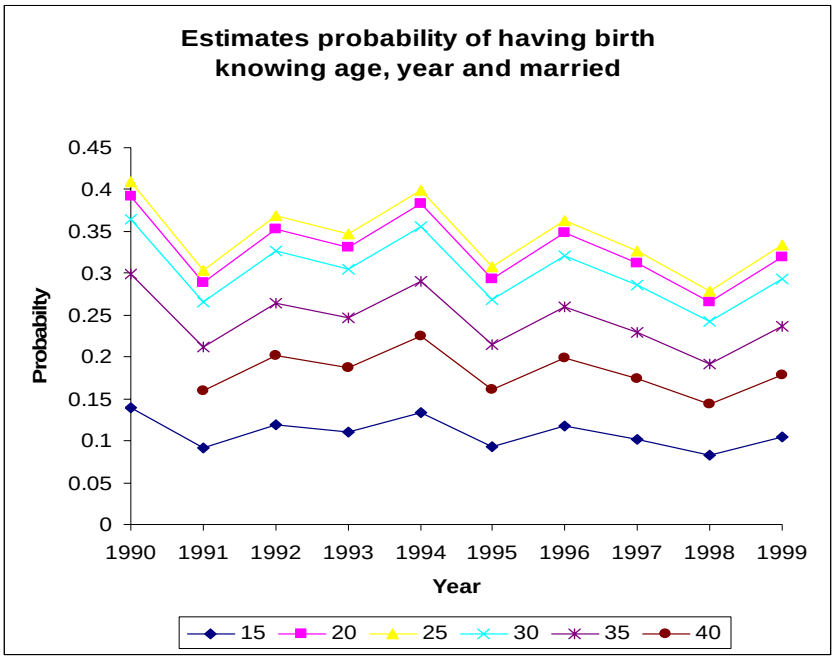


Figure 4.4 show that in the earliest and oldest age groups the estimated probability to have a child was low. For instance, the probability of having a child for woman aged 15 and 40 years old did not exceed 0.15. Young women had a greater chance of giving birth in a given year when they get marriage. Similarly, women aged 20 to 35 years have high probability of having birth when they were married. According to the Figure 4.4 it looks like all the age are parallel. This observation is not correct because this depends on the model. There was a remarkable trough in 1991, 1995 and 1998 per age group for the same years. The trough observed from this figure explains that there were some factors which contributed to the decline of birth during those periods.

In comparison of the 1995 trough with the others trough observed in 1991 and 1998, this valley is not more pronounced as expected. Furthermore, among the factors which, contributed to the reduction of estimated probability, the 1994 Rwandan genocide could be one of them especially in 1995. There was therefore available evidence of the effect of genocide on fertility rate, but because of missing variables from the present data set, it was not easy to estimate the proportion or probability linked to the effect of the genocide.

4.3 Conclusion

The 1994 Rwandan genocide put people in pathetic conditions. People were forced out of their homes into exile both within and out of the country. In such conditions people re-considered the issue of bearing children against the need for survival. Families were also forced into separation as partners had to take refuge separately, let alone imprisonment and camping. Such psychological stress negatively affected fecundity and frequency of intercourse**.**

Even though the use of contraceptives was low especially in the 2000 survey and one would expect an increase in fertility rate in such cases, this was not the case in the period under study. This implies that there were other factors which contributed to the observed decline. This study has suggested that one such factor was the genocide.

In addition there was indiscriminate unprotected sex, which exposed women to unwanted pregnancies as well as sexually transmitted diseases such as HIV/AIDS. This implies that since most mothers were susceptible to contracting HIV/AIDS, most of the children were exposed to death before delivery while those who were carried to term had less chances of survival.

On the other hand, during war and genocide, all the health infrastructures were destroyed thus resulting in poor delivery of health services to all those that required it.

This study used different approaches to assess the impact of genocide. Firstly the study examined fertility rate in the year after genocide. Results were compared with those of previous years as presented in section 4.2. The results showed that there was a decline of fertility in 1991, 1995 and 1998. The decline of fertility in 1995 was not more pronounced in comparison to the others years. In fact, the 1994 Rwandan genocide affected some determinants of fertility and there were some change on socio-economic factors. For instance the 1994 Rwandan genocide decreased the number of married women and increased the number of single, widow and divorced. The comparison of monthly fertility rate in between the period 1990 to 1994 and 1995 from January to April proved that there were effects of Rwandan genocide on fertility. Thus the 1995 fertility rate decline could be attributed to the effects of genocide as one of the factors.

Secondly, through a logistic regression, the results in Table 4.7 were significant and Table 4.8 shows that the comparison between the pairwise years was significant. Table 4.9 and Figure 4.4 show the decline in probability for the years 1991, 1995 and 1998.

The decline in 1991 could be explained by economic crisis and starting of war in 1990 while the 1995 decline attest the possible implications of genocide on fertility. Furthermore the valley in 1995 is not more pronounced in comparison to the years 1991 and 1998. The 1994 Rwandan genocide among others factors contributed to reduce fertility. Therefore the proportion genocide contributed to the reduction of fertility, the study could not estimate, because of the data set used was not enough to make this

decision. Moreover, constant migrations from Rwanda to other countries and back during the period under study may have complicated the process of collection of appropriate data related to genocide. Hence it was not easy to quantify the effect of genocide on fertility.

4.4 Recommendation

In this study, it was showed that the 1994 Rwandan genocide contributed to the reduction of fertility. This Rwandan fertility transition implication of genocide was not quantified because of lack of data. Therefore there is need to conduct a new survey in which will included others variables such as; the number of women who were killed, and raped during the genocide, the number of stillbirth, the number of birth of normal infants, and neonatal death. The survey should also include the analysis of others factors such as psychological, technologic and anthropologic and proportion of HIV/AIDS infected persons and migration.

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