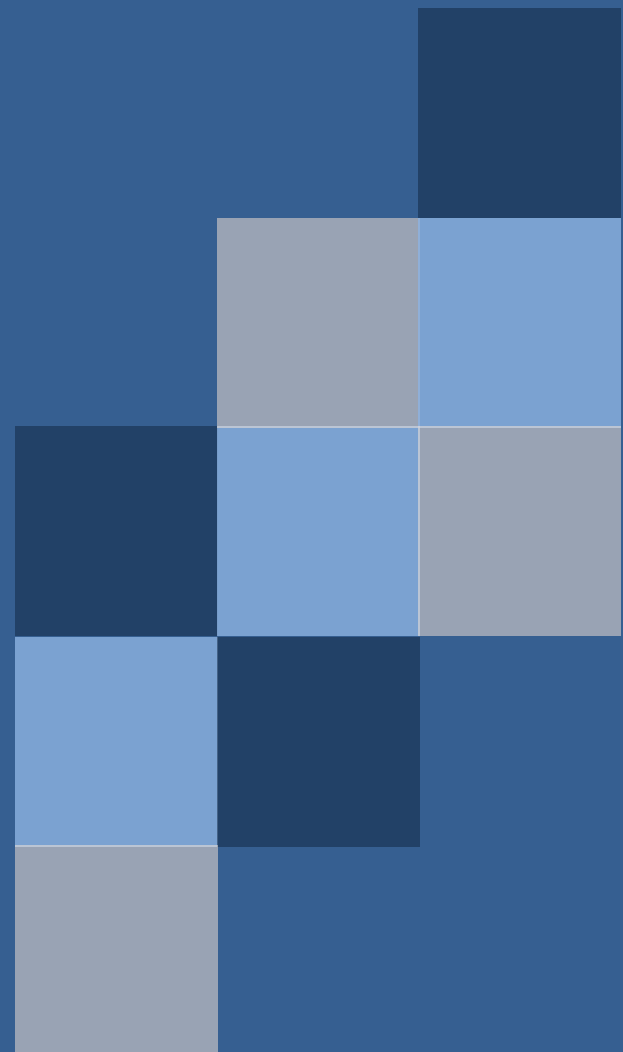THE REPUBLIC OF RWANDA

NATIONAL INSTITUTE OF STATISTICS OF RWANDA

Fourth Population and Housing Census, Rwanda, 2012

Thematic Report

Fertility

NATIONAL INSTITUTE OF STATISTICS OF RWANDA

THE REPUBLIC OF RWANDA

Ministry of Finance and Economic Planning
National Institute of Statistics of Rwanda

Fourth Population and Housing Census, Rwanda, 2012

Thematic Report

Fertility
January 2014

Table of Contents

List of Tables

List of Figures

List of Abbreviations

ASFR   Age-Specific Fertility Rate

ARFE   Arriaga Fertility Estimates

CBR   Crude Birth Rate

CEB   Children Ever Born

DHS   Demographic and Health Survey

EICV   Enquete Integree sur les Conditions de Vie des ménages (Living Standard Measurement Survey)

GFR   General Fertility Rate

GRR   Gross Reproduction Rate

ICPD   International Conference on Population and Development

MAFB   Median Age at First Birth

LFOR   Late Fertility Onset Rate

LFR   Late Fertility Rate

MAWC   Mean Age of Women at Childbearing

MIC   Middle Income Country

NRR   Net Reproduction Rate

NISR   National Institute of Statistics of Rwanda

ONAPO   Office National de la Population (National Population Council)

PHC   Population and Housing Census

PPR   Parity Progression Ratio

RIDHS   Rwanda Interim Demographic and Health Survey

SBR   Standardized Birth Rate

STIs   Sexually Transmitted Diseases

TFR   Total Fertility Rate

FOREWORD

The undertaking of Population Censuses in Rwanda goes back to the year 1978 where the first ever Census was implemented. The second and third censuses were carried out in 1991 and 2002. The 2012 Census marks the Fourth in the series. It is undoubtedly that Census information, particularly if made available on a regular basis, is indispensible for planning, policy development, evaluation and for research purposes.

The final results of the 2012 Census are published in the form of statistical tables and analytical thematic reports. Generally, the results provide population counts down to the lowest administrative level, as well as demographic and socioeconomic indicators at both national and district levels. I recommend that such invaluable information contained in the census results be used as updated benchmarks for all development planning, and in monitoring and evaluation of Rwanda's development goals.

On this occasion, I would like to seize this opportunity to thank His Excellency the President of the Republic of Rwanda for his direct support to the census, the Government of Rwanda and development partners for providing the required resources for conducting the 2012 Census. Special gratitude goes to One UN, the European Union (EU), the United Nations Population Fund (UNFPA), the World Bank (WB), the United Kingdom AID (UKAID-formerly DFID), UN Women and UNICEF.

I would also like to thank all members of the National Census Commission and the Census Technical Committee for their able guidance of the entire Census operation. The National Institute of Statistics of Rwanda (NISR) deserves special appreciation for the successful implementation of this huge statistical undertaking and releasing the final results on time.

Special gratitude goes to all respondents, field staff from NISR and other government institutions and international experts for their sincere cooperation and dedication to successfully complete the mission.

Claver GATETE
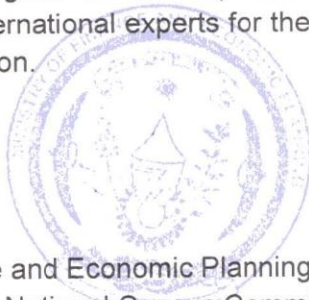
Minister of Finance and Economic Planning, and
Chairperson of the National Census Commission

ACKNOWLEDGEMENTS

The National Institute of Statistics of Rwanda (NISR) is pleased to release the final results of the Fourth Population and Housing Census (PHC4). The execution of different Census phases: preparatory works, data collection, data processing, tabulation and data analysis continued for about four years -- between 2010 and 2013.

NISR has published several Census analytical reports to be of direct help to policy makers, planners, local authorities and other users. The reports have dealt with several issues from population size and distribution, education, settlement, labour, population projections to mention but a few. NISR hopes that the analytical reports would meet the demand of Census data users at central and local levels.

On this occasion, I would like to pay our sincere gratitude to the President of the Republic of Rwanda for the Presidential Decree No. 02/01 of 07/02/2011 organizing the 4th Population and Housing Census and the Minister of Finance and Economic Planning the Chairperson of the National Census Commission for the Ministerial Order No. 001/12/10/TC of 19/01/2012 determining the administrative structure and technical organization of the 2012 Population and Housing Census. These legal instruments laid a solid foundation for all activities that followed without which not much could be achieved.

I also take this opportunity to thank the National Census Commission, the Branches of the Commission at Province and District levels and the Census Technical Committee whose invaluable guidance and advice enabled carrying out Census operations in a highly professional and timely manner.

My greatest gratitude extends to the Government of Rwanda and development partners for availing logistical and technical support.

Special recognition goes to the Ministries of Defense, Local Government, Education, Internal Security, Foreign Affairs, the National Police and National Correctional Services for the direct involvement in field data collection operations.

I also wish to express my appreciation to the local government authorities and NISR staff for their excellent operational organization and to the tens of thousands of enumerators and supervisors for their painstaking efforts throughout the data collection phase.

Finally, the people of Rwanda, residents and visitors your cooperation was crucial for the success of the census. Thank you.

MURANGWA Yusuf

Director General,
National Institute of Statistics of Rwanda

Executive Summary

The objectives of the present report are to estimate the current levels of fertility, trends over time, geographical and socio-economic variations in fertility in Rwanda. The three main findings of the analysis are:

- Fertility is decreasing substantially in Rwanda but not at a too low level that would compromise the replacement of the population at the next generation.

- Fertility varies substantially over provinces and women's characteristics.

- Not negligible proportions of Rwandan women have high-risky fertility behaviours (childbearing at adolescence and at late age) that compromise their own and children's health and well-being.

Fertility Levels and trends

Under the current fertility conditions, a woman residing in Rwanda would have 4 children at the end of her reproductive life. Fertility varies across Provinces. The Total Fertility Rate (TFR) is 3.1 children per woman in Kigali City, 3.6 in the North, 4.0 in the South and 4.4 in the East and West. The analysis seems to indicate a shift of high fertility from Northern to Eastern Provinces as important migration flows are directed from the first to the latter.

Fertility has greatly declined over time since the current level of the TFR (4 children) is as low as less than half its level in 1978 PHC (8.6 children). However the decline was not homogeneous over time. It was slow in the beginning, followed by an increase then a fast decline after 2005. This roughly corresponds to four distinct periods: (i) the mid 70's to mid 90's when an explicit anti-natalist policy was implemented; (ii) the period from 1994 to 1994 which correspond to a civil unrest, (iii) the genocide against the Tutsi aftermath where families were being reunited and baby boom took place to replace the deceased as is classically observed after conflict with high death toll; and (iv) the period 2005 to present characterized by a strong population and development policy aimed, among others, at harmonizing the availability of resources in the country with population growth. This reflects the real impact of interventions aimed at controlling fertility implemented in Rwanda over the last three decades.

Fertility pattern and timing

The pattern of fertility in Rwanda is similar to the one found in the developing countries. Fertility is low during adolescence (less than 0.03 child per woman between 15 and 19 years) followed by a steady increase to reach its maximum by age 25-29 years (0.2 child per woman). Then it decreases continuously to reach 0.02 child per woman by age 49 years. This pattern varies by Province. In Kigali City, the maximum of the childbearing is extended to two age-groups (25-29 and 30-34 years) while fertility reaches its maximum between 25 and 29 years in the other Provinces. This is reflected in the Mean Age of Women at Childbearing (MAWC) which is 29.2 years at the national level, 28.6 years in Kigali City, 28.8 years in Northern Province, 29.1 years in Eastern Province, 29.3 years in Western Province and 29.6 years in Southern Province. The MAWC has continuously decreased from 32 years in 1978 to 31.3 in 1991 and 31.0 in 2002.

Fertility differentials by Education and Religion

Fertility varies significantly according to women's educational level and religious affiliation. Women with secondary educational level and above have twice fewer children (TFR of 2.6 children) than women with no education (TFR of 4.7 children). The TFR is 4.4 among women with primary or post-primary education.

Regarding Religion, TFR varies from a minimum of 3.5 children per woman among Jehovah Witness to a maximum of 4.3 children per woman among Protestants. TFR is 4.1 among Adventists. The low level of fertility among Catholics (TFR of 3.9) as compared to Protestants (4.3) is explained by the Catholic Church's program that promotes natural family planning. Moreover, Catholic women are more likely to use modern contraception ceteris paribus as shown by UWAYEZU (2009) in a multivariate analysis of the determinants of modern contraception use among Rwandan women.

Muslim's fertility is the second lowest one after the Jehovah witnesses (3.7 children per woman) may be explained in the case of Rwanda by the fact that Muslims reside mainly in urban areas (54%) and have among the highest educational level (30% of Muslim women of 15 to 49 have a secondary or higher level of education while at the national level this is only 15.8%). Muslim women have therefore more modern fertility behaviours than most of the other women.

Adolescent fertility

Fertility among adolescents is very low before age 17 but becomes substantial at age 18 and 19. In fact, the percentage of adolescent girls who gave birth is 2.6% at national level. It is stable around 1% up to age 16 from which it starts to increase quickly: 2% at age 17, 6% at age 18 and 12.3% at age 19.

This pattern does not vary by area of residence but varies significantly by current school attendance. It is far higher among out-of school adolescents than among in-school adolescents. Childbearing is a rare event among in-school adolescents (2% at age 19 and less than 1% before gave birth) and more common among out-of-school adolescents, i.e. the drop-outs and the never-attended, just above 5% before age 17 and more than 20% by age 19.

In terms of geographic variations, Kigali City has levels closer to the national ones, e.g. 12.3% by age 19; the Eastern Province has the highest prevalence of adolescent fertility, e.g. 16% by age 19; and the other provinces (South, West, North) have lower levels than the national one.

Adolescent fertility has decreased between 2002 and 2012. The percentage of adolescents who already gave birth dropped from 3.6% in 2002 to 2.9% in 2012. This decrease actually occurred in age-group 16-19 years. The percentage remains low and stable before.

Though fertility is decreasing among adolescents the decline is less important than in older age-groups, especially among women aged 35-39. Adolescents' contribution to the Total Fertility Rate (TFR) has increased from 3% to 4% between 2002 and 2012. This is also the case for the age-group 20-24 (from 17 to 19%). In contrary the contribution to TFR has

decreased for women aged 35-39 and 45-49 years (from 19 to 17%) and remained at the same level for women aged 25-29 years (25%), 30-34 years (23%) and 40-44 years (10%).

Late childbearing

Starting childbearing at late age bears many risks to mother's health. Age 35 is usually set as the lower age boundary for late childbearing onset. In Rwanda late childbearing onset is rare. Among women who gave birth in the last 12 months only 0.5% were aged 35 and above when giving birth to their first child (1480 women). However, this percentage is higher as compared to 2002 (0.2%). The percentage of women who start late their childbearing varies slightly by province: 0.4% in the Western Province, 0.5% in the Northern, Eastern and Southern Provinces and 1% in Kigali City.

Women who pursue childbearing until late ages are exposed to high risk for their own health and their children's health. In this analysis we define late childbearing as giving birth at 45 years or above. The percentage of women who gave birth during the last 12 months among women aged 45 years and above is 1.2%. Overall, 4,262 women aged 45 and above have given birth during the year preceding the census, meaning that a non-negligible of Rwandan women continue to give birth till late ages. Late fertility behaviour does not vary according women's background characteristics such as Province of residence, area of residence, educational attainment and current economic activity status. This means that late childbearing is strongly backed by a cultural characteristic. Strongly culturally backed behaviours do not vary much by characteristics such as the ones mentioned above.

Premarital fertility

At the national level 12% of single women at the time of the census have already given birth. This percentage does not vary by area of residence and varies only slightly by province from 10% in the Western and the Northern Provinces to 13% in Kigali city and in Southern Province. It varies more importantly according to educational attainment level, religious affiliation and household living standard. The prevalence of premarital fertility varies from 7% among women with secondary and above educational attainment level to 11% among those with primary level and 33% among non-educated women. By religious affiliation we distinguish three main groups: Women with no religious affiliation who have the highest prevalence of premarital fertility (27%), the Christians who have the lowest prevalence of premarital fertility (between 10 and 11%), and the Muslims and women with other religious affiliation who have prevalence of premarital fertility between the two extremes that are respectively 17% and 15%.

Infertility and sterility

The percentage of childless women at the end of the reproductive span (50-54 years or 55-59 years) is an indirect measure of the prevalence of sterility in a population. The prevalence of sterility in Rwanda is 3.1% as at the end of the reproductive span (either 50-54 years or 55-59 years) 3.1% women are childless. This level is the same as in 2002. The prevalence of sterility has therefore not changed over the past decade in Rwanda.
The measure above overestimates the true prevalence of sterility because some of the childless women aged 50-54 or 55-59 years may have not had children for reasons not

related to their physiological ability to become pregnant or to give birth. For instance it may be due insufficient lack of exposure to the risk of pregnancy (case of women who never get married), women with mental disability, women who voluntarily decide to not have children.

General fertility indices

Overall, Rwandan women gave births to 321,506 babies during the 12 months preceding the census, equivalent to approximately 880 births per day. In other words, 6 babies are born in Rwanda every ten minutes. The corresponding Crude Birth Rate (CBR) is 31 births per thousand inhabitants per years and the General Fertility Rate (GFR) 122 births per thousand women aged 15-49 per year. Fertility has decreased a lot since 1978, especially between 2002 and 2012. The Standardized Birth Rate (SBR) was 54 children per 1,000 inhabitants per year in 1978, 46 in 1991, 41 in 2002 and 31 in 2012. Fertility varies significantly across Provinces. The SBR varies from a minimum of 24 children per one thousand inhabitants in Kigali City to a maximum of 34 in the Eastern Province.

Population Replacement

To ensure that the population will not decline over time, each woman in the reproductive age should be replaced at least by one daughter. There are three indicators to capture the likelihood of the population to be replaced. The first one is the TFR that should be greater or equal to 2.1 children to ensure the replacement of the population for the next generation. The two others are the Gross Reproduction Rate (GRR) and the Net Reproduction Rate (NRR) which are the number of daughters a woman would have at the end of her reproductive life under the current fertility conditions not taking into account female mortality (GRR) and taking it into account (NRR). Both GRR and NRR should be greater or equal to 1 to ensure that each female is replaced by a daughter.

According the 2012 PHC, the TFR is 4.02 children per woman, the Gross Reproduction Rate (GRR) is 2.0 daughters per women, and the Net Reproduction Rate (NRR) is 1.6 daughters per woman. All these indicators show that the replacement of the Rwandan population is guaranteed.

Chapter 1: Overview of the Fourth Rwanda Population and Housing Census

1.1   Context and justification

The history of the Population and Housing Census in Rwanda dates back to the 1970s. To date, four modern censuses have successfully been conducted in Rwanda, in 1978, 1991, 2002 and 2012.

The 2002 Census collected a number of demographic and socio-economic characteristics and indicated a total population of 8,128,553 people. Following the United Nations Decennial Census Program, the 2012 Census is the Fourth Rwanda Population and Housing Census (RPHC4). It indicates that the country now has a total population of 10,515,973 people.

Besides the endorsement of recommendations from major international conferences held under the auspices of the United Nations, the Government of Rwanda (GoR) has been focusing since 2000 on the long-term Vision 2020 that aims at transforming Rwanda into a middle-income country. This is being implemented through the medium-term planning framework of the Economic Development and Poverty Reduction Strategy (EDPRS) for successive five-year periods. The measurement of progress in implementing the EDPRS and the various UN recommendations calls for the availability of demographic and socio-economic statistical data to inform the selected indicators at different levels.

The RPHC4 is a reliable and comprehensive source of data, which compared to other official statistics data sources (administrative data, surveys, etc.) allows for disaggregation to the lowest geographical level.

The RPHC4 was undertaken to update the national mapping and demographic databases, to provide indicators for monitoring poverty reduction strategies and achievement of international development goals (MDGs, ICPD-PoA, NEPAD, etc.) and to strengthen the technical capacity of the National Institute of Statistics of Rwanda (NISR).

A more detailed discussion of the long- and short-term objectives of the Census is presented in Annex A of this report.

1.2   Legal and institutional frameworks

As an essential precondition for Census execution, the legalization of its operations was secured by a Presidential Decree officially establishing and determining the administrative organization of the Census. In addition, a Ministerial Order of the Minister of Finance and Economic Planning has set forth the official and statutory requirements for Census activities.

The institutional framework set up for implementing the RPHC4 consists of three main bodies: the National Census Commission (NCC), the Census Technical Committee (CTC) and the decentralized branches of the NCC at province and district levels.

In order to ensure focused functioning during the whole period of Census execution, a Census Unit was created within the NISR, as an executing unit, and benefiting from other

financial, logistical and technical support services from the NISR.

1.3   Census phases

Following the preparatory phase of the Census, which consisted of the production of the project documents, schedule and Census budget, the following technical activities were undertaken:

- Census mapping;
- A Pilot Census;
- Questionnaire and manual development;
- Census publicity and sensitization campaign;
- Recruitment and training of field staff;
- Census enumeration; and
- Post-enumeration activities.

Further details on all Census phases can be found in Annex A of this report.

The success of the RPHC4 is attributable largely to the rigorous pre-Census planning and robust Census enumeration monitoring undertaken by the NISR as well as the remarkable support received from the Government and people of Rwanda and the generous technical and financial assistance given by international development partners.

Chapter 2: Context and objectives of the analysis

This section describes the general context of fertility in Rwanda based on a brief literature review and outlines the objectives of the analysis.

2.1 Context

Human reproduction is determined by both individual biological and behavioural characteristics, and wider socio-political, economic, cultural and spatial factors. For example, the probability of a woman having a birth strongly influenced by her age. Human fertility is also determined by national and sub-national or regional population and sustainable development policies and related reproductive health and family planning interventions. The immediate social and cultural context where a woman or a couple lives is also critically important in determining the level of fertility. The analysis of fertility is critically important to understand population growth and its impact on society and to forecast future population development of a country.

2.1.1 Geographic context

The Republic of Rwanda is situated in Eastern Africa with a surface area of 26,338 square kilometres and is bordered by Uganda to the North, Tanzania to the East, the Democratic Republic of the Congo to the West, and Burundi to the South. Landlocked, Rwanda lies 1,200 kilometres from the Indian Ocean and 2,000 kilometres from the Atlantic Ocean. Rwanda forms part of the highlands of Eastern and Central Africa, with mountainous relief and an average elevation of 1,700 meters.

Figure 1: Geographic location of Rwanda
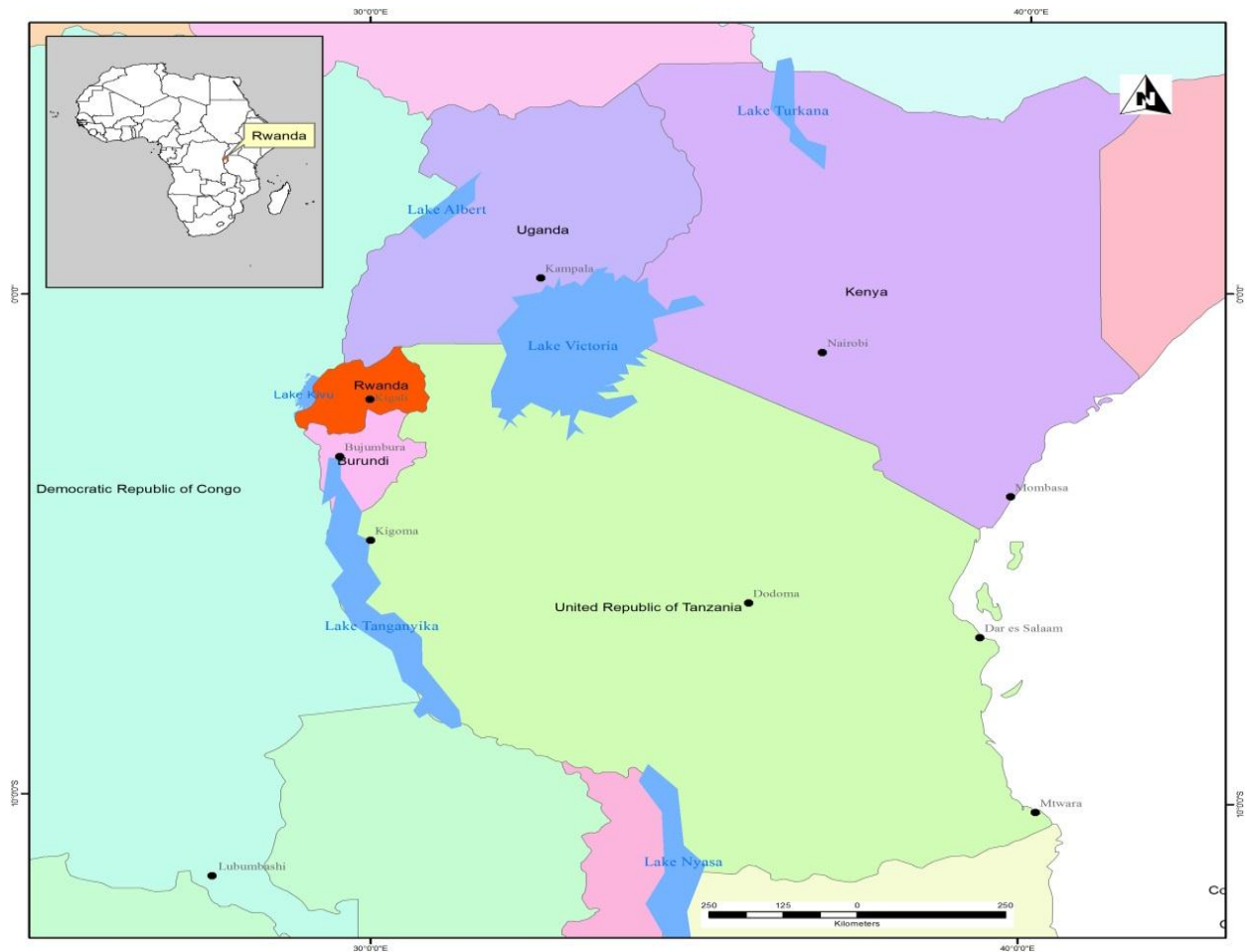
2.1.2 Socio-cultural context

Rwandan society is profoundly affected by the civil war and genocide against the Tutsi in the early 1990s. Poverty and economic hardships increased the vulnerability of many families, particularly the internally displaced and returned refugees who left the country during the civil conflict, families of genocide against the Tutsi victims especially the widows and orphans and the perpetuators of genocide against the Tutsi related crimes.

In the aftermath of the 1994 genocide against the Tutsi, the country introduced political, economic and social reforms and managed to restore social harmony and to rebuild its physical and social infrastructure. The Transitional Government of National Unity established after 1994 prioritised its efforts on improving the health and education especially of young women. The focus of recent government policies has been on enhancing family values and wellbeing, and overcoming the social vulnerabilities associated with polygamy, widowhood, orphaned and street children, disabled and old people (Office of the Prime Minister, Republic of Rwanda, 2005).

As seen elsewhere in Africa, childbearing is universal and a social norm in Rwanda. A union, formal or consensual, without any children is often deemed precarious or socially unacceptable in many countries of Africa.

Ilinigumugabo (1989, p. 40) argues that: "Like any African woman, the Rwandan woman is supposed to be as productive as possible; she has to produce so many children and descendants." In other words, it is considered as a sin for not having children when a woman is fertile. This ideology is deeply embedded in the sociocultural life and religious beliefs of Rwandan society where children are regarded as the foundation of family life.

Families in Rwanda are seen as 'core of life, cradle of the future and pillar of happiness' (Office of the Prime Minister, Republic of Rwanda, 2005, p.2).

Fertility is also linked to religion and religious beliefs in Rwanda. According to the 2012 Population and Housing Census data, the Rwandan population is predominantly Christian: 43.7% Catholics, 37.7% Protestants, 11.8% Adventist and about 2% Muslims. These three Christians religions are generally pro-natalist and reinforce the beliefs that children are a gift from God.

2.1.3 Economic and social context

Agriculture is the backbone of Rwanda's economy and the majority of households in Rwanda are engaged in farming, crop production or livestock activity. According to data from the 2010 EICV3 (national survey on the households living conditions), 72.5% of the active population works in the agricultural, fishing and forestry sector, with a higher representation of females (61.4%) than males (81.6%) (NISR, 2012a, p.32). The 2012 PHC Thematic report on Labour force participation shows that 76% of the employed population are employed in the primary sector.

The households engaged in agriculture tend to have usually high fertility rates. The agricultural sector in Rwanda is not modernised as in economically developed countries which trigger the demand for surplus people. This is perhaps one of the reasons for sustained high fertility rates in rural Rwanda. Yet another reason is the widespread poverty in Rwanda which is strongly associated with high fertility. The 2010 EICV3 data show that about 44.9% of people live below the poverty line in 2010/11 which in comparison was 56.7% in 2005 and 58.9% in 2000 (NISR, 2012b).

The third economic characteristic that is linked with fertility behaviour is education. Formal education provides new knowledge and skills for human development. Women with generally secondary or higher educational level have a relatively low fertility, while women with no education have high fertility. Until recently the majority of women in Rwanda had little or no formal education. However, in recent years there has been substantial progress in school enrolment and education attainment rates. According to the 2012 PHC data, about 25% of women aged 12 years and above have never attended school and only 16% has a secondary or higher level of education.

2.1.4 Demographic context

It took about 50 years between 1900 and 1950 for the Rwandan population to double its size from 1 million to nearly 2 million. The 2012 PHC measures Rwandan population at 10,515,973 million (Figure 2). Population growth was very slow before 1950. Between 1978 and 1991, Rwandan population was growing annually at a rate of 3% which then slowed

down to 1.2% between 1991 and 2002 before increasing again at an annual rate of 2.6% between 2002 and 2012. Population projections based on the current growth trends suggest that Rwandan population is likely to double within the next 25 years (MINECOFINb, 2005).

Figure 2: Evolution of the Rwandan population between 1952 and 2012
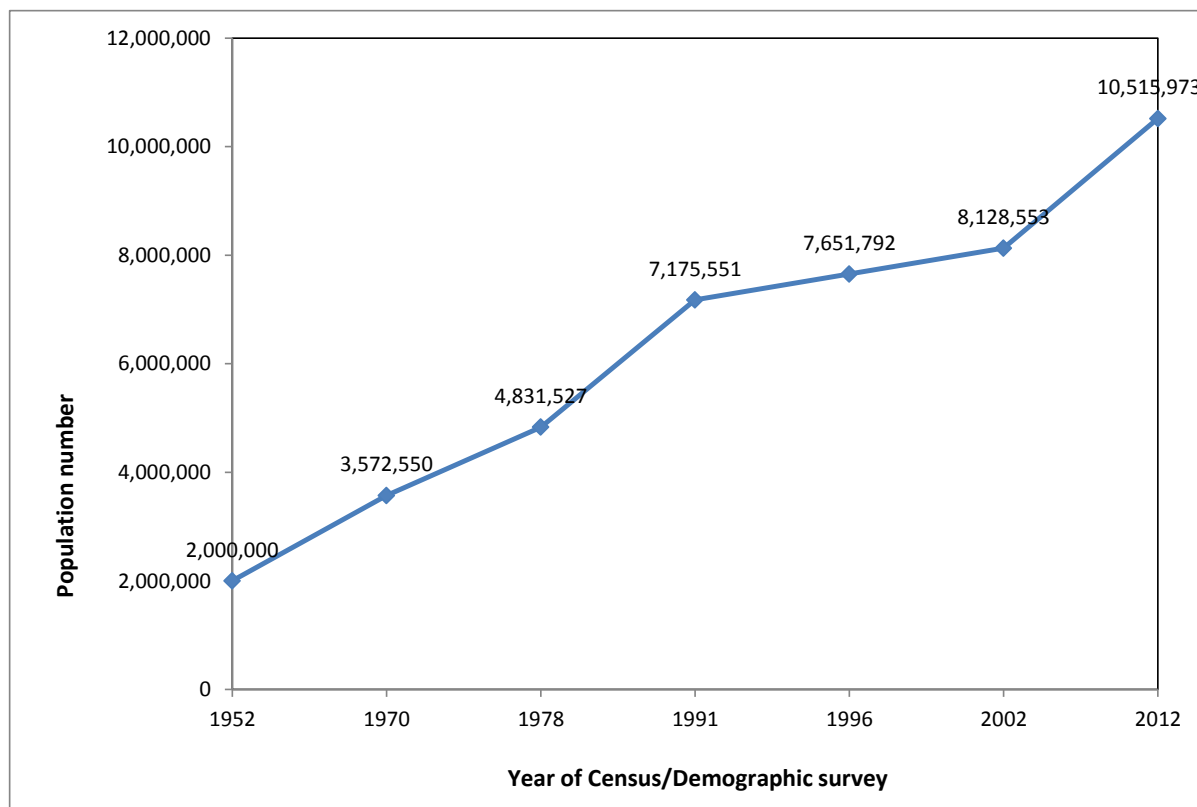
Sources: Population and Housing Censuses (1978, 1991, 2002, 2012), Demographic Survey (1952, 1970) and Socio Demographic Survey, 1996

The population growth described above was mainly driven by high fertility. Even during the period 1991-2002 where the growth rate was slow fertility was high but the slowdown of the population growth was due to the 1994 genocide against the Tutsi against Tutsi which claimed the life of more than one million people.

The total fertility rate before the genocide against the Tutsi was 6.2 children per woman which then decreased to 5.8 in 2000 (NISR, MOH and ICF International, 2012). Fertility rates increased again in 2005 to 6.1 children per woman and then declined substantially by about 33% between 2005 and 2010; the decline between 2007/08 and 2010 was about 20%. The 2010 Demographic and Health Survey (DHS) estimated the total fertility rate (TFR) in Rwanda at 4.6 children per woman (NISR, MOH and ICF International, 2012).

The historical high fertility in Rwanda along with high mortality is clearly reflected in the age-sex structure of the population in 2012 (Figure 3). The population pyramid is characterized by a broadened base narrowing quickly with age. About 41% of the population is below 15 years and those in the working age between 15 and 64 years constitute to about 55.6% while those aged 65 years and above represents only 3.1% (PHC 2012).

The population is predominantly female (51.8% of the resident population are women). Overall there were 3,027,236 women in the childbearing age (12-49 years) in 2012,

representing 28.7% of the total population and 55.5% of the female population. This high population share of the young people indicates that the future growth potential of the Rwandan population is very high.

Figure 3:   5-Years age-group Pyramid of the Rwandan population in 2012

Source: Rwanda 4th Population and Housing Census, 2012 (NISR)
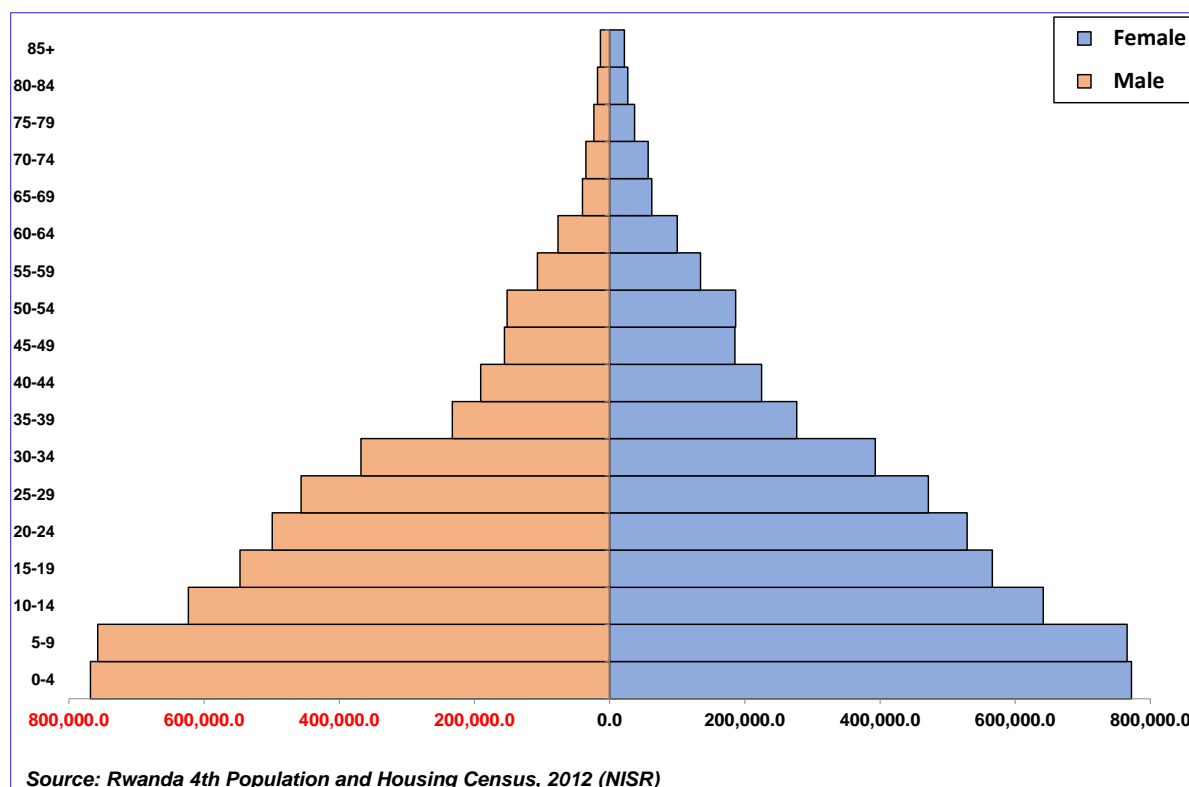
The vast majority of Rwandan population lives in rural areas (83.5%). Women in rural areas have generally higher fertility and they are less receptive to family planning campaigns and have relatively poor access to family planning and reproductive health services.

2.1.5 Policy context

In Rwanda, issues related to population and development has long been a central concern for political authorities. In order to improve the standard of living of the population, the Government has developed a number of population programmes and policies to ensure balanced population growth and distribution of available resources. Concrete actions to reduce the level of fertility were taken through different strategies. Four stages of policy interventions and response can be identified:

a) Anti-natalist policy (1974–1990):

An explicit anti-natalist policy was implemented during the period 1974-1990 based on fertility reduction through promotion of use of modern contraception. In 1974, a Scientific Advisory Board for socio-demographic issues was established. Its mission was to study all issues related to population growth and to propose relevant solutions (ONAPO, 1991 pp. 38-39). However, as the name suggests, the purpose of the Council was only consultative for a term of six years. Therefore, in order to promote a much more dynamic population policy to

serve as a framework for the proposed solutions, the Council proposed the creation of an autonomous institution in charge of studying constantly all population issues.

This recommendation was quickly accepted by the President of the Republic who announced in his speech of January 8, 1979 the creation of the National Office of Population (ONAPO) replacing the Scientific Advisory Board as follows:

> "... what should concern all leaders and all our managers is the fact that Rwanda should be able to feed all Rwandans. Our planning services so ensure to restore and maintain a balance between consumers and what we are capable of producing. Thus, in demographic terms, I felt it necessary to strengthen the "Scientific Advisory Council for the socio-demographic problems" which now is an independent service under the Ministry of Social Affairs and the Cooperative Movement." (ONAPO, 1991, pp. 38-39).

Thus the National Office of Population (ONAPO) was created in 1981. The objectives assigned to this office were, among others:

- Analyse all the dimensions related to population growth and its impact on the socio-economic development;
- Propose solutions that achieve a balance between increasing population and production;
- Study the process of integration of family planning services in public health and propose to health officials the best way of this integration;
- Manage the family planning services;
- Participate in the development of school curricula at all levels in terms of population (ONAPO 1985 quoted by Ilinigumugabo, 1989).

In the same line, the first program of family planning was launched in 1982. Its activities included staff training, improving access to services, and increasing awareness about family planning through Health workers ("Abakanguramba").

Eight years later, the first national population policy was adopted. It was designed to slow down population growth mainly by reducing fertility through family planning. The main demographic objectives of the said population policy were, among others, to reduce population growth from 3.6% in 1990 to 2.0% in 2000, by increasing the use of moderns Family Planning methods from 12% in 1990 to 45.7% in 2000, which would decrease the number of children per woman from 8.5 in 1990 to 4.0 in 2000.

b) Civil unrest (1990–1994)

This 1990-1994 period corresponds to the civil unrest years which impeded the implementation of population policies adopted earlier. The population policy adopted in 1990 was not implemented nor extended as originally planned due to political upheaval following the 1990 war and 1994 genocide against the Tutsi.

c) Genocide against the Tutsi aftermath and recovery (1994–2003)

The genocide against the Tutsi aftermath and recovery (reconstruction period) was characterized by a baby boom. Rwandans, who were traditionally pro-natalist, sought to compensate for loss of human lives occurred during the 1994 genocide against the Tutsi where an estimated one million people or more died. Therefore after the 1994 genocide against the Tutsi, population issues had taken a new dimension, both in terms of the quality of life and reducing population growth.

d) Population and sustainable development (2003– to present)

The post 2003 years witnessed the introduction of various population and sustainable development policies and programmes to address diverse population issues including fertility reduction through improved access to reproductive health services, with the objective of transforming Rwanda to a Middle Income Country (MIC) by 2020.Virtually all sectors were targeted: education for all, universal access to health care, women empowerment and gender equity promotion, to quote a few.

In 2003 a new population policy was adopted in a different international context. Indeed, at the Cairo 1994 International Conference on Population and Development (ICPD), participating countries, including Rwanda, have passed resolutions recommending focusing on quality of life and not on the quantitative aspects of population control, as well as placing concerted attention to safeguarding the reproductive health of men and women. The Rwandan population policy was formulated based on this vision. In addition to reducing the rate of population growth, the policy also aimed at achieving sustainable economic growth, food security, health, education, human resources development and management, environmental management and good governance (ONAPO, 2003a). However the ONAPO in charge of coordinating the National Population Policy was dissolved and the various population issues were "distributed" to different ministries.

In addition, a National Policy for Reproductive Health was adopted in Rwanda in July 2003, with the primary objective of improving the overall health of the population, with a focus on reducing maternal and infant mortality.

Other policies and programs directly impacting fertility were also adopted during this period. The country adopted a National Education Policy and a Girls Education Program to promote, among others, mass education enrolment of girls and to reduce female school drop-out. This coincided with the implementation of a dynamic gender equity policy focused on promoting women's empowerment, strengthening strategies to improve inter-spousal communication and encouraging wider participation of men in reproductive health and family planning.

In the same line, the EDPRS-I (2008-2012) has included among its priorities the improvement of health and slow down the population growth. In that order The EDPRS-I targeted a TFR of 4.5 by 2012-2013 and a modern contraceptive prevalence rate of 70% among females aged 15-49.

2.2 Justification and relevance of fertility analysis based on census data

Fertility analysis is of central importance in demographic studies. Fertility is one of the vital components of population growth, especially in Africa where most of the population is young.

Fertility analysis constitutes an indispensable basis for determining a country's future population growth and evaluating the effectiveness of family planning programmes. Data on fertility is important in many other fields such as sociology, economics, and also for formulation of population policy in general, and evaluation of family planning programs and child spacing practices.

Depending on data availability, fertility can be measured directly from vital registration systems, birth history data from demographic and health surveys and population censuses. Census is unique source to analyse fertility at different geographic levels and across different socioeconomic strata in countries such as Rwanda where the civil registration system coverage is not yet universal. Survey data such as the DHSs, though collecting more reliable data than censuses are limited by their sample size that does not allow disaggregation at a low level.

2.3 Objectives of the analysis

The overall objective of the analysis is to estimate the current levels and trends of fertility and to analyse its geographical and socio-economic variations.

The specific objectives are as follow:

- Estimate the levels, trends and differentials of natality;

- Estimate the levels, trends, age structure and differentials of fertility;

- Estimate the levels and trends in infertility;

- Estimate the levels and trends of high risk reproductive behaviour and unsafe motherhood captured through adolescent and late fertility ; and

- Analyze the relationships between fertility and nuptiality.

- Draw policy and program implications of the findings.

Chapter 3: Methodology

This section will discuss the definitions of the main concepts and key indicators, present the methodology used to collect the fertility data, evaluate the quality of the fertility data and where appropriate propose alternative indirect estimation methods.

3.1 Definition of the main Concepts and key indicators

The term fertility refers to the number of births a woman could have whereas fecundity is the biological ability of women to reproduce. Infertility is the biological inability of women to conceive. The key indicators of period and cohort fertility and their measurement are discussed below.

Fertility: The reproductive performance of an individual, a couple, a group, or a population. When a distinction is made by birth order, the terms first-birth fertility, second-birth fertility, etc. are used.

Natality: The Natality expresses the frequency of births in a population.

Fecundity:The biological capacity, of a woman, a man or a couple, to produce a live birth. Fecundity varies widely from one individual and from one couple to another.

Infertility: The biological inability of a man, a woman or a couple to conceive.

Infecundity: The biological inability of a man, a woman or a couple to produce a live birth. Its synonym is sterility.

Crude Birth Rate (CBR): Crude Birth Rate (CBR) is the most basic form of fertility measure. It is defined as the total number of births during a calendar year divided by the corresponding mid-year population. CBR is usually expressed per 1000 population. The indicator is crude because it relates births to both men and women, heavily confounded with the age distribution of the population. However, the indicator is widely used to indicate the overall effect of fertility and that it could be estimated easily with minimum data requirements. The number of births is corrected for possible underreporting. It has been estimated through multiplying corrected ASFR by the number of woman classified by age and 6 months before the census.

$$CBR = \frac{\text{Number of Births in a year}}{\text{mid} - \text{year population}} \text{x} 1000$$

Age-Specific Fertility Rate (ASFR):

Age Specific Fertility Rate (ASFR) is the number of births in a year to women in a specific age group divided by the mid-year population of women in that specific age group.

$$ASFR = \frac{\text{Number of Births in a year to women aged } x \text{ to } x+n}{\text{mid} - \text{year population of women aged } x \text{ to } x+n} \times 1000$$

where n is the width of the age interval.

General Fertility Rate (GFR): General Fertility Rate (GFR) is similar to the CBR except that the GFR measures the number of births in a given year divided by the corresponding mid-year population of women in the childbearing years (15-49).

$$GFR = \frac{\text{Number of Births in a year}}{\text{mid} - \text{year population of women aged } 15 - 49 \text{ years}} \times 1000$$

Mean Age at Childbearing: The Mean Age of Childbearing is another fertility measure that determines the average age at which women experienced childbearing. It is a summary of the timing of fertility within a population or a group of women.

Total Fertility Rate (TFR): Total Fertility Rate (TFR) is the average number of children a hypothetical cohort of women would have at the end of their reproductive period during their lifetime if they were subject to experiencing the ASFRs of a given period. It is calculated by summing the ASFRs and multiplying the sum by the width of the age interval.

$$TFR = \frac{(\text{Sum of ASFRs to women aged } x \text{ to } x+n)xn}{1000}$$

Parity: The number of children born alive to a woman.

Reproduction rate: The indicator that measures in which conditions generations are replaced.

If calculated not taking into account women's mortality it is called **Gross Reproduction Rate** (GRR). The GRR is exactly like TFR, except that it counts only daughters and literally measures "reproduction"– a woman reproducing herself in the next generation by having a daughter. The GRR is estimated by multiplying the TFR by the percentage of female at birth. The GRR, like TFR, assumes that the hypothetical cohort of women pass from birth through their reproductive life without experiencing mortality. This assumption is satisfactory when one wants to compare levels of fertility and/or gross reproduction across populations and over time. But, for a more realistic assessment of the reproductive potential of a population, taking into account mortality, one needs to calculate the **Net Reproduction Rate** (NRR). The NRR is obtained by multiplying the ASFR by the Survivorship rate of corresponding age-

group from the women life table and summing up all this values. When NRR equals 1, then each generation of women is exactly reproducing itself. When it is larger than 1, the next generation will have more women. When it is smaller than 1, the next generation will have less women.

$$GRR = \frac{(\text{Sum of ASFRs to women aged } x \text{ to } x + n \text{ for female births})xn}{1000}$$

$$NRR = \frac{GRR x \text{ Proportion of women surviving in each age group})xn}{1000}$$

Parity progression Ratios (PPR):

Parity is the number of children born alive to a woman. Zero parity women are those with no live births and single parity refers to those women who have one child and so on. Parity Progression Ratio (PPR) is the probability of having another child given that the mother has reached certain parity. PPRs are usually represented as a0, a1, a2 and so on. The term a0 is a measure of infertility. Women progressing to higher parities usually have high fertility rates.

3.2 Data collection method and information collected

For more than 30 years, Rwanda has collected socio-demographic data to evaluate fertility levels and other general characteristics of its population. These efforts include the following censuses and surveys: the 1978 Rwanda General Population and Housing Census, the 1983 National Fertility Survey, the 1991 Rwanda General Population and Housing Census, the 1992 Rwanda Demographic and Health Survey, the 1996 Socio-demographic Survey, the 2000 Rwanda Demographic and Health Survey, the 2002 Rwanda General Population and Housing Census, the 2005 Rwanda Demographic and Health Survey, the 2007-08 Rwanda Interim Demographic and Health Survey (RIDHS), the 2010 Rwanda Demographic and Health Survey and the most recent data from the 2012 General Population and Housing Census which are analysed in this thematic report.

In the absence of data from civil registration system for the estimation of fertility measures, the alternative approach has always been to analyse the data collected from censuses and sample surveys. The 2012 Rwandan fourth PHC provides an opportunity to analyse relevant data on births from which the most indicators on fertility can be obtained.

Fertility data collected in censuses seeks information both about recent births (live births occurred in households during the 12 months preceding the census), and about lifetime fertility (live children ever-born during women's reproductive life).

Four related questions about births to all current resident females aged 12 years and above have been asked to the head of household or another member of the household if he/she was not available).These include:

- How many live births {Name} has ever had?

- Among those children, how many are still alive?

- How many live births {Name} had during the last 12 months {15/08/2011-15/08/2012}?

- Among those children how many are still alive?

Questions on live births in the last 12 months allow to measure fertility at the census date. Information on all live births (ever born children) is used to determine the past fertility of women of childbearing ages.

These two methods of collection of data on fertility and natality suffer from errors that affect the quality of data collected which are discussed in the next sub-section.

3.3 Data quality evaluation

In the 1960s, William Brass and colleagues observed that each of the recent birth and lifetime fertility data collected by the census were subject to systematic underreporting. For recent births in the year preceding the census, both under and over-enumeration is likely due to misunderstanding of the reference period used and shifting recent births into the reference period (Moultrie et al. 2013). On the other hand, data on lifetime fertility are also subject to reporting errors with increasing age of the mother. There is a tendency among mothers not to report information on children who have died or those older children who have left home for a long period.

This section will examine the potential bias associated with data on recent births and children ever-born from the 2012 PHC and will further assess the severity of the bias they introduce in the data. In doing so, the analysis will specifically focus on the completeness of birth reporting and its variations by mother's age and sex of children, the plausibility and consistency of reported parities including the percentage of women with unknown parity. Where possible, appropriate corrections will be made.

3.3.1 Completeness of the reporting of births in the 12 months preceding the census

The completeness of the reporting of births in the 12 months preceding the census will be assessed through different steps. First, the number of births reported is compared to the number of children aged 0 at the time of the census. It is expected that for the whole country, the number of births in the 12 months preceding the census would be greater or equal to the number of children aged 0, assuming there is no loss of information due to international migration of children aged 0. Second, the Age-specific Fertility Rates (ASFRs) are graphically plotted to check if they follow the expected pattern for countries with high fertility as is the case of Rwanda. Third, the Total Fertility Rates (TFRs) are estimated which will be compared against those from the DHS for consistency and plausibility.

Overall, 299,320 births were reported by 2,424,898 households whereas the number of children aged 0 in the household enumeration was 307,764. This clearly suggests inconsistency and underreporting of births in the year preceding the census. The underreporting does not vary significantly across the age-groups except for the 12-14 age

group. The curve of the ASFRs below follows the expected pattern, the same as the 2010 DHS, between age 15 and age 49 (Figure 4). Regarding the age-group 12-14, only 625 births were reported corresponding to a total of 377,942 women in that age group, suggesting either severe underreporting of births or very low fertility level in that age group.

Figure 4: Age-specific Fertility Rates (ASFRs) from the 2010 DHS and the 2012 PHC

Sources: DHS 2010 and PHC 2012
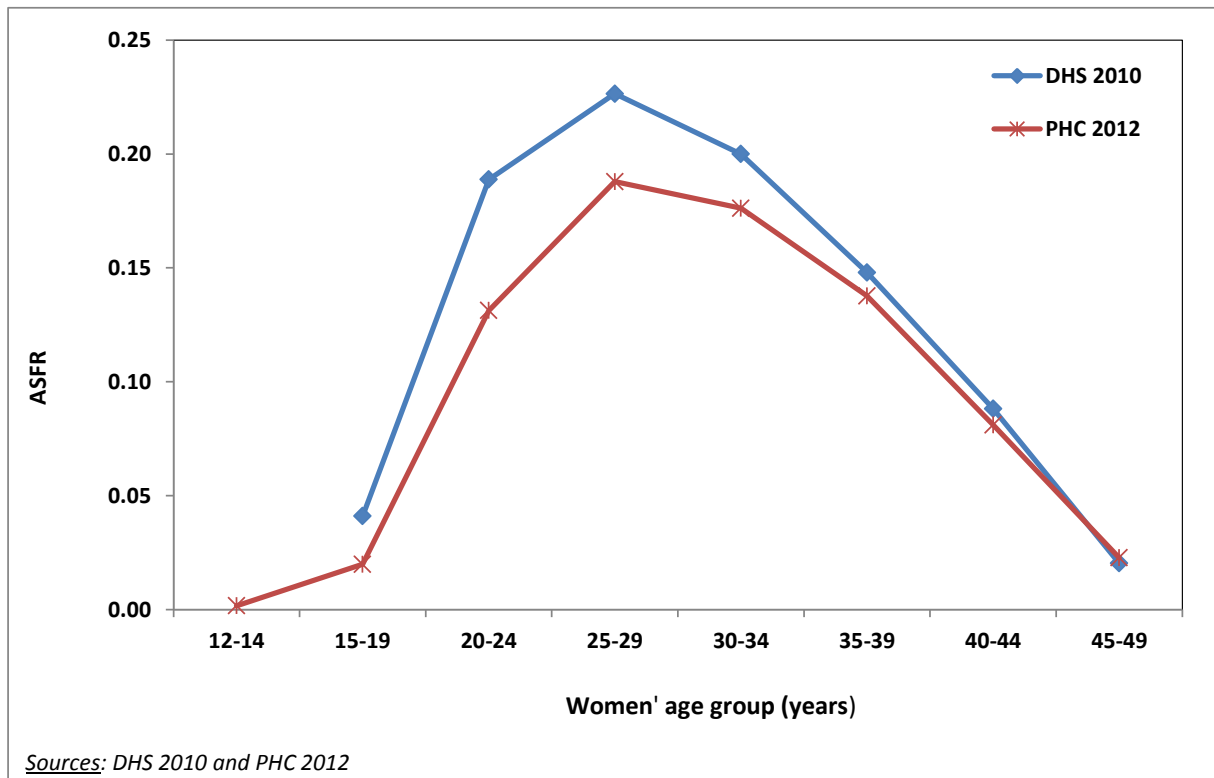
The final step in the evaluation of the completeness of the reporting of the births in the last 12 months is to compare the TFR calculated from the PHC data with the 2010 DHS, the most recent one in Rwanda. The DHSs are a good source of reference in measuring fertility. To allow comparison between the two sources, we have excluded the age-group 12-14 and considered only the age-group 15-49. The estimated TFR based on the 2012 census data is 3.8 children per woman which is significantly lower than the 2010 DHS estimate of 4.6. Though there is evidence of declining fertility in Rwanda, a 20% drop of the TFR in a 3-year period is unlikely. This confirms that there is underreporting of births in the 12 months preceding the census.

3.3.2 Completeness of the reporting of births in the 12 months preceding the census by sex

The sex ratio at birth at the national level does not vary over time in a normal population.

The sex ratio based on the births in the 12 months preceding the PHC from women aged 15-49 is 100.2 males per 100 females. This is slightly smaller than the DHS estimate of 103.5. This indicates possible underreporting of male births as compared to female births in the last 12 months preceding the PHC, assuming that the DHS estimation is accurate.

The relative underreporting of male births will affect the sex differentials analysis of fertility and the Gross Reproduction Rate (GRR) and the Net Reproduction Rate (NRR).

3.3.3 Completeness of the reporting of children ever born (the Brass and Rachad test)

An analytical way to evaluate the completeness of the reporting of children ever born is to calculate the modified General Fertility Rate (GFR) by Coale and Demeny (GFR1) and the modified GFR by Brass and Rachad (GFR2) and to compare these with the mean parity at 45-49 years (P7).

If Min(GFR1, GRF2)>P7, then there is underreporting of live births (Brass et Rachad, 1979; ONU, 1967).

GFR_1 (Coale et Demeny)	$=(P3)^2/P2$
GFR_2 (Brass et Rachad)	$=(P2)*(P4/P3)^4$
P2 :	Mean Parity at 20-24 years
P3 :	Mean parity at 25-29 years
P4 :	Mean parity at 30-34 years

For the 2012 PHC, GFR_1=4.7, GFR2=6.2 and P_7=5.6. Therefore Min(GFR_1, GFR_2)=4.7 is not greater than P_7 (5.6).

Based on the Brass and Rachad test, we can conclude that there is no evidence of underreporting of children ever-born in the 2012 PHC.

3.3.4 Completeness of the reporting of children ever born by women's age-group

If the quality of the lifetime fertility reporting varies significantly according to the women's age, this will appear in the curve of the number of children ever born per woman (mean parity) by women's Age-group. It is expected that the mean parity increases with women's age-group. A moderate increase is expected at the early and late stages of reproductive life and faster in between.

The curve of the mean parity by women's age-group follows more or less the expected pattern except that the increase is sustained up to age 55 years and above due to the late childbearing practice in Rwanda (Figure 5). Therefore, there is no evidence to suggest that births are more underreported for one age-group compared to the other.

Figure 5: Women's mean parity by Age-group

Source: Rwanda 4th PHC, 2012 (NISR)
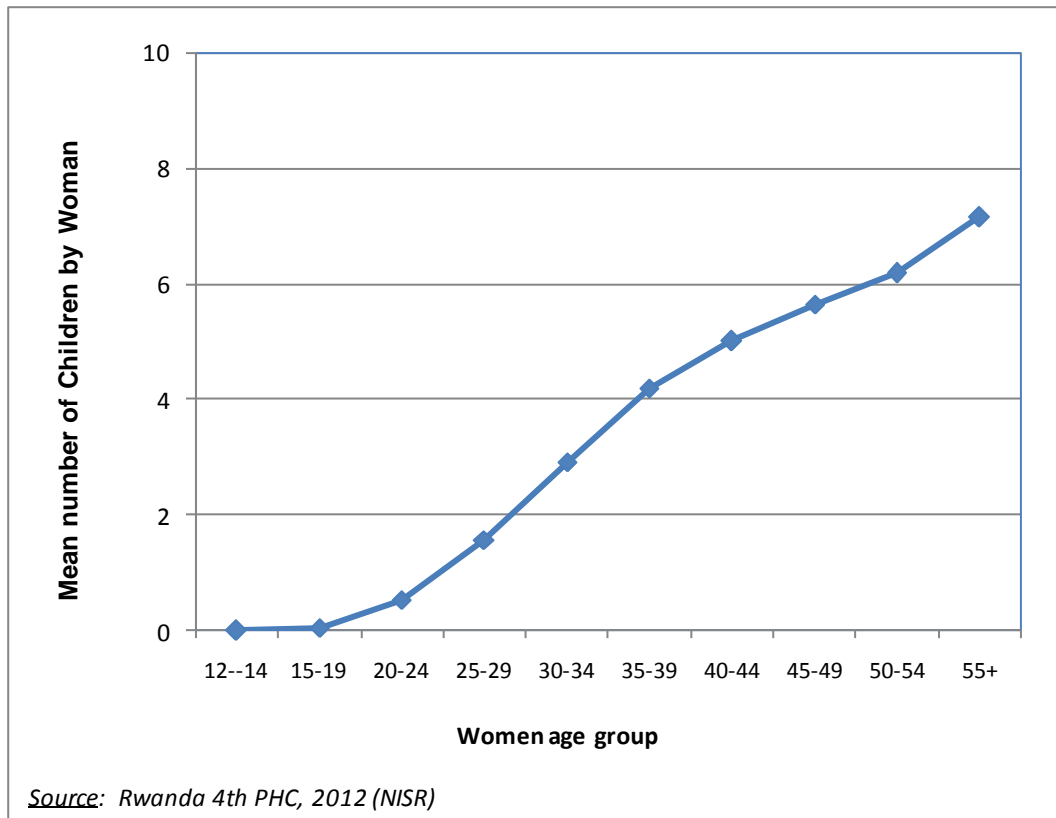
3.3.5 Completeness of the reporting of children ever born by sex

If there is no sex selectivity in the reporting of children ever born, the sex ratio at birth should be closed to what is expected for Rwanda. In this case the sex ratio from the 2010 DHS is considered as a reference though the DHS does not capture births of all women but only women aged 15-49 years. However there is no reason to believe that the sex ratio at birth should vary significantly by age of women.

The sex ratios based on the reported children ever born for women aged 15-49 is 101.1 which is less than 103.5 estimated by the 2010 DHS. This gives an indication that male children ever born are underreported by the 2012 PHC compared to their female counterparts.

3.3.6 Implausible parities relative to women's age

The parity reported for some women exceeds the number of children a woman can normally have given her age. This is known as implausible parity. In evaluating the quality of data on lifetime fertility, the implausible parities were assessed relative to mother's age. Especially at young ages, a small number of women reported excess children ever-born. This should be corrected to avoid bias in the estimation of average children ever-born.

The shaded cells in Table 1 show implausible parities by women's age. Implausible parities were identified using two references. The first reference is the maximum observed parities by women's age provided by Rwandan DHSs. The second reference is the rule of thumb consisting of truncating the maximum number of live births that a woman could have. For instance, one birth every 18 months from age 12 onwards, a maximum of 5 children by exact age 20 and 8 by exact age 25 and so on (Moultrie et al., 2013, p. 35).

Table 1: Distribution of the women aged 12 years and above by parity and age-group

Number of children ever-born	Women's Age-group (years								
	12-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50+
0	346607	498537	261690	82933	26868	10010	5478	2920	4592
1	397	11798	40999	24037	9838	4017	2365	1239	1273
2	73	562	7471	11303	7044	3272	1899	1118	1090
3	22	65	829	3425	4111	2545	1576	894	1027
4	11	18	105	812	2052	1728	1220	692	908
5	18	26	28	133	728	986	806	574	783
6	12	30	13	36	250	521	509	390	672
7	5	14	14	11	69	235	300	253	633
8	4	10	6	7	20	105	169	167	580
9	1	6	8	5	8	26	81	91	453
10	12	28	44	18	9	16	37	41	349
11	1	8	3	6	5	1	17	25	181
12	1	1	3	7	5	2	8	13	125
13	1	2	0	5	5	2	4	6	48
14	1	0	1	0	5	3	3	3	20
15	0	0	0	0	0	0	2	0	19
16	1	6	3	2	1	0	3	2	13
17	0	4	6	7	3	1	2	2	8
18	0	1	14	23	12	11	3	1	18
19	0	6	25	24	24	16	10	6	26
20	1	21	54	50	43	30	18	19	49
21	1	0	33	64	60	39	32	17	53
22	0	2	5	32	57	41	23	26	59
23	0	2	0	10	28	23	25	19	65
24	0	2	1	1	12	9	18	16	53
25	0	1	0	0	5	10	5	9	44
26	0	0	0	0	1	3	5	3	17
27	0	0	1	0	1	0	2	0	9
28	0	0	1	0	0	1	1	1	6
29	0	0	1	0	0	1	1	0	1
30	0	1	1	2	1	1	0	2	8
31	0	0	0	1	0	1	2	1	0
32	0	0	2	2	3	0	0	0	0
33	0	0	0	0	0	1	0	0	0
40	0	0	0	0	0	1	1	0	2
Number of women who declared their parity	347,169	511,151	311,361	122,956	51,268	23,658	14,625	8,550	13,184
Number of women with implausible parity	92	171	226	259	271	192	151	124	431
% of women with implausible parity	0.03	0.03	0.07	0.21	0.53	0.81	1.03	1.45	3.27

Source: Rwanda 4th Population and Housing Census, 2012 (NISR)

3.3.7 Evaluation of the percentage of women with not stated parity

It is expected that the percentage of women with unknown parity does not vary according to the women age-group. However, Table 2 shows that this percentage is 3 to 5 times higher in the youngest age-group (12-24) than among women aged 25 years and above. This is a classical error in fertility data collected by the censuses. Actually the interviewers tend to not fill the questionnaire for the fertility variables for young childless women. If not corrected, this will bias the estimated mean children ever born.

Table 2:   Percentage of women with no child and women who did not declared their parity by Age-group

Women's Age-group (Years)	% of childless women	% of women who did not declared their parity
12-14	92.2	7.3
15-19	90.9	5.0
20-24	57.8	3.2
25-29	22.9	2.1
30-34	9.8	1.6
35-39	5.8	1.3
40-44	4.5	1.3
45-49	3.6	1.3
50+	3.1	1.7

Source: Rwanda 4th Population and Housing Census, 2012 (NISR)

In conclusion, the evaluation of the quality of the fertility data has shown that the quality of lifetime fertility data is relatively better than the recent fertility data. More specifically, the evaluation has shown that the following errors affected the accuracy of the fertility data from the 4th Rwanda PHC:

- Underreporting of births in the last 12 months preceding the census for all women age-group;
- Underreporting of male births as compared to female both for the recent and lifetime fertility;
- Underestimation of the number of childless women especially among women aged 12-24;
- Fertility data unreliable for women aged 12-14.

Some of the above-listed errors are not too serious; others have an important impact on fertility indicators if not corrected. Therefore, there is a need to adjust the data by applying indirect estimation of fertility data for key indicators. The adjustment and indirect methods are described in the following section.

3.4 Method of data adjustment and indirect method of estimation of fertility indicators

As we have concluded in the section on the evaluation of data quality, fertility data collected during the 2012 census need to be adjusted and indirect methods will need to be applied for the estimation of some indicators.

Demographers have developed a set of techniques that allow indirect estimation of key fertility indicators. These techniques are based on assumptions, have their advantages but suffer from some limitations. Generally, there are three indirect methods of estimating total fertility indicators:

- Arriaga method

- Brass P/F ratio method

- Gompertz relational method

These methods estimate fertility rates based on census data on the average number of children ever-born, by age of women and number of births to women during the 12-month period prior to the census. The three methods differ not only in the assumptions they make but also in the input data they require. For instance, the Brass P/F ratio method assumes constant fertility, while the Arriaga method estimates fertility using data on average number of children ever-born by 5-year age-groups of women for two censuses. The Gompertz relational method uses cumulative fertility rates to estimate total fertility rate.

Among these three methods, the Arriaga method was found the most appropriate for determining the level of fertility in Rwanda based on the 2012 census. The Arriaga method used combines the 2012 data with the 2002 data to take into account the recent decline of fertility in Rwanda. The estimation procedure of the Arriaga method is described in Annex A. Moreover the Arriaga method gives estimates that are comparable with the DHSs indicators. Conversely the P/F method could not be applied since fertility in Rwanda has experienced dramatic decline in recent years, particularly since 2005. The alpha and beta parameters of Gompertz relational failed to converge indicating that this method is not suitable with the Rwandan 2012 PHC data. Before the application of the Arriaga method to compute the fertility indicators, the El-Badry correction procedure was applied to adjust for the high percentage of women with not stated parity. The El-Badry Correction method is described in detail in the annex A.

3.4.1 Adjustment of the data

We adjust the data respectively to: (i) correct the implausible parity; (ii) to correct the high percentage of women whose parity was not stated; and (iii) deal with the particularly inaccurate declaration of the fertility variables for women aged 12-14 years.

Correction of implausible parities

Using the Rwandan DHSs findings and the rule of thumb described in section 3.3.6, a maximum plausible parity was assigned to each woman by age-group (Table 3). If the reported number of children ever-born exceeds the allowed maximum for a woman, her parity was recorded as missing. The correction did not distort the data much since we recorded the parity of only 1.1% of women aged 12 years and above as shown in the table below.

Table 3: Correction of the implausible parities

Women's age-group	Maximum observed	Maximum plausible	Percentage women corrected
12-14	21	2	0.03
15-19	30	4	0.03
20-24	32	6	0.07
25-29	32	8	0.21
30-34	32	10	0.53
35-39	40	13	0.81
40-44	40	15	1.03
45-49	31	15	1.45
50+	40	15	3.27

Source: Rwanda 4th Population and Housing Census, 2012 (NISR)

Correction of the high percentage of women with unknown parity: The El Badry Method

To correct the high percentage of women with parity not stated we use the El-Badry correction briefly described as follow: "The method apportions the number of women whose parity is recorded as 'missing' between those whose parity is regarded as being truly unknown, and those women who should have been recorded as childless but whose responses were left blank. It does this apportionment at an aggregate level and not on an individual basis." (Moultrie et al., 2013, p.35).

Adjustment of fertility data for women aged 12-14 years

We found in the evaluation section that the quality of fertility data for women aged 12-14 years is poor. Instead of adjusting the data a decision was taken to exclude this age-group in the computation of indicators that may be seriously biased by the error in that data. Women aged 12-14 has been excluded in the computation of the TFR and other related fertility indicators such as, GRR, NRR, MAWC. On the other hand, excluding fertility information of 12-14 age group had minor l impact on the estimation of fertility indicators.

3.4.2 Indirect methods for estimation of fertility indicators

The Arriaga method based on two datasets (ARFE-2) was used to estimate the ASFRs and TFR. The corrected ASFRs and TFR were used to estimate the MAWC and the number of expected births, GFR, CBR, SBR, GRR and NRR.

The ARFE-2 developed by Arriaga was based on the modification of the original Brass method (P/F method). The Brass P/F ratio method is based on the following assumptions: (1) fertility has been constant in the recent past; (2) the level of underreporting of births in the year prior to the census/survey does not vary by age; (3) data on children ever born for younger women (up to 35 years of age) are more completely reported than births in the previous year (Feeney, 1998; United Nations, 1983); and (4) age misreporting among women of childbearing ages is negligible.

Unlike the P/F ratio method, the Arriaga (1983) method does not make the assumption of constancy of fertility in the period preceding a survey/census. Based on a simulation model, Arriaga (1994) showed that under conditions of declining fertility, the number of children ever-born by age of mother changes linearly for mothers under 35 years of age. This observation and the fact that parity reports for women under 35 years of age are usually of good quality, allowing linear interpolation of the data on children ever-born per woman by age of mother from two or more censuses/surveys to derive estimates of children ever-born for one year prior (or posterior) to the date of the census/survey (Arriaga, 1994). AREF-2 method was chosen because it was more appropriate in the Rwandan context as compared with other methods because it takes into account the recent change in fertility observed in Rwanda. However, using the AREF-2 method has a limitation. It will not allow disaggregating the indicators for the variables captured differently in the two censuses and that could not be recorded. This is unfortunately the case for the area of residence in particular.

For a complete description of the Arriaga method see Annex A.

3.4.3 Method of analysis

The analysis is essentially descriptive, consisting of computing all indicators at the national and provincial levels, disaggregated by background characteristics known to be associated with fertility behaviour: age, education, religious affiliation, economic activity status and disability status.

The analysis also distinguishes groups of women with higher risk fertility behaviour from other women. A separate analysis is conducted for each of the high-risky fertility behaviour.

Chapter 4: Findings

This section presents the main findings of the analysis in four different sections. First, it presents the levels of lifetime fertility, infertility and infecundity in the country. Second, the level, age patterns, trends, geographical variations and other differentials of current fertility are presented. The third section will present high-risk fertility behaviours and premarital fertility. The final section will address natality.

4.1 Lifetime fertility

For each resident woman aged 12 and above the 2012 PHC collected data on the total number of her children ever-born as well as the births occurred during the 12 months preceding the census. The number of children ever-born a woman has at the time of the census, also referred to as parity, captures the life time fertility of the woman.

Four aspects of lifetime fertility are analysed in this section: its current level determined by the total number of children ever-born to women aged 12 years and above; past fertility level measured through parity reached by women at the at the end of their reproductive life; the process of family formation by analysing the Parity Progression Ratios; and infertility through the analysis of the percentage of childless women at the end of the reproductive span and probability of not having an additional child among women who already gave birth.

4.1.1 Total number of children ever-born per woman (parity)

Overall 3,626,238 women were aged 12 years and above at the time of the census. The information on the parity is available for 3,584,971 women (98.8%). The total number of children ever-born for these women varies from 0 to a maximum of 15 per woman (Figure 6). The number of women decreases as parity increases. About 40% of women have no children at the time of census, 10% have one child, 9% two children and less than 5% have 6 or more children. A total of 3,584,971 women gave birth to 9,767,915 children, equivalent to a mean parity of 2.72 children per women.

Figure 6: Distribution of the women aged 12 years and above by number of the number of their children ever-born (parity)

Number of children ever-born	Number of women
15	2,214
14	4,281
13	9,466
12	24,435
11	38,226
10	71,929
9	100,879
8	132,892
7	161,521
6	188,879
5	216,010
4	244,240
3	269,530
2	325,347
1	367,455
0	1,427,667

Source: Rwanda 4th Population and Housing Census, 2012 (NISR)
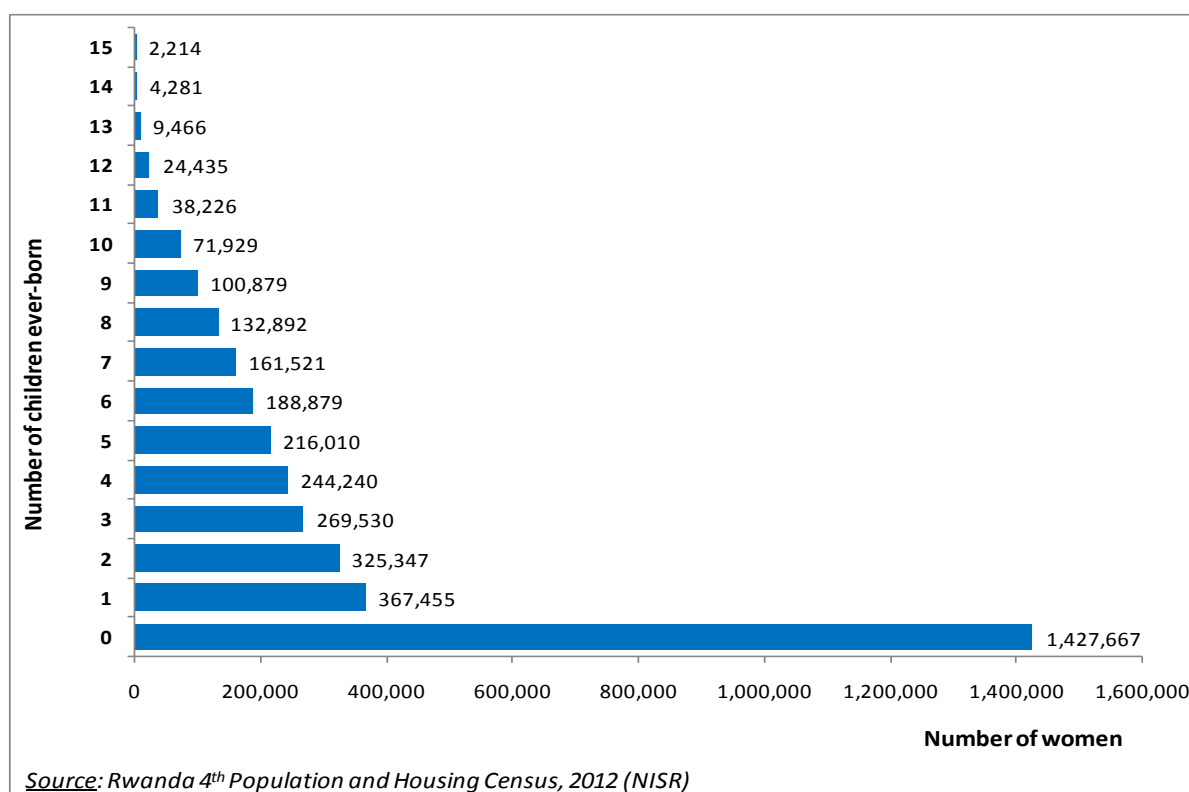
However, the interpretation of mean parity for all women aged 12 years and above is meaningless, since these include women of different ages who are at the start or end of their reproductive period. This limitation is overcome by computing the parity by women's age. Figure 7 presents the parity distribution by women's age group and residence area.

Since the number of children per woman increases with mother's age, the expected pattern of the mean parity curve is a slow increase at the early stage of the reproductive life, followed by a steady increase. By the end of the reproductive period, women no longer have additional children resulting in the curve no longer increasing. The results presented in Figure 7 confirm this pattern, although the mean parity shows an increase well beyond 50 years which is indicative of late childbearing in Rwanda. The mean parity remains close to zero up to age 20. This confirms previous findings by the 2002 PHC and subsequent DHSs that childbearing starts relatively late in Rwanda as compared to other African countries.

The results also suggest that the mean parity varies significantly by area of residence though the general pattern described above holds in both urban and rural areas. Women in urban area have on average less children ever-born than women in rural area at all ages beyond 24, the gap increasing with age. The observed differences reflect the relatively lower fertility in urban area but also the fact that the female population is younger in in urban area with an average age of 29 years than in rural area with an average age of 33 years

Figure 7: Women's mean parity by age-group and area of residence

Source: Rwanda 4th PHC, 2012 (NISR)
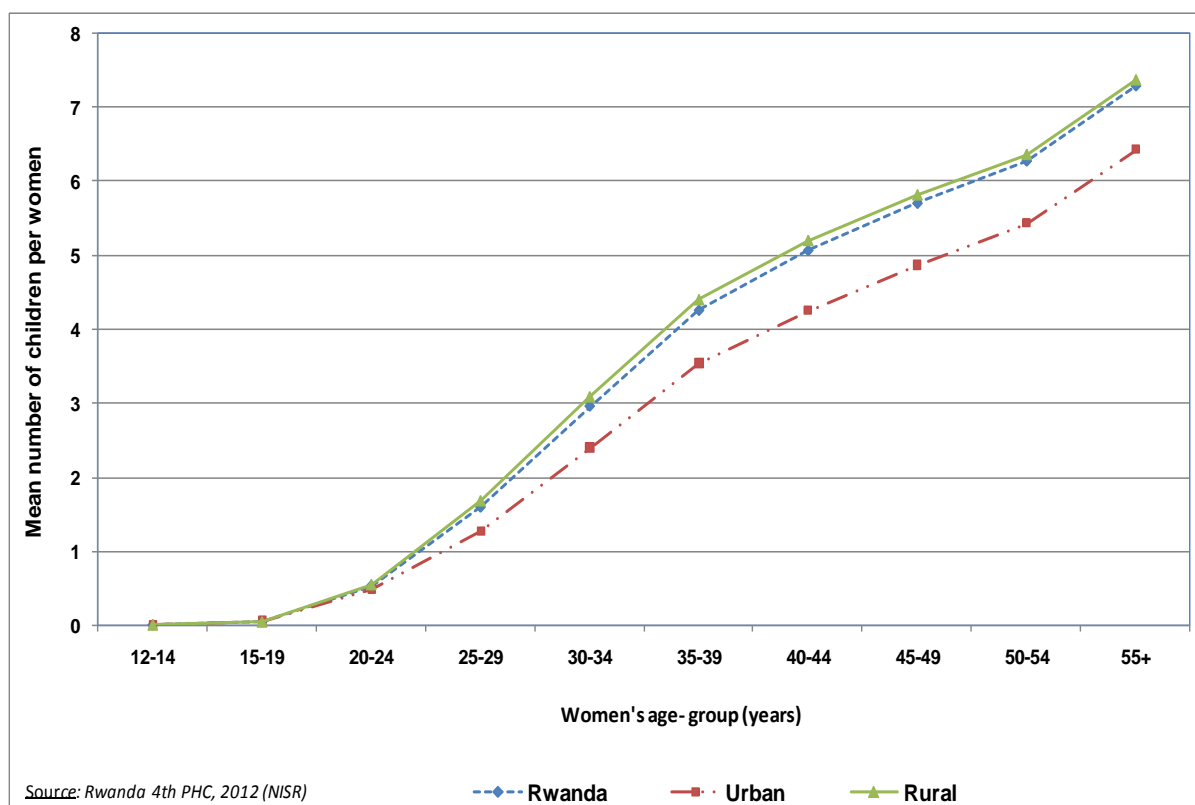
The mean parity by women's age-group also varies by Province, as shown in Figure 8 although the general pattern is similar to the national one. However three sub-patterns can be distinguished: (i) the Eastern, Western and Northern Provinces with the highest mean parities; (ii) Kigali City with the lowest mean parity; (iii) and the Southern Province with mean parities between the two extremes.

Mean parity in Kigali City is different from those in other provinces from age 24 while parities in the Southern Province tend to be lower than those from other provinces but only after age 40.

The lower mean parity in Kigali reflects the influence of urbanisation on fertility but also the fact that its female population is younger as reflected in the mean age of 29 years in Kigali City as compared to 32 in the Eastern and Western Provinces and 34 years in the Southern Province. In contrast, the low mean parity in the Southern Province seems to reflect a true lower fertility rather than the effect of the age-structure.

Figure 8: Women's mean parity by age-group and by province

Source: Rwanda 4th PHC, 2012 (NISR)
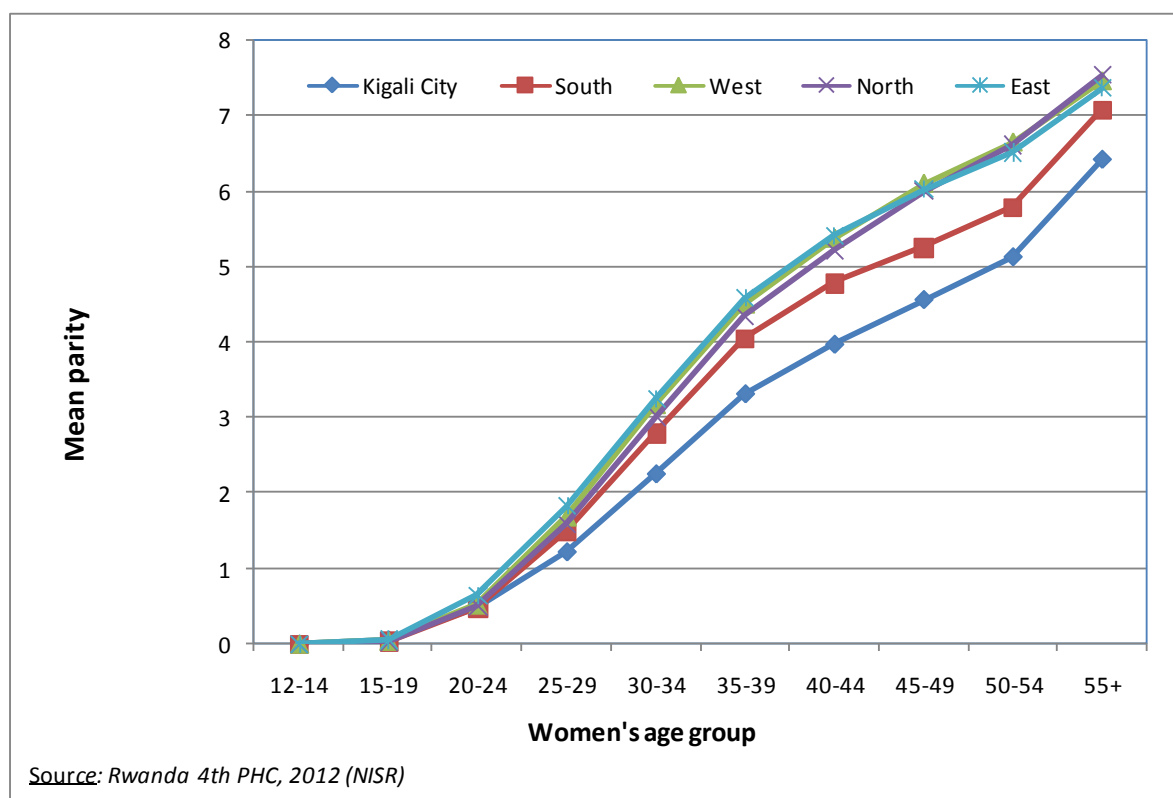
4.1.2 Total number of children ever-born at the end of reproductive life

The total number of children a woman has under the past conditions of fertility is usually measured by mean parity at 50 years of age (D_{50}). This is based on the assumption that women no longer have children after age 49. However, in Rwanda, a reasonable number of women continue their childbearing beyond age 49, and hence a more relevant indicator would be the mean parity at age 55 (D_{55}). We will use both indicators: D_{50} for comparison with previous censuses and D_{55} for a more accurate measure of the level of past fertility. The findings are reported in Table 4.

The findings confirm that fertility was high in the past in Rwanda. Women aged 55 years and above have on average 6.8 children. It is relatively much higher in three provinces: West and North (7.1 children) and East (6.9 children) and lower in Kigali City (5.8 children) and more generally in urban areas (5.9 children).

The mean parity among women aged 50 years and above is systematically lower than the one among women aged 55 years. This confirms that age 50 is not the termination age of childbearing in Rwanda since few women still give birth after age 50.

Area of residence and Province	Number of women aged 50 years and above	Mean parity at age 50 and above (D_{50})	Number of women aged 55 years and above	Mean parity at age 55 and above (D_{55})
Rwanda	620,411	6.0	435,499	6.8
Area of residence				
Urban	59,293	5.2	40,898	5.9
Rural	561,118	6.1	394,601	6.9
Province				
Kigali City	35,656	4.9	24,261	5.8
South	180,602	5.5	127,274	6.4
West	150,298	6.4	104,579	7.1
North	112,081	6.3	81,147	7.1
East	141,774	6.3	98,238	6.9

Source: Rwanda 4th Population and Housing Census, 2012 (NISR)

4.1.3 Family formation and rate of childbearing

One interesting aspect of the study of fertility in a population is the rate at which families are growing and the likelihood for a woman with n children to proceed to a (n+1)[th] child. This is analysed using Parity Progression Ratios (PPR) which measures the proportion of women of a specific parity who progress to the next parity. For instance, the PPR a_n is the proportion of women who have n+1 children among women who already have n children. It is related to the quantity or quantum of fertility. PPRs are used to evaluate changes in fertility in terms of births spacing.

PPR can be analysed through two different perspectives: a purely demographic one (described above) and a public health one to study infecundity among a population. This latter perspective is adopted in section 4.1.4 below.

The PPR from 0 to 1 is not analysed since the estimate is influenced by potential period effects. Figure 9 presents the PPRs for parity higher than 0. The findings indicate that the probability of having an additional child is high and stable between 80% and 83% up to the fifth child just one child above the TFR of 4 children per woman. This means that the vast majority of women (more than 80%) build their family up to the TFR. The PPRs range between 70% and above 50% after the 8th child, suggesting that the majority of women who have already reached higher parities are likely to pursue their childbearing.

Figure 9: Parity Progression Ratio

Sources: Rwanda PHC 2012 (NISR)
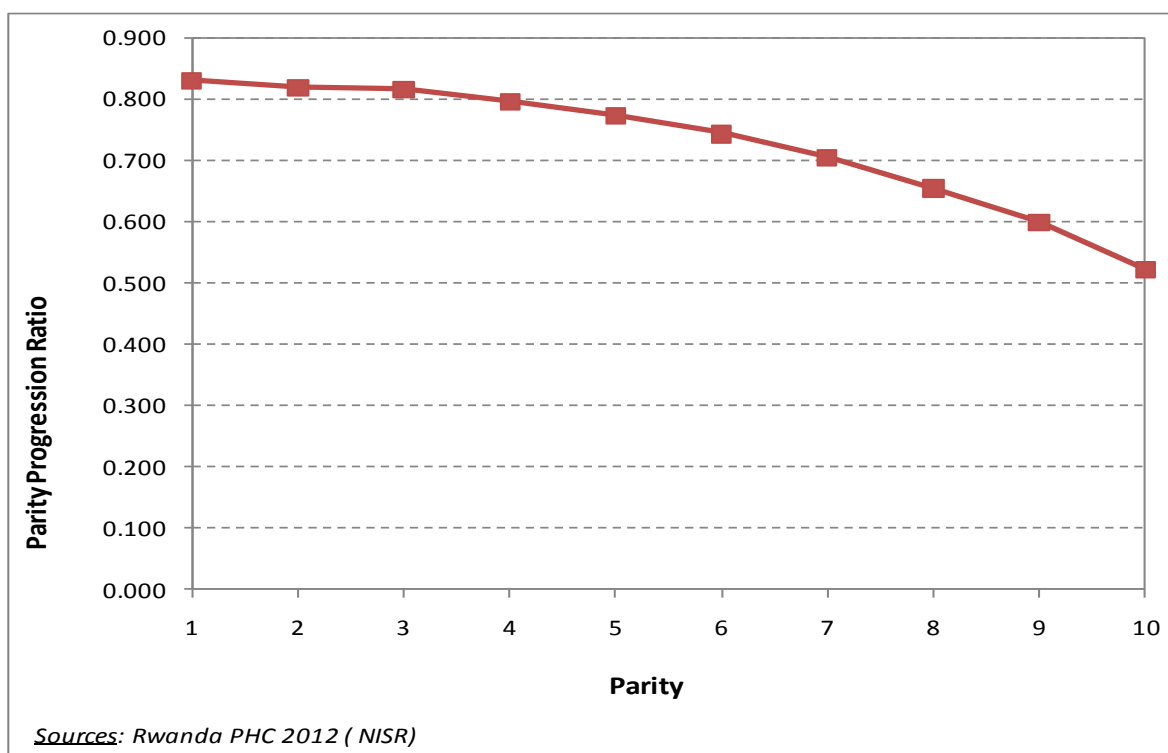
4.1.4 Infertility and Sterility

The sequence of PPRs along with the percentage of childless at age 55 years give an estimate of the level of different types of infertility and sterility in a population.

The percentage of childless women at the end of the reproductive span (50-54 years or 55-59 years) is an indirect measure of the prevalence of sterility in a population. This measure, however, overestimates the true prevalence of sterility because some of the childless women aged 50-54 or 55-59 years may have not had children for reasons not related to their physiological ability to become pregnant or to give birth. For example, women who are never married may have less exposure to the risk of pregnancy or those married may voluntarily decide not to have any children as well as those with physical or mental disability might be reluctant to give births.

The proportion of women who already have n children and who will not have an additional child ($1-a_n$) is an indirect measure of secondary sterility. The reasons for secondary infertility may be biological, or may be a consequence of a previous obstetrical complication or a consequence of untreated sexually transmitted diseases, etc. However $1-a_n$ overestimates the true medical prevalence of secondary infertility because many other reasons might explain why a woman has not an additional child: fulfilment of fertility desire, insufficient exposure to the risk of pregnancy (divorced and separated women who are no longer sexually active) and so on.

The results for both infertility Indices and percentage of childless women at ages 50-54 and 55-59 years from the 2012 PHC are presented in Table 5 below.

The results presented in Table 5 show that about 3% of women in Rwanda are childless at the end of their reproductive span, giving an estimation of the prevalence of sterility among women, with the limitations discussed above. This value is similar to the estimate from the 2002 PHC. This suggests that the prevalence of sterility among women in Rwanda has not changed over the past decade.

Table 5: Infertility indices and Percentage of Childless Women at age 50-54 and 55-59 by area of residence and province

Infertility Indices (1-a_n) and Percentage of Childless Women	Rwanda	Area of Residence		Province				
		Urban	Rural	Kigali City	South	West	North	East
PPR (a_n)								
1-a_1	0.170	0.247	0.158	0.263	0.159	0.155	0.167	0.164
1-a_2	0.182	0.267	0.169	0.294	0.176	0.165	0.167	0.175
1-a_3	0.184	0.266	0.173	0.293	0.183	0.170	0.167	0.179
1-a_4	0.204	0.283	0.195	0.307	0.210	0.190	0.184	0.202
1-a_5	0.227	0.291	0.221	0.308	0.240	0.213	0.204	0.227
1-a_6	0.257	0.307	0.252	0.322	0.277	0.240	0.234	0.258
1-a_7	0.296	0.333	0.293	0.337	0.319	0.282	0.272	0.297
1-a_8	0.346	0.373	0.344	0.373	0.371	0.333	0.326	0.346
1-a_9	0.401	0.409	0.401	0.414	0.424	0.392	0.383	0.402
1-a_{10}	0.478	0.481	0.478	0.473	0.499	0.477	0.464	0.473
1-a_{11}	0.486	0.474	0.487	0.460	0.497	0.493	0.486	0.474
1-a_{12}	0.605	0.620	0.604	0.605	0.623	0.603	0.601	0.596
1-a_{13}	0.593	0.571	0.595	0.543	0.611	0.597	0.592	0.584
1-a_{14}	0.659	0.668	0.658	0.630	0.681	0.676	0.649	0.641
1-a_{15}	1	1	1	1	1	1	1	1
% Childless Women								
At age 50-54 years	3.1	5.6	2.9	6.0	3.1	2.8	3.1	2.8
At age 55-59 years	3.1	5.0	2.9	4.9	2.0	1.9	2.2	1.8

Source: Rwanda 4th Population and Housing Census, 2012 (NISR)

4.2 Current fertility: Levels, Pattern, Trends and Differentials

Current fertility reflects recent childbearing experiences among women aged 15-49 years. This age-group is traditionally considered as the reproductive span though some women start childbearing before 15 and others still continue giving birth after 49 years. Fertility below 15 and above 49 is usually rare and not accurately reported as demonstrated in the data quality evaluation section. Moreover, for comparison over time and across countries, fertility indicators are computed for the age-group 15-49 years. The rest of the analysis will consider only women aged 15-49 years.

In this section we will analyse: (i) the levels, pattern and trends of current fertility at the national level; (ii) the geographic variations; and (iii) selected differentials of current fertility.

4.2.1 Levels, pattern and trends of current fertility at the national level

Current Fertility Level

The widely used indicator to measure current fertility is the Total Fertility Rate (TFR), which is defined as the total number of children a woman would have at the end of her reproductive life if she would experience the current conditions of fertility throughout her all reproductive life. The age patterns of current level of fertility are usually presented by the Age-Specific Fertility Rates (ASFRs) in 5-year age interval.

Table 6 presents the TFR and the ASFRs measured based on the 2012 PHC data. The findings show that under the current fertility conditions, a woman residing in Rwanda would have 4 children at the end of her reproductive life.

Table 6: Age-Specific Fertility Rates (ASFRs) and Total Fertility Rate (TFR) in 2012

Indicators	Rwanda
ASFR	
15-19	0.027
20-24	0.150
25-29	0.202
30-34	0.185
35-39	0.142
40-44	0.079
45-49	0.019
TFR	**4.020**

Source: Rwanda 4th Population and Housing Census, 2012 (NISR)

Fertility Pattern

Table 6 along with Figure 10 also illustrate that the pattern of fertility in Rwanda is similar to the one found in the developing countries where fertility is high. Women give births mostly during their 20 to 34 years of age. Fertility is low during adolescence (less than 0.03 child per woman between 15 and 19 years) followed by a steady increase to reach its maximum by age 25-29 years (0.2 child per woman). Then fertility decreases continuously to reach 0.02 children per woman by age 49.

The Mean Age of Women at Childbearing (MAWC) confirms the fact that fertility is the highest between ages 20-30 years; overall MAWC is 29.2 years in 2012. The MAWC has continuously decreased from 32 years in 1978 to 31.3 in 1991 and 31.0 in 2002.

The 2012 fertility pattern is also similar to that estimated by the 2010 DHS (Figure 10). The comparison between the 2012 PHC and the 2010 DHS ASFRS reveals that the decline in fertility has mainly occurred in the age group 20-34.

Data Sources: DHS 2010 and PHC 2012
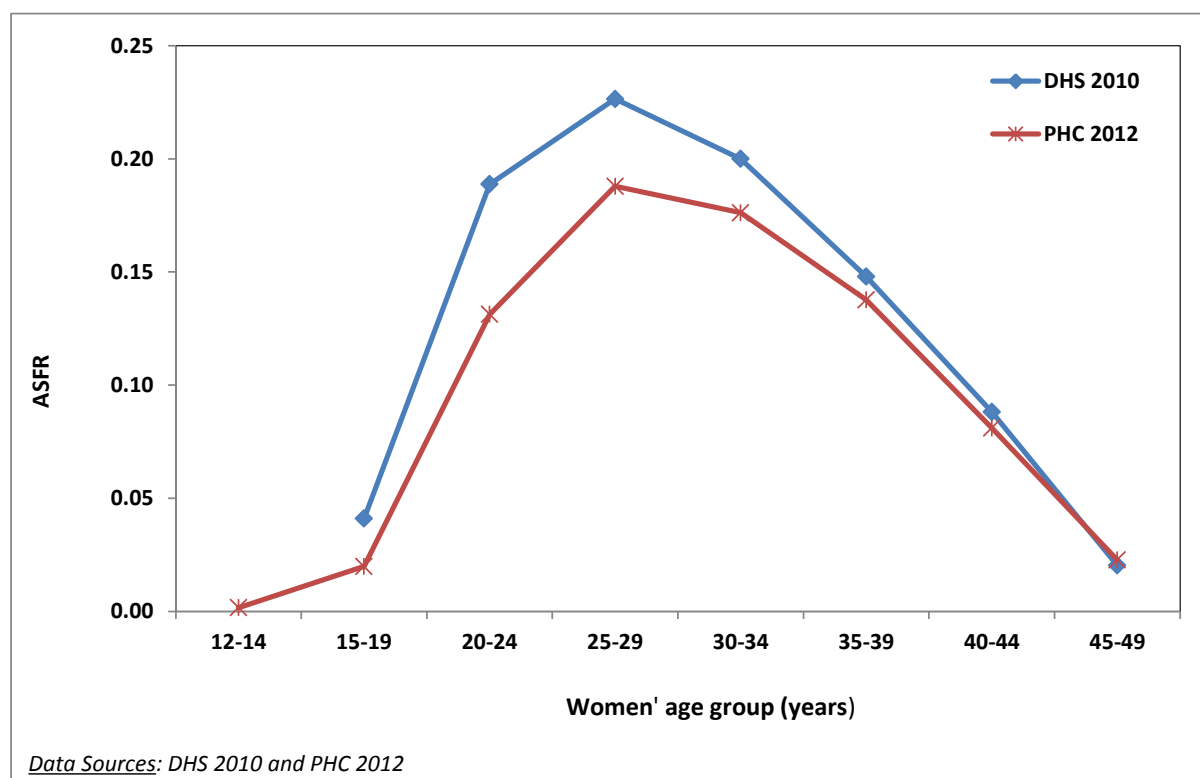
Recent Trends in Current Fertility

The observed decline in fertility by comparing 2010 DHS and the 2012 PHC is generally confirmed by the past trends since 1978 (Figure 11). The decline, however, was not homogeneous over time and could be classified into four distinct periods:

- The 1974 – 1990 period during which an explicit anti-natalist policy based on fertility reduction through promotion of the use of modern contraception were implemented; this period was characterised by a slow decline of fertility, with the TFR decreasing from 8.6 to 6.2 children per woman.

- The 1990–1994 period corresponding to the civil unrest years during which the implementation of the population policy adopted earlier was impeded;

- The 1994 – 2003 period corresponding to the genocide against the Tutsi aftermath and recovery ("reconstruction period") characterized by a baby boom marked by an increase of fertility from 5.8 to 6.1 children per woman; and

- The 2003 to present period where various policies and program were designed and implemented to address diverse population issues with the objective of transforming Rwanda into a Middle Income Country (MIC) by 2020. This period is characterized by a baby bust with a TFR dropping from 6.1 to 4.0 children per woman over the period

These periods roughly correspond to the four periods described in the context: (i) the mid 70's-mid 90's when an explicit anti-natalist policy was implemented; (ii) the civil unrest

impending the implementation of the population policy (iii) the genocide against the Tutsi aftermath where families were being reunited and a baby boom took place to replace the deceased as is classically observed after a conflict with high death toll; and (iv) the period 2003 to present characterized by a strong population and development policy aimed, among others, at harmonizing the availability of resources in the country with the population growth.

The match between the four periods of the evolution of fertility and the four periods corresponding to different population policies reflects the real impact of interventions aimed at controlling fertility implemented in Rwanda over the last three decades.

Figure 11: Evolution of the TFR between 1978 and 2012

Source: Rwandan DHSs (1992,2000,2005,2007-2008,2010)and PHCs (1978,2002,2012)
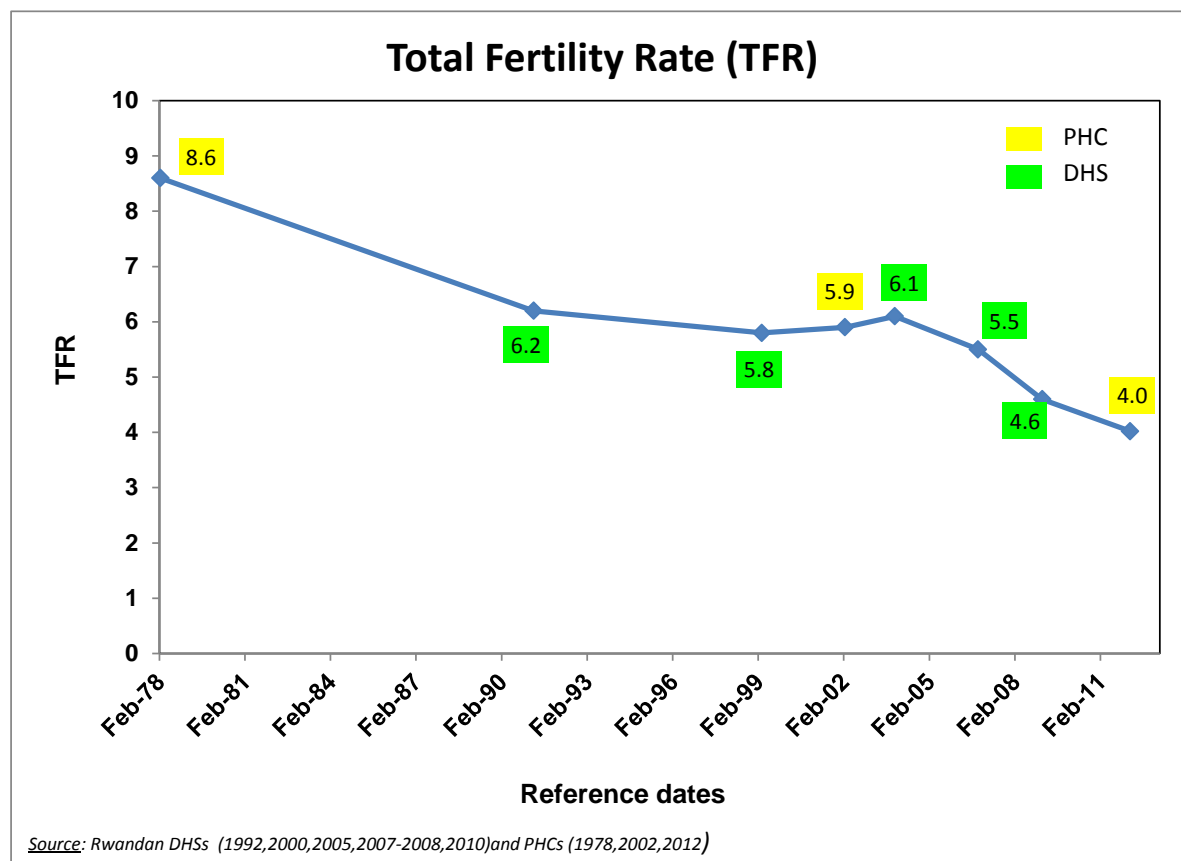
4.2.2 Geographic variations of current fertility

Current Fertility Level

As expected, current fertility varies considerably across Provinces; the TFR increases from a minimum of 3.1 children per woman in Kigali City to a maximum of 4.4 in the Eastern and Western Provinces (Figure 12). Fertility is also low in the Northern Province where the TFR of 3.6 children per woman is below the national level of 4 children per woman.

There are several explanations for these spatial variations. For example, in Kigali city, women have relatively better education and better access to modern contraception than their counterparts in other Provinces. The labour force participation rates are also high among

women in Kigali city as compared to the rest of the country. Moreover, fertility in the Western Province has been historically high although there has been a declining trend in recent years.

In contrast the high fertility level in the Eastern Province is recent and seems to be linked to internal migration. One of the main pull factors of migration to the Eastern Province is the availability of arable land which attracts young migrants in the childbearing ages from other areas, particularly from the Northern Province where agricultural land is scarce (cf. The 2012 PHC Thematic report on Migration). In fact, the outmigration of young people from the North partly explains the decreasing trends in fertility in the Northern Province.

Figure 12: Total Fertility Rate (TFR) by Province

Source: Rwandan 2012 PHC
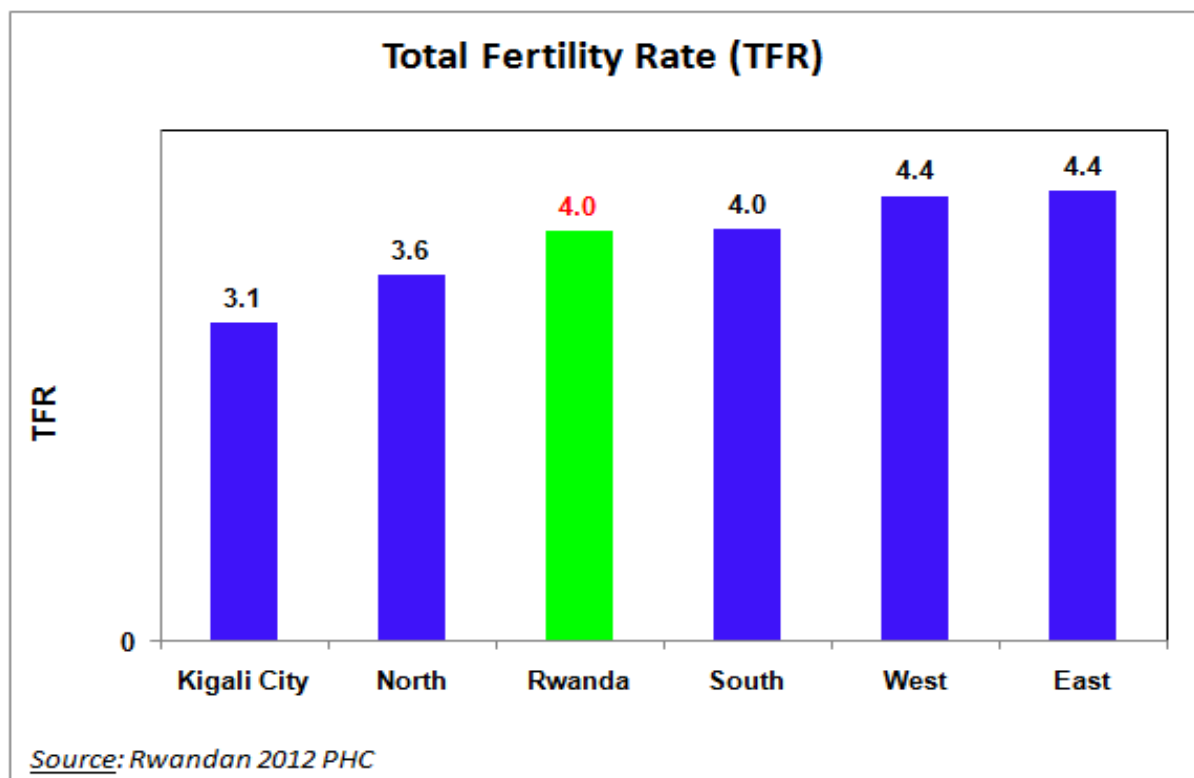
Fertility Pattern and Timing

The general fertility pattern in the five Provinces is the same as the one described at the national level, with some differences in the timing of fertility (Figure 13). In Kigali City, childbearing is more intense in the 25-29 and 30-34 age groups while it tends to concentrate mostly in the 25-29 age group in the other Provinces.

The provincial differences in the timing of fertility is reflected in the mean age of women at childbearing (MAWC): 28.6 in Kigali City, 28.8 in Northern Province, 29.1 in Eastern Province, 29.3 in Western Province and 29.6 in Southern Province.

Figure 13: Age-Specific Fertility Rates (ASFRs) by Province
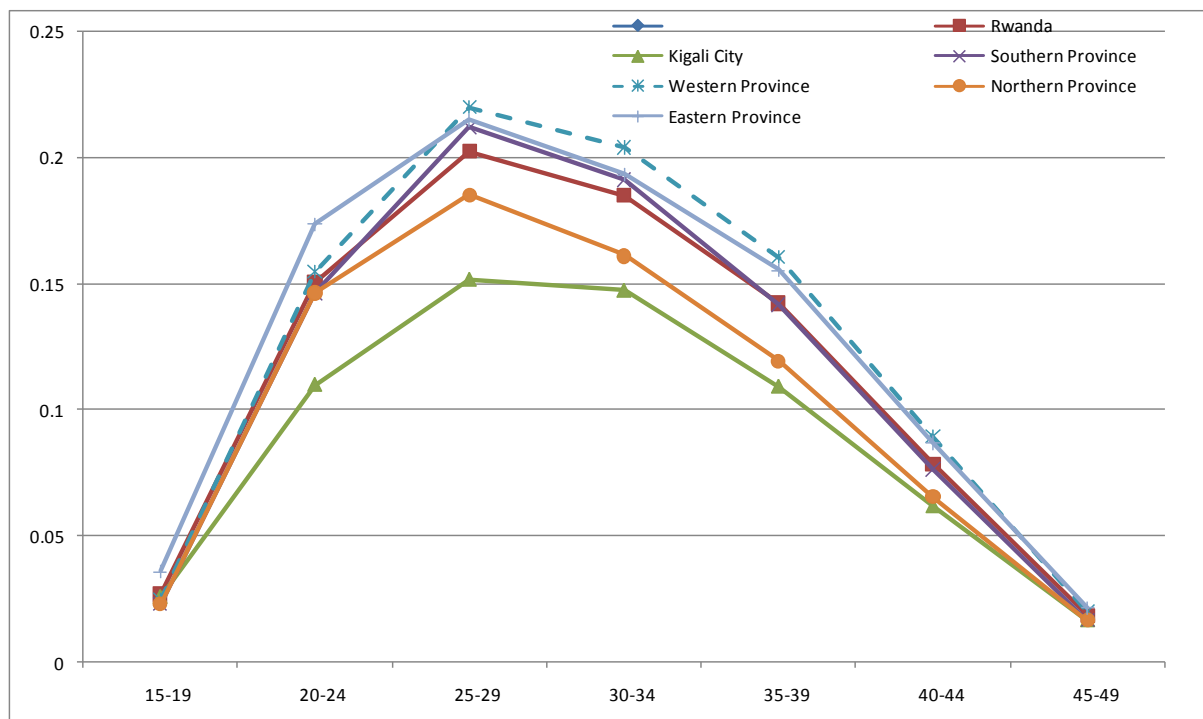
Recent trend in Current Fertility Level

The recent rapid decline in fertility observed at the national level is also reflected at the provincial level. At the national level, the TFR has declined by 13% in three years, between February 2008 and February 2012. This decline varies across provinces from a minimum of 10% in the Eastern Province to 13% in the western Province (Table 7). The decline is less pronounced in the Eastern Province because fertility is sustained there by in-migration of young people in the reproductive ages as explained above. The second lowest decrease is recorded in Kigali City where the decline has started earlier than in the other Provinces, which is a consequence of a threshold effect: the lower the TFR, the smaller its decrease is.

Province	DHS 2010	PHC 2012	Relative decline
Rwanda	4.6	4.0	-12.6
Kigali City	3.5	3.1	-11.0
Southern Province	4.6	4.0	-12.2
Western Province	5.0	4.4	-12.7
Northern Province	4.1	3.6	-12.5
Eastern Province	4.9	4.4	-10.0

Source: Rwanda 4th Population and Housing Census, 2012 (NISR)

4.2.3 Fertility differentials

This section describes the variation in fertility by the level of women's education and religious affiliation.

Fertility and women's education level

Education is known to have significant impact on reproductive behaviours. The higher the level of education, the fewer the children a woman have. Figure 14 confirms this observation. Women with secondary level of education and above have few children with a TFR of 2.6 children when compared to a TFR of 4.7 amongst those with no formal education. The difference in TFR between those with no education and primary/post primary education is trivial. This suggests that the national TFR of 4 children per woman is primarily driven by the high fertility of women with less or no education.

Figure 14: TFR by Education level

Source: Rwanda 2012 PHC (NISR)
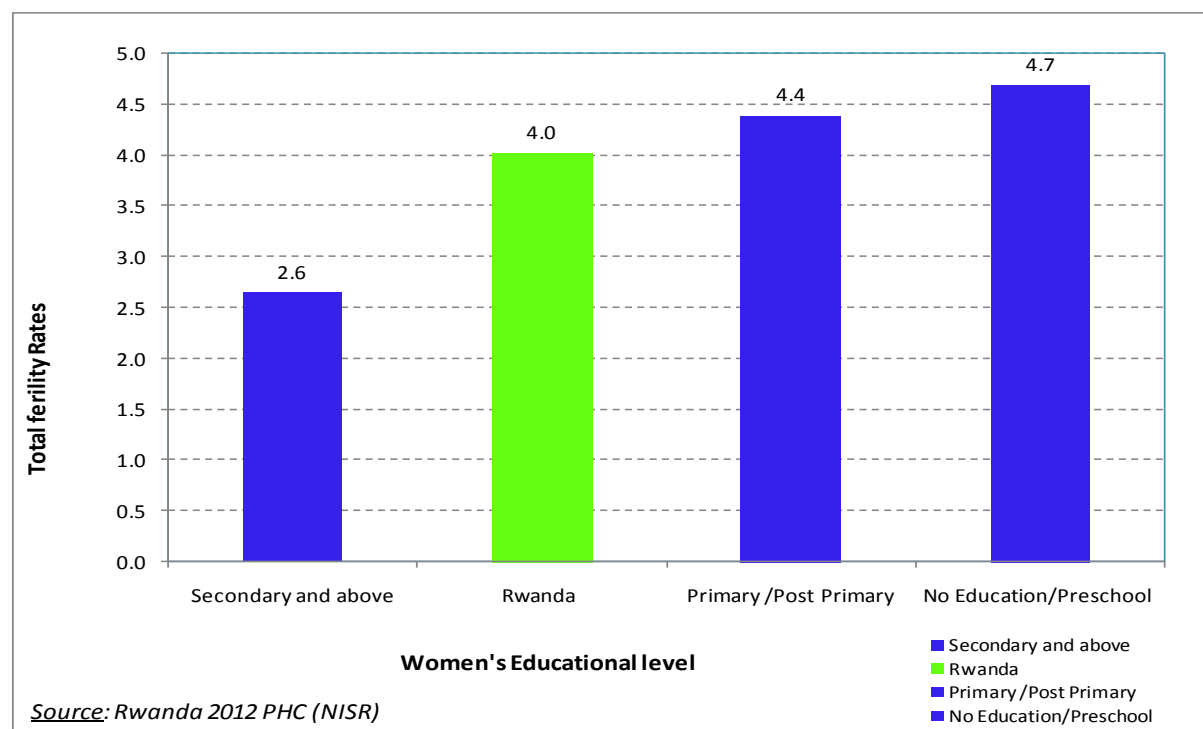
Women's level of education has also an impact on the age pattern of fertility as shown in (Figure 15). Less educated women enter childbearing relatively earlier than those with a secondary level of education or above.

Women with secondary level of education reach their peak of fertility between age 30 and 34 years whereas for women with no education or with primary or post primary level of education this is the case between age 25 and 29 years.

Figure 15: Age-Specific Fertility Rate by Educational level

Source: Rwanda 4th PHC, 2012 (NISR)
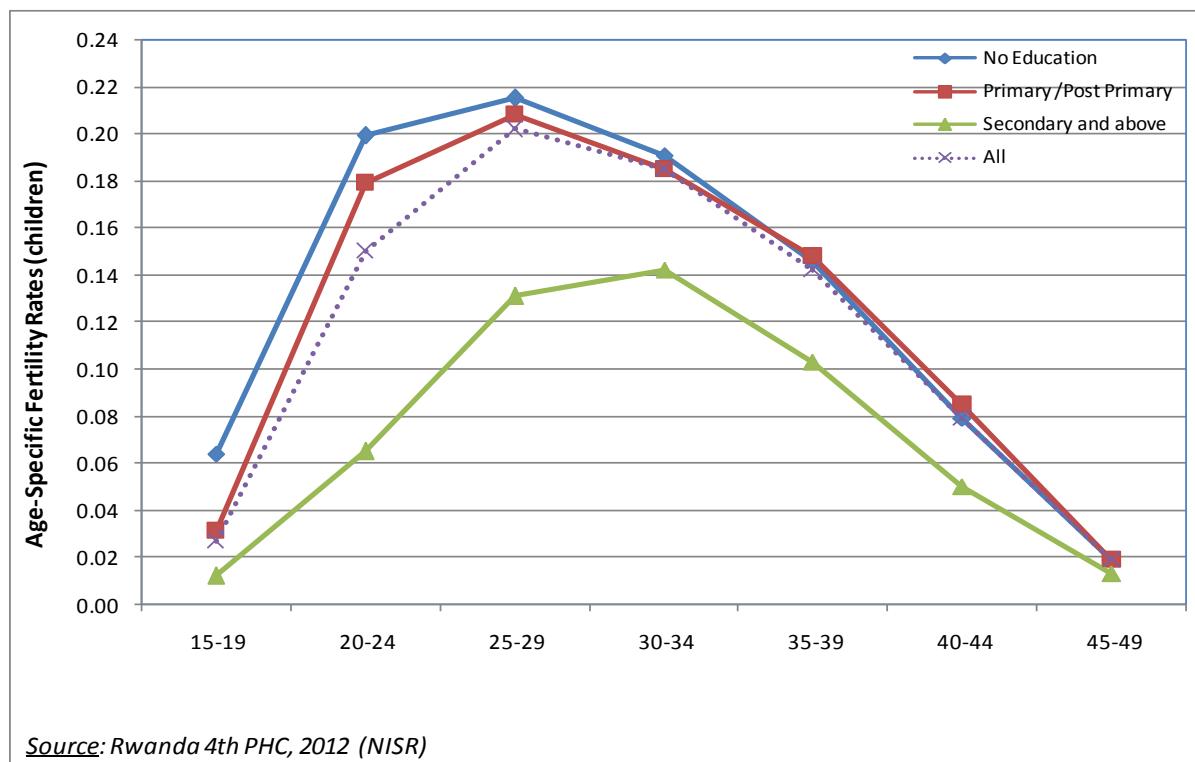
Fertility and women's Religious affiliation

The main religion groups in Rwanda are: Catholics (43.7% of the resident population), Protestants (37.7% of the resident population), Adventists (11.8% of the resident population) and Muslims (2.0% of the resident population). The Jehovah witness account for 0.7% of the resident population, the traditional religions followers and other religious affiliations 0.2%. Overall 2.5% of the resident population have no religious affiliation. Virtually all the religious groups have their own and different guidelines in terms of fertility behaviours. Therefore depending on how their followers stick to these guidelines, religious affiliation has an impact on the timing and intensity of women's fertility.

Fertility level varies by women's religious affiliation, from a minimum of 3.5 children per woman among Jehovah Witnesses to a maximum of 4.3 children per woman among Protestants (Figure 16). Aside from the Protestants, Adventists is the other group with a fertility level higher than the national one (4.3 vs. 4.0 children per woman).

The second main finding from Figure 16 is the lower fertility of Catholics (3.9 children per woman) as compared to Protestants (4.3 children per woman) though both are Christians. This was not expected according to the literature but is explained in the specific case of Rwanda by the fact that the Catholic Church implements a program that promotes natural family planning. Moreover, Catholic women are more likely to use modern contraception ceteris paribus as shown by UWAYEZU (2009) in a multivariate analysis of the determinants of modern contraception use among Rwandan women.

Muslims' fertility is the second lowest one after the Jehovah witnesses (3.7 children per woman). The existing studies show that Muslim women tend to have fewer children than women of other religious groups attributed to higher prevalence of polygyny with shorter exposure to the risk of pregnancy. But in the case of Rwanda the relatively lower fertility rate amongst Muslim women has more to do with two facts. First of all most of them reside in urban areas (54% vs. 16.5% of the total population). Second Muslim women are better educated; 30% of Muslim women of 15 to 49 have a secondary or higher level of education while at the national level this is only 15.8%. Muslim women have therefore more modern fertility behaviours than most of the other Rwandan women.

Figure 16: TFR by Women's Religious affiliation

Source: Rwanda 2012 PHC (NISR)   **Total fertility Rate (TFR)**
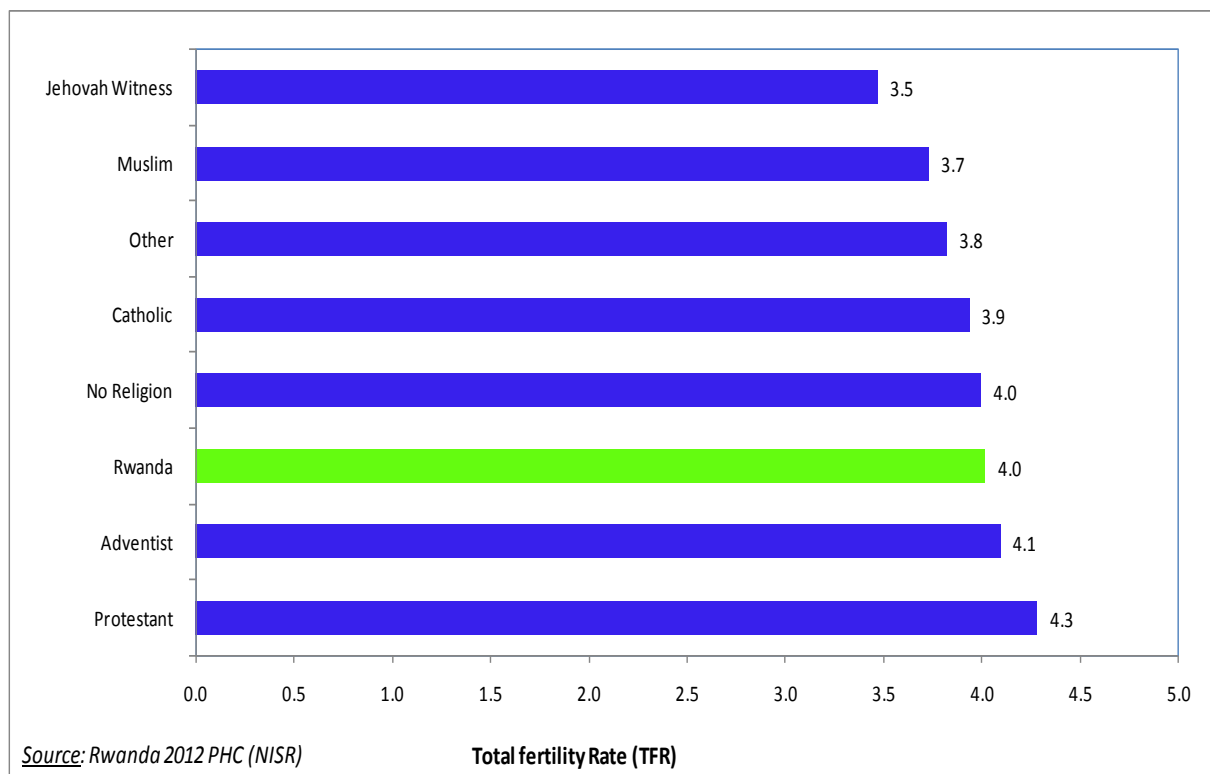
The age pattern of fertility varies by women's religious affiliation (Figure 17). Generally speaking one can differentiate three main groups: (i) women with no religious affiliation and Muslim's women; (ii) Jehovah witness; and (iii) all other groups.

Women with no religious affiliation and Muslims reach their maximum fertility earlier than the other women (20-29 years). These two groups are also characterized by their higher fertility between age 15 and 24 years, and after age 25 their fertility tends to decrease when compared to other groups. As for the Jehovah witnesses, they have their maximum fertility between age 30 and 34 years. The others have a fertility pattern similar to the national one with a maximum fertility reached between age 25 and 29 years.

Figure 17: Age Specific Fertility rates by Women's Religious affiliation

Source: Rwanda 2012 PHC (NISR)
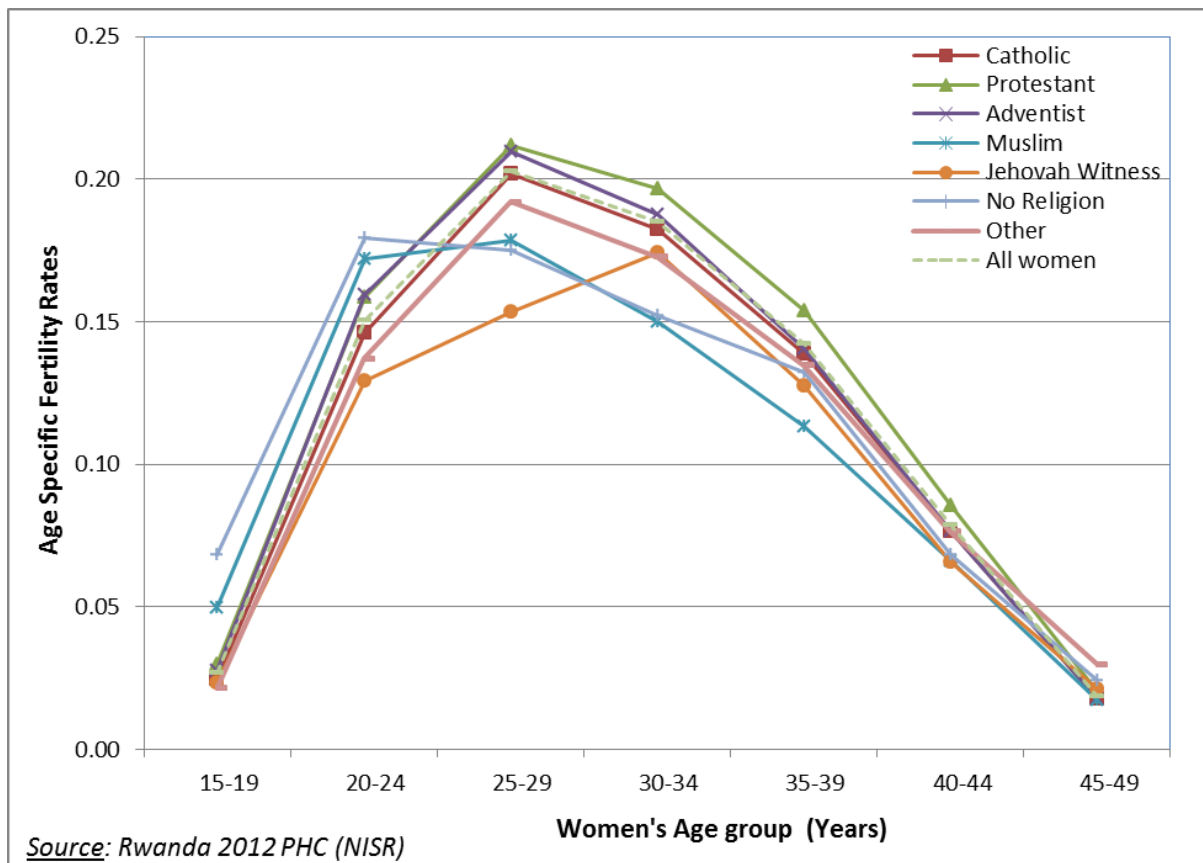
The differences in age pattern of fertility are further reflected in the mean age at childbearing: 29.7 years among Jehovah witnesses, 26.7 years among Muslims women and 27.9 years among women with no religious affiliation. Women of all other religious groups have a mean age at childbearing close to the national level one (29.2 years).

Figure 18: Mean Age at Childbearing by women's religious affiliation

Source: Rwanda 2012 PHC (NISR)　　Mean Age at Childbearing (years)
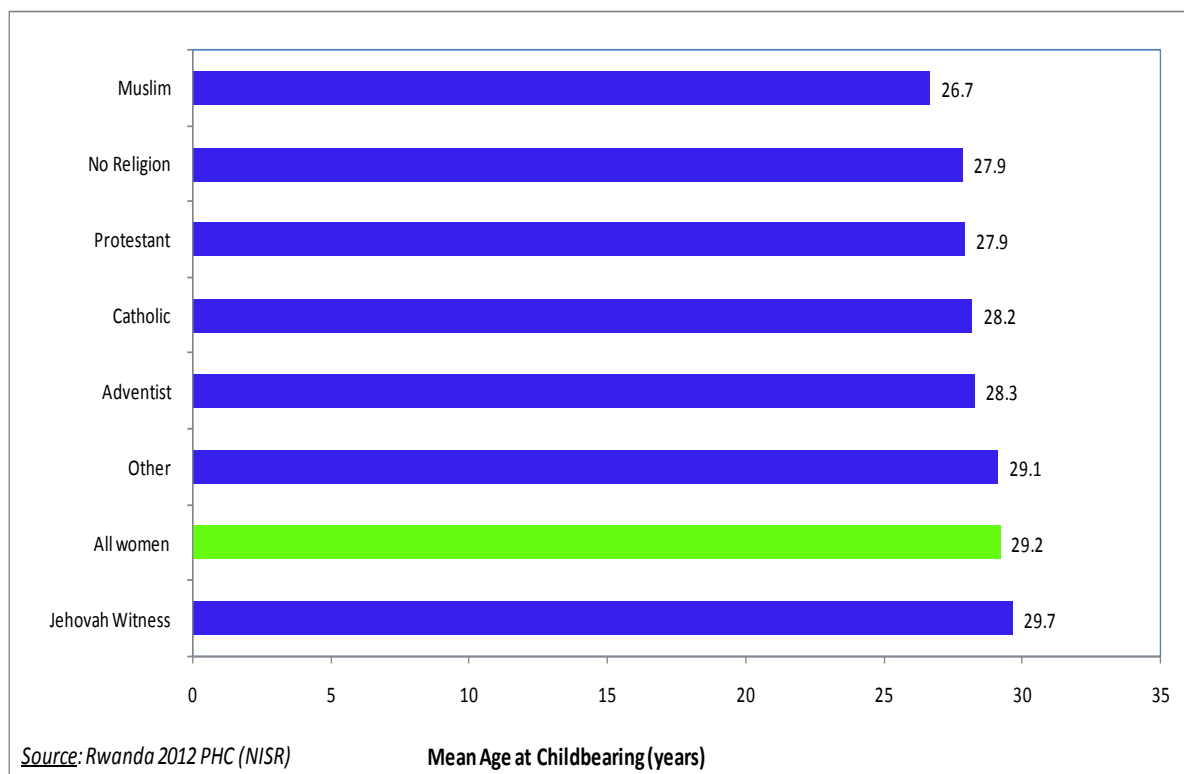
4.3 High-risk fertility behaviours/Unsafe motherhood and premarital fertility

4.3.1 High risk fertility behaviours: Adolescents' fertility

Adolescence is the period of life during which young boys and girls progress to adulthood. Adolescence is defined in Rwanda as the period of life spanning from 12 to 19 years of age. The study of fertility during this crucial period of life is relevant for mainly two reasons: its health impact and its socio-economic impact.

Regarding the health impact, the literature has well documented that maternal and childhood mortality is generally higher among adolescent mothers and their children than among older mothers. Pregnant adolescents are often at high risk of pregnancy, delivery and post-delivery related complications. Adolescent mothers often do not have the biological maturity for reproduction and they lack experience in new born and childcare which partly explain their poorer health status and their babies' one. Also, there is a lot of evidence suggesting that adolescents are exposed to frequent abortions, often unsafe, resulting in increased risk of maternal mortality and morbidity (e.g. obstetrical fistula, secondary infertility).

In terms of socio economic impact, an adolescent girl who becomes pregnant is likely to drop out from school further jeopardizing her chances in the labour market in later years. Moreover, due to childcare burden, she is likely to remain in the vicious cycle of poverty and transmit poverty to subsequent generation. Monitoring adolescent childbearing is therefore crucial for social welfare and health interventions.

For the above reasons, it is crucial for decision-makers and all actors in the public health sectors to be provided with accurate and up-to-date information on adolescents' fertility. The PHC is the unique source to analyse the adolescents' fertility up to the lowest geographical level. Such analysis is not possible with the DHSs due to few number of adolescents included in the sample. In this section we will analyse the percentage of adolescent girls who already gave birth, its evolution over time and the contribution of adolescents to the national Total Fertility Rate.

Prevalence of adolescents' fertility and its variation by area of residence and school attendance

Fertility among adolescents is very low before age 17 but rises substantially at age 18 and 19. In fact, the percentage of adolescent girls who already gave birth is 2.6% at the national level. However, this masks important variations by age and other background characteristics. The percentage varies from 0% at age 12 up to 12.3% at age 19 years. It is stable around 1% up to age 16 years from which it starts to increase rapidly: 2% at age 17, 6% at age 18 and 12.3% at age 19 years.

This pattern does not vary by area of residence, as shown in Figure 19 below. The prevalence of childbearing among adolescents is the same in urban and in rural areas at each age. Though fertility level among adolescents is the same in urban and in rural areas, the driven factors behind this levels may however be different. Early childbearing in rural areas is usually related to early marriage and/or non-use of modern contraception during premarital sexual intercourse. In contrary early childbearing in urban area generally occurs outside marriage and is influenced by modern social norms that promote sexual freedom channelled by the media. This premarital sex combined with non-use or ineffective use of contraceptive methods explain the risk for pregnancy among urban adolescents.

Figure 19: Percentage of adolescent women who gave birth by single year of age by area of residence

Source: Rwanda 2012 PHC (NISR)
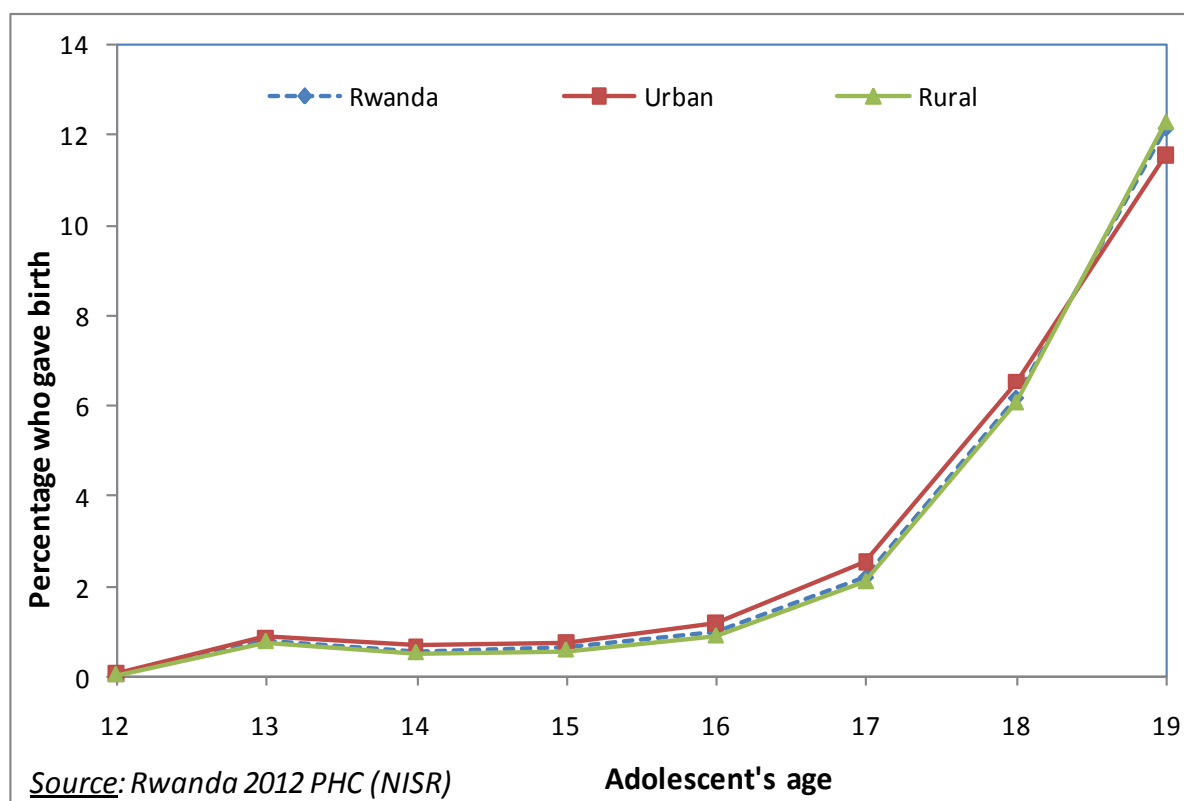
However, adolescent fertility varies considerably by current school attendance. It is far higher among adolescents who have dropped out-of school than those in-school. The percentage of adolescents (aged 12-19 years) who already gave birth is 7.9% among adolescents who never attended school, 7.8% among those who dropped out and 0.4% among those who are currently attending school. This difference holds at each age as shown in Figure 20. Childbearing is a rare event among in-school adolescents (2% at age 19 and less than 1% before) and more common among out-of-school adolescents, i.e. the drop-outs and the never-attended adolescents, just above 5% before age 17 and more than 20% by age 19[1].

---

[1] The figures for age 13 for the drop-out and never-attended adolescents seem to be implausible, maybe due to a poor quality of the data for this age
.

Figure 20: Percentage of adolescent women who gave birth by single year of age by school attendance

Source: Rwanda 2012 PHC (NISR)
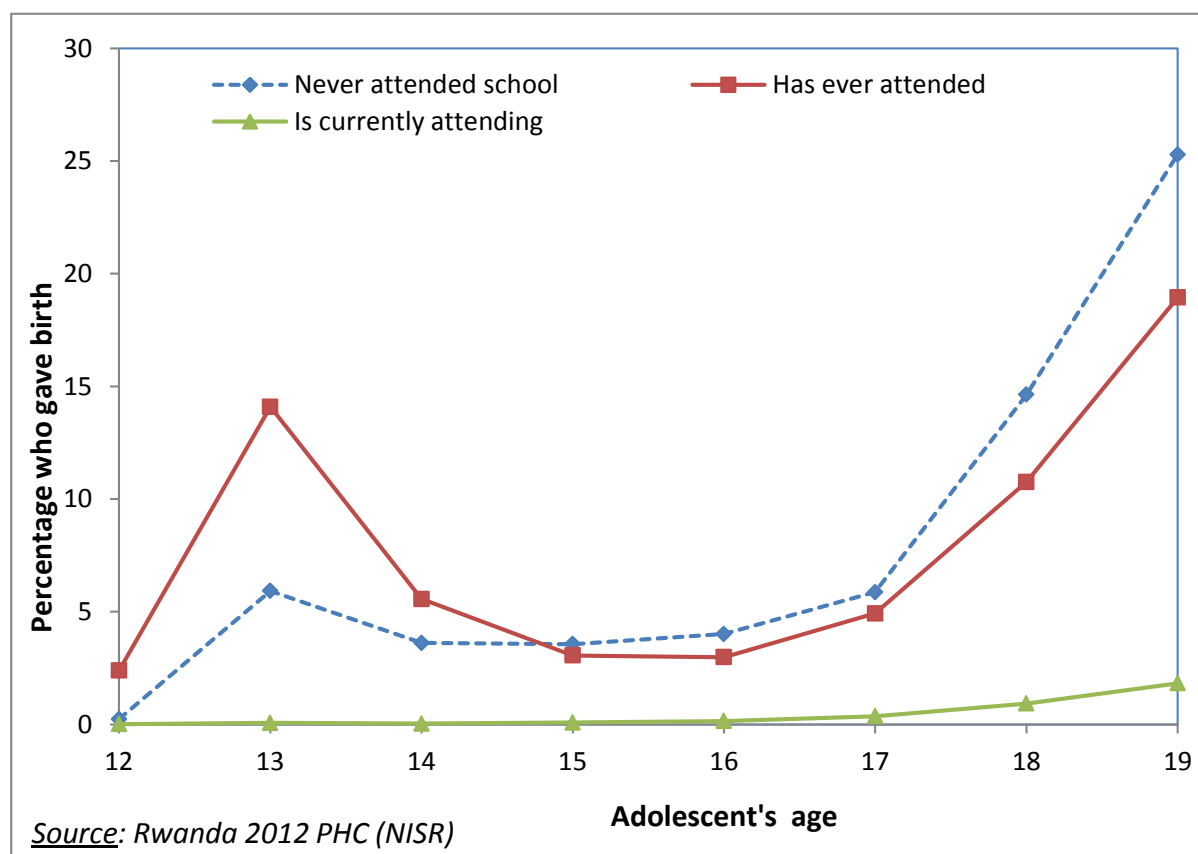
Geographic variations of adolescents' fertility

The pattern of childbearing during adolescence does not vary a lot by Province and is similar to the national one: the percentage of adolescents who already gave birth is stable at a low level up to age 17 before increasing dramatically at ages 18 and 19 years (Figure 21). However in terms of level we distinguish three main groups:

- Kigali City that has levels closer to the national ones, e.g. 12.3% by age 19 years;

- the Eastern Province with the highest prevalence of adolescent fertility, e.g. 16% by age 19 years; and

- All other Provinces (South, West, North) that have lower levels than the national ones.

Figure 21: Percentage of adolescents who already gave birth by single year of age by Province

Source: Rwanda 2012 PHC (NISR)
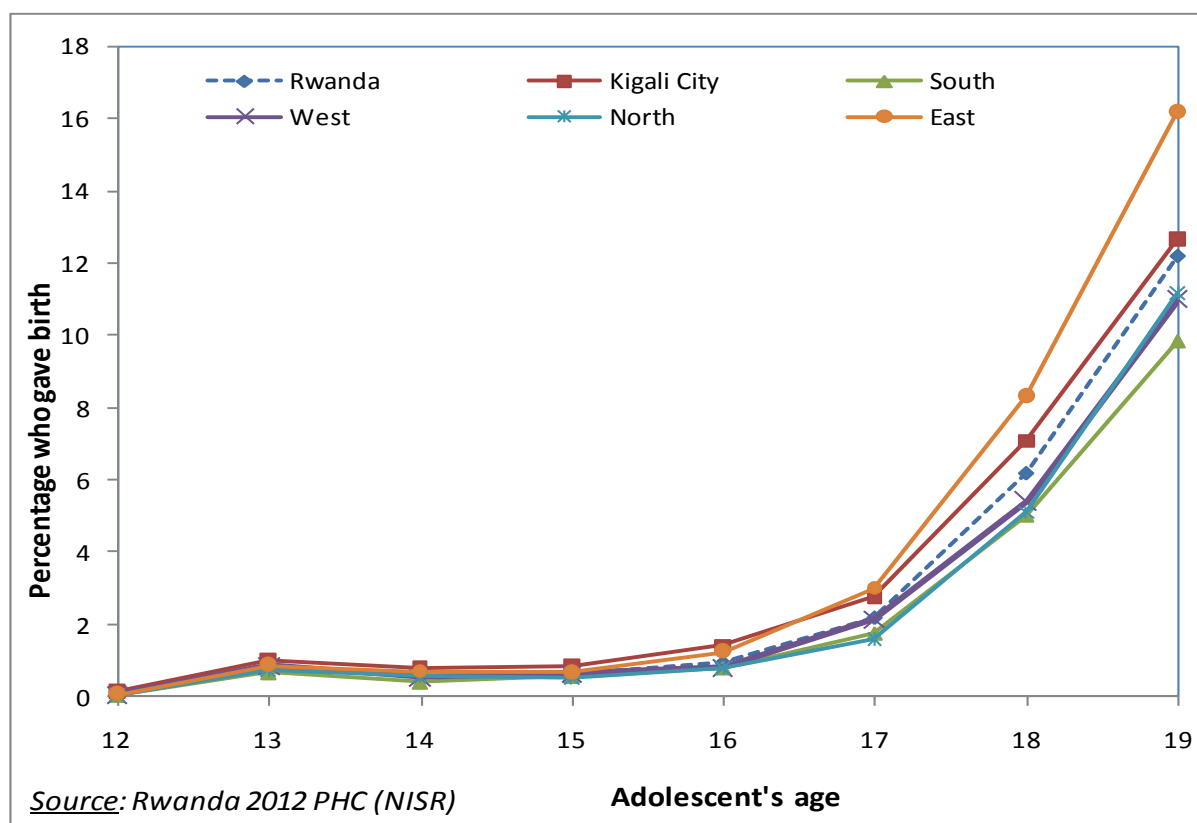
Given that the variations in adolescent fertility by current school attendance status are more important than variation by area of residence, the regional analysis will be disaggregated by Province and school attendance. The findings are presented in Table 8 below. They confirm the findings at the national level. In each of the Provinces, adolescents' fertility varies tremendously by school attendance. Childbearing is much more frequent among out-of-school adolescents than among adolescents attending school.

Table 8:   Percentage of adolescents who already gave birth by age group, by Province, school attendance and age-group

Province	12-17 years			18-19 years		
	Never attended	Dropped-out	Currently attending	Never attended	Dropped-out	Currently attending
Rwanda	3.8	5.5	0.1	19.9	14.9	1.4
Kigali City	3.8	5.5	0.2	20.9	15.4	2.3
Southern Province	3.9	5.0	0.1	18.2	13.0	1.1
Western Province	4.0	5.5	0.1	19.0	13.1	1.2
Northern Province	3.9	5.2	0.1	18.1	12.3	0.9
Eastern Province	3.9	6.3	0.2	23.8	19.8	1.7

Source: Rwanda 4th PHC 2012 (NISR)

Evolution of adolescent fertility between 2002 and 2012

Adolescents' fertility has decreased between 2002 and 2012. The percentage of adolescents who already gave birth dropped from 3.6% in 2002 to 2.9% in 2012. This decrease actually occurred in the 16-19 years age group. The percentage remains low and stable before age 16 as shown in Figure 22.

However, the age patterns of childbearing during adolescence have not changed a lot between 2002 and 2012. The percentage of adolescents who gave birth is stable at a low level up to age 17 (less than 2%) before increasing dramatically at ages 18 and 19 (more than 12%).

The observed decrease in adolescents' fertility between 2002 and 2012 is consistent with the general fertility decline in Rwanda. This is primarily a result of interventions to reduce the burden of early childbearing and its adverse consequences on maternal and child health and wellbeing.

Figure 22: Evolution of percentage of adolescent who have already gave birth from 2002 to 2012

Source: Rwanda 2002 and 2012 PHCs (NISR)
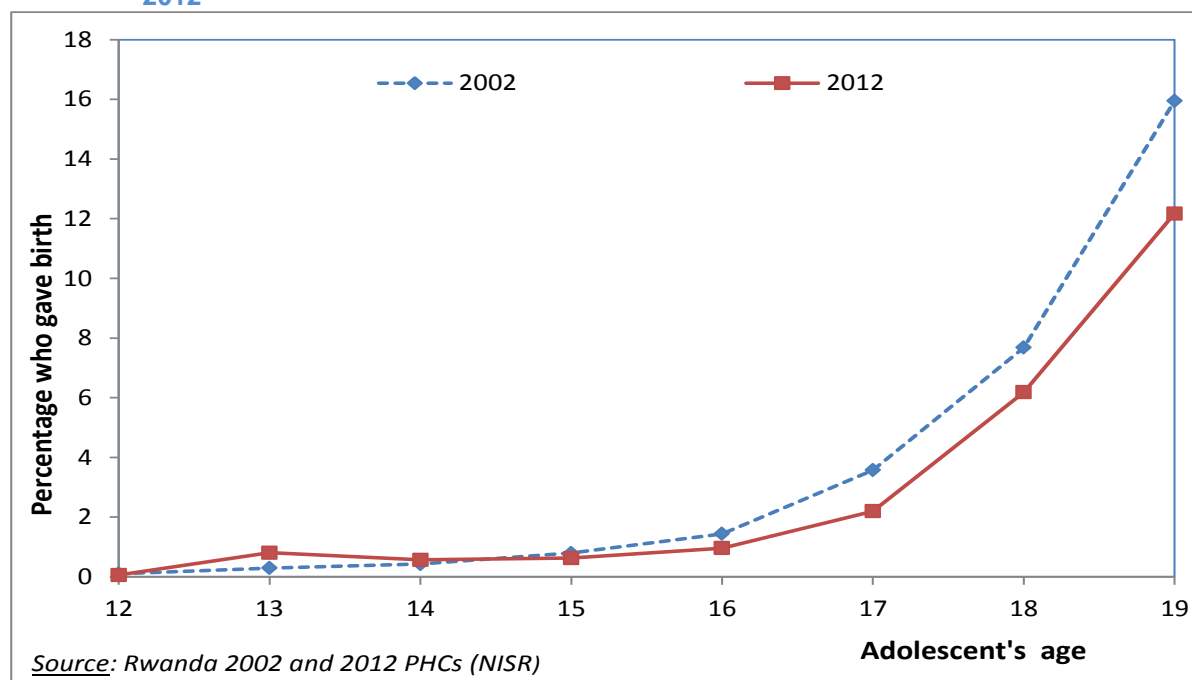
Evolution of the contribution of adolescents' fertility to the national TFR

Figure 23 shows that adolescents' contribution to the Total Fertility Rate (TFR) has increased from 3% to 4% between 2002 and 2012. This is also the case for the age-group 20-24 (from 17 to 19%). In contrary the contribution to TFR has decreased for women aged 35-39 and 45-49 years (from 19 to 17%) and remained at the same level for women aged 25-29 years (25%), 30-34 years (23%) and 40-44 years (10%). This means that though fertility is decreasing among adolescents the decline is less important than among older women, especially among the 35-39-year old.

Figure 23: Adolescents' contribution to the TFR and its evolution from 2002 to 2012

Source: Rwandan 2012 PHC
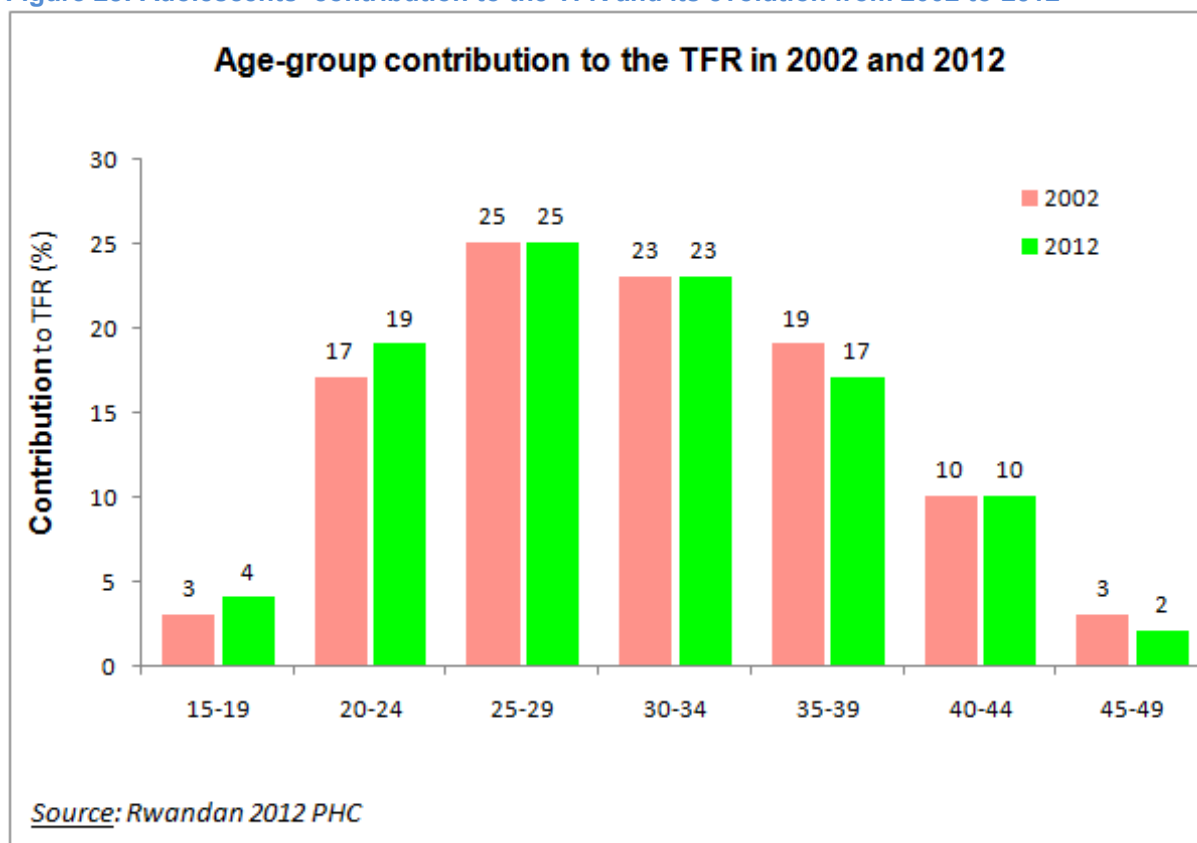
4.3.2 High risk fertility behaviours: Late childbearing onset and late fertility

Late onset of childbearing

Starting childbearing at a late age bears many risks to mother's health. Age 35 is usually set as the lower age boundary for late onset of childbearing. Therefore, in this analysis we will capture late fertility onset by the Late Fertility Onset Rate (LFOR) that we define as the percentage of women who gave their first birth at age 35 and above among women who gave birth during the last 12 months preceding the PHC.

$$LFOR = \frac{\sum Women\ who\ gave\ their\ first\ birth\ in\ the\ last\ 12\ months\ at\ age\ 35\ or\ above}{\sum Women\ who\ gave\ birth\ during\ the\ last\ 12\ months} X100$$

In Rwanda late onset of childbearing is rare. Among women who gave birth in the last 12 months only 0.5% were aged 35 and above when giving birth to their first child (1480 women). However, this percentage is increasing as compared to 2002 (0.2%). The percentage of women who start late their childbearing varies slightly by Province. The LFOR is 0.4% in the Western Province, 0.5% in the Northern, Eastern and Southern Provinces and 1% in Kigali City.

The higher percentage of late childbearing onset in Kigali City is probably associated with women being on average more educated than in other provinces. According to the literature women with higher education level tend to get married later and start their childbearing later.

This is confirmed by the 2012 PHC data that indicate that the percentage of women who gave their first birth at age 35 and above is 0.8% among women with secondary and above education level and 0.5% among less educated women.

Late fertility

Women who keep on giving birth until late ages are exposed to high risk for their own health and their children's health. In this analysis we define late childbearing as giving birth at 45 or above. We will measure it the Late Fertility Rate (LFR) that is the percentage of women who gave birth during the last 12 months among women aged 45 years and above.

$$LFR = \frac{\sum_{45+} \text{ women who gave birth in the last 12 months}}{\sum_{45+} \text{ women}} \text{x100}$$

The LFR in 2012 is 1.2%. Overall, 4,262 women aged 45 and above have given birth during the year preceding the census, meaning that a non-negligible of Rwandan women continue to give birth till late ages. Yet the LFR underestimates the true level of late childbearing in Rwanda because it is based on births occurred in the 12 months preceding the census while women aged 45 and above who still give birth do not deliver every single year. Women who gave birth two years or more before the census while aged 45 years and above are not captured by the LFR.

The variations in LFR by Province, area of residence, educational attainment and current economic activity status are trivial (Table 9). This finding suggests that there is still a culture of extending childbearing at late ages in Rwanda, regardless of other social and economic influences.

Table 9: Late Fertility Rate (LFR) by some women's background characteristics

Women's background variables	Number of women aged 45 and above for whom recent fertility was declared	Number of women aged 45 and above who gave birth during the preceding year	Late Fertility Rate (%)
Area of Residence			
Urban	36,468	457	1.25
Rural	311,391	3,805	1.22
Province			
Kigali City	22,804	299	1.31
Southern Province	100,558	1,107	1.10
Western Province	81,761	1,082	1.32
Northern Province	58,007	629	1.08
Eastern Province	84,729	1,145	1.35
Marital status			
Never married	13,800	220	1.59
Married	218,631	3,354	1.53
Separated/ Divorced	18,000	149	0.83
Widowed	97,003	534	0.55
Not Stated	425	5	1.18
Religious affiliation			
Catholic	171,367	1,937	1.13
Protestant	124,893	1,705	1.37
Adventist	39,656	457	1.15
Muslim	4,626	49	1.06
Jehovah Witness	2,291	23	1.00
No Religion	3,971	73	1.84
Other	1,055	18	1.71
Educational attainment			
No Education	167,440	2,101	1.25
Primary/Post Primary	164,202	1,990	1.21
Secondary and above	14,109	147	1.04
Not Stated	2,108	24	1.14

Source: Rwanda 4th Population and Housing Census, 2012 (NISR)

4.3.3 Premarital fertility

The analysis of premarital fertility is justified by the fact that in many settings, including Rwandan society, women who give births prior to marriage:

- are stigmatized by their family members and the rest of the society, lacks social support and care usually provided by the family or family-in-law and needed by inexperienced young mothers

- tend to experience higher maternal and infant mortality and morbidity; are tempted to resort to unsafe abortion;

- tend to have less means to take care of the child because of lack of support of a husband;

- jeopardize their future (school drop-out, loose of their job if in the informal sector) and may easily fall into the poverty trap; and

- have less chance to get married later on or are more likely to be involved in unwanted marriage (with the father of the baby) which will be more subject to dissolution than otherwise.

In this analysis, premarital fertility is measured by the percentage of single women who already gave birth.

Current premarital fertility by background characteristics

The analysis was done by area of residence, Province, religious affiliation and level of educational attainment. The findings are presented in Table 10 below.

At the national level 12% of single women have already given birth at the time of the census. This percentage does not vary by area of residence. It varies only slightly by Province, from 10% in the Western and the Northern Province to 13% in Kigali City and in Southern Province.

The prevalence of premarital fertility varies more importantly according to the level of educational attainment and religious affiliation. It varies from 7% among women with secondary level of education or above to 11% among those with primary level and 33% among non-educated women. By religious affiliation we distinguish three main groups: women with no religious affiliation who have the highest prevalence of premarital fertility (27%), the Christians who have the lowest prevalence of premarital fertility (between 10 and 11%), and the Muslims and women with other religious affiliation who have prevalence of premarital fertility between the two extremes 17% and 15% respectively.

Table 10: Percentage of single women who already gave birth by women's background variables

Women's background variables	Number of single women whose parity is reported	number of single women who gave birth	Percentage of single women who already gave birth
All single women	1,406,447	162,652	11.6
Residence area			
Urban	260,356	31,634	12.2
Rural	1,146,090	131,018	11.4
Province			
Kigali City	164,642	21,932	13.3
Southern Province	345,820	46,292	13.4
Western Province	337,658	34,248	10.1
Northern Province	244,373	24,339	10.0
Eastern Province	313,953	35,841	11.4
Religious affiliation			
Catholic	640,953	73,273	11.4
Protestant	553,600	61,903	11.2
Adventist	159,539	17,654	11.1
Muslim	23,661	4,126	17.4
Jehovah Witness	9,834	1,018	10.4
No Religion	15,423	4,165	27.0
Other	3,437	513	14.9
Educational level			
No Education	107,103	35,057	32.7
Primary/Post Primary	896,666	98,934	11.0
Secondary and above	389,624	27,225	7.0

Source: Rwanda 4th Population and Housing Census, 2012 (NISR)

Geographical and age variations of premarital fertility

Since the risk of premarital fertility depends on the length of exposure and woman's age, it is important to compute the prevalence of premarital fertility by age-group similar to the ASFRs.

The prevalence of premarital fertility increases rapidly with women's age (Figure 24). It is low during adolescence (less than 5%) but becomes greater than 30% in the age-group 25-29 and thereafter increases till it reaches its maximum at age 50-54 (just above 65%). This pattern is probably explained by the duration of exposure to premarital fertility that increases with age.

Premarital fertility follows the same pattern in the five provinces as the national one described above. However, there are marked variations in terms of level after age 20 by Province:

- the Southern Province has the highest premarital fertility prevalence at all ages above 20;

- Kigali City has the lowest premarital fertility prevalence at all ages above 20;

- The Eastern Province has premarital fertility prevalence higher than the national level between age 20 and 34 and the same PFRs as the national level after age 35; and

- Finally the Western and Northern Provinces have premarital fertility prevalence more or less equal to the national ones at all age-groups;

Figure 24: Percentage of single women who gave birth by age-group and by Province

Source: Rwanda 2012 PHC (NISR)
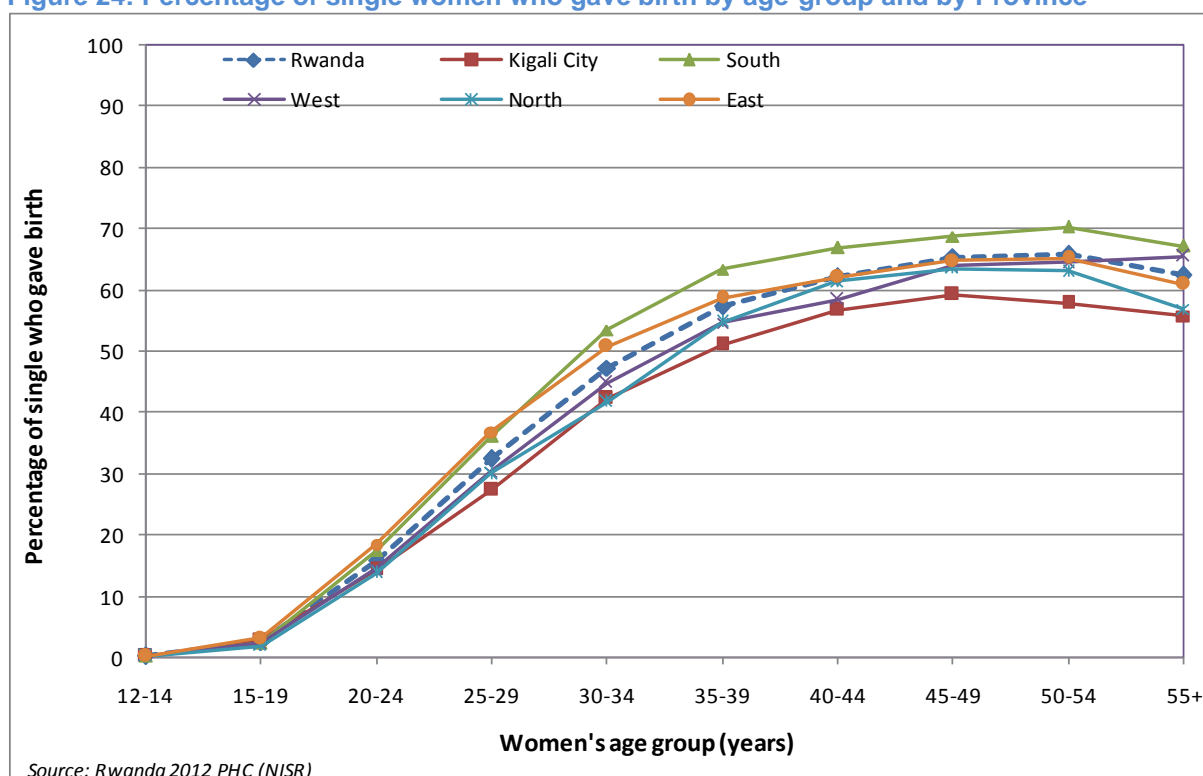
Mean parity of single women vs. mean parity of all women

50

Single women and ever-married women have the same mean parities at any age group (Figure 25).This finding need further investigation since it was expected that married women have a higher parity than single women.

Source: Rwanda 2012 PHC (NISR)
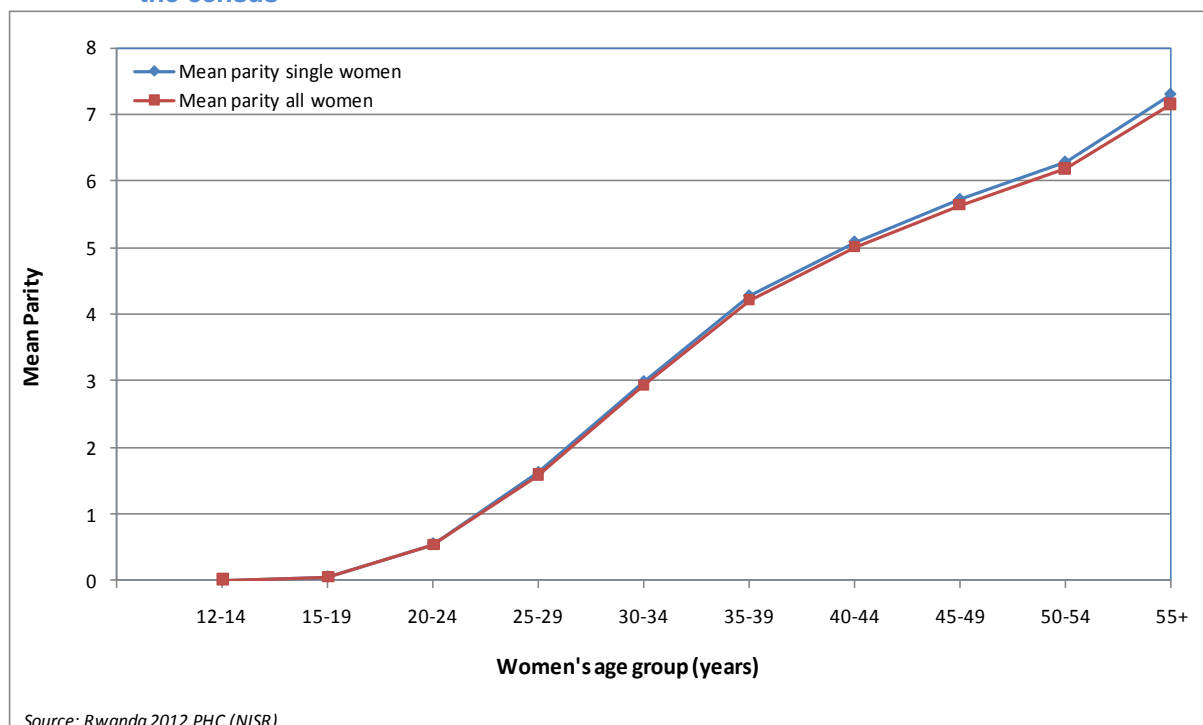
4.4 Other fertility indices

In this section we will analyse: (i) the number and frequency of births in the Rwandan population; (ii) its geographical variations; and (iii) the likelihood that the Rwandan population be replaced during the next generation. The indicators to measure natality that we will use in this analysis are: the number of births occurred in the population during the year preceding the census, the Crude Birth Rate (CBR) that refers to the number of births per 1000 inhabitants per year and the General Fertility Rate (GFR) which is the number of births among 1000 women in the reproductive age (15-49 years).

4.4.1 Number and frequency of births in the population

The number of births that occurred in the year preceding the census is obtained after correction using the age-Specific Fertility Rates for the age-groups 15-49 to adjust for under estimation of observed births as shown by the data quality evaluation. For age-group 12-14 and 50-54 the observed births were used since inaccuracy in the reporting of births from women of those age-groups will not significantly impact the total number of births because only few births were given by women of those age groups.

Overall, Rwandan women gave births to 321,506 babies during the 12 months preceding the census, equivalent to approximately 880 births per day. In other words, 6 babies are born every ten minutes in Rwanda.

The distribution of births by province is shown in Figure 26 below. As expected the highest number of births occurred in the three most populated provinces: South (23,7% of all births), West (24,7%) and East (26,1%). Only 31,179 births (9.7%) occurred in Kigali City

Number of births in the preceding year

Source: Rwanda 2012 PHC
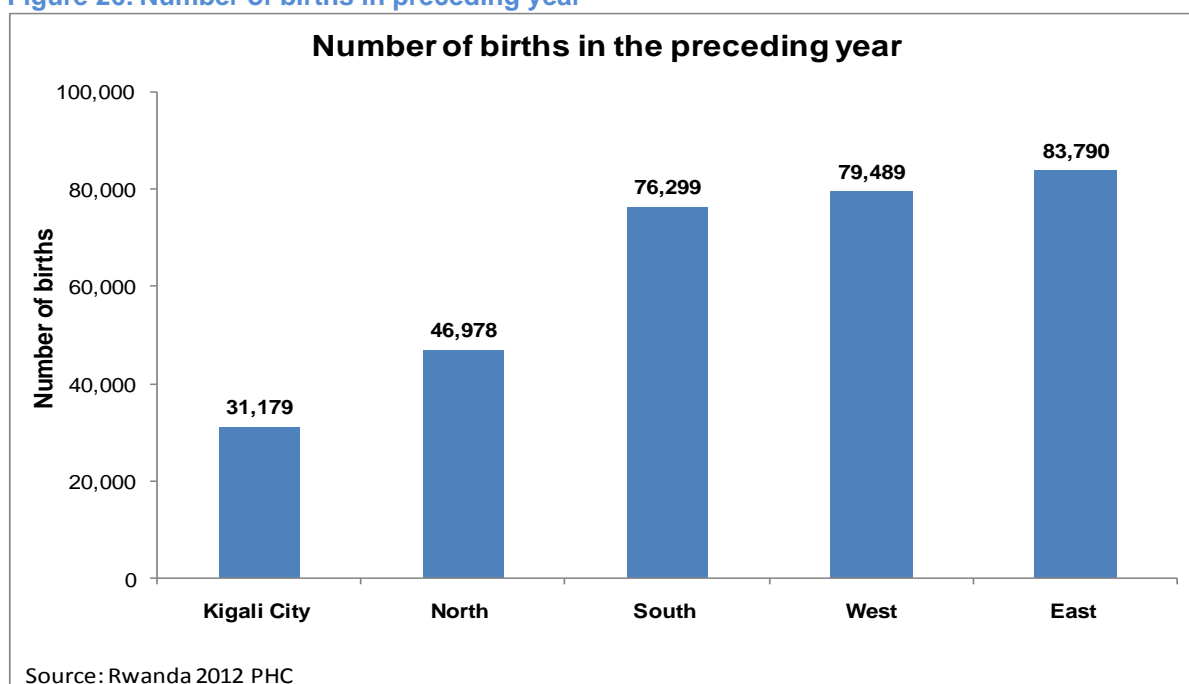
The number of children born in a year depends on the total population and more specifically on the number of women in the standard reproductive age group (15-49). To take into account this, the number of births is divided by the total population to obtain the Crude Birth Rate (CBR) and by the number of women aged 15-49 to obtain the General Fertility Rate (GFR). The two indicators measure more accurately the frequency of births in a population than the total number of births. Table 11 below shows the values of both indicators at the national and provincial levels.

At the national level, there are 31 births per thousand inhabitants per year and 122 births per thousand women aged 15-49 per year. The CBR vary from 27 births per thousand inhabitants per year in the Northern Province to 33 births per thousand inhabitants per year in the Southern Province. The GFR also varies by provinces from 99 births per thousand women aged 15-49 per year in Kigali City to 134 births per thousand women aged 15-49 per year in the Southern Province.

Table 11: Crude Birth Rates and General Fertility Rates by Province

Province	Crude Birth Rate, CBR (‰)	General Fertility Rate, GFR (‰)
Rwanda	30.9	122,2
Kigali City	28,1	98,9
South	29,8	119,9
West	32,5	130,6
North	27,3	108,6
East	32,9	134,3

Source: Rwanda 4th Population and Housing Census, 2012 (NISR)

4.4.2 Trends and geographical variations of natality

To compare natality across different populations at a given time and within the same population at different points of time we will use the Standardized (SBR) rather than the Crude Birth Rate (CBR). The CBR is affected by the age-sex structure of the population. Two populations may have the same CBR but quite different levels of natality due to difference in the number and age distribution of the women in the two populations. The GFR, though more accurate than the CBR, does not fully fixed this limitation. To address this, we resort to SBR that eliminates the effect of age-sex structure by applying the ASFRs of the two populations to the age-sex distribution of a same population. This makes the SBR comparable across different populations at a given time and over time for the same population.

For comparability over time the SBR is computed using only women aged 15-49. Births from women out of this age-group are not available in all censuses (1978, 1991, 2002 and 2012) used in the present trends analysis. The findings are displayed in the Figure 27. It reveals that natality has decreased considerably since 1978, especially between 2002 and 2012. The SBR was 54 children per 1,000 inhabitants in 1978, 46 in 1991, 41 in 2002 and 31 in 2012.

Figure 27: Evolution of Standardized Birth rates from 1978 to 2012

Source: Rwandan 1978,1991,2002 and 2012 PHCs
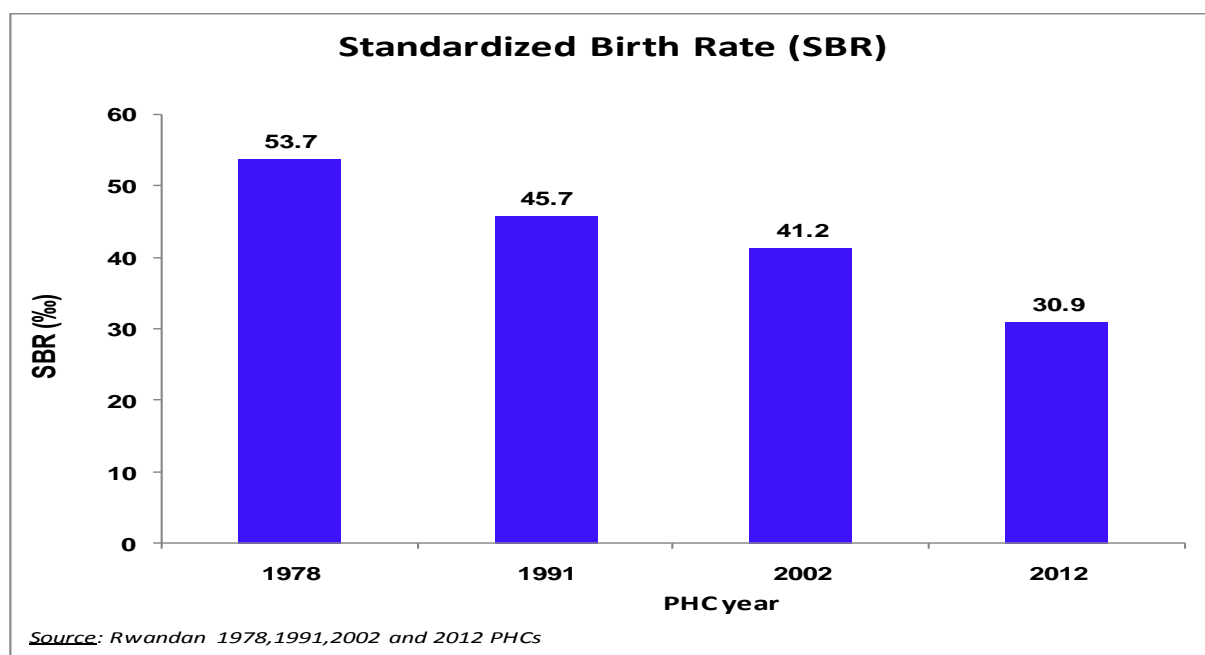
The SBR varies considerably across provinces (Figure 28) from a minimum of 24 children per one thousand inhabitants in Kigali City to a maximum of 34 in the Eastern Province. Thus, the Eastern province appears to be the most fecund, followed by the Western and Southern. On the other side, the Northern Province appears to be the second less fecund province after Kigali City with an SBR as low as 28 children per one thousand inhabitants.

Figure 28: Standardized Birth rate

Standardized Birth Rate (SBR)

Source: Rwandan 2012 PHC
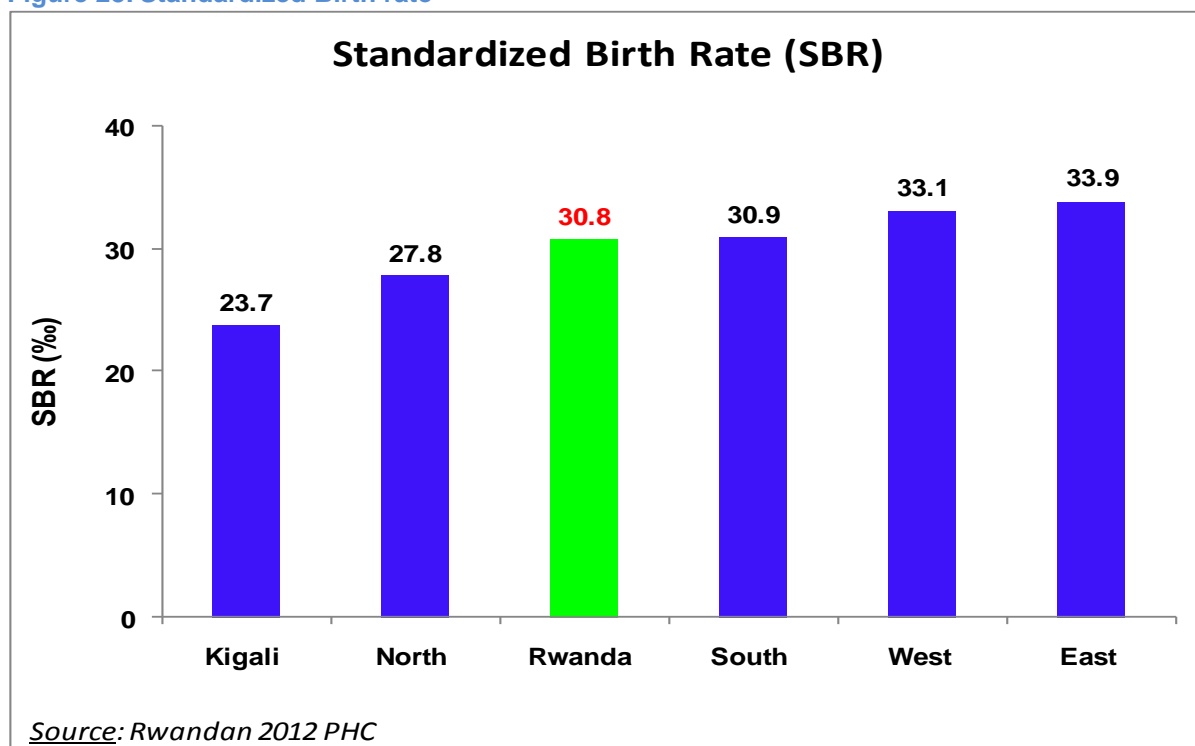
4.4.3 Replacement of the population

To ensure that the population will not decline over time, each woman in the reproductive age should be replaced at least by one daughter. There are three indicators to capture the likelihood of the population to be replaced.

The first one is the TFR that should be greater or equal to 2.1 children to ensure the replacement of the population for the next generation. The second indicator is the Gross Reproduction Rate (GRR) that is the number of daughters a woman would have at the end of her reproductive life under the current fertility conditions. It is obtained by multiplying the TFR by the percentage of girls among the births as shown in the formula below.

$$\text{GRR} = \frac{\text{Number of female births in the last 12 months}}{\text{Total number of births in the last 12 months}} \times \text{TFR}$$

The last indicator to measure the replacement of the population is the Net Reproduction Rate (NRR) that is the number of daughters a woman would have at the end of her reproductive life under the current fertility conditions while taking into account current level of female mortality at each five year age-group. The NRR is calculated by adding the

survivorship rates at the different 5-year age group multiplied by the corresponding ASFR as shown in the formula below:

$$NRR = \frac{\text{Number of female births in the last 12 months}}{\text{Total number of births in the last 12 months}} x \sum_{k=15}^{44} S(k, k+4) x ASFR(k, k+4)$$

Where:

- S(k, k+4) is the female survivorship rate after age k+4 among women aged k to k+4 from the female life table;

- ASFR(k, k+4) is the Age-Specific Fertility Rate between age k, k+4.

If the NRR is equal 1, each generation of women is exactly reproducing itself. If it is larger than 1, the next generation will have more women. If it is smaller than 1, the next generation will have less women.

According the 2012 PHC, the TFR is 4.02 children per woman, the GRR is 2.0 daughters per women, and the NRR is 1.6 daughters per woman. All these indicators show that the replacement of the Rwandan population is guaranteed.

Conclusion

Census is a unique source of data to analyse fertility and natality through different angles and at different disaggregated level. The fertility data of the 2012 Census were analysed here in order to contribute to the general understanding of fertility and natality in Rwanda, needed for evidence-based decision-making.

The methodology used combines both direct and indirect methods backed by a thorough evaluation of the quality of the data. The main findings are as follow:

- Fertility and natality are decreasing substantially in Rwanda but not at a too low level that would compromise the replacement of the population at the next generation.

- Fertility and natality vary a lot according to Provinces and women's characteristics.

- Non-negligible proportions of women in Rwanda have high-risky fertility behaviours (childbearing at adolescence and at late age) that compromise their own and children's health and well-being.

The analysis reveals that the general picture of fertility in Rwanda focussing mainly on the success story of the important decrease observed in the past decades hides many other stories that call for specific interventions towards specific target groups. For instance interventions to reduce adolescents' fertility and its diverse health and socioeconomic impacts should target in priority out-of-school girls. The analysis also shows that the encouraged migration to the Eastern Province brings with it high fertility. This means that land management policies and programs aimed at relaxing the land pressure in the other Provinces should also pay special attention to fertility. Otherwise when people migrate for instance from the Northern to the Eastern Province, the land pressure will not be solved but only moved from the North to the East and postponed from nowadays to sometime in the future.

Policy implications and recommendations based on the census findings

This paragraph summarizes the policy implications based on the preceding analysis. From key findings presented following recommendation can be

The population growth rate of 2.6 percent registered during the intercensal period 2002 to 2012 is among the highest in the world. Such a high population growth rate has major implications on the demand for social services and places a huge burden on the already limited resources of the country and the budget allocated to the social sector. Given that this will not change quickly due to the demographic momentum, all policies and programs implemented in the country should integrate the population growth as a constraint to be managed rather than ignoring it.

Though there is a significant decline in fertility, at the same time, the contribution of the adolescent and young people to fertility is increasing. There should be specific family planning programs oriented to these groups, and in priority to those among them that are more fecund, the out-of-school adolescents.

The analysis has shown that the Eastern province which used to have lower fertility level is for nowadays the one which has the highest levels of fertility and natality. This is linked to the important migration flows of people in the reproductive age to that Province. Therefore the migration policy should have a strong fertility component, otherwise, there will be a kind of shift of high fertility levels from the Northern to the Eastern and land pressure affecting currently the North will be shifted to the Eastern Province in the future.

The percentage of childless women at the end of their reproductive age (an indirect measure of the prevalence of sterility) has remained stable over time though low. Further studies are needed to understand if that percentage is a threshold that cannot be lowered or not. In that latter case specific programs to address that issue are needed.

References

1. Arriaga, EE (1983) Estimating fertility from data on children ever-born by age of mother. International Research Document, No. 11, US Bureau of the Census, Washington DC.

2. Arriaga EE, 1994. Population Analysis with Microcomputers. Volume I. Presentation of Techniques. New York: Bureau of the Census, UNFPA, USAID.

3. Bongaarts, John and Potter, Robert C. (1983) Fertility, Biology, and Behavior: An Analysis of the Proximate Determinants. New York: Academic Press.

4. Brass, W. (1968) Methods of analysis and estimation. In: The Demography of Tropical Africa. Edited by W. Brass et al. Princeton University Press, Princeton.

5. Brass, William (1975) 'Fertility Estimates' in: Methods for Estimating Fertility and Mortality from Limited and Defective Data, Chaple Hill, North Carolina pp 11-21.

6. Brass, William, Coale, Ansley J, Demeny, Paul, Heisel, Don F, Lorimer, Frank, Romaniuk, Anatole and van de Walle, Etienne (1968) The Demography of Tropical Africa, Princeton University Press, Princeton, New Jersey

7. CALDWELL, J.C, (1976), "Toward a restatement of demographic transition theory", in Population and Development Review, Vol.2, N°3-4, 1976.

8. EVINA AKAM & al, (1998), « Vie féconde des adolescentes en milieu urbain camerounais », in Les cahiers de l'IFORD N° 16, Yaoundé, 117p.

9. EVINA AKAM, (2009), « Evolution de l'infécondité secondaire à partir des données d'enquêtes et de recensements », in Chaire Quételet 2004, Santé de la Reproduction au Nord et au Sud : de la connaissance à l'action, Sous la direction de C. GOURBIN, Presses Universitaires de Louvain, Louvain-la-Neuve, 504p.

10. GENDREAU, Francis et al, (1984), Manuel de Yaoundé, Estimations indirectes en démographie africaine

a. Gendreau F. « La population de l'Afrique ». Manuel de démographie. KARTHALA-CEPED, 25 mai 1991.

11. Jacob S., Siegel, David A.S (2004) The methods and materials of Demography, second edition

a. Manuel X « Techniques indirectes d'estimation démographique ».Nations Unies. New York, 1984.

12. Moultrie, T., Dorrington, R., Hill, A., Hill, K., Timaeus, I. and Zaba, B. (2013). Tools for demographic estimation. (eds). Paris: International Union for Scientific Studies on Population. http://demographicestimation.iussp.org/content/get-pdf-book-website (date of access: 20 November 2013).

13. Ministère des Finances et de la Planification Economique (MINECOFIN), Analyse des Résultats du RGPH 2002, Fécondité, Kigali, Février 2005.

14. Ministère des Finances et de la Planification Economique (MINECOFIN), Analyse des Résultats du RGPH 2002, Perspectives et Prospectives Démographiques, Kigali, Février 2005

a.   Nations Unies : Principes et Recommandations concernant les recensements de la population et de l'habitat, 2006.

15.   National Institute of Statistics of Rwanda (NISR) [Rwanda], Ministry of Health (MOH) [Rwanda], and ICF International. 2012. Rwanda Demographic and Health Survey 2010. Calverton, Maryland, USA:NISR, MOH, and ICF International.

16.   NISR (2012a) EICV3 Thematic Report: Economic Activity, National Institute of Statistics of Rwanda.
http://www.mifotra.gov.rw/fileadmin/user_upload/labour_statistics/EICV3_Thematic_Report_-_Economic_Activity.pdf (date of access: 21 November 2013)

17.   NISR (2012b) The evolution of poverty in Rwanda from 2000 to 2011: Results from the household surveys (EICV). National Institute of Statistics of Rwanda.
http://www.statistics.gov.rw/publications/evolution-poverty-rwanda-2000-2011-results-household-surveys-eicv (date of access: 15 November, 2013)

18.   Office of the Prime Minister, Republic of Rwanda (2005) National Policy for Family Formation, Minister in the Prime Minister's Office in Charge of Family Promotion and Gender, Republic of Rwanda.
http://www.migeprof.gov.rw/IMG/pdf/NATIONAL_POLICY_FOR_FAMILY_PROMOTION-2.pdf (date of access: 19 November 2013)

19.   UWAYEZU B. (2009) Explanatory factors of non-utilization of moderns contraceptive Methods among women in union: Dissertation presented for obtaining the Master's degree in population studies; Yaoundé, September 2009

20.   Wulf D and Singh S, Sexual activity, union and childbearing among adolescent women in the Americas, International Family Planning Perspectives, 1991, 17(4): 137-144.

Annexes A: Fertility Evaluation and Analytical Methods

INTRODUCTION

In the absence of good and complete vital registration systems, censuses and single round surveys have become the main source of fertility data in most sub-Saharan African countries. Whereas direct estimates of age specific fertility rates and crude birth rates are possible from census or survey data, these estimates mostly turn out to be gross underestimates which are not useful. Thus, great efforts are made to adjust the estimates. For example, post-enumeration surveys and estimates of the completeness of vital registration have been used to deduce the correction factor in some cases. However, for developing countries in general, particularly African countries, the most common method of estimating fertility rates is the indirect measurement of fertility.

The indirect techniques of fertility and mortality estimation came into being since the sixties (see for example, Brass et al, 1968; United Nations, 1967). Over the years, the techniques have been improved upon and updated by Coale and Trussell (see United Nations, 1983). In 1983, the United Nations published Manual X which incorporates all the techniques in a single volume. These techniques have since been popular not only in bridging the gaps in estimation methodology, but have also proved to be very useful in the estimation of vital rates for developing countries.

In 2012 in collaboration with the UNFPA, the IUSSP published Tools of Demographics estimations which bring together in one place, and in a user-friendly style, key methods used by demographers everywhere to measure demographic parameters from limited and defective data.

THE ARRIAGA METHOD

Arriaga (1983) made further refinements on the Brass method to take care of changing fertility situations. He observed that under conditions of declining fertility the number of children born ever-born by age of mother also changes almost linearly for mothers' age under 35 years. Based on this empirical observation, Arriaga proposed that linear interpolation of children ever-born by age of mother from two or more censuses can provide an estimate of the children ever-born for one year prior to the date of the census.

When information on children ever-born by age of mother and the pattern of fertility are available for one census or survey, the technique can also be used. The results in this case, are practically the same as the Brass and Trussell techniques since fertility is assumed to be constant. Similarly, as in the case of the P/F technique, if an age pattern of fertility is available, such a pattern can be adjusted to the fertility level implied by the fertility rates derived from the information on children ever born. The advantage in this case is that no adjustment is required when comparing children ever-born with the cumulative pattern of fertility since in this technique the comparison is made between two sets of cumulative fertility rates. Thus, one set represents the pattern ant the other which is derived from the children ever-born data represents the level of fertility. By and large, the technique uses the same information as the P/F ratio technique but can be applied also in cases where the pattern of fertility is not available. However, this technique is also sensitive to age

misreporting especially for women in the older ages, as a result, this can produce unacceptable fluctuations in the fertility pattern.

THE EL BADRY CORRECTION METHOD

The El-Badry correction is a method for correcting errors in data on children ever-born caused by the enumerator or respondent failing to record answers of 'zero' to questions on lifetime fertility and, instead, leaving the response blank. When this occurs, during data processing the response is coded as 'missing' or 'unknown', even though it was evident to the enumerator at the time of data collection that the correct answer was 'zero'. The method apportions the number of women whose parity is recorded as 'missing' between those whose parity is regarded as being truly unknown, and those women who should have been recorded as childless but whose responses were left blank. It does this apportionment at an aggregate level and not on an individual basis**.**

Annexe B Census objectives, methodology and data quality assessment

B.1 Objectives of the Census

The long-term objective of the Fourth Rwanda Population and Housing Census (RPHC4) is to contribute to:

i.   Improving the level of knowledge on the social, demographic and economic characteristics of the population of Rwanda;
ii. Enabling a better understanding of population and development interrelationships; and
iii. Reinforcing the National Institute of Statistics of Rwanda's (NISR) human and technical capacity.

In the short term, the objectives of the Census are to:

i.   Determine the current size of the population of Rwanda and its spatial distribution among provinces, districts, sectors, cells and villages and among rural and urban areas;
ii.   Determine the present demographic, social, economic and cultural characteristics of the population of Rwanda;
iii. Determine the level, structure and trends in regard to fertility, mortality and migration among the population in order to come up with the natural and overall growth rates of the population of Rwanda;
iv.   Provide indicators to enable advocacy for particular groups of the population such as women, children, youth, the elderly and disabled persons;
v.   Determine the characteristics of households, housing conditions and household welfare in Rwanda to further use this information for a more elaborate poverty mapping of the country;
vi.   Produce national population projections using updated demographic data and other information on population dynamics to enhance future planning;
vii. Update the relevant databases, providing information right down to the smallest administrative unit in order to enhance the current government policy on 'village clusters';
viii. Provide clear details of the current statutory boundaries of all administrative units of the country to which appropriate geographical codes can then be assigned;
ix.   Constitute an updated sampling frame for Rwanda and produce maps for each enumeration area for future sample surveys; and
x.   Promote the use of Census data at national and local level in formulating, monitoring and evaluation of development programmes.

B.2 Methodology and Census phases

As mentioned in Chapter 1 of this report, following the preparatory phase of the Census which consisted of the production of the project documents, schedule and Census budget, the following technical activities were undertaken.

B.2.1 Census mapping

The purpose of the Census mapping is to divide the whole country into well-delineated enumeration areas that constitute the smallest operational Census units to be assigned to each enumerator during the enumeration period.

The Census mapping operation lasted for about a year (from February 2011 to March 2012), which enabled the NISR to better estimate the number of staff to be recruited (e.g. enumerators, team leaders, supervisors, etc.) and the other Census infrastructure and facilities necessary for planning robust field activities. The outcomes of the Census mapping include the production of a new sampling frame for future surveys and an updated administrative area boundary map for Rwanda. In total, the country was delineated into 16,728 enumeration areas within the current boundaries of administrative units, consisting of five provinces, 30 districts and 416 sectors. This allows for the easy compilation of Census results in these administrative entities.

B.2.2 Pilot Census

Prior to the conducting of the RPHC4, a Pilot Census designed for testing the Census questionnaires, other Census data-collection tools, enumeration time requirements and the state-of-preparedness of the entire field work organisation was carried out. This test was conducted on a sample of 75 enumeration areas throughout all the districts of the country, from 16 to 30 August 2011, exactly one year before the actual Census.

The Pilot Census was a dress rehearsal for the actual Census during which the various methods and procedures for field organisation were tested as well as the Census publicity/awareness campaign, Census map products and data-coding and data-entry equipment.

The lessons learnt from the Pilot Census exercise were used to revise some Census procedures and instruments necessary for a smooth/successful implementation of the actual Census enumeration work.

B.2.3 Questionnaires and manuals

The first draft of Census questionnaires prepared by the NISR was submitted to the Census Technical Committee (CTC) for review before its approval by the National Census Commission (NCC). The CTC-reviewed Census questionnaires and related manuals were tested during the Pilot Census.

The lessons learnt during the Pilot Census were used by the NISR to improve and finalise the Census questionnaires, containing 77 variables, as well as to revise the manuals of instructions for all Census functionaries accordingly. The revised Census questionnaires and manuals were again reviewed and approved by the CTC before final approval was granted by the NCC to use the Census questionnaire for the RPHC4.

The questionnaires used to collect data are presented in Annex B of this report. Two different types of questionnaires were administered – one for private households and one for institutional households. The questionnaire for private households contained a person

record, a household record and a mortality record. The questionnaire for institutional households contained only a person record.

B.2.4 Census publicity and sensitisation campaign

Prior to the conducting of Census enumeration a national publicity and sensitisation campaign was implemented in order to inform the public about the importance and relevance of the fourth Rwanda RPHC4, as well as to seek their active participation and the involvement and collaboration of administrative authorities during the Census enumeration period. A subtle and targeted publicity and awareness campaign was conducted before the Pilot Census, which was later intensified and diversified to cover all of the country as the actual Census enumeration period approached.

The active collaboration and participation of Census commissions at both provincial and district levels in campaign activities contributed significantly to the success of the Census enumeration.

The innovative mass-communication mix that was used to inform the public about the Census and, at the same time, to ask for their full participation in the RPHC4, included the following:

(i)   Census Commission meetings;
(ii)   Articles in local newspapers;
(iii) Radio and television programmes;
(iv)   Outdoor billboards, banners, publicity spots and press releases; and
(v)   Monthly village community development meetings (Umuganda).

The Census results published in this report attest to the high level of cooperation of the political and administrative authorities and the effective participation of the general public in the entire Census enumeration process.

B.2.5 Recruitment and training of field staff

The RPHC4 was conducted by personnel from various institutions: the NISR (the Census executing agency), MINECOFIN, MINALOC (districts and sectors), MINAFFET, the Rwanda Defence Force, the Rwanda National Police, the Rwanda Correctional Services and MINEDUC (heads of secondary schools and teachers). The recruitment of Census functionaries was done by each institution according to the needs (i.e. number and categories of staff) of the NISR, except in the case of teachers whose recruitment was done by the NISR in collaboration with administrative authorities at the district, sector and cell levels.

At each stage of Census implementation, the necessary induction and mandatory training for NISR staff and Census functionaries took place. For example, the Census mapping phase was preceded by the training of cartographers, while the Pilot Census and the actual Census enumeration were preceded by training of enumerators and their supervisors.

About eight weeks prior to the commencement of actual Census enumeration cascading training was organised for all categories of Census functionaries, namely:

(i) Core master trainers' dialogue;
(ii) Training for 275 master trainers;
(iii) Training for 1,004 trainers organised in five training centres, one centre per province; and
(iv) Training for 24,426 enumerators in 68 training centres spread across all districts of the country.

The Census training sessions focused on the understanding of Census enumeration processes and the correct completion of Census questionnaires, reading and interpretation of Census maps, practical role plays, and field practice. All the trainers and trainees were subjected to mandatory qualifying tests which they had to pass before being appointed.

In order to mitigate the risk of declining quality of training at the various cascading training levels, the comprehensive enumerator training was voice-over simulated by core master trainers at a recording studio. The audio recorded training session was mass-recorded on CDs and distributed to all the training classes as a reference source for the trainers.

B.2.6 Actual Census enumeration

As initially planned, the actual Census enumeration of the population in private and institutional households was conducted across the country from 16 to 30 August to 2012, immediately after the Census reference night.

Although data-collection activities were carried out by well-trained enumerators, quality assurance of the Census enumeration was ensured through close supervision by line managers at various levels. The Census functionaries deployed for the RPHC4 comprised the following personnel:

(i) Enumerators and support staff;
(ii) Team supervisors, covering an average of five enumeration areas each;
(iii) Sector controllers;
(iv) Zonal supervisors, covering between two and five administrative sectors;
(v) District coordinators;
(vi) Province coordinators; and
(vii) National coordinators.

In accordance with the instructions contained in the Census Manual, each manager oversaw and ensured the operations of daily Census activities within his/her area of supervision. Enumerators were accountable for the work done on a daily basis to their team leaders, who carried out the verification of completed questionnaires and also resolved to the best of their ability challenges and/or problems encountered.

The team leaders communicated their daily progress achieved to the innovative Census Command and Control Centre (CC&CC) established at the NISR using a SMS (i.e. Short Message Service) system. The CC&CC system was an open source and web-based system that allowed NISR senior management and authorised staff to continually monitor the progress of Census enumeration in all the 16,728 enumeration areas via the internet. These officials were also able to contact each other through a MTN Closed User Group.

Prior to the conducting of Census enumeration, a robust field operations plan with worst case scenarios and risk analyses was established to facilitate hitch-free data collection and supervision of the work. Appropriate logistical support was made available to field staff, such as bicycles, motorcycles, vehicles and other necessary equipment. The mechanism utilised for the distribution of Census material for data collection as well as the repatriation of questionnaires and other materials to NISR headquarters was mainly facilitated by Rwanda Defence Force trucks.

B.2.7 Post-enumeration activities

The logistical arrangement employed for the repatriation, inventory of Census questionnaires and collating of Census counts was swift and seamless, which enabled the rapid publishing of the Provisional Census Report within 90 days of Census enumeration being concluded. The other post-enumeration activities included: the Post-Enumeration Survey (PES); data coding; data processing; the release of final results; thematic analysis; and the dissemination of Census results.

The PES was conducted from 19 September to 3 October 2012. The aim of the PES was to assess the coverage and quality of Census data gathered during the actual Census. A total of 120 enumeration areas was sampled from across all districts of the country.

The data-coding and data-processing activities were done concurrently and completed within six months. The Census data-cleaning, data-editing and data-stabilisation processes were completed in two months, after which approximately 1,000 basic Census data tables were generated. The final results were subjected to an in-depth analysis across 17 generic themes (one of which is presented in this report) in accordance with the analysis plan developed for each theme. Census monographs for each of the 30 districts will also be produced.

B.3 Data quality assessment

An independent quality review (available as an internal report to NISR) was conducted in parallel with the thematic analysis. This investigated the work done prior, during, and after enumeration to maximise the data quality. The assessment confirmed the strong planning and quality assurance throughout the enumeration to maximise representation of the population; but also found potentially weaker direct quality assurance during the data processing phase. The overall conclusion of the assessment is that the RPHC4 was implemented with strong quality control and gives an excellent representation of the population of Rwanda with generally good measurement of its structure both in terms of spread and demographic and socio-economic characteristics.

The claim of high quality with respect to representation is confirmed by the Post-Enumeration Survey (PES), which measured the net-coverage of the household population in the RPHC4 to be over 99% nationally with little variation across regions and by age and sex. Gross under-coverage was around 1.5% while gross over-coverage (erroneous inclusions) was around 0.6%. The conclusion of excellent representation is also consistent with the plausible growth rate for the population over the inter-censal period implied by the national results.

Analysis of the demographic and socio-economic information contained in the final RPHC4 database and triangulation with other data sources also confirm that for most areas, the RPHC4 gives a reliable and comprehensive representation of the population. However, some issues were found with respect to measurement of population characteristics: some possible under-reporting of males (especially at young ages), some age-heaping around the digits 0 and 2 as well as particular irregularities around the ages 2 and 12. Moreover, despite careful testing of the questionnaire with explicit enumerator instructions regarding these sections, there is also evidence of under-reporting of mortality, and to a lesser extent fertility. Indirect estimation may be appropriate in these two thematic areas. However, apart from these issues the analysis of the RPHC4 database supports the assertion of good quality with respect to measurement.

Annexes C Census questionnaire

This annex provides the key pages of the Census questionnaires. The full questionnaires including all cover sheets can be obtained from the NISR.

As mentioned above, two different types of questionnaires were administered, one for private households and one for institutional households. The questionnaire for private households contained a person record, a household record and a mortality record. The questionnaire for institutional households contained only a person record.

C.1 Private households: person record

REPUBLIC OF RWANDA

| MINISTRY OF FINANCE AND ECONOMIC PLANNING | | NATIONAL CENSUS COMMISSION |

NATIONAL INSTITUTE OF STATISTICS OF RWANDA
P.O. Box 6139 Kigali. Tel.: (+250)252571035
Fax: (+250)252570705 *E-mail :info@statistics.gov.rw*

GENERAL POPULATION AND HOUSING CENSUS
16 – 30 AUGUST 2012

Legal Basis: Presidential decree No, 02/01 of 28/02/2011

CENSUS QUESTIONNAIRE *(PRIVATE HOUSEHOLD)*

I. SECTION L - LOCALIZATION AND IDENTIFICATION OF HOUSEHOLD

L01. PROVINCE / KIGALI CITY: ....|___|

L02. DISTRICT: ....|___|

L03. SECTOR: ....|___|___|

L04. CELL: ....|___|___|

L05. VILLAGE: ....|___|___|

L06. ENUMERATION AREA (N° EA): ....|___|___|___|

L07. AREA OF RESIDENCE: (Urban = 1, Rural = 2): ....|___|

L08. BUILDING NUMBER: ....|___|___|___|___|

L09. HOUSEHOLD NUMBER: ....|___|___|___|

L10. TYPE OF HOUSEHOLD: ....| 1 | 0 | 0 |

| L11. NUMBER OF QUESTIONNAIRES FILLED IN THIS HOUSEHOLD: | |___| / |___| |

II. SECTION S - HOUSEHOLD SUMMARY TABLE TO BE FILLED IN AFTER

	MALE	FEMALE	TOTAL
PRESENT RESIDENTS (PR)			
ABSENT RESIDENTS (AR)			
TOTAL RESIDENTS (PR + AR)			
VISITORS (VIS)			
TOTAL ENUMERATED			
RESIDENTS ABOVE 18 YEARS OLD			

CONTROL SHEET

ENUMERATOR	TEAM SUPERVISOR
Enumeration Date:	Date of Verification: ....
Observations:	Observations:
Name of Enumerator:	Name of Team Supervisor: ....
Signature:	Signature:

CODER	VERIFIER	DATA ENTRY CLERK
Name :............................. Date: .... Signature:	Name :............................. Date: .... Signature:	Name:............................. Date: .... Signature: Code: |___|___|

N°	Name and First Name (P01)	Relationship to the Head of Household (P02)	Sex (P03)	Age at last birthday (P05)
	1. Resident household members Write the names of all resident members who were present or absent during the census night: (15-16/08/2012) according to the following order : - The Head of the Household ; - Unmarried resident children of the head of the household whose mothers /fathers are not resident in the same household beginning with the eldest ; -The first Spouse, followed by her unmarried children resident in the household beginning with the eldest ; -The second, third, … .Spouses, followed by their unmarried children resident in the household beginning with the eldest; - Married resident children of the head of the household followed by their resident spouses and children; - Children unrelated to the head being brought up within the household; - Other resident persons who are related either to the head of the household or to his spouse or spouses; - Other resident persons who are unrelated either to the head of the household or to his spouse or spouses; - Names of all other residents who did not spend the census night within the household; **2. Visitors** Record the names of all visitors who spent the census night within the household (if any).	What is [NAME]'s Relationship to the head of the household? *Circle the code corresponding to the response options found at the bottom of the page, depending on the declaration of the respondent.*	What is [NAME]'s Sex? *Circle the number which matches the response given.*	How old was [NAME] at his/ her Last Birthday? *If respondent do not know the exact age; Use the historical calendar provided to estimate his/her age.*
1		1. HH 3. SD 5. FM 7. GC 9. NR 2. SP 4. UC 6. BS 8. OR	1. Male 2. Female	|__|__|__|
2		1. HH 3. SD 5. FM 7. GC 9. NR 2. SP 4. UC 6. BS 8. OR	1. Male 2. Female	|__|__|__|
3		1. HH 3. SD 5. FM 7. GC 9. NR 2. SP 4. UC 6. BS 8. OR	1. Male 2. Female	|__|__|__|
4		1. HH 3. SD 5. FM 7. GC 9. NR 2. SP 4. UC 6. BS 8. OR	1. Male 2. Female	|__|__|__|
5		1. HH 3. SD 5. FM 7. GC 9. NR 2. SP 4. UC 6. BS 8. OR	1. Male 2. Female	|__|__|__|
6		1. HH 3. SD 5. FM 7. GC 9. NR 2. SP 4. UC 6. BS 8. OR	1. Male 2. Female	|__|__|__|
7		1. HH 3. SD 5. FM 7. GC 9. NR 2. SP 4. UC 6. BS 8. OR	1. Male 2. Female	|__|__|__|
8		1. HH 3. SD 5. FM 7. GC 9. NR 2. SP 4. UC 6. BS 8. OR	1. Male 2. Female	|__|__|__|
9		1. HH 3. SD 5. FM 7. GC 9. NR 2. SP 4. UC 6. BS 8. OR	1. Male 2. Female	|__|__|__|
10		1. HH 3. SD 5. FM 7. GC 9. NR 2. SP 4. UC 6. BS 8. OR	1. Male 2. Female	|__|__|__|
11		1. HH 3. SD 5. FM 7. GC 9. NR 2. SP 4. UC 6. BS 8. OR	1. Male 2. Female	|__|__|__|
12		1. HH 3. SD 5. FM 7. GC 9. NR 2. SP 4. UC 6. BS 8. OR	1. Male 2. Female	|__|__|__|

Relationship to the head

1. HH: Head of Household
2. SP: Spouse
3. SD: Son/Daughter
4. UC: Unrelated child
5. FM: Father/ Mother
6. BS: Brother/ Sister
7. GC: Grand child
8. OR: Non Relative
9. NR: Other relative

SECTION P – CHARACTERISTICS OF POPULATION

FOR ALL MEMBERS OF HOUSEHOLD

P01 – Serial Number of the person

NAME: _____

P02 – What is [NAME]'s relationship to the Head of Household?

1. Head of Household

P03 – Is [NAME] male or female?

1. Male   2. Female

P04 – In what month and year was [NAME] born?

Month: _____   Year: _____

P05 – How old was [NAME] at his/her last birthday?

Record age in completed years

P06 – What is residence status of [NAME]?

1. Present Resident – PR
2. Absent Resident - AR
3. Visitor – VIS

FOR USUAL RESIDENTS

P07 – Where [NAME] was born?

Province: _____

District: _____

Foreign Country: _____

P08 – What is [NAME]'s Nationality?

1st Nationality: _____

2nd Nationality: _____

Foreigner: _____
        (Record the name of the country)

P09 – Where was [NAME] residing previously?

Province: _____

District: _____

Foreign Country: _____

P10 – How long has [NAME] been living continuously in this District?

Record 000 if less than 1 year;
Record 999 if the residence has not changed since birth

P11 – What is [NAME]'s Religion?

1. Catholic   4. Muslim   7. No Religion
2. Protestant   5. Jehovah Witness   8. Other…………
3. Adventist   6. Tradit/Animist

P12 – Does [NAME] have any difficulty or problem as listed below? If yes, what were the causes?

Type of disability (D)	Causes (C)
1. Seeing	1. Congenital
2. Hearing	2. Disease/Illness
3. Speaking	3. Injury/Accident
4. Walking/Climbing	4. War/Mines
5. Learning/Concentrating	5. Genocide
6. Other……………………	6. Not Known
	7. Other…………….

If None *(Write 0 in first D)* → Go to P13

D	C	D	C	D	C	D	C	D	C

P13 – What is [NAME]'s Medical insurance?

1. Mutuelle   2. RAMA   3. MMI   4. FARG
5. Insurance Cie   6. School   7. NGO   8. Employer
9. None   10. Other………………………………

FOR RESIDENTS LESS THAN 18 YEARS OLD

P14 – Parental survivorship and residence

P14a – Is [NAME]'s natural mother alive?

1. Yes 2. No
3. Don't know

P14b – If yes, does [NAME]'s natural mother live in this household?

1. Yes
2. No

P14c – Is [NAME]'s natural father alive?

1. Yes 2. No
3. Don't know

P14d – If yes, does [NAME]'s natural father live in this household?

1. Yes
2. No

P15 – Was [NAME]'s birth registered?

1. Yes   2. No   3. Don't know

FOR RESIDENTS AGED 3 YEARS or OLDER

P16 – Can [NAME] read and write with understanding in the following languages?

Kinyarwanda	1	Record the SUM of the codes circled
French	2	
English	4	
Other	8	
None	0	

P17 – Has [NAME] ever attended school?

1. Has never attended → Go to P20
2. Has ever attended
3. Is currently attending school

P18a – What is the highest level of education [NAME] attended?

	Level		Level
Preschool	0	Secondary	3
Primary	1	University	4
Post Primary	2		

P18b – How many years of school did [NAME] complete successfully at that level?

Level	Years Completed
Preschool	0 1 2 3
Primary	0 1 2 3 4 5 6
Post primary	0 1 2 3
Secondary	0 1 2 3 4 5 6 7
University	0 1 2 3 4 5 6 7+

P19 – What is the highest certificate/degree [NAME] obtained?

0. None
1. CE/FM
2. EMA/ENTA
3. A3/D4/D5
4. A2/D6/D7
5. A1: Bacc/Diploma
6. A0: Bachelor
7. MA: Master
8. PhD: Doctorate

FOR RESIDENTS AGED 5 YEARS or OLDER

P20 – Aside from his/her own housework, did [NAME] work at least 1 hour during the last 7 days preceding the census night (8-14/08/2012)?

1. Yes → Go to P25
2. No

P21 – Why [NAME] did not work during the last 7 days (8-14/8/12)?

0. Home worker
1. Non-worker (Never worked)
2. Non-worker (Ever worked)
3. On leave, but has job → Go to P25
4. Retired
5. Old age → Go to P23
6. Student
7. Other: ……………………………..

P22 – Did [NAME] do one of the following activities during the last 7 days (8-14/08/2012)?

1. Farming/Rearing animals/Fishing
2. Production
3. Services/Selling → Go to P25
4. House worker at someone's house
5. Home worker at own house
6. None

FOR RESIDENTS WHO ARE CURRENTLY WORKING or HAVE EVER WORKED

P23 – Is [NAME] available to work?

1. Yes   2. No → Go to P29

P24 – Has [NAME] been seeking for work during the last 7 days (08-14/08/2012)?

0. No
1. Yes, 1st job } Go to P29
2. Yes, new job

FOR RESIDENTS WHO ARE CURRENTLY WORKING or HAVE EVER WORKED

P25 – What was [NAME]'s main occupation (type of work) during the last 7 days preceding the census night or during the last time he/she worked?

_____

P26 – What is [NAME]'s status in employment?

1. Employee   5. Producers' cooperative member
2. Employer
3. Self-employed   6. Other
4. Contributing family worker

P27 – What is the main product, service or activity of [NAME]'s place of work?

_____

P28 – What is [NAME]'s institutional sector of employment?

1. Public   3. Non-profit institution
2. Private   4. Household

FOR RESIDENTS AGED 12 YEARS or OLDER

P29 – What is [NAME]'s marital status?

1. Never married   3. Separated   5. Divorced
2. Married   4. Widowed

If never married and FEMALE → P33

If Widowed or Divorced → P32

If never married and MALE → Next Person

P30 – How many spouses [NAME] have? *(For men only)*

Current number of spouses:

P31 – What is the rank of [NAME] to the spouse?   *(For women only)*

Current rank as spouse:

P32 – How old was [NAME] when he/she first got married or lived together with partner?

Age at first marriage :

FOR RESIDENT WOMEN AGED 12 YEARS or OLDER

P33 – How many live births [NAME] has ever had?

If none, write 00 for each sex and proceed to the next person

Male [ ][ ]   Female [ ][ ]

P34 – Among those children, how many are still alive?

Male [ ][ ]   Female [ ][ ]

P35 – How many live births has [NAME] had during the last 12 months (from 15/08/2011 to 15/08/2012)?

Male [ ]   Female [ ]

P36 – Among those children, how many are still alive?

Male [ ]   Female [ ]

SECTION P – CHARACTERISTICS OF POPULATION

FOR ALL MEMBERS OF HOUSEHOLD

P01 – Serial Number of the person ☐ ☐

NAME: _____

P02 – What is [NAME]'s relationship to the Head of Household?

2. Spouse
3. Son/Daughter
4. Unrelated Child
5. Father/Mother
6. Brother/Sister
7. Grandchild
8. Other Relative
9. Non Relative

P03 – Is [NAME] male or female?

1. Male
2. Female

P04 – In what month and year was [NAME] born?

Month:_____ ☐ ☐   Year: ☐ ☐ ☐ ☐

P05 – How old was [NAME] at his/her last birthday?

Record age in completed years ☐ ☐ ☐

P06 – What is residence status of [NAME]?

1. Present Resident – PR
2. Absent Resident - AR
3. Visitor – VIS

FOR USUAL RESIDENTS

P07 – Where [NAME] was born?

Province: _____
District: _____
Foreign Country: _____
☐ ☐ ☐

P08 – What is [NAME]'s Nationality?

1st Nationality: _____
2nd Nationality: _____
Foreigner:_____
(Record the name of the country)
☐ ☐ ☐

P09 – Where was [NAME] residing previously?

Province: _____
District: _____
Foreign Country: _____
☐ ☐ ☐

P10 – How long has [NAME] been living continuously in this District?

Record 000 if less than 1 year;
Record 999 if the residence has not changed since birth
☐ ☐ ☐

P11 – What is [NAME]'s Religion?

1. Catholic
2. Protestant
3. Adventist
4. Muslim
5. Jehovah Witness
6. Tradit/Animist
7. No Religion
8. Other……...…..

P12 – Does [NAME] have any difficulty or problem as listed below? If yes, what were the causes?

Type of disability (D)	Causes (C)
1. Seeing	1. Congenital
2. Hearing	2. Disease/Illness
3. Speaking	3. Injury/Accident
4. Walking/Climbing	4. War/Mines
5. Learning/Concentrating	5. Genocide
6. Other…………………	6. Not Known
	7. Other…………….

If None (Write 0 in first D ➞ P13)

D	C	D	C	D	C	D	C	D	C	D	C
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

P13 – What is [NAME]'s Medical insurance?

1. Mutuelle   2. RAMA   3. MMI   4. FARG
5. Insurance Cie   6. School   7. NGO   8. Employer
9. None   10. Other…………………………………...

FOR RESIDENTS LESS THAN 18 YEARS OLD

P14 – Parental survivorship and residence

P14a - Is [NAME]'s natural mother alive? — 1. Yes 2. No 3. Don't know

P14b - If yes, does [NAME]'s natural mother live in this household? — 1. Yes 2. No

P14c - Is [NAME]'s natural father alive? — 1. Yes 2. No 3. Don't know

P14d - If yes, does [NAME]'s natural father live in this household? — 1. Yes 2. No

P15 – Was [NAME]'s birth registered?

1. Yes   2. No   3. Don't know

FOR RESIDENTS AGED 3 YEARS or OLDER

P16 – Can [NAME] read and write with understanding in the following languages?

Kinyarwanda	1	Record the SUM of the codes circled
French	2	
English	4	☐ ☐
Other	8	
None	0	

P17 – Has [NAME] ever attended school?

1. Has never attended ➞ Go to P20
2. Has ever attended
3. Is currently attending school

P18a – What is the highest level of education [NAME] attended?

	Level		Level
Preschool	0	Secondary	3
Primary	1	University	4
Post Primary	2		

P18b – How many years of school did [NAME] complete at that level?

Level	Years Completed
Preschool	0 1 2 3
Primary	0 1 2 3 4 5 6
Post primary	0 1 2 3
Secondary	0 1 2 3 4 5 6 7
University	0 1 2 3 4 5 6 7+

P19 – What is the highest certificate/degree [NAME] obtained?

0. None
1. CE/FM
2. EMA/ENTA
3. A3/D4/D5
4. A2/D6/D7
5. A1: Bacc/Diploma
6. A0: Bachelor
7. MA: Master
8. PhD: Doctorate

FOR RESIDENTS AGED 5 YEARS or OLDER

P20 – Aside from his/her own housework, did [NAME] work at least 1 hour during the last 7 days preceding the census night (8-14/08/2012)?

1. Yes ➞ Go to P25
2. No

P21 – Why [NAME] did not work during the last 7 days (8-14/08/2012)?

0. Home worker
1. Non-worker (Never worked)
2. Non-worker (Ever worked)
3. On leave, but has job ➞ P25
4. Retired
5. Oldness
6. Student ⎫ Go to P23
7. Other: ……………………….. ⎭

P22 – Did [NAME] do one of the following activities during the last 7 days (8-14/08/2012)?

1. Farming/Rearing animals/Fishing
2. Production
3. Services/Selling ⎫ Go to P25
4. House worker at someone's house
5. Home worker at own house
6. None

FOR RESIDENTS LESS THAN 18 YEARS OLD (right column)

P23 – Is [NAME] available to work?

1. Yes   2. No ➞ Go to P29

P24 – Has [NAME] been seeking for work during the last 7 days (8-14/08/2012)?

0. No
1. Yes, 1st job ⎫ Go to P29
2. Yes, new job ⎭

FOR RESIDENTS WHO ARE CURRENTLY WORKING or HAVE EVER WORKED

P25 – What was [NAME]'s main occupation (type of work) during the last 7 days preceding the census night or during the last time he/she worked?

_____ ☐ ☐ ☐ ☐

P26 – What is [NAME]'s status in employment?

1. Employee
2. Employer
3. Self-employed
4. Contributing family worker
5. Producers' cooperative member
6. Other

P27 – What is the main product, service or activity of [NAME]'s place of work?

_____ ☐ ☐ ☐ ☐

P28 – What is [NAME]'s institutional sector of employment?

1. Public
2. Private
3. Non-profit institution
4. Household

FOR RESIDENTS AGED 12 YEARS or OLDER

P29 – What is [NAME]'s marital status?

1. Never married   3. Separated   5. Divorced
2. Married   4. Widowed

If never married and FEMALE ➞ P33

If Widowed or Divorced ➞ P32

If never married and MALE ➞ Next Person

P30 – How many spouses [NAME] have? (For men only)

Current number of spouses: ☐

P31 – What is the rank of [NAME] to the spouse? (For women only)

Current rank as spouse: ☐

P32 – How old was [NAME] when he/she first got married or lived together with partner?

Age at first marriage : ☐ ☐

FOR RESIDENT WOMEN AGED 12 YEARS or OLDER

P33 – How many live births [NAME] has ever had?

If none, write 00 for each sex and proceed to the next person

Male ☐ ☐   Female ☐ ☐

P34 – Among those children, how many are still alive?

Male ☐ ☐   Female ☐ ☐

P35 – How many live births has [NAME] had during the last 12 months (from 15 August 2011 to 15 August 2012)?

Male ☐   Female ☐

P36 – Among those children, how many are still alive?

Male ☐   Female ☐

C.2 Private households: household record and mortality record

SECTION H: HOUSING UNITS CHARACTERISTICS

H01 – TYPE OF HABITAT
1. Umudugudu (clustered rural settlement)
2. Old settlement
3. Dispersed/Isolated housing
4. Planned urban housing
5. Spontaneous/Squatter housing
6. Other type of housing

H02 – TYPE OF BUILDING
1. House occupied by one household
2. House occupied by several households
3. Storey building occupied by one or more households
4. Several buildings in a compound occupied by several households
5. Other type of building

H03 – TENURE OF THE HOUSING UNIT
1. Owner
2. Tenant
3. Hire purchase
4. Free lodging
5. Staff housing
6. Refuge/Temporary camp settlement
7. Other......................

H04 – MAIN MATERIAL OF THE ROOF
What is the main material used for the roof?
(In case of a storey building, consider the roof of the last floor)
1. Iron Sheets
2. Local Tiles
3. Industrial Tiles
4. Asbestos
5. Concrete
6. Cartoons/Sheathing
7. Grass
8. Other material

H05 – MAIN MATERIAL OF THE WALLS
What is the main material used for the walls?
1. Wood/Mud
2. Wood/Cemented mud
3. Sundried bricks
4. Plastic Sheathing/Cardboard
5. Cement blocks/Concrete
6. Stone
7. Timber
8. Burnt bricks
9. Other

H06 – MAIN MATERIAL OF THE FLOOR
What is the main material used for the floor?
1. Earth/Sand
2. Concrete
3. Stone
4. Burn bricks
5. Timber
6. Other

H07 – NUMBER OF ROOMS
How many rooms do the housing units have, including bathrooms, toilets, kitchen, store rooms?

H08 – NUMBER OF BED ROOMS
How many of these rooms are used for sleeping?

H09 – NUMBER OF OCCUPANTS
How many persons usually sleep in the housing unit?

H10 – MAIN SOURCE OF WATER
What is the main source of water supply for members of the household?
1. Internal pipe-born water
2. Pipe-born water in the compound
3. Public tap out of the compound
4. Protected Spring/Well
5. Unprotected Spring/Well
6. Rain water
7. River
8. Lake/Stream/Pond/Surface water
9. Other

H11 – TYPE OF TOILET FACILITY
What is the main type of toilet facility used by the members of the household?
1. Flush toilet/Water Closet (WC) system
2. Private pit latrine
3. Public pit latrine
4. Bush
5. Other

H12 – MAIN SOURCE OF ENERGY FOR LIGHTING
What is the main source of energy the household uses for lighting?
1. Electricity by EWSA
2. Hydro-electric or other private source
3. Solar power
4. Generator
5. Kerosene lamp
6. Paraffin
7. Biogas
8. Candle
9. Firewood
10. Other

H13 – MAIN SOURCE OF ENERGY FOR COOKING
What is the main source of energy the household uses for cooking?
1. Electricity
2. Gas
3. Biogas
4. Kerosene
5. Firewood
6. Charcoal
7. Grass/Leaves
8. Other

H14 – ENERGY SAVING STOVE
Do you have an energy saving stove in this house?
1. Yes, and it is used
2. Yes, but it is not used
3. No

H15 – MODE OF WASTE DISPOSAL
What is the main mode of household waste disposal used?
1. Compost dumping
2. Private dust bins
3. Public refuse dumps
4. In the bush
5. On the farms
6. In a River/Stream/Drain/Gutter
7. Other

H16 – MODE OF SEWAGE DISPOSAL
What is the main mode of sewage disposal used by the household?
1. Sump
2. In the courtyard
3. Rivulet/Trench/Channels
4. In the street
5. Main sewer
6. Cesspool
7. Bush
8. Other

H17- H25 – HOUSEHOLD ASSETS
How many does the household have of the following assets in functioning condition?

H17 – Radio	
H18 – Television	
H19 – Telephone (fixed line)	
H20 – Cell phone	
H21 – Refrigerator/ Freezer	
H22 – Computer	
H23 – Vehicles	
H24 – Motorcycles	
H25 – Bicycles	

H26 – INTERNET ACCESS: Does any member of this household have access to Internet?
1. Yes   2. No → Go to H28-H34

H27 – Where do you access Internet?

From Home	1	Record the SUM of the codes circled
From Office / School	2	
From Cyber Cafe	4	
Other	8	

H28-H34 – How many cattle, goats, sheep, pigs, poultry/fowl and rabbits do you have in this household?

H28a – Local breed cow	
H28b – Cross breed cow	
H28c – Exotic breed cow	
H29 – Goats	
H30 – Sheep	
H31 – Pigs	
H32 – Rabbits	
H33 – Poultry	
H34 – Other poultry	

H35 – During the last 12 months (15/08/2011 – 15/08/2012), has any member of this household done agriculture activity or rented his land?
1. Yes, in his own land
2. Yes, in land he rented
3. No, he/she has rented it out
4. No, he/she has not rented it
5. No, without land

SECTION M: MORTALITY

Please record information on deaths that occurred in the household during the last 12 months.
Do not forget the children.

M1 – Is there any member of the household who died during the last 12 months (15/08/2011-15/08/2012)?
1. Yes   2. No → End of the interview

M2 – Specify the sex, age and cause of death.

Death No.	Sex 1. Male 2. Female	Age at death (Record 000 if less than 1 year)	Cause 1. Accident 2. Murder 3. Violence 4. Suicide 5. Injury 6. Illness *If 1-5 and Next Person*	If death of Woman aged 12-49, ... Did the death occur while pregnant? 1.Yes 2.No	Did the death occur during childbirth? 1.Yes 2.No	Did the death occur during the 6 weeks period following the termination of pregnancy, irrespective of the way the pregnancy was terminated? 1.Yes 2.No

C.3 Institutional households: person record

REPUBLIC OF RWANDA

S/N: 0000000

MINISTRY OF FINANCE AND
ECONOMIC PLANNING

NATIONAL CENSUS COMMISSION

NATIONAL INSTITUTE OF STATISTICS OF RWANDA
P.O. Box 6139 Kigali. Tel.: (+250)252571035
Fax: (+250)252570705 E-mail :info@statistics.gov.rw

GENERAL POPULATION AND HOUSING CENSUS
16 – 30 AUGUST 2012

Legal Basis: *Presidential decree No, 02/01 of 28/02/2011*

CENSUS QUESTIONNAIRE *(INSTITUTIONAL HOUSEHOLD)*

I. SECTION L - LOCALIZATION AND IDENTIFICATION OF HOUSEHOLD

L01. PROVINCE / KIGALI CITY: ....|___|

L02. DISTRICT: ....|___|

L03. SECTOR: ....|___|___|

L04. CELL: ....|___|___|

L05. VILLAGE: ....|___|___|

L06. ENUMERATION AREA (N° EA): ....|___|___|

L07. AREA OF RESIDENCE: (Urban = 1, Rural = 2): ....|___|

L08. BUILDING NUMBER: ....|___|___|___|___|

L09. HOUSEHOLD NUMBER: ....|___|___|___|___|

L10. TYPE OF HOUSEHOLD:...| 2 |___|___|

L11. NUMBER OF QUESTIONNAIRES FILLED IN THIS HOUSEHOLD: |___| / |___|

II. SECTION S - HOUSEHOLD SUMMARY TABLE TO BE FILLED IN AFTER

	MALE	FEMALE	TOTAL
PRESENT RESIDENTS (PR)			
ABSENT RESIDENTS (AR)			
TOTAL RESIDENTS (PR + AR)			
VISITORS (VIS)			
TOTAL ENUMERATED			
RESIDENTS ABOVE 18 YEARS OLD			

CONTROL SHEET

ENUMERATOR	TEAM SUPERVISOR
Enumeration Date: ....……………	Date of Verification: ....
Observations:	Observations:
Name of Enumerator: ………………………………….	Name of Team Supervisor: ………………………………….
Signature:	Signature:

CODER	VERIFIER	DATA ENTRY CLERK
Name :……………………………….	Name :……………………………….	Name:……………………………….
Date: ………………………………..	Date: ………………………………..	Date: ………………………………..
Signature:	Signature:	Signature: Code: |___|___|

N°	Name and First Name	Is [NAME] male or female?	In what month and year was [NAME] born?	How old was [NAME] at his/her last birthday?	What is residence status of [NAME]?	Where [NAME] was born? (Province and District or Country)	What is [NAME]'s Nationality?
	P01	P03	P04	P05	P06	P07	P08
1		1. Male 2. Female	|_|_|/|_|_|_|_|	|_|_|_|	1. Present Resident 2. Absent Resident 3. Visitor	.... |_|_|_|	.... |_|_|_|
2		1. Male 2. Female	|_|_|/|_|_|_|_|	|_|_|_|	1. Present Resident 2. Absent Resident 3. Visitor	.... |_|_|_|	.... |_|_|_|
3		1. Male 2. Female	|_|_|/|_|_|_|_|	|_|_|_|	1. Present Resident 2. Absent Resident 3. Visitor	.... |_|_|_|	.... |_|_|_|
4		1. Male 2. Female	|_|_|/|_|_|_|_|	|_|_|_|	1. Present Resident 2. Absent Resident 3. Visitor	.... |_|_|_|	.... |_|_|_|
5		1. Male 2. Female	|_|_|/|_|_|_|_|	|_|_|_|	1. Present Resident 2. Absent Resident 3. Visitor	.... |_|_|_|	.... |_|_|_|
6		1. Male 2. Female	|_|_|/|_|_|_|_|	|_|_|_|	1. Present Resident 2. Absent Resident 3. Visitor	.... |_|_|_|	.... |_|_|_|
7		1. Male 2. Female	|_|_|/|_|_|_|_|	|_|_|_|	1. Present Resident 2. Absent Resident 3. Visitor	.... |_|_|_|	.... |_|_|_|
8		1. Male 2. Female	|_|_|/|_|_|_|_|	|_|_|_|	1. Present Resident 2. Absent Resident 3. Visitor	.... |_|_|_|	.... |_|_|_|
9		1. Male 2. Female	|_|_|/|_|_|_|_|	|_|_|_|	1. Present Resident 2. Absent Resident 3. Visitor	.... |_|_|_|	.... |_|_|_|
10		1. Male 2. Female	|_|_|/|_|_|_|_|	|_|_|_|	1. Present Resident 2. Absent Resident 3. Visitor	.... |_|_|_|	.... |_|_|_|
11		1. Male 2. Female	|_|_|/|_|_|_|_|	|_|_|_|	1. Present Resident 2. Absent Resident 3. Visitor	.... |_|_|_|	.... |_|_|_|
12		1. Male 2. Female	|_|_|/|_|_|_|_|	|_|_|_|	1. Present Resident 2. Absent Resident 3. Visitor	.... |_|_|_|	.... |_|_|_|
13		1. Male 2. Female	|_|_|/|_|_|_|_|	|_|_|_|	1. Present Resident 2. Absent Resident 3. Visitor	.... |_|_|_|	.... |_|_|_|
14		1. Male 2. Female	|_|_|/|_|_|_|_|	|_|_|_|	1. Present Resident 2. Absent Resident 3. Visitor	.... |_|_|_|	.... |_|_|_|
15		1. Male 2. Female	|_|_|/|_|_|_|_|	|_|_|_|	1. Present Resident 2. Absent Resident 3. Visitor	.... |_|_|_|	.... |_|_|_|

SECTION P - CHARACTERISTICS OF POPULATION

SECTION P - CHARACTERISTICS OF POPULATION (cont'd)

	QUESTIONS ADDRESSED TO ALL HOUSEHOLD MEMBERS		FOR MEMBERS AGED 3 YEARS or ABOVE			MEMBERS AGED 12 YEARS or ABOVE
	Where was [NAME] Residing previously? (District and Province or Country)	Does [NAME] have any disability? If yes, what were the causes? If None *(Write 0 in D and Go to P17)*	Has [NAME] ever attended preschool, school or literacy program? *If P17 = 1 Go to P29*	What is highest level of school or literacy program [NAME] attended?	How many years of school did [NAME] complete at that level?	What is [NAME]'s marital status?
	P09	**P12**	**P17**	**P18a**	**P18b**	**P29**
1		D C D C D C D C D C	1. Has never attended 2. Has ever attended 3. Is currently attended	|__|	|__|	1. Never married 2. Married 3. Separated 4. Widowed 5. Divorced
2		D C D C D C D C D C	1. Has never attended 2. Has ever attended 3. Is currently attended	|__|	|__|	1. Never married 2. Married 3. Separated 4. Widowed 5. Divorced
3		D C D C D C D C D C	1. Has never attended 2. Has ever attended 3. Is currently attended	|__|	|__|	1. Never married 2. Married 3. Separated 4. Widowed 5. Divorced
4		D C D C D C D C D C	1. Has never attended 2. Has ever attended 3. Is currently attended	|__|	|__|	1. Never married 2. Married 3. Separated 4. Widowed 5. Divorced
5		D C D C D C D C D C	1. Has never attended 2. Has ever attended 3. Is currently attended	|__|	|__|	1. Never married 2. Married 3. Separated 4. Widowed 5. Divorced
6		D C D C D C D C D C	1. Has never attended 2. Has ever attended 3. Is currently attended	|__|	|__|	1. Never married 2. Married 3. Separated 4. Widowed 5. Divorced
7		D C D C D C D C D C	1. Has never attended 2. Has ever attended 3. Is currently attended	|__|	|__|	1. Never married 2. Married 3. Separated 4. Widowed 5. Divorced
8		D C D C D C D C D C	1. Has never attended 2. Has ever attended 3. Is currently attended	|__|	|__|	1. Never married 2. Married 3. Separated 4. Widowed 5. Divorced
9		D C D C D C D C D C	1. Has never attended 2. Has ever attended 3. Is currently attended	|__|	|__|	1. Never married 2. Married 3. Separated 4. Widowed 5. Divorced
10		D C D C D C D C D C	1. Has never attended 2. Has ever attended 3. Is currently attended	|__|	|__|	1. Never married 2. Married 3. Separated 4. Widowed 5. Divorced
11		D C D C D C D C D C	1. Has never attended 2. Has ever attended 3. Is currently attended	|__|	|__|	1. Never married 2. Married 3. Separated 4. Widowed 5. Divorced
12		D C D C D C D C D C	1. Has never attended 2. Has ever attended 3. Is currently attended	|__|	|__|	1. Never married 2. Married 3. Separated 4. Widowed 5. Divorced
13		D C D C D C D C D C	1. Has never attended 2. Has ever attended 3. Is currently attended	|__|	|__|	1. Never married 2. Married 3. Separated 4. Widowed 5. Divorced
14		D C D C D C D C D C	1. Has never attended 2. Has ever attended 3. Is currently attended	|__|	|__|	1. Never married 2. Married 3. Separated 4. Widowed 5. Divorced
15		D C D C D C D C D C	1. Has never attended 2. Has never attended 3. Is currently attended	|__|	|__|	1. Never married 2. Married 3. Separated 4. Widowed 5. Divorced

P12: Type of disability (D)
1. Seeing
2. Hearing
3. Speaking
4. Walking/Climbing
5. Learning/Concentrating
6. Other

Causes (C)
1. Congenital
2. Disease/Illness
3. Injury/Accidents
4. War/Mines
5. Genocide
6. Not known
7. Other

P18a: Level
0. Preschool
1. Primary
2. Post-primary
3. Secondary
4. University

P18b Year completed
0 1 2 3
0 1 2 3 4 5 6
0 1 2 3
0 1 2 3 4 5 6 7
0 1 2 3 4 5 6 7+

96

Annexes D Glossary of key terms and definitions

This Glossary provides definitions of key concepts and indicators used in the thematic reports of the Fourth Rwanda Population and Housing Census (RPHC4). Readers are referred to the methodological sections of the respective reports for a more detailed technical explanation of indicators.

D.1 Population and demographic characteristics

Residents: persons who have lived for more than six months in the place where they were enumerated or who intended to live for more than six months in that place. They represent the population usually living in a place. Residents could be:

- **Present residents:** present in their place of usual residence on the reference night; or
- **Absent residents:** not present in their place of usual residence on the reference night. The person must be absent for a period shorter than or equal to six months.

Visitors: persons who were not usual residents of the household. They might be residents in another place in Rwanda, and thus absent residents in that place, or non-residents of the country, for example tourists present at the moment of the Census.

De facto population (present residents + visitors): includes all persons physically present in the country or area at the reference date.

De jure population (present residents + absent residents): includes all usual residents of the given country or area, whether or not they were physically present in the area at the reference date. The de jure population is also referred to as the (usual) resident population. Most of the analysis presented in these thematic reports is based on the de jure population.

Demographic dependency ratio: is measured as the ratio between those typically not in the labour force and the age group typically in the labour force. Using the national definition of working age, it is defined as the sum of persons aged 0 to 15 and elderly people aged 60 and above, divided by the population in the 16 to 59 age group, multiplied by 100. For international comparisons, age groups 0 to 14 and 65 and above are used to identify dependents.

Population pyramid: graphically displays a population's age and sex composition. Horizontal bars present the numbers (or percentages) of males and females in each age group or at each individual age. The sum of all the age/sex groups in the population pyramid equals the total population.

Sex: refers to the classification of people as male or female, based on biological and physiological characteristics such as chromosomes, hormones, and reproductive organs.

Sex ratio: the number of males per 100 females in the population. A sex ratio of 100 would imply that there are as many males as females.

Disability status: characterises the population into those with and without a disability. The 'International Classification of Functioning, Disability and Health' defines disability as 'an umbrella term for impairments, activity limitations and participation restrictions. It denotes the negative aspects of the interaction between an individual (with a health condition) and that individual's

contextual factors (environmental and personal factors).' The following limitations in activity functioning are considered in the RPHC4: seeing, hearing, speaking, walking/climbing, learning/concentrating and another type of difficulty/disability.

Total fertility rate (TFR): refers to the average number of children a hypothetical cohort of women would have at the end of their reproductive period during their lifetime if they were subject to experiencing the ASFRs of a given period. It is calculated by summing the ASFRs and multiplying the sum by the width of the age interval.

Age-specific fertility rate (ASFR): refers to the number of births to women in a specific age group, divided by the number of women in that age group. The ASFR is expressed as number of births per 1,000 women.

Mean age at childbearing: the mean age of mothers at the time of the birth of their children if women were subject throughout their lives to the ASFRs observed in a given year.

Parity: the number of children born alive to a woman. Zero parity women are those with no live births and single parity refers to those women who have one child and so on.

Nuptiality: refers to marriage as a population phenomenon, including the rate at which it occurs, the characteristics of people united in marriage, and the dissolution of such unions (through divorce, separation, widowhood, and annulment). The question on marital status was formulated as follows: 'what is [name]'s marital status?' Men in marital union were further asked the type of union, whether it is a monogamous or a polygamous union, and the age at first union. Women in union were asked about their rank as spouse and their age at first union.

Marital status: personal status of each individual in relation to the marriage laws or customs of the country and defined in the Census in five categories: Never married: an individual who has never been in a union; Married: an individual who was in marital union at the moment of the Census, legally or not; Divorced: an individual who has been separated from his or her spouse through a court decision, according to legislation; Separated: an individual who has separated temporarily from his/her spouse and is awaiting the court decision; Widowed: a man or a woman who has lost his or her spouse by death, not yet remarried. The marital status of all usual residents aged 12 and above is enquired about in the Census questionnaire.

Monogamous: is defined as having one spouse. This indicator is only calculated for currently married or separated males aged 12 and above living in private households.

Polygamous: is defined as having more than one spouse. This indicator is only calculated for currently married or separated males aged 12 and above living in private households.

D.2 Housing and household characteristics

Household: the concept of the household is based on the arrangements in regard to food or other essentials for living. One household occupies a single housing unit.

Private household: consists of one or more persons living together and sharing at least one daily meal. Persons in a private household may or may not be related, or may constitute a combination of persons both related and unrelated. In order to facilitate analysis of the de jure population (usual residents) across thematic reports, private households were further categorised as follows:

a) Households where there is at least one usual resident in the household (present or absent resident); and
b) Households consisting only of visitors (e.g. households found during the Census in their holiday homes, etc.)

Subsequently, and across all thematic reports, any analysis of the characteristics of 'private households' will refer to the definition in (a) above, whereas analysis of 'private housing units' will refer to households under both (a) and (b).

Institutional household: comprises a group of persons who are being provided with institutionalised care, and includes educational institutions, health care institutions, military institutions, religious institutions, or institutions for the elderly or persons with disabilities. In the RPHC4, persons who were homeless on the night of the Census were also classified as belonging to an institutional household.

Head of household: refers to a person recognised as such by the respondent. Every private household has one and only one household head.

Sources of drinking water: have been split into improved and unimproved sources. Improved sources include internal pipe-borne water, pipe-borne water in the compound, public tap outside the compound, protected spring/well, and rain water. These categorisations are based on the definition developed by the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) Joint Monitoring Programme (NISR, n.d.) in 2010. Unimproved sources include unprotected springs/wells, rivers and lakes/streams/ponds/surface water.

Housing tenure: refers to legal occupation of the dwelling. Usually, occupancy here is defined as owner, tenant, hire purchase, free lodging, staff housing or refugee/temporary camp settlement.

D.3 Education

Education system (Rwanda) and degrees/certificates: the education system in Rwanda is organised in four levels:

- **Pre-primary education:** is organised in nursery schools for a period of three years for children between the ages of three and six.
- **Primary education:** lasts for six years and the official age at this level is seven to 12.
- **Secondary education:** lasts for six years and the official age for this level is 13 to 18. It is composed of lower secondary (the first three years – often referred to as Tronc Commun) and upper secondary (the second three years). The following certificates and/or diplomas were or are currently awarded at this level of education:
    i) **ENTA:** (Ecole Normale Technique Auxiliaire) – a certificate awarded upon successful completion of five years of secondary school. This type of certificate is no longer available.
    ii) **A3/D4/D5**: certificates awarded upon successful completion of three, four or five years of secondary school. This type of certificate is no longer available.
    iii) **A2/D6/D7**: certificates awarded upon successful completion of six or seven years of secondary school.
    Previously, **post-primary education** constituted an alternative to lower secondary school that targeted specialised fields of study and allowed students, after successfully completing three years of study, to either: i) enter upper secondary level or ii) enter the labour market.

Some disaggregations by highest level attended may group post-primary and secondary education. The following certificates and/or diplomas were awarded at this level of education:

    i) **EMA** (Ecole des Moniteurs Auxiliaire): a certificate awarded upon successful completion of two years of post-primary education, when this level existed in the education system.

    ii) **CE/FM** (Centre d'Enseignement Rural Artisanal Integré/Certificat d'Etude Familiale): a certificate awarded upon successful completion of three years of post-primary education.

- **Tertiary education:** the duration of tertiary education varies between three and six years according to the institution and the field of study. The following certificates and/or diplomas were or are currently awarded at this level of education:

    i) **Bacc/diploma**: a degree previously awarded upon successful completion of two years of university. It is no longer available.

    ii) **Bachelor's**: a degree awarded upon successful completion of four years of university.

    iii) **Master's**: a degree awarded to a university graduate upon his/her successful completion of at least one year of post-graduate studies.

    iv) **PhD**: a degree awarded to a university graduate upon his/her successful completion of a doctoral programme, usually lasting between three and four years.

Highest level of education attended: current or previous attendance at any regular accredited educational institution or programme, public or private, for organised learning at pre-school, primary, post-primary, secondary, university level – or none.

Net Attendance Ratio (NAR): attendance of the official age group for a given level of education expressed as a percentage of the corresponding school-age population.

Literacy: the ability to both read and write with understanding (self-reported). A literate person is one who can both read and write a short, simple statement on his or her everyday life. An illiterate person is one who cannot, with understanding, both read and write such a statement. Hence, a person capable of reading and writing only figures and his or her own name should be considered illiterate, as should a person who can read but not write as well as one who can read and write only a ritual phrase that has been memorised. Literacy is recorded in the following languages: Kinyarwanda, English, French and Other.

D.4 Employment/economic activity

Working age: even though the minimum working age specified in the labour law of Rwanda is 16, the 2012 RPHC collected data on the economic activities of persons aged five and above. The official retirement age is 60, but there is no upper limit to the working age in the Rwandan context. Employment indicators are computed for the resident population aged 16 and above, except for the analysis of children in employment.

Employed population: refers to persons who worked at least one hour in the seven-day period before the Census night, or who were temporarily absent from a job, or who were engaged in productive activities during the reference period, including: farming/rearing animals/fishing; production; services/selling; and domestic work at someone else's house.

Unemployed population: refers to persons who, during the seven-day period before the Census night, were without work but available for work. This constitutes the 'relaxed' definition of unemployment, as the condition of seeking work during the reference period is not taken into consideration.

Economically active population/labour force: refers to the sum of the employed and unemployed populations.

Inactive population: refers to persons who during the seven-day period before the Census night were without work and not available for work. These include persons looking after the house/family, students, people who have retired and persons who consider themselves too old to work.

Labour force participation rate (LFPR): defined as the ratio of the active population to the sum of the active and inactive population, expressed in percentage terms. Persons whose economic activity status has not been stated are excluded from the calculation of the LFPR.

Unemployment rate: defined as the ratio of unemployed to the labour force, expressed in percentage terms.

Status in employment: the International Standard Classification of status in employment identifies the following statuses: employees are persons working in paid (wage/salary, in-kind) employment; employers are persons on own account or with one or a number of partners in a self-employed job who engage one or more employees on a continuous basis; the self-employed are persons on own account or with one or a number of partners in a self-employed job not engaging any employee on a continuous basis; contributing family workers are persons working for an establishment operated by a household member who cannot be regarded as a partner; and members of producers' cooperatives are persons working in a cooperative producing goods and services, in a self-employed job, not engaging any employee on a continuous basis.

Main industry and main occupation: the classifications of the main branch of economic activity are based on the International Standard Industrial Classification (ISIC), version 4 and the classifications of the main occupation are based on the International Standard Classification of Occupations (ISCO), version 4.

Economic dependency ratio: is measured as the ratio between economically dependent persons (sum of unemployed, inactive, and children aged five and under) and employed persons, multiplied by 100. An economic dependency ratio of 100 would imply that one employed person has to support one economically dependent person.

D.5 Socio-cultural characteristics

Religion: the following nine response options were offered to measure religious affiliation in Rwanda: Catholic, Protestant, Adventist, Jehovah's Witness, other Christian religion, Muslim, traditionalist/animist, other religion and no religious affiliation

Nationality: nationality means the state of being legally a citizen of a particular country or the legal right of belonging to a particular nation whether by birth or naturalisation. Types of nationality are identified as single and dual nationality, which refers to the state of being a citizen of two countries. Article 7 of the Constitution of Rwanda specifies that persons of Rwandan origin, along with their descendants, have the right to acquire Rwandan nationality on demand. The same article provides allowance for dual nationality.

**PERSONS AND INSTITUTIONS THAT CONTRIBUTED TO
THE FOURTH RWANDA POPULATION AND HOUSING CENSUS, 2012**

National Census Commission

Chairperson:
Claver GATETE   Minister of Finance and Economic Planning
John RWANGOMBWA   Former Minister of Finance and Economic Planning
Vice Chairperson:
James MUSONI   Minister of Local Government
Secretary:
Yusuf MURANGWA   Director General of NISR
Dr. Diane KARUSISI   Former Acting Director General of NISR

Members of the National Census Commission

Venantia TUGIREYEZU	Minister in the Office of the President
Stella Ford MUGABO	Minister of Cabinet Affairs
James KABAREBE	Minister of Defense
Sheikh Mussa HARERIMANA	Minister of Internal Security
Louise MUSHIKIWABO	Minister of Foreign Affairs and Cooperation
Dr. Vincent BIRUTA	Minister of Education
Dr. Mathias HAREBAMUNGU	Minister of State in charge of Primary and Secondary Education
Dr. Agnes BINAGWAHO	Minister of Health
Odda GASINZIGWA	Minister in Prime Minister's Office in charge of Gender and Family Promotion
Jean Philbert NSENGIMANA	Minister of Youth and ICT
Prof. Silas LWAKABAMBA	Minister of Infrastructure
Albert NSENGIYUMVA	Former Minister of Infrastructure
Anastase MUREKEZI	Minister of Public Service and Labour
Stanislas KAMANZI	Minister of Natural Resources
Willy RUKUNDO	Former Acting Director General of ORINFOR
Arthur ASIIMWE	Director General of RBA
Hannington NAMARA	CEO of the Private Sector Federation
Robert BAYIGAMBA	Former CEO of the Private Sector Federation

National Technical Committee

Chairperson:
Leonard MINEGA RUGWABIZA

Former Director of National Development Planning and Research in MINECOFIN

Vice Chairperson:
Egide RUGAMBA

Director General of Planning in MINALOC

Secretary:
Prosper NKAKA MUTIJIMA

Census Coordinator of the RPHC4

Members of the National Technical Committee

Dr. Agnes NTIBANYURWA	Assistant Representative of UNFPA in charge of Population and Development
Esther MUTAMBA	Director General of Rwanda Housing Authority
Anna MUGABO	Director General of Labour and Employment
Dr. Erasme RWANAMIZA	Director General of Education
Innocent MUSABYIMANA	Director of Planning in MINIRENA
Jeanne d'Arc UMULISA	Director of Planning and M&E in MIGEPROF
Parfait UWARIRAYE	Director of Planning in MINISANTE
Redempter BATETE MUKUNZI	Director of Youth Employment and Program Coordination
Antonio MUTORO	Former Executive Director of IPAR-Rwanda

Branches of the National Census Commission

Members of the Branches of the NCC at Province Level (Governors of Provinces)

Kigali City:
Fidele NDAYISABA, Mayor

Sothern Province:
Alphonse MUNYENTWARI, Governor

Western Province:
Celestin KABAHIZI, Former Governor
Caritas MUKANDASIRA, Governor

Northern Province:
Aime BOSENIBAMWE, Governor

Eastern Province:
Odette UWAMARIYA, Governor

Members of the Branches of the NCC at District Level (Mayors of Districts)

Solange MUKASONGA	Nyarugenge District	Gedeon RUBONEKA	Ngororero District
Willy NDIZEYE	Gasabo District	Oscar NZEYIMANA	Rusizi District
Paul Jules NDAMAGE	Kicukiro District	Jean Baptiste HABYARIMANA	Nyamasheke District
Abdallah MURENZI	Nyanza District	Justus KANGWAGYE	Rulindo District
Leandres KAREKAZI	Gisagara District	Deogratias NZAMWITA	Gakenke District
Francois HABITEGEKO	Nyaruguru District	Winifrida MPEBYEMUNGU	Musanze District
Eugene MUZUKA KAYIRANGA	Huye District	Samuel SEMBAGARE	Burera District
Philbert MUGISHA	Nyamagabe District	Alexandre MVUYEKURE	Gicumbi District
Francois Xavier MBABAZI	Ruhango District	Nehemie UWIMANA	Rwamagana District
Yvonne MTAKWASUKU	Muhanga District	Fred SABITI ATUHE	Nyagatare District
Jacques RUTSINGA	Kamonyi District	Ambrose RUBONEZA	Gatsibo District
Bernard KAYUMBA	Karongi District	John MUGABO	Kayonza District
Gaspard BYUKUSENGE	Rutsiro District	Protais MURAYIRE	Kirehe District
Sheikh Hassan BAHAME	Rubavu District	Aphrodice NAMBAJE	Ngoma District
Abdoulatif TWAHIRWA	Nyabihu District	Louis RWAGAJU	Bugesera District

National Directors
Yusuf MURANGWA, Director General of NISR
Dr. Diane KARUSISI, Former Acting Director General of NISR

Census Technical Director
Willy MPABUKA GASAFARI

Census National Coordinator
Prosper NKAKA MUTIJIMA

Census Field Operations

Census National Coordinators

Prosper NKAKA MUTIJIMA	National Institute of Statistics of Rwanda
Major-General Jacques MUSEMAKWELI	Rwanda Defence Force
Eric KAYIRANGA	Rwanda National Police
Alex MUGISHA	Rwanda Correctional Services

Census Province Coordinators

Juvenal MUNYARUGERERO	Kigali City
Baudouin RUTERANA	Southern Province
Willy MPABUKA GASAFARI	Western Province
Francois SEKAMONDO	Northern Province
Astrid SEGAHWEGE	Eastern Province

Census District Coordinators

Jean Nepo. RWABUKUMBA	Nyarugenge District	Patrick NSHIMIYIMANA	Rusizi District
Franck Mine	Gasabo District	Jean BIZIMANA	Nyamasheke District
Jean Paul RUSHAKU	Kicukiro District	Issa MUSABEMUNGU	Rulindo District
Francois ABALIKUMWE	Nyanza District	Clement BIZIMUNGU	Gakenke District
Evelyne KANYONGA	Gisagara District	Beatrice UWAYEZU	Musanze District
Etienne KWIZERA	Nyaruguru District	Esther MAHUKU	Burera District
Juvenal NTAMBARA	Huye District	Vital HABINSHUTI	Gicumbi District
Albert KARERA	Nyamagabe District	Ephrem RUKUNDO	Rwamagana District
Annonciata MUKABAGIRE	Ruhango District	Dominique M. KANOBANA	Nyagatare District
Francois KABAYIZA	Muhanga District	Nicolas MWIZERWA	Nyagatare District
Andre KAJABIKA	Kamonyi District	David MASENGEHO	Gatsibo District
Jean Baptiste SERUGENDO	Karongi District	Venuste NKURUNZIZA	Kayonza District
Jean Marc MUKUNDABANTU	Rutsiro District	Basile NJAMAHORO	Kirehe District
Jean MUGABO	Rubavu District	Dominique MICOMYIZA	Ngoma District
Immaculee MUKANGENDO	Nyabihu District	Eugene UWIRAGIYE	Ngoma District
Olivier MBANGUTSE	Ngororero District	Florence UWIMBABAZI	Bugesera District
Wellars MUDASHIMA	Rusizi District		

Zone and Sector Controllers and Enumerators

Zone Controllers:
127 (mostly Districts Education Officers and Headmasters of some Secondary Schools)

Sector Controllers:
451 (mostly Sector Education Officers)

Enumerators:
24,005 (mostly Primary School Teachers)

Cartography and Data Processing

Programmer:
  Augustin TWAGIRUMUKIZA, Director of ICT
Assistant Programmers:
  Didier UYIZEYE
  Donath NKUNDIMANA
  Massoud HARERIMANA
Coders:
  Number = 308
Data Entry Clerks:
  Number = 308

Cartography:
  Florent BIGIRIMANA
  Olivier MBANGUTSE
  Clement BIZIMUNGU
  Albert KARERA
  James RWAGASANA
Archiving:
  Eric RUSA
  Pierre Claver KABANDANA

Administration and Finance

Odette MBABAZI	Deputy Director General in charge of Corporate Services in NISR
Didier GAKUBA	Former Director of Finance in NISR
Liberal SEBULIKOKO	Former Coordinator of Basket Fund
Jean Pierre UWINEZA	Former Acting Director of Finance in NISR
Andre GASHUGI	Director of Administration in NISR
Silas MUNYEMANA	Director of Finance in NISR
Jerome UWIBAMBE	Accountant in NISR
Alicia INGABIRE	Accountant in NISR
Jocelyne UWAMAHORO	HR Manager of Permanent Staff in NISR
Esperance UWIMANA	Former HR Manager of Temporary Staff in NISR
Nina RURANGIRWA	HR Manager of Temporary Staff in NISR
Maureen TWAHIRWA	Former Public Relations Officer
Yolande KABEGA	Former Public Relations Officer
Antoinette HABINSHUTI	Planning Officer
Theodore RUGANZU	Former Planning Officer
Jean Paul NDISANZE	Planning Officer
Hassan YAHYA	Coordinator of Basket Fund
Eric BUGINGO	Procurement Officer
Alphonse SHUMBUSHO	Procurement Officer
Gerald YEMUKAMA	Procurement Officer
Nadine BABYEYI	Administrative Assistant
Elias DUSENGE	Messenger
Sita KAZIMBAYA	Messenger

Census Data Analysis

National Data Analysts

Jean RUGARAMA	Population Size and Spatial Distribution
Dieudonne MUHOZA	Marital Status and Nuptiality
Beatrice UWAYEZU	Fertility
Willy MPABUKA GASAFARI	Mortality
Dr. Bosco BINENWA	Socio-Cultural Characteristics of the Population
Pierre Claver RUTAYISIRE	Migration and Spatial Mobility
Prof. Emmanuel TWARABAMENYE	Characteristics of Housing and Households
James BYIRINGIRO	Labour Force
Charles RURANGA	Measurement and Mapping of Non-Monetary Poverty
Annonciata MUKABAGIRE	Education
Dominique M.KANOBANA	Gender
Apolline MUKANYONGA	Socio-Economic Status of Persons with Disability
Jules RUBYUTSA	Socio-Economic Status of Children
Venant HABARUGIRA	Socio-Economic Status of Youth
Michel NDAKIZE	Socio-Economic Status of Elderly
Prosper NKAKA MUTIJIMA	Population Projections

International Technical Support

National Institute of Statistics of Rwanda (NISR):

Dr. Mohamed ABULATA

United Nations Population Fund (UNFPA):
Dr, Bolaji TAIWO, Chief Technical Adviser
Dr. Mady BIAYE, Regional Technical Adviser
Jean Marc HIE, International Data Processing Expert
Dr. Macoumba THIAM, International Census Analyst
Dr. Ben MWASI, International GIS Expert

Oxford Policy Management (OPM):

Mary STRODE	Ludovico CARRARO
Felix SCHMIEDING	Juste NITIEMA
Cora MEZGER Jean Michel	Prof. James BROWN
DURR	Wine LANGERAAR
Gilberto RIBEIRO	Stephi SPRINGHAM
Philippe N. GAFISHI	Sophia KAMARUDEEN
Prof. Sabu PADMADAS	Paul JASPER
	Johnson FIFI

NISR MANAGEMENT TEAM

Yusuf MURANGWA, Director General
Odette MBABAZI, Deputy Director General/CS
Andre GASHUGI, Director of Administration
Jean Pierre UWINEZA, Director of Finance
Willy GASAFARI, Director of Census
Juvenal MUNYARUGERERO, Census Field Expert
Prosper MUTIJIMA, Census Coordinator
Augustin TWAGIRUMUKIZA, Director of ICT
Sebastien MANZI, Director of Economic Statistics
Dominique HABIMANA, Director of Statistical Methods, Research and Publications
Antoinette HABINSHUTI, Planning Officer
Jean Paul NDISANZE, Planning Officer