FERTILITY PREFERENCE AND ITS IMPLICATIONS ON FERTILITY TRANSITION: – A CASE OF SELECTED EASTERN AFRICAN COMMUNITY COUNTRIES

BY

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Q80/96049/2014

A THESIS SUBMITTED IN FULFILMEMT OF THE REQUIREMENTS OF THE DEGREE OF DOCTOR OF PHILOSOPHY IN POPULATION STUDIES, UNIVERITY OF NAIROBI

DECLARATION

I declare that this research thesis is my original work. It has been submitted solely for the Doctor of Philosophy Degree award in Population Studies at the Population Studies and Research Institute of the University of Nairobi. To the best of my knowledge, this thesis has not been submitted before in part, or in full for any award of degree or examination at this or any other university.

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[Q80/ 96049/2014] **…….……. ….……**

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DEDICATION

This work is dedicated to my late father John Otieno King'ora whose vision and push for a little more success gave me strength to accomplish this noble course. Although you went to be with the lord, your quest to see me scale more heights in seeking further knowledge has stood the test of time. No matter what, I give all credit to you dad.

ACKNOWLEDGEMENT

First and foremost, my gratitude goes to the Almighty God for walking with me through this journey. Then to my Alma Mata. The mother to many; - Peninah Taabu Otieno. The one I cherish the most. You never lost hope. You are the oil that kept me moving during the tough times. I know you weren't aware though. You did a priceless job in raising me up. May God bless you mama. You are the only woman who never tires about me.

I also want to thank one honest soul that has absolutely stood by me all time in this. Rose Anyango, I'm truly beholden and humbled. To my children; John Humphrey, Chelsea Valery, Liam Barack and Bob-Vincent Simba (II). You all won. Further to the people who stuck around and not quite sure how immense they contributed in a way or another, you are a great team in my life.

I also wish to give special thanks to two great minds of whom I owe a lot; my supervisors and mentors as well, the only truest of professors I know, Prof. Alfred T. Agwanda Otieno and Dr. Anne Khasakhala without whom this exercise would have been futile. Dr. Anne, I once again salute you for standing by me all through and especially during the turbulent times. Certainly, I have learnt that not everyone smiling around you will love your success. As my supervisors, I'm deeply indebted and for sure I am. You did a tremendously invaluable job and it won't be in vain. With your toil to see me through, demographic discourse is indeed reinvigorated.

ABSTRACT

Fertility transition of the Sub-Saharan Africa has generated great interests and debate in the past decade. Two fundamentally interrelated observations have been made: the extent to which changes in fertility levels are due to changes in fertility preference and the extent to which the observed fertility changes result from the ability of women to implement their fertility desires. This conclusion was the key motivation of the study. The first objective of this study was to establish the prevailing trends and determinants of fertility preference within the sub regions of selected East African countries. The second objectives was to estimate the fertility preference implementation and their differentials overtime while the last objective was to estimate the extent of the contribution of fertility preference and implementation to fertility change in the region. The choice of the four East African countries (Kenya, Uganda Tanzania and Rwanda) was based on the fact that fertility in Eastern Africa is changing in a more complex way than any of the current literature suggests which therefore warranted further investigation.

The source of data was Demographic and Health Surveys conducted periodically in each of the countries since 1980s. This study was guided by Bongaarts (1993) modification of Easterlin (1975) and Easterlin and Crimmins (1985) supply-demand framework for fertility analysis.

The key results of the study indicate that in Tanzania, fertility preference was a key contributor to the reduction of fertility for most regions while for Kenya and Rwanda, and to some extent Uganda, the most important contributor to fertility decline by sub regional level, place of residence and socio-economic groups is the ability to implement fertility desires. Rwanda had the largest fertility decline due to the contributions by both changes in the wanted fertility and ability to implement fertility desires supported by the universal coverage of programs. Kenya's decline is associated with the long history of family planning programs even though the reach is intermittent.

Amid all these results, there's is a definite convergence towards ability to implement fertility desires but fertility declines faster when both wanted fertility and ability to implement desired fertility occur simultaneously. In addition, Rwanda shows similar change across all the regions irrespective of which regions are dominated by urban centers and across socio economic groups. The Rwanda case appears to follow the Bangladesh example where fertility transition can occur due to strength of the programs. The results here concur with Bongaarts and Casterline (2013) that although each country has a unique fertility trajectory, fertility transitions share similarities. This study concludes as in (Bongaarts, 2017) that for policy and programs to be effective, e family planning programs must be accompanied by rigorous, consistent sensitization and public education campaigns to trigger demand for contraception in anticipation to lower desired family size by diffusing new ideas about the benefits of smaller families and the role of women. However, further research is needed examine the estimation of degree of fertility preference implementation index when the main proximate factors associated with fertility levels is not contraception as in the North Eastern region of Kenya and some regions of Tanzania.

LIST OF ACRONYMS

AIDS:	Acquired Immune Deficiency Syndrome
ASFR:	Age Specific Fertility Rate
CPR:	Contraceptive Prevalence Rate
DHS:	Demographic and Health Survey
Fn:	Natural Fertility
Fo:	Total Fertility Rate
Fw:	Wanted Fertility
GDP:	Gross Domestic Product
GLM:	General Linear Model
HDI:	Human Development Index
HIV:	Human Immunodeficiency Virus
ICF:	Intermediate Care Facility
ICPD:	International Conference on Population and Development
Ip:	Degree of Fertility Preference Implementation Index
KNBS:	Kenya National Bureau of Statistics
MPI:	Multidimensional Poverty Levels
RWA:	Readiness, Willingness, Ability
TFR:	Total Fertility Rate
UN:	United Nations
UNFPA:	United Nations Fund for Population Activities

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CHAPTER 1: INTRODUCTION

Introduction

This is the first chapter of the eight chapters of this thesis. Chapter one introduces this study by furnishing the background under which this study rides. It articulates the problem statement together with the corresponding research questions, the study objectives, scope and limitations as well as the rationale for this study. Further it provides a summary of the contents of the subsequent chapters in this thesis.

1.1. Background.

Fertility transition results from complex interactions between the different combinations of stimuli, either social or cultural among others that change patterns of fertility desires. In fact, family formation and fertility control behaviours may vary significantly within different settings (Harwood-Lejeune, 2001; Lloyd & Emery, 2000; Zaba, et al., 2004). To date there is still no single theory that fully encompass these processes and Van de Walle and Knodel (1980) in their classic study of the European fertility transition, attested to no linkages in tying the onset and speed within which fertility transition manifests itself as well.

Consequently, fertility transition of the Sub-Saharan Africa has generated great interests within the past few decades due to a number of peculiarities (Bongaarts & Casterline, 2013). First is its uniqueness unlike the fertility declines witnessed within the pioneer countries in the European continent attributed majorly to the catalysed women empowerment and autonomy through education and access to fertility control technologies as well as the prevailing global economic systems making children more costly (Caldwell & Schindlmayr, 2003; Odwe, 2015). Caldwell et al. (1992), who described the Sub-Sharan African transition as a new type of fertility transition reported that in the African case, there would be similar fertility declines across all age groups"

(p. 237), which would be in contrast to "the greater declines among older women that characterized the non-African transitions" (p. 237). Despite this overarching claim, quite a meagre studies have directly tested this phenomenon (Moultrie, Sayi, & Timæus, 2012).

The fertility transition in the sub-Saharan Africa has further raised curiosity based on the fact that quite a significant number of countries that had inherently high birth rates have recently began the downward paths as previously seen throughout Latin America and Asia (Bongaarts and Casterline 2013; Casterline and Agyie-Mensah, 2017). One debate stands out across all these discourses. This is the contemplation as to whether the fertility transitions in Sub Saharan African region will follow the pattern of earlier fertility transitions such as in the Latin American or Asian (Kohler, 2012). A third concern of the debate as postulated by Shapiro and Gebreselassie (2013) and Garenne (2008) is that the earlier fertility transition in the Sub-Saharan Africa in general was either very hesitating or stalling after only but a brief start.

In addition, there are still disputes about two aspects of fertility transition: - first is whether there is a robust theory of fertility decline applicable to all its areas and secondly, is whether there is indeed any association between the onset and speed of the fertility transition and the various socioeconomic indicators, such as levels of education, urbanization, social class/status, or industrialization. Casterline and Agyei-Mensah (2017) report that most of the literature on the Sub-Saharan African fertility transition has dominantly focused on the timing of the onset of decline. They argue that the timing is only but one stage of the overall transition process and subsequent search for explanations of fertility transitions should therefore also examine the specific historical contexts of each population.

Subsequently, many other researches on fertility transition in Sub-Saharan Africa focuses on demand for children in order to explain how this demand bears on prospects for fertility decline

(Casterline and Agyie-Mensah, 2017; Bongaarts and Casterline, 2013). The general conclusion is that the high fertility and slow pace of decline stems from high fertility desires. However, at present there is ample evidence of conscious desires to limit family size which applies even to most of the countries that showed little or no fertility decline to date (Casterline and Agyei-Mensah, 2017). In fact, the desire to limit family size is far more prevalent in East Africa than in West or Middle Africa. These conclusions warrant further studies on fertility transition in the region.

First, Casterline and Agyei-Mensah, (2017) cautions about drawing simple inferences about likely future trajectories of fertility in sub-Saharan Africa on the basis of fertility desires alone. This implies that other factors behind fertility change should subsequently be examined as well. Secondly, the correspondence between fertility desires and reproductive behaviour outcomes is diverse in some settings than in others and therefore they are context dependent. This suggests the need for comparative studies which also include variations in fertility desires by different groups of populations. Third, an emergent and consistent conclusion from recent studies suggests that accelerated fertility decline in Sub Saharan Africa will occur if, there is both substantial decline in desired fertility and amplified levels of implementing these desires (Bongaarts, 2017; Casterline and Agyei-Mensah, 2017; Bongaarts & Casterline, 2013). Fourth, there are now exceptions such as Rwanda, Ethiopia, Malawi (Bongaarts, 2017; Mahy & Gupta, 2002) with prospects for rapid fertility decline.

In particular, Towriss & Timæus (2018) report that fertility in Eastern Africa is changing in a more complex way than any of the current literature suggests, where parity progression ratios have fallen for all groups of women in similar fashion to that described by Caldwell et al., 1992. This points to it as an anchored behaviour after high level advocacy for family planning. In line with these exceptions and following suggestions from a seminal workshop organized by Committee on

Population of the National Academy of Sciences in 2015, further search for explanations of fertility transition may as well lie in the examination of specific historical contexts of each population (Casterline & Han, 2017). Studies on fertility transition also needs to take cognisance of the conclusions by Mason (1997) that there exists many theories of fertility transition, each containing critically valuable ideas, but none provides a complete explanation for all known fertility declines (Mason, 1997).

1.2. Research Problem

The association between fertility desires and its outcomes at both the aggregate level and the individual level is variable; and the correspondence between fertility desires and actual reproductive behaviours is far closer in some settings than in others (Bongaarts, 2017; Casterline and Agyei-Mensah, 2017; Bongaarts & Casterline, 2013). This fluctuating correspondence between fertility desires and fertility outcomes is due to variations in the extent to which desires are implemented in those behaviours that directly determine fertility (Casterline and Agyei-Mensah, 2017).

Although all the East African countries exhibit some semblance in their population policy frameworks and orientation, only Rwanda and Kenya appear as exceptional in their drive towards accelerating further fertility decline (May 2017). Subsequently, Muhoza, et al., (2014) indicated that there are indeed significant variances in desired and excess fertility between the four East African countries and between certain communities within these countries. This is in contrast to the earlier studies on the historical fertility transitions in Western Europe which alluded that fertility change in one country may have implications in the neighbouring country because neighbouring regions share common dynamics including language and cultural traits that permit shared flow of ideas to eventually spread new models of behaviour (Dribe et al 2013) through

diffusion. Despite this earlier observation, the East African countries have indeed shown remarkable differences in their fertility transition.

Kenyan fertility began to rapidly decline in the 1980s followed by stall and then another phase of decline recently (KNBS, 2015). Tanzania progressed slowly in decline followed by stall mainly in rural areas (Ezeh, et al., 2009; Garenne, 2014; Otieno & Amani, 2014) and then further decline within similar timelines as Kenya (Otieno, et al, 2016). Uganda has generally been regarded to still be at the pre-transition stage (Ezeh et al., 2009) that lately initiated a decline. Rwanda equally experienced rapid declines in the recent decades (Dhillon & Phillips, 2015) because of the government's management of the economy through the provision of social and health care services, including family planning, that are exceptional by regional standards (Dhillon & Phillips, 2015; May, 2017). Despite all the conclusions, they are however not cognizant of the in-country differences (Eloundou-Enyegue, et al., 2017) which calls for examination of what accounts for the observed heterogeneity in sub national fertility change within the East African countries. Are the differences in fertility change among the sub groups within countries attributed to differences in fertility preferences or differences in implementation modes of fertility desires? These statements provide the key research questions presented in the next section.

1.3. Research Questions

The intent of this study was to answer the following questions across contextual issues:

1. What factors determine differentials in sub-national fertility preferences? Are they different in different country settings, or stage in fertility transition? To what extent have women implemented their fertility preferences? How has the implementation of fertility preferences changed overtime across the sub-national levels and across socio economic groups?

2. What are the implications of the prevailing trends on fertility preference and preference implementation on fertility change within these east African countries?

1.4. Objectives of the study

The principal objective of this study was to establish the extent to which fertility preference and preference implementation explain fertility change evident among selected East African countries within the sub national levels. This was to establish how the women's ability to implement their fertility preferences could elicit valuable explanations to the currently prevailing heterogeneity in observed fertility transition. The specific objectives were as follows:

Objective 1: To establish the prevailing trends and determinants of fertility preference within the sub regions of these countries.

Objective 2: To estimate the fertility preference implementation measurers and their differentials overtime.

Objective 3: To estimate the extent of the contribution of fertility preference and implementation to fertility change in the region.

1.5. Rationale for the Study

The rationale for this study stems from the suggestions of a seminal workshop organized by the Committee on Population of the National Academy of Sciences in 2015. Casterline (2017), in the overview of the key deliberations of the workshop indicated that further search for explanations of fertility transition may lie in the examination of specific historical contexts of each population. Trends in fertility desires by sub national regions and social class stratification also provide an understanding of the evolution of fertility decline important for policy (Freedman, 1979; Dribe et al 2013).

In particular, many countries in Sub Saharan African are keen to prioritize the acceleration of their fertility decline and revise their population policies accordingly owing to the prospects for demographic dividend (Zulu, et al., 2015). Demographers also study fertility preference because they help to predict future fertility rates in a given population (Philipov, 2011) and these predictions have always tended to be quite accurate at the macro level (Hagewen & Morgan, 2005; Schoen, et al., 1999). Fertility preferences also represent a key link in the chain of causation between fertility and its socioeconomic determinants.

The third objective draws from Bongaarts and Casterline (2013) assertion, which posits that the understanding of factors influencing desired family size and fertility preference in general helps to provide not only the explanations to the observed fertility but also on how preference implementation accounts for the fertility change. Two fundamentally interrelated issues observed in number of developing countries ascend, namely the extent to which changes in fertility levels are due to changes in desired births and the extent to which the observed fertility changes result from the ability of women to consciously make decisions on their fertility desires of choice, offering important explanations on fertility transition (Bongaarts and Casterline 2013; Casterline and Agyie-Mensah, 2017).

1.6. Scope and Limitation

This study is based on a population of women aged between 15-49 years within the sub national regions, hence all facts under consideration will be informed by this category of the women population. It is however in the public domain that there are women of younger and older ages who also influence quite a significant overall outcome of the fertility transition in a population. Studies have also indicated the limitations in how fertility preferences are measured; especially the extent to which women are able to respond without rationalizing their responses.

Secondly, secondary (DHS) data suffers a number of limitations. Being cross sectional in nature, it limits the extent to which causality can be established. Secondary data also restricts this study to the utilization of only those variables used in the survey. This therefore will not allow for total control of independent variables to be tested against the dependent variable consequently limiting the frontiers to other crucial knowledge. On the same note, the sample size selection in some countries could also pose limitations to the knowledge frontier being sought for this thesis. One notable area is the country of Tanzania. The population size and its diverse nature is well known. However, the DHS sample size could be a cause of concern. It is a fact that fertility indicators at sub national levels in Tanzania could create significant bias because of small sample sizes. While these will not adversely affect the potential estimates, the uncertainty areas are recognised and noted.

This formulation to a greater extent assumes that actual fertility is always greater than wanted or desired fertility in the course of development. Certainly, it's been only but true for the region overtime. However, a further task of clearing this incongruity towards a generalised formulation is therefore required in order for the indicator to incorporate all the possible outcomes of the interplay between natural, wanted and actual fertility. The formulation also only works best at the macro level analysis (where averages of the determinants are used in the calculations). Further, fertility preference implementation is an aggregate measure hence fail the test of time and cannot be used to estimate the parameter at an individual woman level (Micro level). These identified lags undeniably fall beyond the scope of this study. Finally, the fertility indicators at the sub national levels of Tanzania may create biases based on the small sample sizes used to inform the status of their underlying populations.

1.7. Thesis Organization

This thesis is organised into eight chapters each bringing into context the piece of valuable information that aim to elucidate in clear terms the thematic aspects of each chapter component. Chapter one has introduced this thesis articulating the background on which this study rides. It illuminates the problem statement, the research questions, the study questions and objectives, the rationale as well as the scope and its corresponding limitations. It further delivers in summary the organization of this thesis with respect to the corresponding chapters thereafter.

Chapter two delivers the historical background of the region with regards to the underlying population including the socio-economic situation based on selected metrics. It sets an overview of the study context highlighting its geography, history of the major grouping of the natives, social and cultural set up among other characteristics, the physical characteristics including the political administration, population distribution, growth and structure, the population policy and the social and economic dynamics, growth and a corresponding brief highlights of related theories.

Chapter three brings in the contextual debates related to the study. This is the chapter of literature review regarding the subject matter. It is concerned with the aligned discourse by the various scholars in demographic research. It provides a detailed assessment of the previous studies and related literature, including related frameworks used to guide this study. It discusses a body of past published knowledge structures and systems regarding fertility preference in an attempt to explain fertility transitions together with its related sub areas. The work involved a review of the thematic knowledge bases that have been consulted to understand the subject matter within the confines of fertility in broader terms and specifically fertility preference. It also provides a platform in which the key fertility terms are defined within the similar contexts of preference.

Chapter four then aligns the study into a methodological approach through which the results will be gathered and engaged. It defines the respective dependent variables together with their corresponding definitions and measurers. It also explains the information on data sources highlighting the quality related aspects and corresponding merits as well, including the expected data analysis methods. Further, this chapter highlights the objective specific analytical methodologies, the numerous independent and any control variables in use, together with their corresponding measurements and definitions as well. This is followed by a subsequent objective based three chapters of results five six and seven.

Chapter five as the first of the results chapters provides the findings of the first and second objectives of the study. The first objective in this case was to establish the variations and determinants of fertility preference within the countries. It is therefore the only modelling chapter in this thesis with each of the two dependent variables modelled independently to the selected known explanatory variables controlling for transition period. It is the chapter aimed at establishing using the pooled regional Demographic and Health Survey (DHS) data set gathered overtime, the extent at which the selected predictors influence the dependent variables.

The chapter first begin with a descriptive statistic results of the key variables under this study. The trend information of the fertility preference variables, the dependent variables as well as the explanatory variables are well analysed and explained as preliminaries within this chapter; grounded on the measures of central tendency and dispersion; applied in order to provide clear scenario built on progression around the mean and range from the minimum and the maximum value of each variable in question over the years. It further seeks to establish how the factors among the selected known, determine fertility preferences trajectories at the macro scale and further whether they are different in different contexts and particular stages in fertility transition.

The second goal of Chapter five explains objective two of this thesis; enunciating how fertility preference has changed overtime within the sub national regions of the East African countries together. It therefore also seeks to provide answers to the following questions: - To what extent have women implemented their fertility preferences? How has the implementation of their fertility preferences changed overtime across the sub-national levels and across selected groups?

Chapter six delivers results for the objective three of the study. The purpose of this chapter was to explain the implications of fertility preference and preference implementation in explaining the prevailing fertility changes; decomposing these trends so as to assess the contribution of each of the preference measurers to the overall fertility changes observed within the corresponding periods. The key preference variables under consideration here are the wanted fertility, mean ideal number of children and the unwanted fertility thereby detailing trends in the levels of the degree of fertility preference implementation index (Ip) across the years within specified categories. Subsequently, this chapter highlights also the results of the decomposition of trends and the contribution of each of the fertility preference parameter measures to the course of prevailing fertility change.

This thesis aimed to improve the general knowledge and understanding on the contemporary women fertility dynamics at play in the Sub-Saharan Africa in general and the Eastern Africa region in particular. The intent of this study was to apply the fertility preference in an attempt to explain the present phase of fertility transition currently underway in selected East African countries across a variety of contextual issues. It also aimed at assessing the levels and trends of fertility preference, determinants and their corresponding contribution to the prevailing fertility change in the region. The chapter seven therefore encapsulates the results with a key discussion of the findings further drawing conclusions as well as recommendations.

CHAPTER 2: EAST AFRICAN CONTEXT

2.1. Introduction

This section sets an overview of the study context. It highlights geography, history of the major groupings of the natives, their social and cultural set up among other characteristics, the physical characteristics including the political administration, population distribution and structure, the population policy and the socio-economic state and dynamics, growth and a subsequently, a brief section of related theories.

2.2. Physical Geography

The countries lie within the great lakes' region, encompassing diverse geographical features majorly the numerous lakes, plentiful mountainous areas and the great Rift-Valley as the most distinct landforms (Ogola et al., 2015). A zooming look at the Eastern Africa Geography, Kenya, Rwanda, Uganda and Tanzania cover quite a sizable proportion of the African continent with great diversity in its underlying population (See map appendix 1). According to Ominde (1975) this region lies to the almost central of the Africa continent exhibiting tropical climatic characteristics. With the vast climatic conditions cutting across these countries thereby determining the population distribution, intertwined together with other characteristics, clear insights will be taken into consideration while presenting this population information.

The equator passes through both Kenya and Uganda dividing the countries into two unequal portions. Rwanda and Tanzania on the other hand fall within the southern hemisphere just below the equator both as immediate neighbours to Uganda. In fact Rwanda is the smallest of them all in terms of actual physical land coverage located at the extreme South Western side with its North Eastern neighbour Uganda (Ominde, 1975). He further states that Tanzania principally inhabits the whole southern part while Kenya is visibly taking the North Eastern part of the region

bordering the Indian Ocean, Somalia and Ethiopia. Uganda on the Western side of Kenya is actually situated in an inland position just like its South Western neighbour Rwanda.

Ominde (1975) affirms that only 10% of Uganda lies to the South of the equator while Kenya has more than half its area on the northern part of the equator. The rest of the countries fully fall within the southern part of the equator. These countries were formed by the colonial administrations who carried out the massive mapping and boundary demarcation for ease in administration during the scramble and partitioning of Africa (Mascarenhas, Flaxman, Boerma, Vanderpoel, & Stevens, 2012).

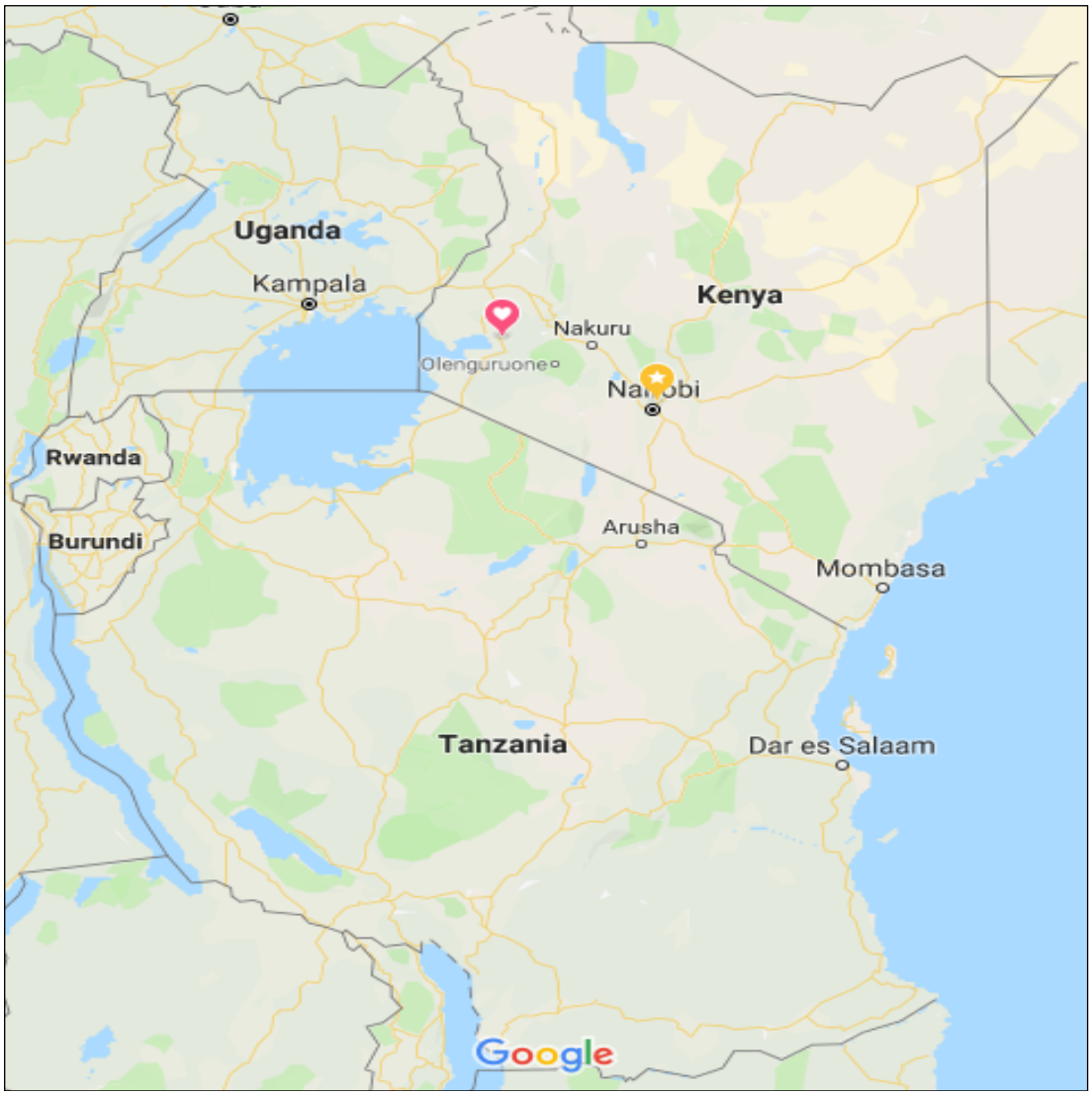


Figure 2. 1 Physical sizes Map of Eastern African Counties

Uganda covers a total of 193,503km^2 of land area with Kenya - the most diverse - covering up to 582,644km^2. Tanzania, the largest of all the countries covers an area 939,700km^2 while Rwanda being the smallest is 26,338km^2. The countries were further again divided into several administrative regions with Tanzania having up to 29 regions, Kenya having 8, Uganda 4 while Rwanda have 5 regions. Kenya Tanzania and Uganda share the Lake Victoria always fed with perennial overflow rainfall water from the three countries. Its productive potential is dependent on a favourable rainfall overtime draining its water to the Mediterranean Sea through the river Nile in Uganda (Mascarenhas et al., 2012).

Geographically, Rwanda has a characteristic hilly terrain where population is dispersed within the habitable areas of their landscapes (Linard, Gilbert, Snow, Noor, & Tatem, 2012). The country is dominantly agricultural due to the favourable climatic conditions (Mascarenhas et al., 2012). Worth noting too is that Rwanda naturally has the highest proportion of favourable agricultural land than its neighbours. It is a common knowledge within the region that the most arable lands are inhabited by high population households. Rift valley – another ancient phenomenon is one of the land forms that has characteristically determined the landscape of these countries over the years with most of the lakes coming forth due to it.

The Eastern African region equally suffers periods of seasonal moisture deficit due to prolonged droughts as well as flooding during the rainy seasons leading to migrations, deaths, impaired infrastructure among others (Mascarenhas et al., 2012). The displacement of populations from these perennial disasters definitely determine their demographic course albeit at some unknown numerable level. The region is less populated in some significant areas as well, dominantly occupied by wildlife thereby facilitating tourism activities; another economic activity of the people where agriculture is not vibrant.

The tendency of these countries to have their population concentrated in certain favourable regions is common. In fact agriculture as well as urbanization too are the two most common pull factors towards settlement and distribution in these countries (Linard et al., 2012). The countries' population distribution is highly correlated with land productivity. Overall population density is low in dry areas, but high in the rich agricultural lands as well as the urban centres.

The countries are dominantly agricultural, practiced by over 80% of the population with just below 30% of the population found in urban areas through rural-urban migration as well as a minimal population of international immigrants (Brass & Jolly, 1993). There is an active population re-distribution through internal migration too – both voluntary and involuntary (May, 2017b; Oucho, 1996). These populations are basically youthful with dominant intermarriages among the moving populations. The proportional share of children under age 15 has reduced over the years in these countries, while that of the elderly, aged 65 and over has increased, signalling the onset of aging too (Zulu, et al., 2015) Just like other parts of the developing world, East African countries, even though at a slower pace are experiencing a phase of increased urbanization characterised by lack of reasonable employment opportunities, disease burden, strained infrastructure and related facilities, and deterioration in the living conditions of the dependent populations (Mascarenhas et al., 2012; Zulu, et al., 2015).

However, the East African Countries boasts of diversity in culture aligned to their traditional inclinations that they originated from. Broadly classified, the indigenous populations of this region are dominantly Bantu, Nilotes or the Cushites (Ominde, 1975). These groupings gave birth to the various communities living in the various regions of the countries. These ethnic groupings sometimes almost certainly in the past determined where the particular groups of people lived as well as defining their traditional dialect and other cultural inclinations. These major groupings are

also characterised by the kinds of economic activities they inherited from their fore fathers (Ogola et al., 2015). Apart from the alignment to these major groupings, most of their social and behavioural practices including cultural practices and orientations were dominantly affiliated to ethnic group from which one come from (Ominde, 1975).

These native populations usually have commonalities ranging from local language all the way to the practised cultural norms; sometimes off-centre and attributed to diffusion factors among the different populations living within close proximity to each other (Mascarenhas et al., 2012). The populations are dominantly socialised based on the kinds of networks they have especially ethnic group and region of residence among others. It is a known fact that the indigenous groupings of Bantu, Nilotes and Cushites were dominantly pronatalist with regards to fertility due to the harsh climatic conditions that existed then including epidemics, constant attacks from their hostile neighbours and high demand for labour in farms and forests during hunting and gathering activities as a mitigation to the eminent agents to extinction (Ominde, 1975; Ogola et al., 2015).

Ominde (1975) traced these groups by origin and established that the Nilotic people are indigenous to the Nile Valley who speak Nilotic languages; this is a large sub-group of the Nilo-Saharan languages spoken in South Sudan and the Lake Victoria region of Uganda, Kenya, and northern Tanzania. They were dominantly fishermen (River-Lake Nilotes) - solely the Luo ethnic community and other of hunters and gatherers and nomadic pastoralists (Highland and Plain Nilotes) - the Maasais and Kalenjins (Ogola et al., 2015).

Cushitic people are another group. The term Cushite is derived from the ancient peoples of North-Eastern Africa, whose heritage can be traced most clearly in the languages descended from those of the ancient people. In broad terms the people now, designated Cushite are the cultural descendants. Cushitic ethnic groups associated themselves with nomadic pastoralism as their main

socio-economic activities. From their origin by historical tracing, the Eastern African Bantu speakers may have moved due to external pressure, especially the migration of the Arabs into West Africa through Congo forest, down south before scattering again within the region. The North African Arabs were believed to be more sophisticated and hostile forcing them to move southwards.

Additionally, the internal conflicts from the Bantu groups, misunderstanding between the different clans is also thought to have brought them down south to the East African region with another splinter going south. The migrations and splits diluted most of the cultures. Inherently agriculturalists during their settlement in the region, they adopted livestock husbandry from other unrelated Cushitic and Nilotic speaking people they encountered. Archaeological, linguistic, genetic, and environmental evidence all support the conclusion that the Bantu expansion was a significant human migration. The major Bantu groups in Kenya are the Kikuyus and Luhyas inhabiting the Central and Western Kenya respectively. Other major Bantu groupings are the Sukumas, Chagas among others in Tanzania, Tutsi and Hutus of Rwanda and the Bugandas, Banyankoles and Bagisu of Uganda

With the colonial powers partitioning country boundaries, some groups found themselves split. Among them are the Luos who inhabited most of the Lake Victoria basin and the Nile basin comprising of the three countries of Kenya, Uganda and Tanzania. The Maasai community also inhabit vast tracks of Tanzania and Kenyan land. Other Bantu ethnic community groupings are the Luhyas, and Kalenjins found in the Eastern Uganda and Western Kenya. These ethnic communities like many others, amid the separation by the international boundaries still share commonalities in cultural orientation, dialect, community hierarchies and decision making with regards to birthing among others (Mason, 2001). This is bound to hence influence information flows beyond the

international borders. As has been recently described by Korotayev, Zinkina, Goldstone, and Shulgin (2016) in her recent anthropological studies about the non-falling fertility in the region, these communities were dominantly patriarchal with males fending for their families as women become home makers (Linard et al., 2012).

A Swahili group of community found itself along the coastal zones of Kenya and Tanzania, formed dominantly by the intermarriages between the native groups and the ancient Arab traders as English and Kiswahili dominates most of the other regions due to the influence left by the colonial powers and intermarriages respectively. Rwanda was predominantly French until around the turn of the millennium when they changed their official national language to English for communication. The respective governments of all the four countries saw the need to enshrine in their constitution Kiswahili and English as their official languages aimed at unifying their populations.

Another group of secularised population mostly the minority immigrants inhabited the urban areas paying allegiance and inclination to western life styles and practices. This group have since polluted many definitive customary cultural practices by their westernised adherence and behaviour among the natives leading to an emergence of a modern hybrid lifestyle characterised with elitist traits, intertwined within the traditional lifestyle and conduct (Mascarenhas et al., 2012). Intermarriages among the different groupings is equally evident. This occurs within the socio-cultural context, where significantly newer languages have had to evolve especially among the sprouting urban populations showing traits of an amalgamation of languages; - commonly defined as slang or sheng.

2.3. Socio-economic Characteristics and Inequalities

Among the neo-Malthusian adherents, it is believed that rapid population growth - though currently slowing for Eastern African countries has persistently continued to strain countries' ability to cater for the basic human rights including nutrition, health services, clean water and healthy environment. The socioeconomic status of populations are quite often affected by the particular dynamic demographics at play. It is also known that demographic changes are one of the most crucial long-term challenges that will have grave influence on the economies' performance (Collier & Gunning, 1999). Despite the potential grave consequences, demographic facts usually do not take centre stage in many country macroeconomic policy discussions or debates by the governments.

Upon attaining independence, these countries emphasised socio-economic development, especially the eradication of poverty, ignorance (illiteracy) and disease. Opiyo (2009), while carrying out studies in Kenya confirms that the government policies in place helped them achieve reasonable economic growth that allowed them to make modest gains in living standards and social welfare in spite of its high rate of population growth.

The market-oriented approach to development and other liberal economic policies pursued attracted substantial foreign aid and investment, which resulted in fairly impressive socio-economic gains in the 1960s up to around 1980s. Tanzania and Kenya currently have the largest economy in terms of GDP in billions of dollars, which in turn reflects high GDP per capita. Their wealth distribution is nonetheless questionable as reflected in the wellbeing of their underlying population. However, only Tanzania and Rwanda have shown significantly rapid growth rate in the regional economy; almost doubling Kenya's while that of Uganda is the slowest (Table 2.1).

Table: GDP and Growth rate

Table 2. 1: GDP and Growth rate

	GDP billions US $ at 2011 PPP	GDP per capita US$ at 2011 PPP	GDP growth rate (Annual %)
	2017	2017	2017
Kenya	148.8	2,993	2.3
Tanzania	149.3	2,683	3.7
Rwanda	22.6	1,854	3.6
Uganda	72.8	1,698	0.6

Source: UNDP 2018

With the structural adjustment taking place across the globe within the recent past, Kenya as one of the East African countries has been graduated to a middle income country with foreign aid diminishing as time passes by. Brass and Jolly (1993) believed that these changes had huge social and psychological impact – through linking all sectors to the market economy, increasing population mobility, and rapidly changing values, perceptions and attitudes – thereby initiating wide-ranging demographic changes.

The developments have however been hampered by among others, the perennial infighting and political upheavals at different times slowing gains made in the previous years. Each of these countries except Tanzania have undergone at least to some extent civil unrest in the recent decades derailing their economic progress on the one part; as well as significantly determining their prevailing demographic blue print in some ways. Further, economic structural adjustment programs that ensued earlier limiting overreliance on foreign aid weakened the government programs and subsequently weakening economies that heavily relied on them. Political goodwill is equivocally posing a clear challenge in driving the robust economic blue prints designed by the predecessor leaderships in the respective countries.

2.3.1. The Gross Domestic Product and Economic Growth

Among the countries, Kenya has been leading the race to the middle-income country status. Kenya is regarded as the richest in East Africa based on the parameter measures used in determining its per capita income. Its falls just below by 20% mark to hit the 100% threshold to qualify its position

in the middle-income category countries (Ravallion, 2017). The other East African compatriots of Rwanda, Uganda and Tanzania are equally known to be catching up fast (Ravallion, 2017; Ravallion et al., 2009). Controlling their population is trusted to in part help elevate their status. A number of bottle necks abound nonetheless. However, if all these factors remain constant, the middle-income status would still be possible, though only later.

According to Ravallion et al. (2009) it is known that the other East African countries' growth are faster than Kenya much as the region is rated as one of the fastest growing regions in the world. The rate of growth therefore determines whether and when they are going to join the middle-income economies. International market brands as an indicator of countries' potential continue to register their presence in the region almost regularly with the local firms equally competing to push for presence across the regions.

From the ancient times, the region's dominant economic activity has been pegged on agriculture due to favourable average rains over the years with temperatures favouring a variety of tropical crops. The agricultural capacity of the regions are heavily hinged on the environmental conditions with manual labour acting as the major factor of production (Linard et al., 2012). This together with the vast lands that still exist in most of these regions, along with quite a sizable proportion of people with limited or no education at all puts very limited pressure on family size limitation.

According to the African Development Group report of 2017, average real GDP for the East Africa region grew at an estimated 5.9%, but with considerable country variations. According to KNBS (2017) different economic performances highlights regional and global shocks as well as individual country policies and circumstances (Table 2.2). In the fastest growing economies, growth resulted from strong domestic private consumption, public investment in infrastructure,

growth in light manufacturing, and growth in agriculture, particularly during periods of good rainfall (Ravallion, 2017; Zafar, 2007).

Table 2. 2: Trends in GDP Growth Rate

	2015	2016	2017	2018
Kenya	5.7	5.9	4.9	5.5
Rwanda	8.9	5.9	6.2	6.8
Tanzania	7.0	7.0	6.5	6.8
Uganda	5.7	2.3	4.4	5.2

Source: Economic Survey 2018; Kenya National Bureau of Statistics - KNBS

2.3.2. Income Inequalities

With an inequality situation as imperfections flourish, there is indeed a lasting detrimental effect on a population's net capital formation and a subsequent lag in economic development. A strain on the limited resources wears the said populations down (Bongaarts, 1982). No matter what, there is always the low-income stream and the high-income stream detached by a moderate group commonly referred to as the middle class. The strain in development depends on the proportion belonging to each side of the extreme as well as the gap between either side. The income spread within a people determine their level of economic inequality and even their eventual wellbeing including the demographic processes (Ravallion, 2001, 2017).

One key similarity within the East African countries in general is that neither belong to both the extremes of the scale but rather lie closer to perfect inequality on average than perfect equality (Figure 2.2). The regions level of inequality falls just below the average mark (Ravallion, 2017). Zooming into each country equally portrays a further variation within the different sub national units and among its other consequent categories. With the population's inequality being more tilted towards zero, there is a high likelihood that an unprecedented surge in poor population from the natural increase through births from poor parents compared to the economically endowed population will prevail.

A myriad of reasons have been put across to explain the tragedy of economic inequality. However, the most dominant of all in the region are the increase in inequality in wages, education and salaries through skewed labour market outcomes and orientation thereby intentionally or unintentionally killing some niche at the expense of the others (Fosu, 2015) as well as corrupt vices. The underlying fertility – a potential demographic dividend (Zulu, et al., 2015) has instead brought forth the current dominantly unemployed population due to the limited opportunities available within the general economy casting doubts on to the wellbeing of the underlying populations in general. This deepens the inequality scale.

Further, the household capacities and resources are linked to their financial endowment and strength. Majority households are limited putting a lot of strain to their levels of advancement and progress across all parameters including household size choices from the conscious decisions, thereby forcing them to rethink about subsequent births; either to implement their fertility or not, to what levels including the pathway or method to take towards such a course.

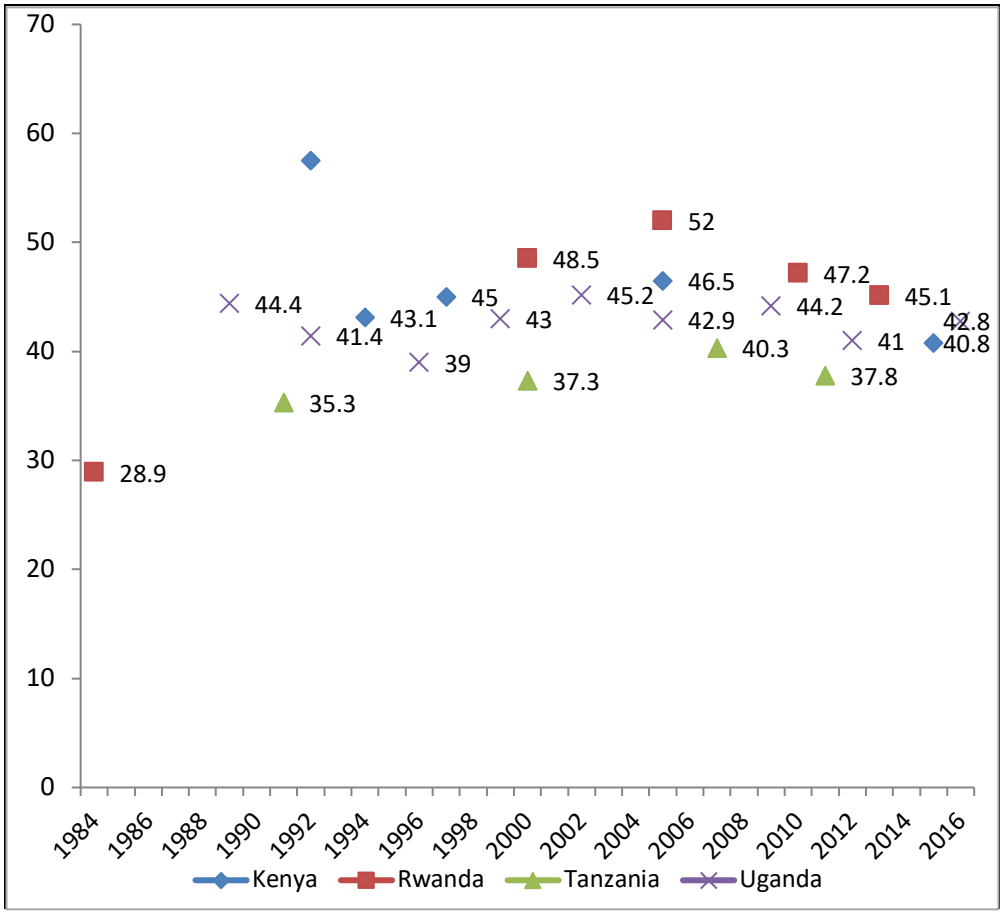


Figure 2. 2: Trends in Gini Coefficient for East African Countries
Source: World Bank 2018

The recent economic survey conducted by the Kenya National Bureau of Statistics reveal that across the region only a meagre proportion of the potentially fit for work population is earning a living from reasonable work with the majority either under employed or unemployed. Results exposed quite a reduction in the ratio of the actual working population to the fit to work population over the years due latent youth bulge; a demographic dividend syndrome characterised by a continuous surge in the young educated population across board (KNBS, 2015; Zulu, et al., 2015). Inequality in education, contraception knowledge, availability and use among other forms of population inequalities have also been faulted as some of the major drawbacks bedevilling the current state of the region's progress. Policy frameworks, and all forms of population

discrimination including gender biases has also increased inequality among the populations of the region.

Among the ancient theories, the Marxist economics on the other hand obstinately points out that rising inequality is a function of the capitalist mentality surrounding job cuts through automation and capital deepening in the centre of a growing population ready for the job market. Neoclassical economics on the other hand opines that inequities in the circulation of revenue arise from variations not limited to workforce worth and land but also to capital injected. Differences in value addition by the classifications of workers dictate the trajectory of the income distribution.

This implies that the gains are dictated by the value bestowed on each economic actor comprising of the investor all the way to the lowest cadre of worker. This renders inequality to be an image of a productivity gap based on top earners and the rest within the hierarchy. The current situation across the Eastern African countries is the huge proportion of the lowest cadre work force characterised with either semi-skilled or totally unskilled labour force competing for the limited spaces within the labour market (Ravallion, 2017).

The trends in the distribution of wealth cross these countries are a wash. Actually its widens as it narrows with a characteristic stall in most countries (Fosu, 2015). This could be attributed to the fact that the rarefied class of population who are the top 1% are enjoying beyond measure and more than any reasonable proportions of what the economy has to offer. According to Ravallion (2017) the absence of supplementary data to back this hypothesis especially from the 1% top class who as would be expected never participate in surveys, that could be used to inform the wealth quantum of a country render this as a mere speculation.

Previously according to Ravallion and Chen (2010) and Ravallion, Chen, and Sangraula (2009) while reflecting on composite series of literature, there are a number of factors held responsible to

the regions disappointing poverty numbers. The first is the region's rapid population growth average of 2.6% per year with Uganda leading at 3.2% (Bongaarts, 1982; Odwe, 2015). These economies are known to generate substantial amounts of incomes, however the income diminish upon subsequent sharing among an ever-swelling population characterised by heavy dependency burden (Bongaarts, 1982).

With the (Ravallion & Chen, 2010) apothegm that there isn't any proportionate growth in the region's income to its underlying population, the mean earnings continue to rise as the proportions living in extreme poverty fall. However, the poverty fall is not commensurate with the population surge. This renders the resultant number of the poor to rise. Indeed the region's state reveal only but marginal growth on average (Ravallion & Chen, 2010).

The second factor is the depth at which poverty has hit the region compared to other regions elsewhere. Indeed, it is prudent to say that quite a vast majority start form way below the poverty line coupled with high dependency burden, regardless of the individual capacity of the care givers. This inability drives poverty to a more complex situation to the extent that even with an income growth there is barely enough quantifiable proportions of income to drive populations beyond the threshold (Bongaarts, 1982; Odwe, 2015).

The third factor appreciates the fact that as much as inequality isn't rising in a majority countries, it's peaking at an unprecedented level in areas where it's evident. The extent of inequality is rated worse than it looks especially within the region in general. However, the fact that Africa is divided into so many countries masks these eminently big differences in income between them. The fourth factor borders on the degree of mismatch between the points of growth in a population as well as where growth indeed occurs and where the poor populations actually are. This has rendered some of the oldest metrics irrelevant to some populations especially the GDP as an econometric measure.

It is however known that the region's growth acceleration has benefited the poorest countries like Rwanda (Ravallion, 2001). This points to the fact that as long as the poor states strive to build and sustain their economic momentum, the poor population must fall to achieve this.

2.3.3. Population Human Development

The Human Development Index (HDI) summarizes the country's overall achievements in providing its citizens with quality education, health care, longevity, and basic necessities to lead a decent life. HDI ranges from one (perfect equality in access) to zero (totally unequal). There has been indeed a progression from inequality towards equality across countries with the gaps between the first and the last of the countries narrowing.

Kenya is the most highly ranked in terms of human development index while Uganda is lowest ranked. A closer look at the countries, Rwanda and Uganda are East Africa's most unequal countries. In 2011, the richest 10 per cent of Rwandans earned 3.2 times the income of the poorest 40 per cent of their compatriots. Income inequality rose between 1985 and 2006, taking Rwanda from the most equal to the most unequal country in the region (Ravallion, 2017).

Table 2. 3: Trends in Human Development Index (HDI)

Country	1990	2000	2010	2012	2014	2015	2016	2017	HDI rank 2017
Kenya	0.47	0.45	0.54	0.56	0.57	0.58	0.59	0.59	142
Tanzania	0.37	0.40	0.49	0.51	0.51	0.53	0.53	0.54	154
Rwanda	0.25	0.34	0.49	0.50	0.51	0.51	0.52	0.52	158
Uganda	0.31	0.40	0.49	0.49	0.50	0.51	0.51	0.52	162

Source: UNDP 2018

2.3.4. Population Poverty Levels

Multidimensional Poverty Index (MPI) captures the multiple deprivations that people in developing countries face in their education, health and living standards. The MPI shows both the incidence of non-income multidimensional poverty as a headcount of those in multidimensional poverty and its intensity as the average deprivation score experienced by poor people. Compared

to the neighbouring countries in East Africa, Kenya has the highest proportion of the population living below the defined national poverty line while Uganda has the lowest. However, based on MPI, Kenya again has the lowest poverty level (Figure 2.3).

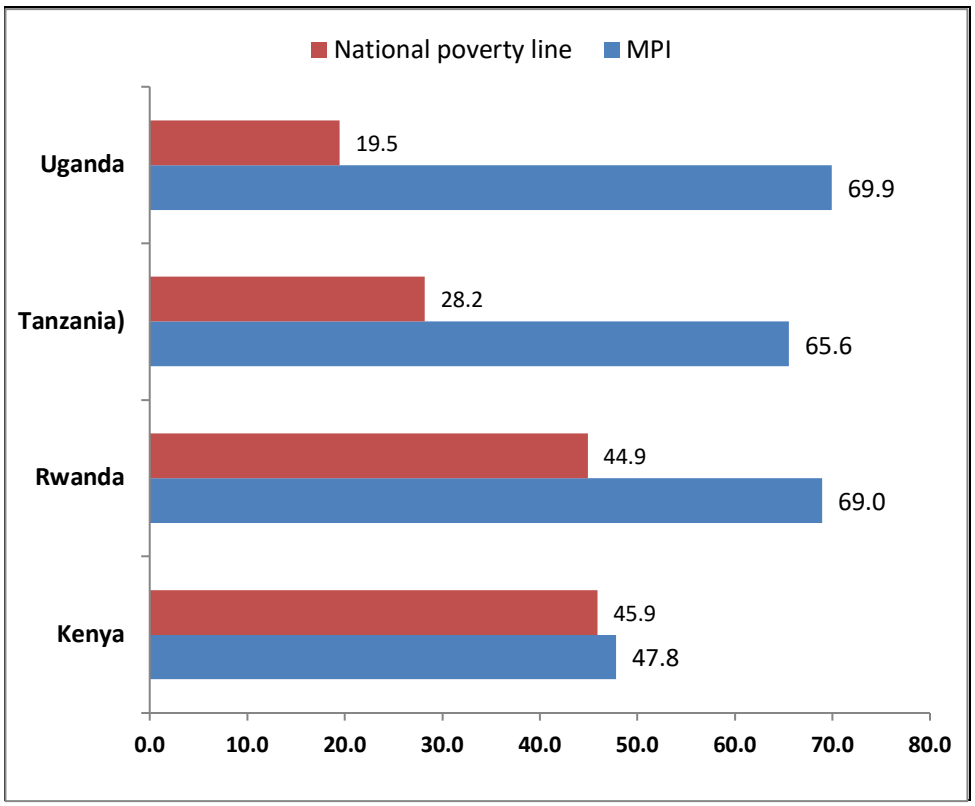


Figure 2. 3: Population Poverty Levels
Source: UNDP

2.3.5. Population Living Standards

Table 2.4 shows differentials in quality of living standards. The measure of the living standards is pegged on the metrics of employment vulnerability, access to electricity, improved drinking water as well as the access to improved sanitation services. Among the selected countries of East Africa, Kenya is well above all the other three countries which also coincides with better ranking in terms of HDI. However, the employment vulnerability ranks Kenya last among its Neighbours with Tanzania and Rwanda coming first and second respectively (Table 2.4).

Table 2. 4: Quality of standards of living

Country	Vulnerable employment (% of total employment)	% of population with access to electricity	% of population with access to improved drinking water	% of population with access to improved sanitation facilities
	2017	**2016**	**2015**	**2015**
Kenya	54.3	39.3	58.5	29.8
Tanzania	83.5	16.9	50.1	23.5
Rwanda	80.0	17.8	56.7	62.3
Uganda	74.5	18.0	38.9	19.2

Source: UNDP 2018

2.4. Population Distribution

The East Africa region is one of the fastest growing regions in terms of population in the world with a subsequent new surge in urbanization. Records from the United Nations reveal that more populations are living in urban areas, compared to the previous years. A pointer of the shift in the kinds of economic activities the populations are engaging in. With all these known facts, East Africa still forms part of the least urbanized regions in the world (UNDESA 2014). Table 2.5 below highlights the recent progression after the turn of the millennium. The rural dominance is still visible to date however, the urbanization is undoubtedly shaping the next generations in years to come.

Table 2. 5: Population of Eastern Africa Region (2000 - 2017)

Year	Population	Yearly % Change	Yearly Change	Fertility Rate	Density (P/Km²)	Urban Pop %	Urban Population
2017	422,036,243	2.78 %	11,398,256	4.80	63	26.1 %	110,357,119
2016	410,637,987	2.80 %	11,179,961	4.80	62	25.7 %	105,614,849
2015	399,458,026	2.86 %	10,494,106	4.89	60	25.3 %	101,034,466
2010	346,987,498	2.91 %	9,277,558	5.35	52	23.2 %	80,635,931
2005	300,599,706	2.86 %	7,897,163	5.76	45	21.7 %	65,108,773
2000	261,113,890	2.93 %	7,018,571	6.12	39	20.5 %	53,484,357

Source: **Worldometers** (www.Worldometers.info); Elaboration of data by United Nations, Department of Economic and Social Affairs, Population Division. World Population Prospects: The 2017 Revision. (Medium-fertility variant).

From the (UNDESA 2014) statistics, two of the East African countries were among the least urbanized with Uganda at 16.1%, and Kenya at 25.6% (Table 2.6). In terms of population density,

Rwanda is rated as one of the most densely populated countries in Africa with 471 persons/sq. km. Uganda follows at a distant while Kenya and Tanzania are the least populated per square kilometre (WHO & UNICEF, 2015) With very minimal urbanization taking place compared to their base population, it therefore implies that most of these populations exhibit heavily populated household characteristics that are dominantly rural in nature (Table 2.5).

Table 2. 6: Demographic indicators and population density in inhabitants/km²

Country	Density (inhabitants./km²)	Annual growth rate	Population (2015 est.)	Area (km²)
Rwanda	470.8	2.45	11,610,000	26,338
Uganda	165.4	3.29	39,032,000	236,040
Kenya	79.0	2.56	46,050,000	582,650
Tanzania	56.6	3.09	53,470,000	945,087

Source: World Bank estimates and projections

Table 2.6 shows that Tanzania and Uganda have the highest population growth rates while Kenya and Rwanda have the least growth rates respectively. The consequences of the eminent rapid population growth and a high dependency ratio will be pressure on basic services though (Zulu, et al., 2015) Looking at the areas under habitation together with their population density, indeed it is clear that Rwanda experience the highest pressure on its meagre habitable land size compared to its neighbours

2.5. The Demographic Situation and the Age Structure

The East African community countries have gained substantial focus on the context of demographic research in the recent past. Notable are the fertility studies that date back to the last century each providing insightful analysis and even recommendations. With the persistent aggravated growth rate, the regional population has been rising steadily (Bongaarts, 2008). This warrants for a classification of the East African community countries population growth as rapid in general though slowing going by the recent trends. With regards to the latest censuses' figures compared to the previous censuses, the population size has more than tripled since independence.

The rapid population growth is evidently attributable to high and increasing fertility – reaching nearly 8 births per woman in the late 1970s with a fairly slowing mortality that almost rivalled those contemporaneously observed in some developed countries. Amidst the periods of international debates and the world conferences on population, Kenya as an integral East African member was hailed as having one of the highest population growth rates in the world (Opiyo, 2009). This could have prompted the country to promptly rethink their population policies and related blue prints.

According to the Malik (2014), East Africa has a young age structure with about 40% of its population in the 0-14 age bracket and nearly one fifth (19%) in the 15-24 age bracket. The population pyramid for 2015 reveals the effects of high fertility manifesting itself in a population pyramid with a broad base (Ogola et al., 2015). Every successive bar of the population pyramid is narrower, suggesting fertility levels above replacement. A higher proportion of females in the 65 and above age group is a result of the higher life expectancy at birth for women (Ogola, et al., 2015)

The population of children aged 0-14 years has increased in absolute numbers while the proportion declined over the years leading to a Demographic Dividend (Zulu, et al., 2015) The declining trend is expected to continue into the future, although the absolute number of children aged 0 -14 years will continue to increase, forming quite a significant chunk of the 585 million children for Africa in general in 2025 and 885 million in 2050, when they will make up for the 39% and 28% of the overall African population, respectively (Ogola et al., 2015)

The countries' population pyramids are more or less a perfect bell shaped with each country pyramid looking like a replica of the other except of the contributing denominators. The figures 2.5 and 2.6 show the individual country pyramids. One clear conclusion drawn from the population

distribution by age across countries reflect the overall regions distribution structures. This characterises the Malthusian hypothesis associated with persistent high fertility in a majority of the regions over the years. A youth bulge is currently being experienced by all the countries (Zulu et al., 2015).

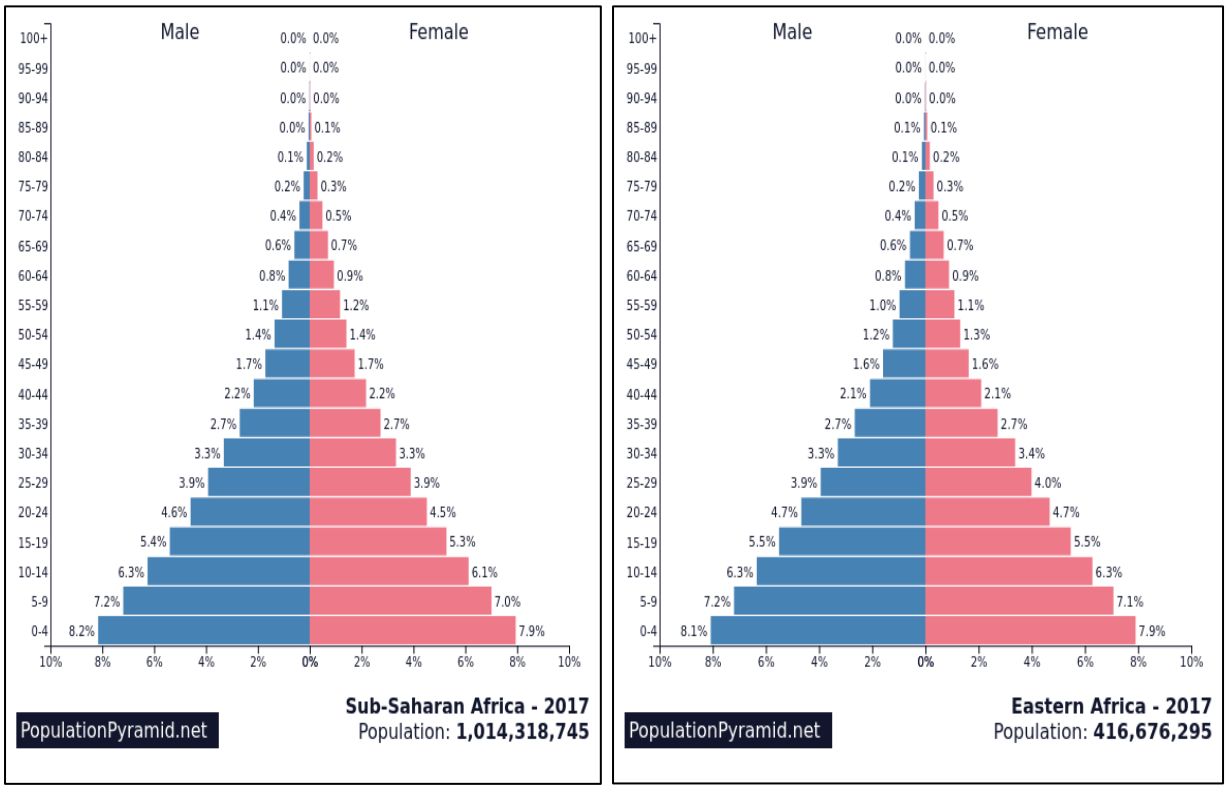


Figure 2. 4: Regional Population Pyramids – Sub-Saharan Africa and the Eastern Africa

Within the age category populations, Rwanda's population pyramid explicitly manifests its uniqueness. This is the fact that it experiences the lowest proportion of children below the ages of fifteen compared to all of the countries. The Rwandan structure is equally a typical bell-shaped pyramid with a narrower base and widening itself as the progression heads towards young adult age categories compared to the other countries. To be precise, the merits that abound these population pyramids are likely to be experienced within varied intensities by each of the countries. In real terms the various categories calls for commitments to services ranging from child care development and services provision; a pointer to the dependency burden, as a result of untapped

demographic dividend from the eminence of youth bulge (Zulu, et al., 2015). These together with the old age social security and welfare are glaringly manifesting themselves in diverse degrees among these populations. However, the trends remain the same with Rwanda likely to face lower complexities in age related population distributions compared to the rest of the other countries.

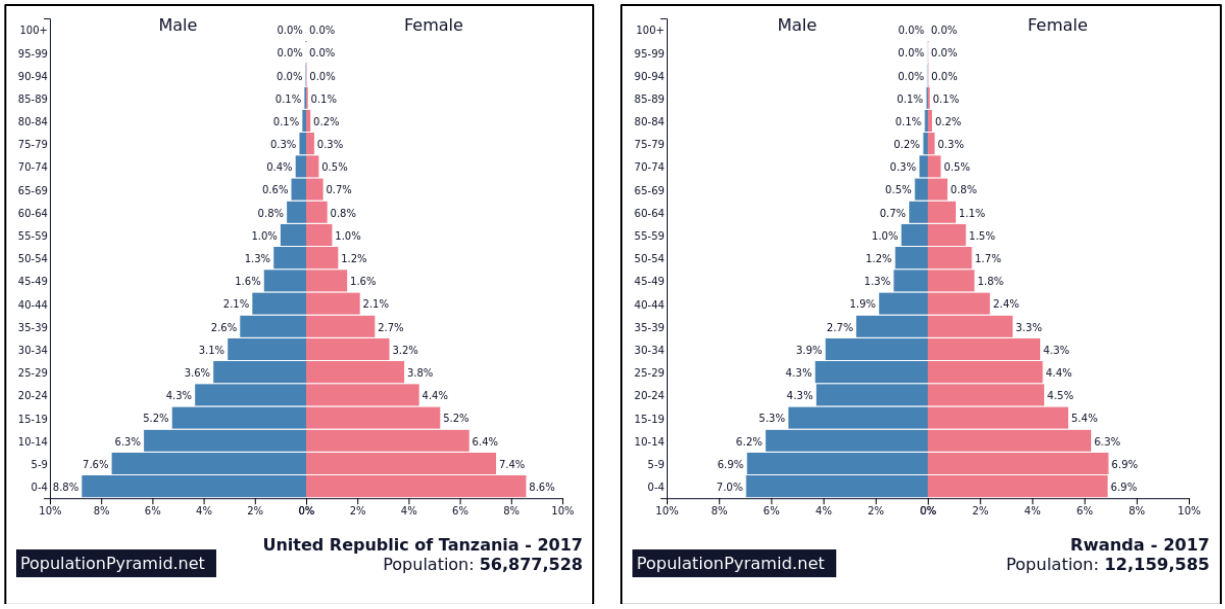


Figure 2. 5: Country Population Pyramids – Tanzania and Rwanda

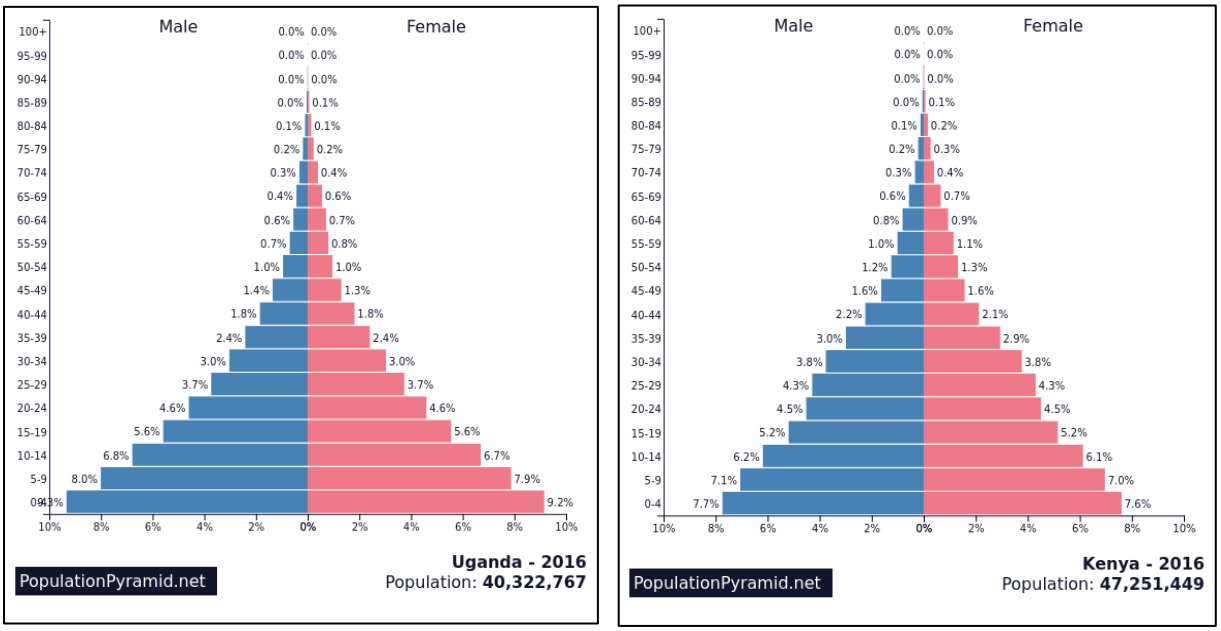


Figure 2. 6: Country Population Pyramids – Uganda and Kenya

Table 2.7 highlights the current indicators regarding the determinants of fertility based on the latest KDHS survey reports. With the policies geared at reducing fertility of the respective populations, Kenya and Rwanda are the two countries with the best scores across all the categories aimed enhancing fertility preference and implementation by regional standards while Uganda scores lowest across all of them.

Table 2. 7: Indicators of fertility its key determinants

Country	TFR	U5MR /1000	Mean Age at first Marriage	Mean age at first Birth	% women with Secondary and above level of Education	Contraceptive Prevalence (CPR)	Unmet need for Family Planning
Kenya	3.9	52	22.5	20.3	42.7	53.2	17.5
Rwanda	4.2	50	22.7	23.0	23.4	47.5	18.9
Tanzania	5.4	67	21.4	19.8	23.4	32.0	22.1
Uganda	6.2	90	20.3	18.9	27.7	26.0	34.3

2.6. Population Policy

All the countries have had to grapple with their respective national population policies aimed at shaping their population agenda, in line with the global standards. Up to the current dispensations, the country policies have undergone various reviews, with the overall aim to attain a balance between population and economic growth based on the feedbacks and guidance through international partnerships. The partnerships date back to the historical second half of the last century – the time at which these countries attained independence from their colonial powers - when population scientists converged in a number of conferences to deliberate on matters demographic as a developmental pillar. A case in mind is the response and follow up to the 1994 International Conference on Population and Development held in Cairo (Mertens, 1995).

The conference's take homes emphasized the right to information for couples to access credible birth control technologies of their choice as well as related methods to regulate fertility. All these were declared to unconditionally conform to the legal laws of their respective countries. These concepts also relate to Coale's (1973) hypothesis that adoption of fertility limitation practices must

be “within the calculus of conscious choice” and that the technical means must be available and acceptable as reflected in the 1994 ICPD conference.

These acquired rights were to rest on the recognition that all couples have the basic rights to decide freely and responsibly on the number, spacing and timing of their child bearing. This echoed recommendations from the previous conferences like the World Population conference in Bucharest 1974, the 1981 Jakarta Conference on family planning as well as the Mexico Conference of 1984 which shaped most of the preliminary ideologies.

In the 1994 conference, new bench marks were set to measure progress. From the policy stand point, these countries therefore incorporated targets contained in the Programme of Action of the (ICPD) Cairo meeting (Mertens, 1995). There is however an indication that prevailing transitions faced challenges during the course of decline and even started rising again within numerous sub categories of the populations due to a myriad of issues; but predominantly suspected to be majorly the surge in the HIV/AIDS prevalence around the turn of the millennium as an insurance artefact to cancel the eminent losses from the anticipated HIV dominant deaths at the time (Brass & Jolly, 1993).These deliberations are clearly captured in the current policy blue prints of each country.

The current country policies vouch for reduction of the unwanted fertility thereby providing subsidies on contraception on top of routine advocacy and health education as some of the actionable lines by the governments cognisant of the international population discourse. The implementation is however believed to be varied across countries as well as the subnational regions. Kenya was actually boldly cited among its neighbours in general as the first Sub-Saharan Africa country to nationally adopt a population policy by 1967 favouring controlled fertility followed by its neighbours closely. The National Council for Population and Development

(NCPD) has recently aggressively spearheaded discussions in fast tracking most of the population indicators performances after the turn of the millennium (Muhoza et al, 2014).

On the other hand, Rwanda does not have in strict terms, a national population policy per se. However, it can be traced to the works on population engagements dating back to 1977 up until in 2006 when it developed a family planning policy aimed at fast tracking their fertility course. Their economic policy has doubled as a population control policy due to the burden it bestows on taxation based on household numbers (May 2017; Zulu et al, 2015). This has influenced the number of births in households to a contraction as a means of mitigating the heavy taxation that goes alongside the household membership numbers, prompting as well, a surge in the uptake of birth control commodities thereby leading to scenarios of unmet need to contraception in the country.

Tanzania's first national population policy developed in 1992 borrowing a lot from the Kenyan blue print. However, the first use of contraception in Tanzania is traced back to 1959 with the Family Planning Association of Tanzania (UMATI) playing a major role especially within urban settlements (Mturi and Hinde, 2001). This they did until 1989 when the government established National Family Planning Program followed by a policy three years later.

Tanzania later enacted its first population policy in 1992 focussing primarily on family planning with a goal of raising its Contraceptive Prevalence Rates (CPR) though not stating to what benchmarks. The revised policy of 2006 later incorporated a wide range of other topics including development and stressed on reproductive and child health where the family planning is integrated. The 2006 policy amid stating targets lacked clear pathways to achieving them (Otieno, et al., 2016). They were nevertheless precise in explaining the family planning programme and its goal of raising the CPR from 28% to 60% by 2015 (Anasel, 2017). In Uganda, the country's National

Population Council was founded in 1988 to champion population policies. Their work was to formulate an explicit National Population Policy, which was later promulgated 1995 with a revision in 2008 setting clear targets. The extent at which the policy drives its course has been hampered by an amalgam of issues including resource allocation, political goodwill all the way to the weak advocacy levels by programs among others

2.6.1. The Demographic Dividend

Other notable debates on population policies in the four countries revolve around the demographic dividend and its consequential merits. Demographic dividend by definition is a temporary opportunity for faster economic growth that begins when fertility rates fall, leading to a larger proportion of working-age adults and fewer young dependents (Okech, et al., 2011; Zulu et al., 2015). May (2017) supposedly put it that rapid fertility decline could help countries to open a demographic window of opportunity and capture a first demographic dividend (Zulu et al., 2015). The issue of fertility decline appears therefore to be crucial for countries to reap the potential benefits of such a demographic dividend (May, 2017b). Demographic dividend contributes to economic growth by investments in human capital and creating an enabling environment (Zulu et al., 2015).

These countries are on the path to a population age structure that may enable it to experience a demographic dividend albeit at different paces (Bloom, 2009; Zulu et al., 2015). The comparison between the broad bases within their population pyramids after their independence and equally after the turn of the millennium represent a reduction in the large number of children in relation to the working age population implying a shrinking proportion with regards to the general population (Bloom, et al., 2009; Okech et al., 2011).

Recent evidence shows bases that are beginning to narrow at the youngest ages, representing a fertility decline. These pyramids assume that with all factors remaining constant, fertility will significantly decline to reasonable averages with corresponding changes to the respective age structures. The pyramids show a larger working age population that currently exist compared to the number of dependent children and elders (Bloom et al., 2009).

Arguably, a policy framework has shaped the current phase of transition leading to the likely apparent population dividend. The underlying questions could seek answers as to how it came about with answers bordering on the same lines of thought; pointing at the policy implementation. Indeed, each of these governments share almost similar demographic ideologies over time (Zulu et al., 2015). This includes practices involving family health education and sensitization to encourage couples to bring forth the number of children within their means as well as providing either free or subsidised birth control technologies as a means to the course (Opiyo, 2009).

The success in general is attributable to the enhanced family planning programmatic efforts which ensued in the recent past including advocacy amidst reducing rates of unmet need to contraception (Zulu et al., 2015) One lateral case for instance is the case of Rwanda in its attempt to streamline economic and financial policies. They introduced household taxes based on the households' sizes which eventually doubled as an unforeseen inferred population policy.

This has had a direct implication on the fertility of households as families tend to bear fewer children as a subsidy in an attempt to mitigate the taxation by the government (May, 2017). The currently visible challenge in Rwanda as a result of the policy on the one part is the unmet need to contraception with a consequent surge in the degree of fertility preference implementation index and high consumption of birth control commodities. One would also equate this to a forced fertility limitation rather than a voluntary response.

On a different context, Opiyo (2009) further confirm that growth rates have slowed considerably within most regions of Kenya. This trend is also evident among the other East African countries of Rwanda, Tanzania and Uganda albeit at different levels, traced back to the initial phases of the policy discussions (Zulu et al., 2015). The motive was to influence their population in general, through voluntary control of family sizes of households by availing vital services including education to women in order to make conscious choices about the number of children they desire to bear. Programs implementation strength in the initial phase was slow and varied over the years across countries (Dribe, 2013; Ross and Smith, 2010).

2.6.2. Family Planning Effort

Various national government programs have strived to expand fertility programs to near universality. Going by the trends, metrics have been posed to help assess their levels of effort. They have served to inform policy positions and resource allocations, as well as technical analyses of program impact on contraception usage and fertility trajectory. Table 2.8 highlights the trends taken by the countries' overall performance over the years. Notable is that there have been improvements across all the East African countries with a recent slowing in the family planning effort index. Ross and Smith (2010) further confirms that there is a general gain in effort across countries with very high policy rating positions though low service arrangements and actual access to contraceptive technologies and related services. Actually, the average effort still dwindles within the average mark (Table 2.8).

Table 2. 8: Total score trends in Family Planning effort Index

Country	1972	1982	1989	1994	1999	2004	2009
Kenya	20.0	28.1	57.6	55.8	49.6	-	48.7
Rwanda	-	23.0	43.3	-	44.0	35.7	-
Tanzania	10.0	22.3	41.7	47.5	71.2	44.7	47.0
Uganda	-	17.1	33.1	44.2	61.1	43.0	50.4

Source: Ross and Smith (2010)

Some of the important facts shaping fertility dynamics are that Kenya has the lowest level of fertility, highest level of female education and lowest unmet need for family planning. Rwanda equally has the lowest childhood mortality, older age at entry into marriage and forming families yet similar levels of female education compared with Uganda and Tanzania. Figure 2.7 further presents the latest scores of each of the countries in the family planning effort index. Indeed, Rwanda leads by wide margins in all the components as the other countries tail interchangeably across the metrics. Literature is replete with Rwanda's exemplary performance. The country while compared to the rest experienced rapid decline in the recent past (Dhillon & Phillips, 2015) because of the government's management of the economy and provision of social and health services, including family planning, that are exceptional by regional standards (Dhillon & Phillips, 2015; May, 2017).

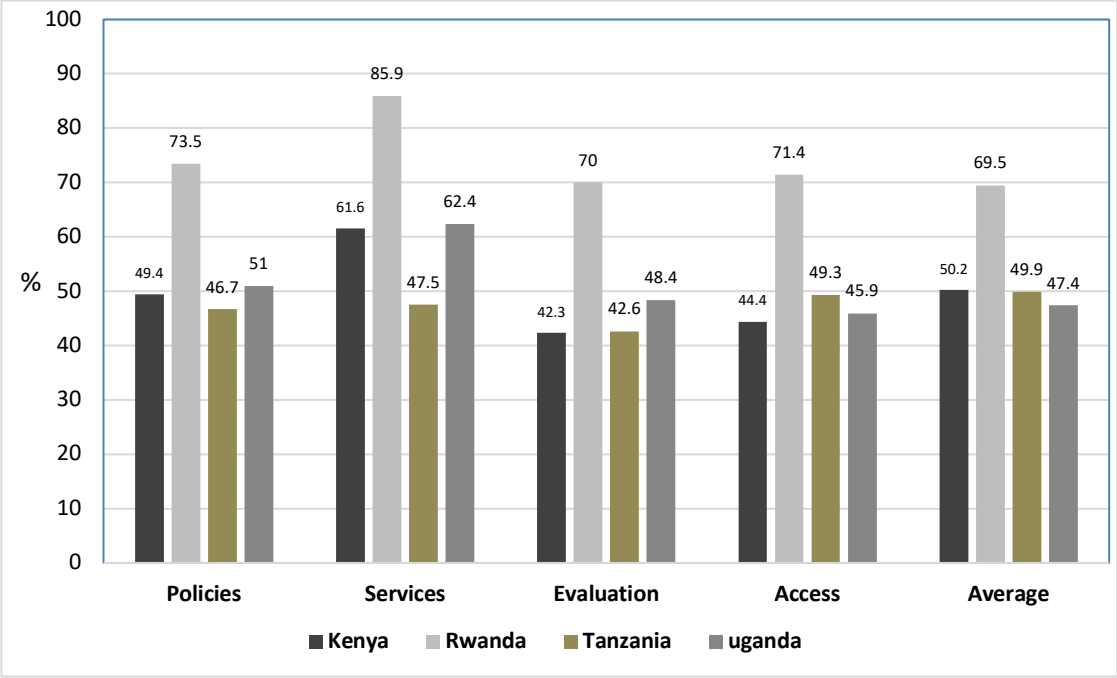


Figure 2. 7: The 2014 Family Planning Effort Index

2.7. Summary and Conclusion

On top of the similarities in population regulation mechanisms, all the countries have their populations rising over the years amid declining fertility across board at different levels. The urbanization trends though marginal are equally on the rise across all countries. With Uganda having the highest growth rate as Rwanda pose highest population density, all these countries exhibit young structures with near perfect bell-shaped pyramid. The distribution of these populations heavily relies on the climatic conditions of the favourable habitable geographical landscapes with more arable lands experiencing population pressure as semi-arid areas exhibit sparse distribution.

The latest population structures evidently revealed Rwanda and Kenya leading the pool towards an ageing structure with a corresponding high family planning effort index. On the converse, there is an evident surge in the unmet need to contraception partly as a result of the high demand within the two countries for deliberate birth regulation. The GDP of Kenya is the highest with Tanzania being the least unequal among these countries. However, based on monetary studies Rwanda exhibited the highest inequality compared to the other countries. All the countries are nevertheless on the verge to experiencing demographic dividend from the surge in population experienced in the past recent decades.

From the previous studies, scholars are in congruence that indeed human fertility is a fairly complex phenomenon to describe; resulting from a series of repeated physical and biological stimuli among others and further affected by the physical environment where these populations inhabit among others including culture and development. The outcomes of fertility implementation are equally imperfectly similar based on couples' preferences. Competing explanations therefore abound regarding these oscillations. A rapidly growing population exerts pressure on the limited

public resources and related infrastructure. This is more prominent in the low-income countries (Bongaarts, 1982)

According Bongaarts on the linkages between population growth and development, he alludes to the fact that a rapidly growing population diminishes modern economic development since it leads to a distortion in the ratio of young non-productive population to working age category. This has a net effect of lowering the income per head as well as lowing household reserves and further exhausting down the available infrastructure due to the excess demand for utilization. For instance, as health infrastructure deteriorates one can link this to the surge in population consequentially putting high pressure through overdependence on the limited facilities. Bongaarts believe that this is the typical case in the low-income countries characterised with underserved inadequate private and public health care resources, East African countries being no exception.

He further points out that, high birth rates, childbearing at very young and at advanced ages, and short birth intervals across these countries increase probability of poor developmental outcomes especially the health outcomes like maternal and child mortality. However, with a developing population transitioning from natural fertility through to a controlled fertility, there comes a corresponding surge in deliberate marital fertility regulation by the spouses. According to Bongaarts (1982) this control is exerted principally through contraception usage including induced abortion in some populations based on preference after weighing between the corresponding benefits of bearing many children versus the modern lifestyles with new ways of satisfaction. The East African countries have had this share of the transition with its turbulence creating critical imbalances and deep underlying inequalities in the developmental characteristics of the population thereby affecting its human developmental indicators as well as the living standards.

Further, these countries are diverse with regards to poverty levels, income inequalities, developmental levels such as education accomplishment, basic household amenities such as grid electricity connection, safe water and enhanced sanitation mechanisms. Even within individual countries, there exist high variations across the subnational regions. These variations are expected to influence the fertility preference, differentials as well as implementation across the different subcategories of the populations.

CHAPTER 3: LITERATURE REVIEW

3.1. Introduction

This chapter puts the thesis into context. It discusses a body of past published knowledge structures and systems regarding fertility preference in an attempt to explain fertility transitions together with its related sub areas. It is concerned with the aligned discourse by scholars in demographic research. The work involved a review of the body of knowledge that has been consulted to understand the subject matter within the confines of fertility and specifically fertility preference.

3.2. Explaining Fertility Transitions

Ever since the World War II, demographers have focused on explaining changes in demographic events. Most notably is the change from high to low births rates often referred to as the fertility transition. Fertility transitions are the net results of a complex interaction of social, economic, cultural and political forces among others that change patterns of family formation, family size desires, and fertility control behaviours (Harwood-Lejeune, 2001; Lloyd & Emery, 2000; Zaba, et al, 2004).

The relative importance of different forces may be quite different in different settings and no single theory has emerged that fully encompasses these processes (Mason, 1997). Within this framework, Coale (1973) proposed a simple, general framework within which to understand the diversity of fertility change. Coale who based his analyses of fertility decline in Europe, concluded that: "the diversity of circumstances under which marital fertility has declined, and the consequent difficulties of formulating a well-defined threshold, may originate in the existence of more than one broad precondition for a decline" (Coale 1973). According to Coale, three preconditions were important for a major fall in marital fertility: (i) fertility must be within the calculus of conscious

choice; (ii) reduced fertility must be advantageous; (iii) effective techniques of fertility control must be legally available.

These conditions have provided tools for discussing the approaches of different behavioural schools of thought in explaining and predicting future trajectories of fertility change. It should be noted that Coale did not provide a clear idea of how to integrate the related strands of theory, or of the weight of each of the three dimensions in explaining fertility in a particular historical situation but he may have assumed that these preconditions are of equal importance.

Coale's hypotheses have generated other several threads of thought in recent times. Among the economic explanations driven by institutions, increasing investments and enrolments in higher education, career and personal goals to overcome economic hardship causes women to preferentially respond by postponing fertility until they have accumulated enough social capital (Billari, et al., 2007; Myrskylä, et al., 2012). Further, it has also been posited that women postpone births due to the fear and the anticipation of union dissolution, long term inability to finding suitable partners, fertility wastages through miscarriage, or prolonged waiting times to conception (Billari et al., 2007) which may lead to low fertility associated with delays or lags in childbearing and postponement.

However, others have posited that family policies, child care system, and welfare typologies sometimes leads to incompatible relationships between career and motherhood in some countries (Brewster & Rindfuss, 2000). According to McDonald (2000), there is a mismatch between high gender equity in individual-oriented institutions and low gender equity in family oriented institutions. In countries where gender equality is high and institutions support child care and maternity, fertility tends to be higher than countries where there is major gender inequality and no support for child care (McDonald, 2000).

Morgan and Rackin (2010), noted that women are heterogeneous in their life styles. Some are family oriented; only work when it is a necessity and only study to have more bargaining power in the household while others are career oriented. These two profiles might be the extremes of intermediate types: the ones that try to combine work and family, enjoying the opportunities as they appear. According to Morgan and Rackin (2010), preferences and life style are the main determinants of the women's fertility and three categories of women emerge due to five structural changes namely; the emergence of contraceptive pills, the sex revolution which increased equality and opportunities, the expansion of white collar jobs, the increase of the secondary sector in the economy, and the increase in the attention to personal values and preferences.

Lesthaeghe (1983), points towards an increase in individualism and self-fulfilment proportioned by increases in secularization that represents a rupture in the status quo, as well as the growth of individualization and more gender equality. This framework explains fertility decline as the increasing necessity for non-material goods, such as prestige and recognition; increase in tolerance, individual autonomy, gender equality, de-standardization of the life course, and diversification in household formation (Van de Kaa, 2004). In this case, late marriage, increase of cohabitation and divorce, less remarriages, and more extra-marital childbirth are associated with having fewer children and are also part of this new set of attitudes. Compatible with the description of the deinstitutionalization of the life course is a new schema in which children are not the main goal of marital unions; lately becoming more acceptable (Morgan, 2003; Otieno V., Otieno A., & Khasakhala, 2018).

Caring for children is now optional and adults are looking for stimulant and meaningful lives without necessarily becoming parents. If their preference is to have no child, the decision is to contribute for individual self-actualization with altruism toward the children as the core of

schemas with growing sentiment and investment in them (Van de Kaa, 2010). More than a decade earlier, Van de Kaa (1987) had noticed that the demand for children will vary according to a woman's or couple's preferences, and will match their necessity for non-material goods. Surkyn and Lesthaeghe (2004), later elaborated a dual model of economy and culture called ideational change. Changes and preferences are transmitted by diffusion or education, not necessarily through material wellbeing, but rather culturally and ideationally. Potter, et al., (2010) showed spatial spread of fertility transition in Brazil and how much faster the spread was among the educated when compared to the less educated implying that economic factors are not necessarily the main drivers of fertility decline.

The dominant economic interpretation of fertility behaviour pose it that the forces behind the reduction of the preferred fertility are structural socioeconomic transformations in societies leading to the increasing expected costs for and diminishing incentives for bearing children (Muhoza et al., 2014). They further relay that in modernizing societies, new forms of investments and benefits have since emerged replacing the older norms like having large agrarian families. The monetized economy too hence quantifies every aspect of raising children; thereby propelling education ahead of the pack as an avenue of increasing job prospects and relevance. This has occurred consistently across modern studies with Ruzicka (1994) stating that much of the demographic analysis of fertility concentrates on finding answers to two questions: why are the levels of fertility widely different in different populations, or among different strata of a given population; and what factors contribute to such differences or, for that matter, to such fertility trends in a population?

According to Bongaarts (2008) in his studies of the fertility transitions in developing countries, two factors may have played a role towards the slowing pace of fertility in these countries. First,

within the premise of the conventional theory, socioeconomic development of a population drives fertility towards decline as earlier posited in the original formulation of demographic transition (Bulatao, et al, 1983; Caldwell, 1982; Notestein, 1953). Studies have established that it is almost universal that the type of place of residence and education attainment are some of the most featuring intermediate predictors linked to slowing fertility across board (Machiyama, 2010).

More importantly, urbanisation which has equally surged in sub-Saharan Africa according to Machiyama (2010) puts families under pressure and thus leading to postponement of marriages and spacing of births, improving access to education, health services as well as jobs and adoption of modern contraception for birth control methods. The second explanation for the fertility scenario touches on the limited concern programs were putting on family planning and related issues (Blanc & Tsui, 2005; Cleland et al., 2006).

Other studies posit that the motivation towards low fertility, which is the focus of current passionate debates, revolves around two major themes. On one hand, economic explanations driven by either institutional changes or a lack of institutional changes to accommodate new necessities of modern life and on the other hand, cultural changes surrounding the meaning of parenthood (and of having children) responsible for the fertility decline.

In exploring these two dimensions a third and more embracing body of theory called "theory of conjunctural action" has emerged. Jennifer Johnson-Hanks and colleagues constructed an interdisciplinary framework which appears to be more complex and promising attempt at generating an integrative theory of fertility change (Johnson-Hanks et al., 2011a). This theory provides a framework allowing the convergence among all theories explaining not only fertility intention and outcomes, but changes and variations within and across developed countries (Johnson-Hanks, et al, 2011b).

They demonstrate that low fertility is a product of the interactions between materials and schemas of fertility that emphasizes an individual's pursuit for quality life from his/her toil as well as perseverance in focus and achievement goals. The diverging response of fertility relates to the interaction of these demographic stimuli with the existing institutional structures, people's values, norms, historical and even demographic trends (Johnson-Hanks et al., 2011a; Johnson-Hanks, et al, 2011b).

3.3. Role of Fertility Preferences in the Explanation of Fertility Transition

Several studies have pointed out at the importance of fertility preference in understanding how the fertility transition might unfold in countries that are experiencing transitions (Westoff 1999; Bongaarts 2006; Westoff and Cross 2005; Bongaarts and Casterline 2013; Hinson, 2015). In these studies, fertility preferences are taken to indicate the demand for children - a theme that originated from earlier postulates by Henry (1961). The predominant view is that individuals or couples formulate desires about family size and limit fertility largely in response to achieving their desired number of children. According to this paradigm, the central consideration for having additional children revolves around the achievement of desired family size. This view has developed to generate various concepts of fertility preference dynamics and fertility behaviour where the key assumption is that individuals exercise the choice to have children or not as postulated by Coale (1973). That is to say, individuals and couples engage in some form of conscious fertility management.

Contributing to the fertility preference are the debates where scholars had previously held antagonistic views regarding the course of fertility change together with their most probable trigger factors. The conjecture generated by Pritchett (1994) was that as a fertility preference regulation mechanism; family planning have no direct influence on fertility of a population

(Bairagi & Chowdhury, 1994). They give credit to the changes in the demand and attitudes for child bearing rather than the thriving knowledge of birth control methods as a trigger factor to fertility change.

This wing of scholars are for the view that, an improvement in birth control methods is mainly an aftermath of induced response to other declines in the demand for childbearing but not an important cause of the reducing demand (Becker, 1991). Pritchett (1994), in support of this pondered that in reducing fertility rate of a population, one has to be cognisant of the desired fertility. In this case, the desired fertility is directly associated with development and culture which in turn influence the level or extent of fertility preference regulation by the respective subjects. He argued that with all these facts at play, family planning programmes together with contraceptive use will have an almost zero role to play in reducing the fertility of a population.

By implication, family planning or contraception is only but technology – defined as a means by which an induced mind towards a preferred fertility uses to control their course of birth preference including intervals among others. This therefore means that the desired fertility is rather attitudinal, where couples make conscious choices first without any technology thereby deciding to either take a natural pathway to control births or embark on modern contraception.

With examples albeit at different times, he explained that contraception play no role in lowering fertility. His classic examples were Haiti in 1977, with a desired fertility of 4.3 and modern contraceptive prevalence standing 4.7%; while Zimbabwe in 1989, with desired fertility 4.3 and modern contraceptive prevalence rate was 36.2%. With the two observations of prevalence it was surprising that the fertility gap between the two countries were only 0.4 births per woman. Bangladesh also provided similar concrete scenario overtime (Table 3.1) with a significantly changing prevalence in contraception in a span of seven years.

Table 3. 1: Bangladesh Fertility

Year	CPR	Change in CPR	TFR	Change in TFR
1993-1994	44.6%	-4.6	3.4	0.1
1996/1997	49.2%	-5.6	3.3	0.0
1999/2000	53.8%	-	3.3	-

Source: Lant H. Pritchett, Population and Development Review Vol. 20, No. 1 (Mar., 1994), pp. 1-55

Perhaps Pritchet appears to be the only one who openly dismissed the statement, with his argument facing criticisms. Nevertheless, Ross and Stover (2001) contrary to Pritchet, provided evidence that family planning program efforts forms an integral part of contraceptive practice which in turn trigger fertility change irrespective of social settings. In addition, Potts (1997) equally contradicted Pritchett's belief by showing that unconstrained behavioural practice and access to fertility regulating innovations are the sole major factors responsible for fertility declines – a preference condition. It was thus consented that what supersedes the others is the principle of choice.

3.4. Sub Saharan Fertility Transition

There has been heightened debates among scholars on fertility transition in Africa in the recent decades. First issue in the debate was whether African fertility transition was exceptional following a widely cited study by Caldwell, Orubuloye, and Caldwell (1992) who argued that the fertility decline in sub-Saharan Africa represented "a new type of transition"(p. 211). The second aspect of debate was whether the fertility transitions in sub Saharan Africa will follow the pattern of earlier fertility transitions, such as those in Latin America and Asia (Kohler, 2012; 2016).

Despite these debates, two conclusions emerge: slow pace of decline (Bongaarts, 2017; Bongaarts & Casterline, 2013) because of weak facilitating social programs (Otieno, et al., 2016) and high demand for large families amid weak family planning programs (Bongaarts & Casterline, 2013). Bongaarts, (2017) and Bongaarts & Casterline, (2013) conclude that accelerated fertility decline in Sub Saharan Africa will occur if, there is both substantial decline in desired fertility and increased level of preference implementation (Bongaarts, 2017; Bongaarts & Casterline, 2013).

Despite these conclusions, there are also exceptions, for instance, Rwanda, Ethiopia, Malawi (Bongaarts, 2017; Mahy & Gupta, 2002). Fertility decline in Rwanda is said to be exceptional because of the government's management of the economy and provision of social and health services, including family planning, that are exceptional (Dhillon & Phillips, 2015; May, 2017). As a result of these program factors Muhoza et al., (2014) conclude that in Rwanda, the poor, uneducated people have the same desired fertility as their wealthy, educated compatriots, regardless of their religion.

Thus, a key feature of fertility transition in Africa lies not in generalizations but rather the examination of change across different contexts (Towriss & Timæus, 2018). In a seminal workshop organized by Committee on Population of the National Academy of Sciences in (2015), there were suggestions that further search for explanations of fertility transition may lie in examinations of specific historical contexts of each population (Casterline & Han, 2017) rather than generalizations.

In sum, these studies and hypotheses about explanation of fertility transitions anchors on aggregate measures of fertility preference and their predictors, structural changes, such as economic development and societal improvements in education and health (Bongaarts and Casterline 2013). They point to the fact that changes in country-level fertility preference have important implications for the explanations of fertility change and therefore fertility preference can be taken to represent a key link in the chain of causation between fertility and its socioeconomic determinants (Bongaarts and Casterline 2013).

A key explanation to the observed levels and trends in fertility transition in sub Saharan Africa is heavily hinged on fertility preference. The conclusion drawn from these is that in sub-Saharan Africa, fertility desires too are generally high (Bongaarts and Casterline 2013) and high fertility is

sustained by high demand for children. Investigations of the association between fertility desires and fertility outcomes at both the aggregate level and the individual level also conclude that the association is variable and therefore depends on context (Casterline and Agyei-Mensah 2017) that is to say that the correspondence between fertility desires and reproductive behaviour is imperfect - far closer in some settings than in others

The factors influencing fertility preference are therefore potentially wide ranging and over the years, demographers have sought to explain the critical elements driving change in fertility preference as potential explanations for the current and future fertility. Fertility preference may develop from a combination of factors pertaining to biological dispositions, age-related social expectations, economic and social aspirations, marital conditions, spousal fertility preference, and the experience of childbearing itself (McClelland 1983; Elder 1985; Bongaarts 1990; Thomson et al. 1990; Friedman et al. 1994; Miller and Pasta 1995).

Muhoza et al., (2014) in their study of the fertility preference within the East African region established that couples with higher education have fertility desires closer to replacement level regardless of their religion, while those with no education, particularly those in Muslim communities, have virtually uncontrolled fertility. Their study implies that education is one of the most important factors in determining fertility preference.

Ibisomi and Odimegwu (2011), in their study of the fertility preference implementation in Nigeria found out that there were significant regional variations to fertility preference implementation, as well as the type of place of residence, marital status and education attainment level of the women and spouse and differences in fertility preference reflect the level and nature of expected fertility change. A number of other factors correlating with fertility preference include economic status, existing children's gender composition, speculation for old age security, loss of infant and modern

contraception knowledge (Odwe, 2015; Pust, et al., 1985; Smith, 1993). There has also been concerns about HIV-AIDS in fertility preference structure that would seem relevant also in the abstract to give an explanation but are difficult to connect ambiguously (Westoff & Cross, 2005).

3.5. Issues around Fertility Preference

Despite this focus, other researchers have also raised various conceptual and methodological issues and problems in the study related to fertility preference (Casterline and El-Zeini (2007). Korotayev et al. (2016) while studying fertility dynamics in tropical Africa established a number of issues. They said that no systemic explanation of the mechanisms sustaining high fertility had been presented in cross-cultural perspective. In their study they showed how a set of anthropological factors provided both social and economic foundations for the preservation of high fertility in tropical Africa.

They concluded that the most important obstacles to tropical Africa's fertility transition are a fairly high ideal family size, a large potential to absorb increases in the female labour force participation rate without any substantial decreases in fertility due to ample child care readily available through extended family structures. Other bottlenecks in their study included large potential to increase fertility at the early stages of economic development through the abolition of postpartum sex taboos, and a low potential for increases in birth spacing to contribute to fertility decline. These have increased the freedom of space once infringed by the old cultural norms.

Freedman et, al., (1965) in his investigations on how stable women expectations are about the number of additional children they would bear in future years concluded that the answers to such would have both practical and theoretical implications. In a bid to get clarifications about the discrepancies between preferred and expected number of children and an important influence both on whether expectations change and the corresponding direction of change, they noted that

changes tend to occur more often if there is an inconsistency between the number of children wanted and expected, and that the change is in the direction of reducing the discrepancy (Freedman, et al., 1965). In summary he deduced that social norms about family size tend to control child bearing behaviour of a population.

Casterline (2017) on his study of prospects for fertility decline in Africa ruled that high risk of children dying in infancy or early childhood as an insurance artefact would no longer be a valid rationale for high fertility and that would soon be widely recognized. He further stressed that emergence of small-family desires is a matter, dependent on economic growth and through direct and indirect channels and establishment of effective systems of governance. In the short term, enhanced provision of family planning is capable of producing impressive fertility decline by meeting well-documented unsatisfied demand (Casterline, 2017) while also suggesting that factors functioning at the micro level are most influential in family size preference too (Pullum, 1980)

In general, it is indeed clear that the sub-Saharan population has embarked on its demographic transition characterized by shifts from high to low crude birth rates and crude death rates. The total demand for contraception involving both actual contraceptive use and unmet need slides between fair and modest scales of measure within sub-Saharan Africa in general (May, 2017b). Nonetheless, the strain on contraception provides a ripe circumstance for equivalent response and action. First it points at the level at which women populations have had to consciously think about their fertility and work around their family sizes over time by demanding more supplies; while at the same time, it faults the respective governments for the limited and unstable supply of crucial contraception commodities that aims at ensuring policy outcome achievement.

3.6. Conceptual Framework

In the explanations of fertility transition, three major theoretical strands stand out. The first is the early neoclassical microeconomic theory of fertility (Becker 1960; Schultz 1973) which emphasizes three proximate determinants of couples' fertility choices: the relative costs of children versus other goods, the couple's income, and their preference for children versus competing forms of consumption (Mason, 1997). Despite providing quantifiable framework for investigating fertility change, researchers point out its weaknesses in bringing to the fore the role of environmental and institutional conditions that change costs, income or preference, and thereby triggering fertility declines (Mason, 1997).

The second strand is the Easterlin's framework (Easterlin and Crimmins, 1975, 1983, 1985) which not only elaborates the microeconomic fertility model but also adds the sociological perspective about, the supply of children. The Easterlin framework explains fertility in terms of three proximate determinants: the supply of children, that is, the number of children that couples would bear in the absence of deliberate fertility limitation; the demand for children, or the number of surviving children they would like to have; and the costs of fertility regulation, where "costs" are psychic, social, and monetary costs.

This framework has been considered as useful in organizing thinking about fertility decline (Bulatao and Lee 1983; Robinson and Cleland 1992); however as in the other neoclassical models it lacks ideas about the institutional determinants of fertility decline. The third strand is the ideational theory elaborated by Cleland and Wilson (1987; Cleland 1985) which attributes the timing of fertility transition to the diffusion of information and new social norms about birth control. However, Cleland and Wilson noted that it was difficult to apply this theory in the African context.

Mason (1997) posited that there exist many theories of fertility transition, each containing important ideas, but none provides a complete explanation for all known fertility declines (Mason, 1997). Mason offered several explanations but most important for the Sub-Saharan African situation is the rapidly expanding state-organized family planning and population programs, which has led to quite influential fertility changes in some countries but did not exist during the nineteenth- and early twentieth-century fertility transitions in the Western Countries (Mason, 1997). Second, the assumption that all transitions have a common cause is also unreasonable in light of the increasing evidence that diffusion of information and ideas about fertility limitation can influence reproductive behaviour in the absence of major structural changes (Mason, 1997).

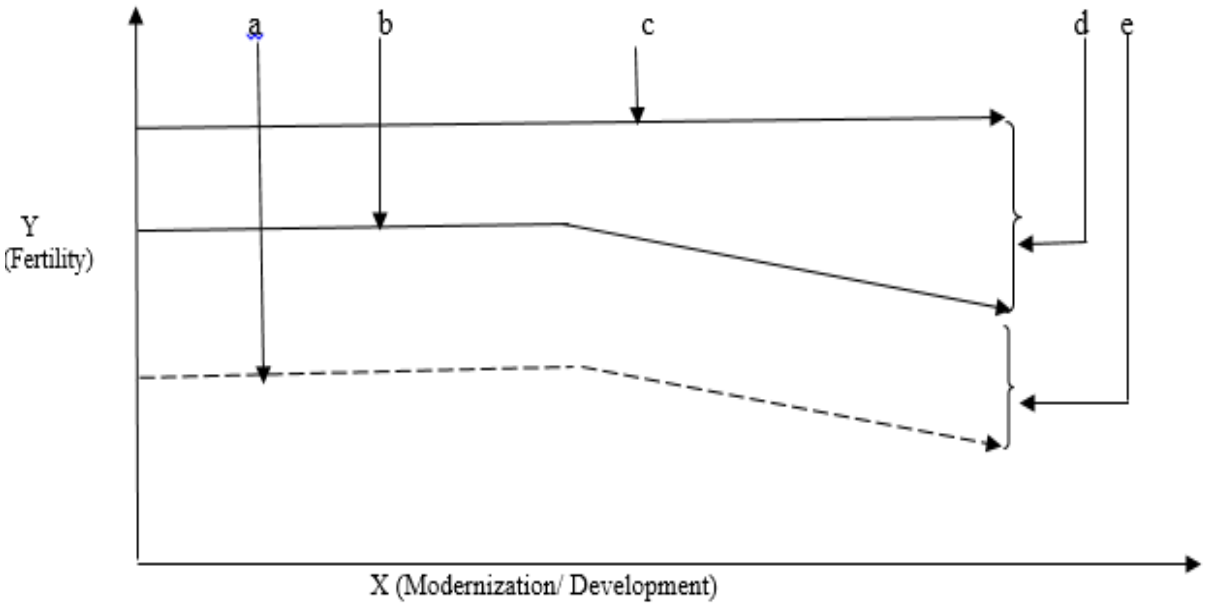
A critical lesson can be derived from Freedman (1979) who put emphasis that what was critical for triggering ancient fertility transitions were combinations of causes that provided sufficient impetus for the widespread adoption of fertility limitation within marriage. In addition to a combination of improved health, rising educational levels for both sexes, and strong family planning program as observed in Thailand and China may be sufficient to initiate a fertility transition.

Amid all these debates, Coale's (1973) hypothesis in sum concluded that the only generalization about fertility transition left standing was that fertility would decline when three preconditions were met: "(1) when fertility was within the realm of conscious calculation for most individuals, (2) when most of them know to the very least, a method to limit the said fertility, and (3) when they perceived that there was to be an advantage to doing so. Huinink et al (2014) in his suggestions further echoed that the three prerequisites i.e. fertility must be within the calculus of conscious choice, second, reduced fertility must be advantageous and finally, effective techniques of fertility reduction must be available. (Coale 1973) refer to complex multi-level

interdependencies, and each of them addresses a variety of micro as well as macro-analytical, and of substantive as well as methodological issues.

Huinink et al., (2014) noted that the economic approaches to fertility often referred to as the "new home economics" (Becker 1991), have traditionally taken the first and third condition as granted, and analysed fertility behaviour as an adaptation to changing environmental conditions. On the other hand, Huinink et al (2014) reported that ideational and diffusion approaches (Cleland and Wilson 1987; Montgomery and Casterline 1993), emphasize the first and third factor. Ideational and diffusion approaches interpret conscious fertility control within marriage as an innovation and focus on the diffusion or acceptance of this behaviour. Supply theories anchored on Easterlin and Crimmins (1985) framework emphasizes the role of the third factor, the availability of methods to control fertility and the biological context of reproduction (Huinink et al 2014).

Based on the above observations, the conceptual basis for this study is anchored on the Easterlin (1975), framework because it has been considered as useful in organizing thinking about fertility decline (Bulatao and Lee 1983; Robinson and Cleland 1992; Bongaarts, 1993) taking into account the role of fertility preference. Three factors are important in the linkages: supply and demand for children and the cost of fertility regulation. In as much as Easterlin's model provides reasonable conceptual clarity on the underlying factors at play in the child bearing process, there are gaps in its application because all the three key components are difficult to quantify in the original formulation (Bongaarts, 1993).



KEY

a – Wanted fertility, **b** – Observed fertility, **c** – Natural fertility,
d – Fertility limited by birth control **e** – Unwanted fertility

Figure 3. 1: Hypothetical framework for the association of fertility and modernization

Source: Easterlin and Crimims (1985)

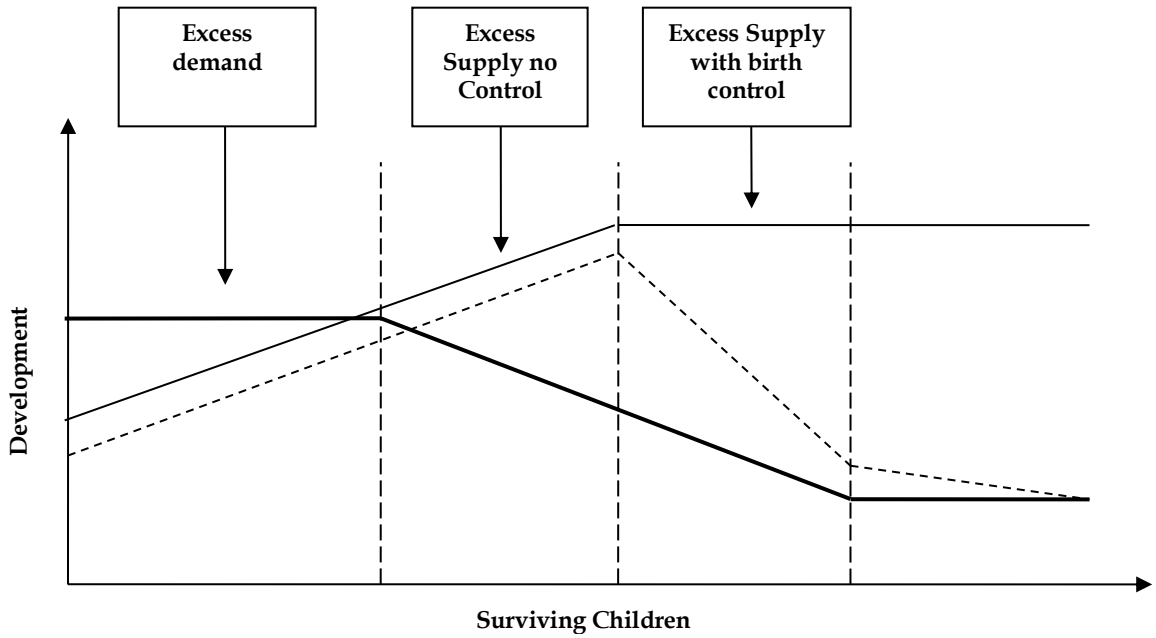


Figure 3. 2: Hypothetical trend in supply, demand and number of surviving births linkage to development

Source: Easterlin and Crimims (1985)

Development is considered as a key factor for the decline of fertility and can be divided into four phases: period of excess supply no control, period of excess demand, and period of excess supply with birth control and even when supply equals demand (Bongaarts, 1993; Ibisomi, 2002). This illustration is provided in Figures 3.1 and 3.2. In a pre-modern society, a couple cannot produce as many children as it wants. The demand exceeds supply due to adverse mortality condition, high pregnancy loss, extended lactation among others. The natural fertility prevails i.e. the number of surviving children corresponds to supply.

As modernization progresses, an excess supply condition emerges due to change in cost and benefit associated with child bearing. The excess supply generates a motivation for fertility control which is usually low in the initial stages and cannot offset the regulation costs sufficiently to result into deliberate family size limitation; hence the births surviving correspond to supply. As modernization progress, with motivation growing and regulation costs falling, deliberate restriction emerges. Thus, the number of surviving children falls to correspond to demand at this point.

3.6.1. Bongaarts Modified Easterlin's Supply-Demand Framework

The analytical model is derived from the modified form of the original Easterlin Framework by Bongaarts 1993 shown in Figure 3.3. The model consists of three fundamental concepts: demand for children; the potential supply of children, and the monetary and psychic costs of contraception. According to the model, women whose potential supply of births exceeds demand would consider contraception, taking into consideration the costs involved while choosing suitable family planning methods (Montgomery, 1987).

In this modification, the fertility outcome measured by the total fertility rate is a function of: supply of births (natural fertility); demand for births (wanted fertility) and degree of preference

implementation. The latter in turn is dependent on cost of fertility regulation and cost of unwanted childbearing. The degree of preference implementation is the net result of a decision-making process in which couples weigh the cost of fertility regulation and the cost of unwanted pregnancy. This was to measure the role of the two variables namely the cost and incentive that comes with the fertility regulation.

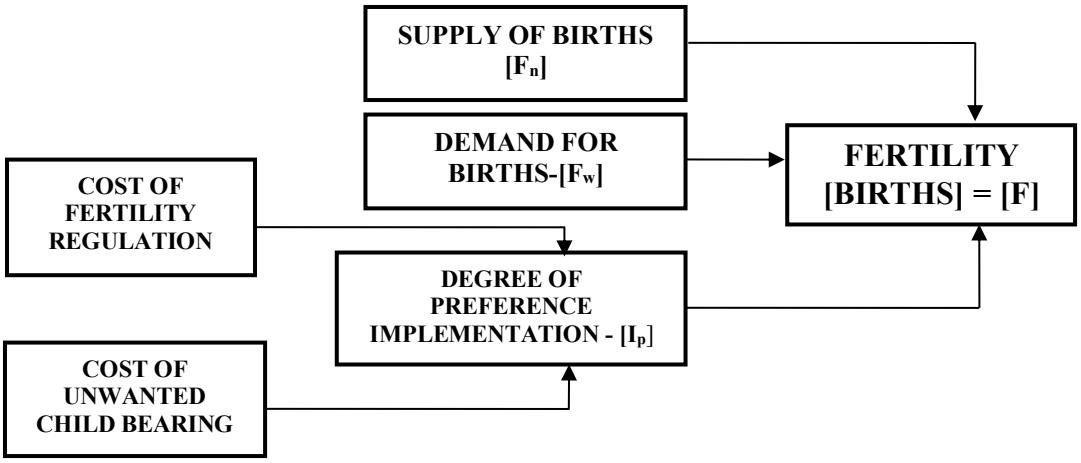


Figure 3. 3: Key variables and interrelations in variant of supply-demand model.

Source: Bongaarts, J. (1993). The supply-demand framework for the determinants of fertility: An alternative implementation.

Biological and behavioural factors are the proximate determinants through which social, economic and environmental variables affect fertility (Bongaarts 1993). In the model, socio-economic advancement, modernization among other determinants is believed to affect reproductive results through some form of mediating variables. Bongaarts (1993) modified approach simplifies the application thereby hanging some key features in it while at the same time maintaining its conceptual set up. It differs with Easterlin's in the following: births rather than surviving children have therefore become the core measure of reproductive performance including the supply and demand and with focus on period measures of fertility. The degree of preference implementation becomes the new variable for the quantification of the roles of the cost of fertility regulation and unwanted child bearing.

In Bongaarts' approach, the degree of fertility preference implementation index can be taken to measure Coale's ability (A). That is a measure of the women's extent/level of fertility control in the attempt to regulate the number of births. The readiness (R) component falls within the biological qualification of a fecund woman capable of carrying a pregnancy to its full term. This is due to the fact that to implement fertility, fecund women are by no doubt having their body merchandize ready (R) for such an event. The same women have to be consciously willing (W) after weighing the cost and benefits of such an event before embarking onto the means through which to deliver the choice; upon weighing their demand founded on the cost of regulation and the cost of bearing an unwanted child.

Bongaarts and Bruce (1995), describes demand for children as a component of completed fertility where change in the demand for children is associated with the changes in the supply of children. The degree of fertility preference implementation as an aggregate measure tends to measure whether women achieve their desired family size and by extrapolation could point to the details behind the preponderant fertility transition. The desired family size is basically achieved through contraception whether natural or through technological enhancement. The explanation of the extent of women's ability to implement their fertility desires subsequently yield an understanding of the variations in the supply of children.

Bongaarts (1993), asserted that there exists a reciprocal correlation between socio-economic development and the desired fertility and an incremental influence on the degree of fertility preference implementation index. Ibisomi et al. (2005), on the other hand further noted the strong direct correlation between the level of development of a population and its subsequent implementation index thereby recommending a rigorous pursuance to holistic developmental investments in order to achieve the requisite degree of fertility preference implementation. The

operationalization of this model is provided in the analytical framework described in the next chapter and is used to examine the third objective of this study.

3.7. Summary and Conclusion

In the recent decades, there has been continuous drive for debates among scholars on fertility transition targeting the sub-Saharan Africa. From the themes of those studies, two conclusions emerge: slow pace of decline because of weak facilitating social programs and high demand for large families amidst weak family planning programs. Accelerated fertility decline is expected to occur if there is both substantial decline in desired fertility and increased level of preference implementation (Otieno et al., 2018b; Bongaarts and Casterline, 2013; Casterline and Agyei-Mensah 2017). Despite these conclusions, there are also emergent exceptions in Africa even among the Eastern African countries such as Rwanda (May 2017).

Further, there is no single measure within the fertility preference that stands out to overarch as every single one of them poses certain limitations (Mason 1997). However, the utilization of triangulation methodologies that encompass a series of these parameter measures in one go has helped to reduce the spurious scenarios that come along with them. The search for a measure that encompass attitudes as well as other components is the line of thinking that gave birth to the degree of fertility preference implementation; which fuses a number of parameter measures within it to provide an index of implementation; dynamic and robust enough to limit distortions that are prevalent in other major conventional fertility parameter measures. The index scale slides from zero to unity and takes in to account the cost of fertility regulation as well as the cost of unwanted child bearing where couples strike a balance between the two to decide on the number of children to bear.

Various factors have been highlighted to influence fertility preference measures ranging from socio economic, socio cultural, behavioural among others as well as the limitations too. Ex post rationalization is among the single most challenges that affects measures of preference across board with Bongaarts attempting to create a buffer through which to limit its effects within studies of fertility preference. By definition, ex-post rationalization manifests itself through responses to questions on desired fertility size characterized by a great deal of ambivalence because individuals are not sure of what might happen in the future and so individuals say that the number of children they desired to have is left to the powers of their gods or God. Further, this artefact is characterised by a woman affirming the number of children corresponding to her existing actual number as exactly what they indeed desired. Wanted and desired fertility questions together have been posed as some of the strategies to mitigate on this bias among other forms of mitigation.

CHAPTER 4: DATA AND RESEARCH METHODS

4.1. Introduction

This chapter is the methodology chapter. It articulates the approaches and frameworks under which the key findings will be validated. The chapter begins by presenting the sources of data and the corresponding objective specific analytical methods utilised in this thesis and further being cognisant of the quality related aspects as well. Involved too in the dialogues are the merits associated with the data used to inform this study; specifically, the secondary data together with its parallel limitations. It is also patently imperative to evaluate the data to facilitate comparability and interpretation of the results. Further this chapter highlights the interconnected methodologies, the numerous variables in use together with their respective measurements and definitions, as well as the methods of data analysis to be applied at each of the stages for the objectives.

4.2. Data Source

This study utilized cross sectional secondary data gathered overtime by the Demographic and Health Surveys (DHS) for the countries Kenya, Rwanda, Uganda and Tanzania. The data was collected between the years 1988 and 2015. All the data from women of reproductive age (15 to 49 years) was pooled and exploited in detail during the analysis. Demographic and Health Survey (DHS) data sets are eminently renowned for their elevated quality standards across countries thereby warranting their suitability for comparability across studies.

4.3. Analysis Methods

The principal aim of this study is to establish the extent at which fertility preference and preference implementation explain fertility change among selected countries of the Eastern Africa. The unit of analysis is women of reproductive age (15-49 years) within the subnational regions of the

respective countries. The analysis methods are hence presented according to the specific objectives of the study.

Objective 1: To establish the determinants of sub-regional variations in fertility preference

The first objective focuses on what accounts for heterogeneity in fertility preference across the sub-national regions of the four countries. The fundamental focus of this section was to establish the key factors that are associated with the differences in fertility preference levels across the sub national regions of selected East African countries. It further sought to examine whether the factors differ by stage of fertility transition.

4.4. Measurement of Fertility Preference

There have been debates on the measurement of fertility preference and different approaches have been used. Casterline and El-Zeini (2007) discussed and reported measures based on the convention of referring to items that ask respondents what they "want" or "desire" as measures of fertility preference, distinct from fertility intentions or fertility expectations. Demographic and Health Survey (DHS) on the contrary uses two approaches, first originally developed by Westoff and Ryder (1971) thereby concluding that the most direct and readily interpretable fertility attitudinal measures are fertility preference - seeking to understand whether a recent child birth was either wanted or not wanted; whether another child is still wanted by the woman and how many more births are wanted in future in absolute numbers. In subsequent decades, fertility preference items have been the basis for classifying births as wanted or unwanted.

The other measure is defined in terms of lifetime fertility desires- i.e., a question of sorts as follows; "If you could have exactly the number of children you want, what number would that be? Although the two measures are about fertility preference, they are subjective and may elicit different responses in same settings informing the basis why the study uses the two instead of only

one i.e. Measure 1 tackles the Ideal family size – a measure of preference based on lifetime fertility and measure 2; fertility preference estimated from recent births. In this study both measures were used.

4.4.1. Total Fertility Rate

This is deduced from the number of live births women would sire during their reproductive phases of life falling between 15-49 years subject to their respective age-specific fertility rates. According to Measure (2014) age-specific fertility rates (ASFRs) are expressed as the number of births per thousand women in a specified age group showing age patterns of fertility. "The Demographic and Health Surveys (DHS), measure of Total fertility rate is presented for the three-year period preceding the survey, always in correspondence with the calendar period. A three-year period is used for calculating these rates to provide the most current information while also allowing the rates to be calculated for a sufficient number of cases so as not to compromise the statistical precision of the estimate," (KNBS, 2015).

4.4.2. Total Wanted Fertility Rate

Measure (2011) defined wanted fertility as "the demand for births". This is measured as the rate of childbearing that would be achieved if all women were able to eliminate unwanted births. In theory it is what the level of fertility would have been if all unwanted births are eliminated. It is calculated as the Total Fertility Rate (F_o) but the unwanted births are excluded in the numerator. Unwanted births are those that occur after an achievement of the wanted family size. Any births that are mistimed and occurring before the desired family size is achieved are considered wanted. Women are considered to have specific desired fertility size which they translate and actualize into numbers through subsequent births after considering past child losses as well as risk of future child mortality

Bongaarts (1993) affirms that it is the total wanted fertility rate for the three years preceding the survey for age group 15-49 years expressed per woman. Total wanted fertility rate is calculated in the same way as the total fertility rate, but only including births described as wanted. He states that a birth is considered wanted if the number of living children plus this birth is less than or equal to the wanted number of children. Data on desire for more children can indicate future reproductive behaviour provided that the required family planning services are available, affordable and accessible to allow people to realise their fertility preference (Bongaarts, 1993)

4.4.3. Ideal Family Size

Just like the other indicators discussed above, the unit of analysis for this objective shall be the women within the sub national regions of each of the four countries' regions as defined by the Demographic and Health Survey (DHS) data sets. The indicator is based on the reports to the questions asked to each woman (Measure, 2014). The respondents who have no children are asked to choose exactly the number of children they would likely want to bear in their whole life taking into consideration the rationalization and non-numerical responses that are commonly associated with such questions. According to Measure (2011), for respondents who already have children, the question is rephrased as follows: "If you could go back to the time you did not have any children and could choose exactly the number of children to have in your whole life, how many would that be? From the figures provided, it clearly reveals that the ideal family size increases with the number of living children." That perhaps is the weakness of the measure.

4.5. Factors Associated with Sub-regional Variations in Fertility Preference

Education

Education is widely considered as a key determinant of fertility and its related decisions the world over. Several causal channels have been emphasized. First, education ideally raises a woman's

permanent income through earnings, tilting her optimal fertility choices toward fewer offspring of higher quality. Second, under positive assortative mating, a woman's education is often causally connected to her mate's education (Behrman & Rosenzweig, 2002), so that the effect of education on household permanent income is augmented through a multiplier effect.

Third, education may improve an individual's knowledge of and reasoning in the ability to process information regarding, fertility options and healthy pregnancy and reproductive behaviours. By implication, maternal education determines the particular mindset and key decisions a woman makes with regards to the number as well as the quality of children she desires to raise. Maternal education exerts the most consistent influence on fertility in developing countries (Caldwell, 1979, 1986; Cochrane et al., 1980), which persists even after controlling other factors in addition to being a proxy for a household's standard of living. In this study, we proxied educational achievement measure by using proportion of women with no education to indicate the gravity of each region's education attainment.

Place of Residence

Urbanization is an integral factor to child bearing practices. According to Easterlin (1983) it is understood that the level of urbanization influences the fertility of a population holding other factors constant. The urbanization level is used as an auxiliary measure for modernization; characterised with flawless services and technological advancement across board including better quality services supporting fertility decisions.

The secularization of such urbanised economies leads to a sprouting of amalgamated lifestyles, subsequently rendering culture redundant with regards to child bearing. This has ensured women have other competing options replacing the benefits associated with child bearing like modern life styles and ethos to the extent of infringing on the child bearing space. The residence type

dichotomy manifests itself through the socioeconomic and socio-cultural differentiation rather than being an explanatory factor in itself.

Modern Contraceptive use

The underlying assumption within the hypothesis of contraception is that when contraceptive use is highly dominant in a given population then it becomes an anchored behaviour that diffuses in a society holding other factors constant; thereby defining their attitudes towards practice and conscious usage. Besides changes in population, fertility dynamics concern is stronger on the role played by the technological innovations that come along with it. Actually, literature reveals a surge in the adoption and uptake even amongst the conservative populations themselves.

In general, contraception has been described as the means through which to control any fertility. However, competition is rife on some methods as opposed to others. A typical one is the condom use as a method. Studies reveal on a number of occasions that its significant consumption is not only linked to birth control but rather the STIs and HIV prevention as well – a competition scenario. Hence the prevalence figures on condom utilization targeting birth control is erratic and could as well be exaggerated after all.

Level of Development of the sub-national region

Contextual factors play a major role in determining the differentials in fertility rates, particularly in countries such as these where huge disparities in socio-economic development, distribution of natural resources, and access to services and other social amenities exist between regions. Historically, excessive births have been noted among the inhabitants of the numerous parts of these regions. These patterns have been closely attributed to the low household development indices, high environmental risks as well as the cultural orientation (Ewbank, et al., 1986). A number of variables are used to measure household development levels in the Demographic and Health

Survey (DHS) data. However, for purposes of this study the proxy indicator taken as a measure of the extent of respective regional development is the proportion of households with electricity.

Culture

One very autonomous factor that have proved significant in relation to child bearing is the people beliefs and way of life (Caldwell, 1982). This is also reflected in their perceptions with regards to child bearing. Governments provide the necessary vital services to its population with a view to influencing its subsequent behaviour. Conformity of these policy aspirations with the populations' way of life is therefore important if they are to make any significant changes. However, without efficient influence and support to the population by the respective government bodies, the population adopts its own internal mechanisms and controls within which to pursue their aspirations; child bearing being one of them.

Caldwell (1982) further states that culture becomes an autonomous factor to the population's way of behaviour passed from one generation to another. The intensity of influence to fertility outcomes is therefore commensurate with the level of cultural predisposition bestowed on its adherents. Other factors including education and contraception among others hence become artificial imports and must only influence a people if culture subjects them to a buy in. Diffusion of ideas and attitudes could as well not be ruled out being a non-closed population.

With insignificant influence and limited vital services across most regions, the cultural variable dominates freely determining people's response to child bearing practices. Most conservative cultures especially those bestowing births to nature or some other individuals and not the women themselves pose the potential risks of ex post-rationalization rendering credible researches a hoax. The proportion of the population affiliated to Islam has been used as a proxy measure for culture.

Period

Period variable measures characteristic changes in the various variables within the intervals between the different surveys collected from 1988 to 2015. The time period a survey round was conducted marks a definite time period. Each point at which Demographic and Health Survey (DHS) data was collected manifest itself with a pattern of change in the conditions of the respective fertility outputs and related indicators based on the prevailing stimuli at each of the time periods. These changes together with a number of other factors not within the scope of this study must have led to shifts in state and magnitude of births across each of the countries. The periods will be demarcated with a recent stalling period, regarded as a significant regional fertility marker thereby defining each of the other periods as either pre-stall or post stall (Table 4.1). Table 4.1 shows a summary of the selected variables and their measurement. The unit of analysis was the sub region.

Table 4. 1: Summary of Variables and Measurements

Key Concept	Variable or Proxy	Measurement	Remarks
Fertility preference	Wanted Fertility Rate	Continuous	Dependent variable
	Mean Ideal Family Size	Continuous	Dependent variable
Period	Post-Stall	1 if period was after 2003, else 0	Control
	During stall	1 if period of survey was between 1995 and 2003	
	Pre-stall	1 is period before 1995, else 0	
Stage in fertility transition	Transition Complete	1 if TFR is <3 else 0	Independent variable
	Still in Mid transition	1 if TFR is between 3 and 6 else 0	
	Pre-Transition	1 if TFR is 6 or more, else zero	
Education	% of women with no education	Continuous	Independent variable
Place of residence (Urbanization)	% of population living in rural areas	Continuous	Independent variable
Contraception Prevalence	% of women using modern contraceptive methods	Continuous	Independent variable
Culture	% of population who are Muslims	Continuous	Independent variable
Development of the region	% Households with electricity	Continuous	Independent variable

4.6. Analytical Method

This analysis uses generalized linear model (GLIM), expanding it to ensure a linear linkage between the dependent variable, the factors and covariates through the specification of a link function. This grants a non-normal distribution behavior on the dependent variable. Standard multiple regression only but precisely calculates the link between outcome and predictors if the

associations exhibit linear correlation. Although there are situations whereby non- linear interactions occur between variables, it is indeed prudent to assess for non-linearity. In cases where the linearity rule is breached to non-linearity, regression results tend under-estimate the true relationship.

A generalized linear model "(GLIM) has two main parts: The first is a function describing the dependence of the mean to the linear predictor called the link function, followed by another describing how the variance of Y associates with the mean called the variance function. There are three components of a GLIM; the random component comprising of independent observations from a distribution in the natural exponential family. The link function connecting the random and systematic components. It describes the relationship between the mean of the response, and the linear predictor. When the link function, g, is specified it means that the systematic effects are additive on the scale given by the link function. A fourth component is sometimes specified explicitly. This is the variance function, which is a function relating the variance to the mean. It is proportional to the variance of the response distribution, with proportionality constant; the inverse of a parameter called the dispersion parameter."

The general formulation is as below

1. A probability distribution from the exponential family.
2. A linear predictor $\eta = \mathbf{X\beta}$.
3. A link function g such that $E(\mathbf{Y}) = \boldsymbol{\mu} = g^{-1}(\eta)$.

When the probability distribution comes from an exponential family then the pdf can be written in the form:

$$f_Y(y|\theta,\tau) = h(y,\tau)\exp\left(\frac{b(\theta)T(y) - A(\theta)}{d(\tau)}\right).$$

$\boldsymbol{\theta}$ - correlated to the mean of the distribution.

If $\mathbf{b}(\boldsymbol{\theta})$ is the identity function, then the distribution is said to be in canonical form (or natural form). Any distribution can be converted to canonical form by rewriting $\boldsymbol{\theta}$as $\boldsymbol{\theta}'$and then applying the transformation, $\boldsymbol{\theta} = \mathbf{b}(\boldsymbol{\theta}')$. It is always possible to convert $A(\boldsymbol{\theta})$ in terms of the new parameterization, even if $\mathbf{b}(\boldsymbol{\theta}')$is not a one-to-one function

The mean or expected value is thus given by:

$$\mu = \mathrm{E}(Y) = A'(\theta).$$

And the variance $\mathrm{Var}(Y) = A''(\theta)d(\tau).$

The parameters are estimated via maximum likelihood method. In a generalized linear model (GLM), each outcome of the dependent variables, Y, is assumed to be generated from a particular distribution in the exponential family.

The mean, μ, of the distribution is dependent on the explanatory variables, X, through:

$$\mathrm{E}(\mathbf{Y}) = \boldsymbol{\mu} = g^{-1}(\mathbf{X}\boldsymbol{\beta})$$

Where E(Y) is the expected value of Y; Xβ is the linear predictor, a linear combination of unknown parameters, β; g is the link function. The variance is typically a function, V of the mean:

$$\mathrm{Var}(\mathbf{Y}) = \mathrm{V}(\boldsymbol{\mu}) = \mathrm{V}(g^{-1}(\mathbf{X}\boldsymbol{\beta})).$$

Link function is most important for estimation and prediction since it provides the relationship between the linear predictor and the mean of the distribution function. When using a distribution function with a canonical parameter θ, the canonical link function is the function that expresses θ in terms of μ, i.e. $\theta = b(\mu)$. For the most common distributions,

μ - the mean is in standard form of the distribution's density function,

$b(\mu)$ - Function that maps the density function into its canonical form.

When using the canonical link function, $b(\mu) = \theta = \mathbf{X}\boldsymbol{\beta}$ allowing $\mathbf{X}^{\mathrm{T}}\mathbf{Y}$ to be a sufficient statistic for $\boldsymbol{\beta}$. Some of the common distributions and canonical links are provided below. The support for the distribution specifies range of outcomes.

Table 4. 2: Common distributions with typical uses and canonical link functions

Distribution	Support of distribution	Characteristic uses	Link name	Link f(x)	Mean f(x)
Normal	real: $(-\infty, +\infty)$	Linear-response data	Identity	$\mathbf{X}\boldsymbol{\beta} = \mu$	$\mu = \mathbf{X}\boldsymbol{\beta}$
Exponential Gamma	real: $(0, +\infty)$	Exponential-response data, scale parameters	Inverse	$\mathbf{X}\boldsymbol{\beta} = -\mu^{-1}$	$\mu = -(\mathbf{X}\boldsymbol{\beta})^{-1}$
Inverse Gaussian	real: $(0, +\infty)$	Continuous but limited to non-negative numbers	Inverse squared	$\mathbf{X}\boldsymbol{\beta} = -\mu^{-2}$	$\mu = (-\mathbf{X}\boldsymbol{\beta})^{-1/2}$
Poisson	integer: $[0, +\infty)$	count of occurrences in fixed amount of time/space	Log	$\mathbf{X}\boldsymbol{\beta} = \ln(\mu)$	$\mu = \exp(\mathbf{X}\boldsymbol{\beta})$

The indicators used in the analysis were the mean ideal/desired family size and total wanted fertility rates as measures of fertility preference at regional level. Although the dependent variables are continuous, their distribution is unknown hence we cannot use ordinary least squares and that was the main reason for using generalized linear model (GLIM).

The first level of analysis is to examine trends in variation of fertility preference as measured by both mean ideal family size and wanted fertility rate. Through the Demographic and Health Survey (DHS) reports, we compiled the regional figures of ideal and wanted fertility across the countries by sub national regions.

The second level of analysis involves the identification of fertility preference factors. Generalized linear regression models is used to identify factors that determine regional differences in fertility preference based on the selected independent variables namely, the regional proportions of women

with no education, proportion rural, proportion Muslim, regional modern contraception prevalence, Demographic and Health Survey (DHS) round period, stage in fertility transition and regional development level measured by the proportion of households with electricity connection. In our model, the assumed distribution is normal with identity link hence the estimated model is given as……

$$E(Yi) = \mu = \mathbf{X}\boldsymbol{\beta}$$

…. where in our case Yi would be taken as the mean ideal family size for regression involving the desired family size for the first model and Yi is taken as the wanted fertility rate for the second model.

Objective 2: Estimation of Fertility Preference and Degree of Fertility Implementation Index

The second objective of the study was the fertility preference estimation based on Bongaarts (1993) modification of Easterlin (1975) and Easterlin and Crimmins (1985) supply-demand framework for fertility analysis summarized in Figure 3.1. The fertility outcome measured by the total fertility rate which is considered as a function of: supply of births (natural fertility); demand for births (wanted fertility) and degree of preference implementation. The latter in turn is dependent on cost of fertility regulation and cost of unwanted childbearing. The cost of fertility regulation and cost of unwanted childbearing is not estimated because it is unobserved.

Demographic and Health Surveys (DHS) often computes the wanted fertility rate by regions with the difference between Total Fertility Rate (F_o) and Wanted Fertility Rate (F_w) determining the women's unwanted Total Fertility Rate. The unwanted TFR is a measure of preference implementation pointing at the unimplemented proportion ($1-I_p$) which in turn imply the gap existing either within the unmet need to contraception or otherwise. These measures are

categorised by the regions per country. We computed these parameter measures from the ICF data bases often referred to as "Stat Compiler" thereby categorizing them each by country, region and period. Due to the biases that arise with the wanted fertility, we applied the Bongaarts formula to deduce corresponding figures of natural fertility and wanted fertility.

According to Bongaarts,

$$F_n = F/C, \ldots\ldots\ldots\ldots\ldots\ldots \text{ (i)},$$

C is an index ranging from 0 to 1 measuring the proportional reduction in natural fertility attributed to deliberate birth control mechanisms. Birth control not only confined to contraception also encompass induced abortion practises though always ignored in studies. Total fertility rate data is always available and hence the only additional task required is to compute the natural fertility in (i) with an estimate of C. Bongaarts further provided a procedure for deducing C, with an approach though the limitation was the unavailability of data. Hence:

$$C = 1 - 1.02 \times U, \ldots\ldots\ldots\ldots\ldots \text{ (ii)}$$

U is the fraction of women in marriage practising all forms of birth regulation except during the post-partum in-fecundity period. The error associated with this is negligible hence ignored sometimes. By Substituting C in (i) above yields the anticipated approximation of natural total fertility.

Wanted fertility computation: According to Bongaarts, the favoured approach is dependent on the equation below.

$$F_w = F^w + 1.09 - W_m\,(40\text{-}49) \ldots\ldots\ldots \text{ (iii)}$$

Where F^w, proportion of women who want more children, equalling the resulting total fertility after deleting all births to women who want no more children

at the time of the survey and W_m (40-49) is the proportion of women in union aged from 40 to 49 who want no more births.

These two equations helped normalize the biases in order to compute the respective natural fertility and wanted fertility trends across the regions. With most of the erratic curves expected, a normalization process using the natural logarithms of the equation was applied to give meaning to the various trend curves.

Preference implementation index is derived from a synthesis from past studies. It begins from the fact that, all social and economic factors of fertility operate through a unified pack of proximate factors to exert an impact on fertility (Bongaarts, 1993). The Easterlin's economic approach is a model of behavioural and biological factors affecting fertility in developing countries. Interestingly, the model consists of three central concepts: demand for children; the potential supply of children, and the momentary and psychic costs of contraception. According to the model, women whose potential supply of births exceeds demand would consider contraception, taking into consideration the costs involved while choosing suitable family planning methods (Montgomery 1987).

The model is simple and attractive; however, it cannot address dynamic issues and has not succeeded in quantifying these factors in acceptable manner (Bongaarts, 1993; Ibisomi, 2002; Ibisomi, Odimegwu, Kimani, Otieno, 2005). Emerging from the model is the fact that fertility (measured by the total fertility rate – F_o) is a function of three determinants namely: supply of births (natural fertility - F_n), demand for births (wanted fertility - F_w) and the degree of preference implementation (I_p) (Figures 3.1 - 3.3)

Supply of births (F_n) is measured as natural total fertility. Natural fertility infers the rate of birthing likely to prevail minus the premeditated attempts by spouses to limit their number of children.

Demand for births (F_w) is the wanted total fertility defined as the rate of prevailing childbearing after eliminating all unwanted births. Under normal circumstances, it is simply calculated as the Total Fertility Rate (F_o) while eliminating the unwanted births from the numerator. Unwanted births are births occurring after an achievement of the ideal family size. Any births that are mistimed though occurring before the achievement of the desired family size are considered wanted births as well.

The degree of preference implementation (I_p) is an index from zero value to unity. Its level of implementation implies the net result of decision-making process. This is the state in which a spouse ponders the cost of fertility regulation as they consider costs of bearing an unwanted child to its end. In general, the index has an inverse variation to the cost of fertility regulation as well as a reverse correlation to the unwanted births. If couples fully implement their fertility preference, the index is equal to unity. This signifies that no unwanted births occur as actual fertility corresponds to wanted fertility. Conversely, if the index is equal to zero, the observed fertility equals natural fertility, that is, fertility in the absence of any deliberate fertility control assuming women remain sexually active over their reproductive cycles. The value of the index at play stipulates the position where actual fertility falls as dictated by the range set between wanted and natural fertility parameter levels.

Total Fertility Rate (F_o) gives the estimate of the number of children a woman would have by the end of childbearing if she were to pass through her reproductive cycle at the customary age specific birth rates. The model shows that the operation of these variables determines the level of fertility in a community or households. In this variant of the original Easterlin's model, infant and child mortality dynamics affects the desired fertility rather than the natural fertility. Women are deemed

to possess precise desired fertility size translated and actualized into numbers through subsequent births after considering past child losses and risks related to future child deaths as well.

According to this variant, as development occurs, the trend in prevailing fertility transforms to become a function of the equilibrium between the wanted fertility (F_w), natural fertility (F_n) and the degree of fertility preference implementation (I_p). Wanted fertility is expected to decline over time, as a result of the changes associated with the costs and benefits of child bearing (Caldwell, 1982), as well as reductions in the infant-child mortality. The index of preference implementation rises as fertility regulation costs decline; with the benefit of fertility regulation focusing on the elimination of any unwanted births (Bongaarts, 1993; Montgomery 1987). According to Bongaarts (1993), the relationship between these variables under discussions and fertility can be expressed in statistical form as follows:

$$F = F_w + F_u \quad \text{..... (iv)}$$

Where F is the total fertility rate (births per woman), F_w is the wanted fertility rate and F_u is the unwanted fertility (which can simply be expressed as $F - F_w$).

Also,

$$Fu = (F_n - F_w) \times (1 - I_p) \quad \text{..... (v)}$$

Where F_n is total natural fertility and I_p is the index of preference implementation (Range from 0 to 1). With full preference implementation, $I_p = 1$ (which implies that $F_u = 0$ and $F = F_w$) and Ip is 0 with no preference implementation (This implies a substantial level of unwanted childbearing and $F = F_n$). Noted here is that as defined by Bongaarts, F_n here is not the same as in total fecundity as in the Bongaarts proximate determinants but taken to mean fertility level achieved in absence of contraception (see Bongaarts 1993).

Fu is a function of the difference between supply and demand, and the degree of preference implementation.

Substitution of ……. (v) In ……. (iv)

Yields $F = F_w \times I_p + F_n \times (1 - I_p)$ ……. (vi)

Noting that natural fertility is given by:

$$F_n = F/C$$

Where C implies an index ranging from 0 to 1 measuring the reduction in proportional of natural fertility attributable to deliberate birth control is estimated as:

$$C = 1 - 1.02 \times U$$

Where U; - represents the proportion of married women who were practising contraception at the time of survey. It is measured as the number of married women using contraceptive method to the total number of married women. The values for U and C can be used to estimate F_n

Rearranging equation (vi) gives

$I_p = (F_n - F_o)/ (F_n - F_w)$ …… (vii)

Equation vii can now be used to estimate the degree of preference implementation once natural fertility (fertility in absence of contraception), actual fertility and wanted fertility are known. One thing to note is that the estimation of wanted fertility (Fw) as previously done overtime contain traits of upward bias as per the recent observation. An alternative estimation of Fw from Bongaarts model detail that the average wanted TFR derived from the wanted status of births as reported by women was 2.8, indicating that this measure of wanted fertility contains an average upward bias of 0.4 birth.

The analysis consists of two stages namely:

First we computed the degree of preference implementation within the variable categories overtime from the natural fertility, wanted fertility and the total fertility rate. The total fertility rate (F_o) and the wanted fertility rate (F_w) as a series of indicators are provided by the various country specific Demographic and Health Survey (DHS) reports. This involves compiling all the components of the index within the equation so as to come with the actual figures per the subsequent time intervals. The component variables are natural fertility (F_n), wanted fertility (F_w) computed to form the degree of fertility preference implementation (I_p).

Objective 3: To estimate the contribution of fertility preference and preference implementation to fertility change

With the estimation of the trends in the degree of fertility preference implementation index the next objective is to decompose the various components of change based on fertility levels for the region.

4.7. Decomposition of fertility trends

According to Bongaarts (1993) the core objective of the demand framework lies in the identification of the causes of fertility decline in a population with proceeding comparative analysis providing worthwhile insights yet not achieving its sole objective. Turning to the issue at hand; the decomposition of the variations in fertility and to abridge the methodological exposition, trends therefore should inform the basis of focus between two points in time i.e. T_1 and T_2 running up to the determinants. The derivation of the decomposition equation warrants the introduction of the following variables as well.

Table 4. 3: Fertility Decomposition

	Observation Point	
Time Periods	T_1	T_2
Total Fertility	F_1	F_2
Natural Fertility	F_{n1}	F_{n2}
Wanted Fertility	F_{w1}	F_{w2}
Index of Implementation	I_{p1}	I_{p2}

Source: Bongaarts (1993*)*

The decline in fertility between the two periods is F_1-F_2, conveyed by substitution as; -

$$\mathbf{F_1-F_2 = [F_{w1}I_{p1} + F_{n1}(1-I_{p1})] - [F_{w2}I_{p2} + F_{n2}(1-I_{p2})]} \text{ ..... (i)}$$

The above equation therefore can be written as below

$\mathbf{\Delta F = \Delta F_w \bar{I}_p + \Delta I_p (\acute{I}_w - \acute{I}_n) + \Delta F_n (1-\bar{I}_p)}$ ..... **(ii)** (See Bongaarts 1993)

Where: -

i) ΔF, ΔF_w, ΔF_n and ΔI_p are the change within F, F_w, F_n and I_p respectively

ii) $\acute{I}_w$, $\acute{I}n$ and $\bar{I}_p$ are the mean values of correspondingly, F_w, F_n and I_p. For example, the mean of the degree of implementation index ($\bar{I}_p$) is: - $[0.5(I_{p1} + I_{p2})]$

Table 4. 4: Fertility Change Contribution

Change (Δ) in Key measures	Contribution to fertility decline - ΔF
Natural fertility - ΔF_n	$\Delta Fn\ (1- \bar{I}_p)$
Wanted fertility - ΔF_w	$\Delta F \times \bar{I}_p$
Degree of Fertility Implementation Index - ΔI_p	ΔIp (Average Fw - Average Fn)

Source: Bongaarts (1993)

$\bar{I}_p$ implies the average of the Degree of Fertility Implementation Index (I_p). The influence of change in wanted (ΔF_w) as well as the natural (ΔF_n) fertility to prevailing fertility change hinge on the average extent or degree of implementation. Consequently, the outcome of fertility from every shift registered on the degree of fertility implementation index is determined by the corresponding mean change between natural and wanted fertility ($\acute{I}_w$-$\acute{I}_n$). This function requires two successive points in the estimates of the parameter measurers i.e. the Total fertility rate, natural and the wanted fertility including the implementation index as well within the population under consideration. It

is this function that is used to determine the extent to which implementation of fertility desires contributes to fertility transition.

CHAPTER 5: REGIONAL VARIATIONS IN FERTILITY PREFERENCE

5.1. Introduction

The main objective of this section was to examine how fertility preference has changed overtime within the sub national regions of the east African countries together with their accompanying factors. This chapter therefore seeks to provide answers to the following questions: - What factors among the selected known fertility variables account for the prevailing fertility preference changes at the macro scale? Are they different in different context and particular stages in fertility transition within the sub national regions? Using a series of pooled country Demographic and Health Survey (DHS) data sets, it begins with the highlights of the descriptive statistics of the variables of concern. Further analysis in this chapter seeks to explain the extent women in the regions have been able to implement their fertility preferences overtime as well as the contribution of each of the respective preference measurers to the prevailing fertility changes.

Perhaps this calls for the apparent assessment of the countries' regional statuses and disparities in fertility preference in a bid to shed more light on to the underlying fertility dynamics. Embedded into this assessment is the non-omission of the other analysis acting to provide a triangulation discourse to the prevailing results. To achieve this, the study identified from several determinants only the significant factors for further discussion, propelling the fertility preference to change within the different stages of fertility transition at 95% confidence level. The descriptive statistics included too, the measures of central tendencies as well as measures of dispersion.

As guided by the body of knowledge, the independent variables covered a sphere of categories ranging from socio-cultural, socio economic, modernization and prevalence, all the way to the technological advancement parameters represented by proxy measures such as levels of household development as well as household grid electricity connection. On the first phase of analysis based

on the General Linear Models, the dependent variables used in the multivariate linear regression were the mean ideal family size and the wanted fertility for the first and second models respectively. This rationale is equally prompted by the previous studies where scholars posit that the extent of fertility transition is a function of the variations in the demand for children, the diffusion of new attitudes about fertility control as well as the prevailing level of advancement and accessibility to birth control technologies.

Even so, interesting patterns are still discernible. Summarily, this chapter henceforth attempts to explore some of the factors associated with the changes in selected fertility parameter measures, the level of fertility preference over the years and the contribution of each to the prevailing fertility changes. In particular too, we aim to emphasize how these factors cause effect at the macro-level as we seek to explain the trends within these specific fertility parameter measures. The chapter therefore highlights the different results and findings as aligned to the three specific objectives of the study.

5.2. Trends in Fertility and Fertility Preference and their key Determinants

Table 5.1 shows trends in the variations of fertility preference and their explanatory variables across the respective regions of Kenya, Rwanda, Tanzania and Uganda. It presents the analogous trend measurers of central tendency, measures of dispersion, information on the total wanted fertility rate, mean ideal family size, total fertility rate as well as for the subsequent proportions of non-education among women, type of place of residence, modern contraception and electricity connection within the various regions. The measure of variability is denoted by the respective standard deviations as well as the maximum and minimum absolute values of the corresponding variables.

Preliminary evidence within the Table 5.1 corroborate the finding showing the general average status within the country measures at different time periods deduced in a trend analysis format and supported by the graphical presentation as per the Figures 5.1 up to 5.4. These pieces of evidence clearly reveal considerable general variations and temporal inconsistencies among indicators under consideration.

All the fertility parameter measures exhibited overall steady declines overtime. However, the variables of education, type of place of residence, contraception prevalence and electricity connection showed swerving irregular trends. It is also true that overall trend analysis exhibits erratic and incoherent patterns that are quite expected within these aggregate measures. However, it's known that deeper analysis into the sub-categories within national and their sub-national regions will reveal the masked characteristics and any hidden periodicity exhibited by the general analysis below.

Table 5.1 subsequently highlights a descriptive statistic of the various fertility preference measures together with indicators of actual period fertility by indicators of education status, rural residence, prevalence of modern contraception in region, measure of development levels proxied by proportion of households with electricity. It reveals one interesting pattern within the fertility parameter measures overtime. This is that over the survey periods, the mean ideal number of children for all women registered the lowest mean, while the wanted fertility and the prevailing fertility recorded higher and highest figures respectively. This is truly consistent with the available literature for this region (Garenne, 2008; Westoff & Cross, 2006) as quite a huge proportion of women desire fewer births than what they've actually had over the years. Why?

Table 5. 1: Trends in Fertility, Fertility Preference and Selected key Determinants

					Percent			
DHS Round	Statistic	Total Wanted Fertility Rate	Mean Ideal number of children	Total Fertility Rate 15-49	Women in Region with no education (%)	Women living in rural areas (%)	Women using Modern contraception (%)	HHs in region with electricity (%)
2013 +	Mean	4.73	4.27	5.03	15.05	68.01	27.37	23.89
	No of Regions	52.0	52.0	52.0	52.0	43.0	43.0	52.0
	Std. Deviation	1.28	1.19	1.28	11.10	19.69	12.11	19.55
	Grouped Median	4.60	4.05	4.64	14.65	71.70	28.10	17.15
	Minimum	3.00	2.10	2.70	0.90	0.00	2.70	4.50
	Maximum	9.30	6.70	7.50	73.60	89.60	48.70	86.80
2000-2012	Mean	4.84	4.52	5.39	21.68	74.14	24.18	14.02
	No of Regions	99.0	99.0	99.0	99.0	79.0	78.0	99.0
	Std. Deviation	1.35	1.19	1.24	13.50	23.58	11.92	16.75
	Grouped Median	4.67	4.42	5.40	20.23	81.43	23.00	7.27
	Minimum	2.80	2.20	2.50	1.00	0.00	0.20	0.00
	Maximum	11.10	7.20	8.00	97.10	100.00	49.50	88.60
1994-1999	Mean	5.19	4.88	5.86	24.23	76.04	15.28	10.18
	No of Regions	57.0	57.0	57.0	57.0	44.0	40.0	57.0
	Std. Deviation	0.89	0.99	1.20	10.72	20.24	8.16	10.99
	Grouped Median	5.16	4.90	5.75	26.80	80.70	13.20	6.57
	Minimum	2.90	2.30	2.60	1.20	0.00	4.00	0.70
	Maximum	8.10	7.20	8.10	47.60	96.10	40.00	60.10
Pre-1994	Mean	5.51	5.15	6.19	32.83	80.50	19.51	7.86
	No of Regions	46.0	46.0	46.0	46.0	18.0	18.0	35.0
	Std. Deviation	1.17	1.22	1.08	13.50	30.40	12.72	9.32
	Grouped Median	5.85	5.37	6.37	33.70	92.50	18.67	5.40
	Minimum	2.70	2.50	3.40	7.20	0.00	0.00	1.10
	Maximum	6.90	7.20	8.10	69.60	100.00	42.80	50.80

Further, from the three fertility measures under discussion, the wanted fertility and mean ideal number of children for all women have made modest declines in their means as well as the total prevailing fertility rate within the same periods in general. In numerical terms, the change in the wanted fertility has shifted from a mean of 5.5 to 4.7 births registering 15.7% of the change, while the mean ideal number of children for all women changed by an almost similar digit of 14.5% to 4.3. The total fertility rate equally changed from 6.2 to 5.0 (19.4%). By implication, all these parameters measures of fertility conformed to the common trend of negative deviation overtime.

However, the total fertility rate is more pronounced, registering the most significant deviation amongst these three parameter measurers. Literally, the total fertility rate change is slightly higher by over a birth from 3.4 to 2.7. One critical argument posed here is whether these trend changes occurring within the two-decade periods could be regarded as the most optimal or whether other factors not within the scope of this study are at play to only render and dispense such limited declines compared to other countries who had gone through similar phases currently being exhibited in the region. As much as there has been a general decline in the fertility measures over time (Figure 5.2) and looking at the gaps between the maximum and minimum fertility measures (Figure 5.1), clearly the deviations have been widening until recently when the measurers began to take a nose dive as gaps subsequently narrow. This shows that previously, quite a sizable proportion of women antagonised the drive to lower births until recently.

The narrowing of the gaps could be an implication that the women population have begun adopting similar attitudes with regard to the childbearing intentions. Worth noting too is the erratic nature of the gap existing between the maximum and the minimum values of the Wanted Fertility Rate compared to the other measurers. This also doubles as an indication that the wantedness of births undergo constant reviews. With these shifts through reviews in the wantedness of births (Wanted Fertility), prevailing fertility therefore correspondingly portray eminent shifts with an aim to accommodate the nature of the intention of women through their wanted fertility. Implementing the actual fertility hence takes a meniscus that quite lie in line with the intermittent nature of the reviewed wanted fertility holding other factors constant (Figure 5.1).

There has equally been variations across selected major fertility determinants. The proportion of non-education as well as the proportion of women living in rural areas is way below average with marginal changes registered over the years. In numerical terms, the magnitude of the drop in the

proportion of women with no education and the proportion living in rural areas were 17.6% to 15% and 12.5 to 68% respectively, while the proportion using contraception as well as households with grid connection increased by a magnitude of 7.7% to 27.4% and 16% to 23.9% respectively. The changes reveal by implication that with slow but consistent increases in education uptake as well as urbanization the two variables are bound to shape the next generations' demographic processes albeit at slow pace. Contraception has equally increased overtime across the regions as well as grid electricity connection across households implying increased decision making with regards to child birth as well as improvement of life styles in households. The coefficient of variation as implicitly revealed by the standard deviation have exposed erratic changes over the years across all variables except for the total fertility rate and households with grid connection.

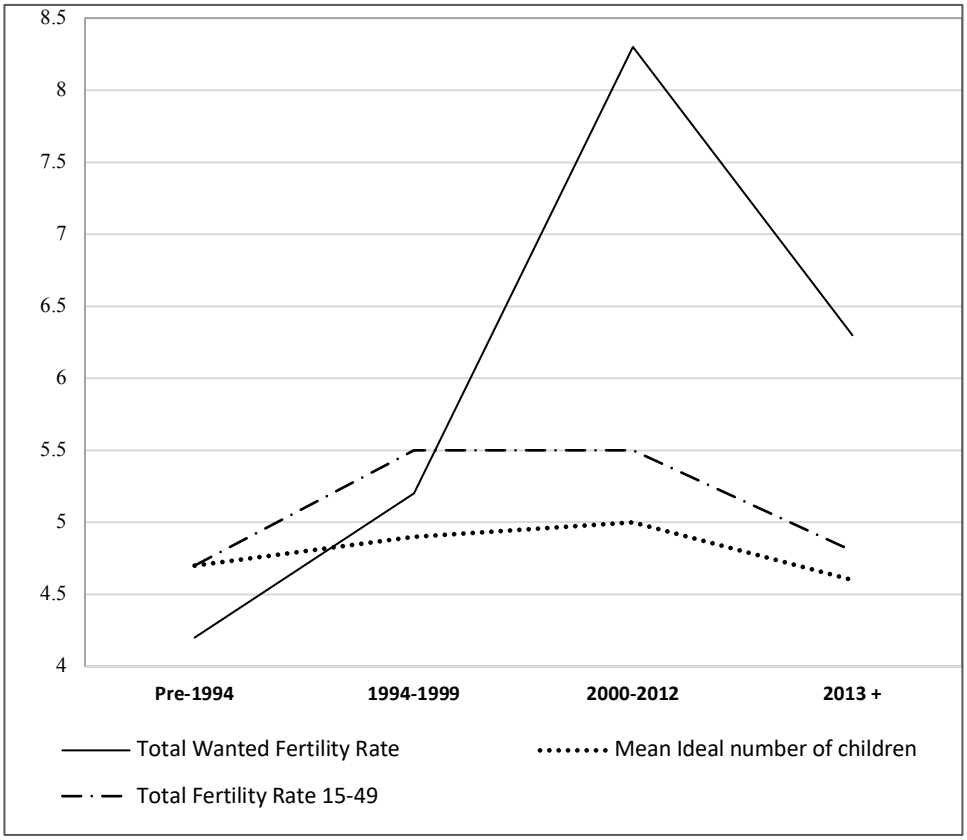


Figure 5. 1: Trends in the Max/Min gap key fertility and fertility preference measures

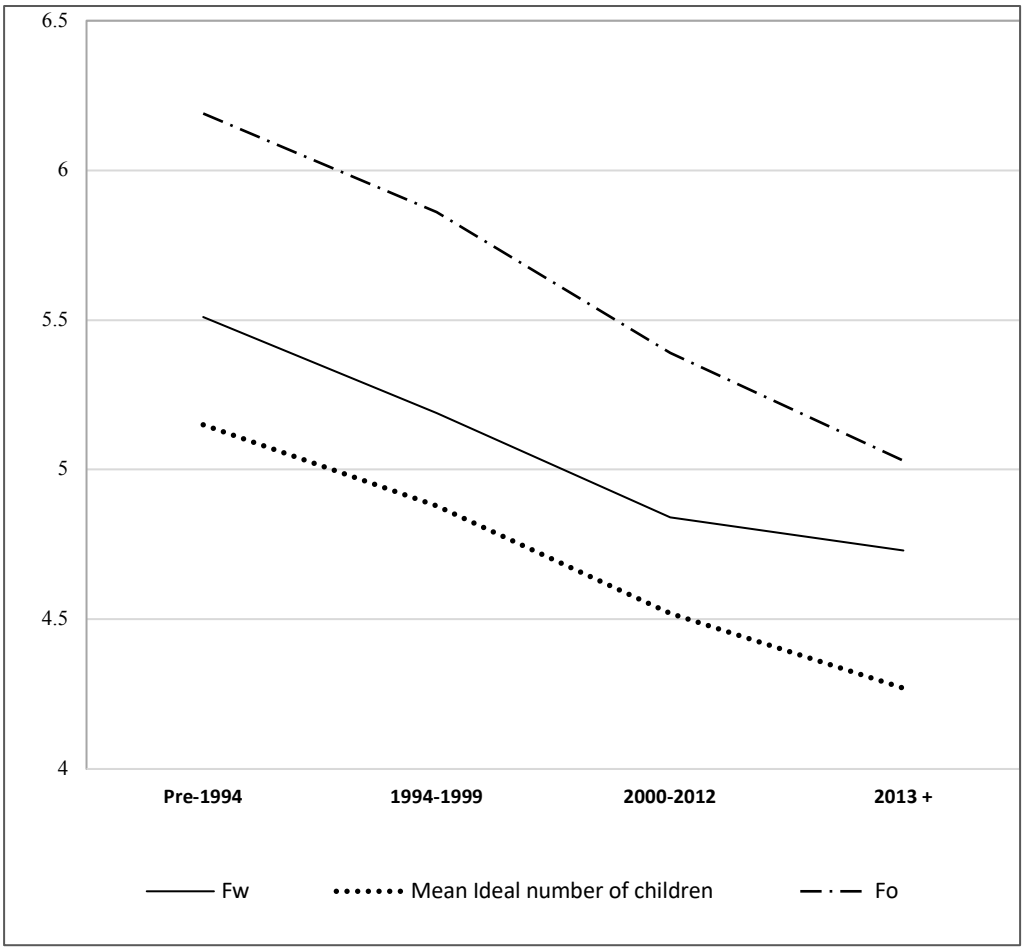


Figure 5. 2: Trends in Fertility and fertility preference Measurers

These countries bear almost perfect semblance within most of their population policy lines especially of consciously regulating births to manageable levels among couples without discrimination. It however goes against the grain that some record highest births registered among these populations over the years have had not any modest declines within the same periods thereby holding the overall mean numbers to an almost static mode overtime. An assessment and interpretation of the Table 5.1 still at the general level, reveal that the mean number of prevailing births, wanted births and the mean ideal family size made some significant reductions between the minimum and the maximum values implying that as much as quite a significant proportion of women reduced their births within the latest two surveys, the narrowing of those gaps points to a convergence in the general population's drive and aspirations with regards to fertility.

Several variables have been pointed at to trigger interchange made by the various fertility preference measures over the years. Further from the Table 5.1, discussed too are the variables of non-education attainment proportions, type of place of residence, modern contraception prevalence as well as the regional household development index through a proxy, grid connection to the households. In general, all the indicators showed quite some modest progress overtime as gaps narrow with each variable taking its own resultant trajectory (Figure 5.3 & 5.4).

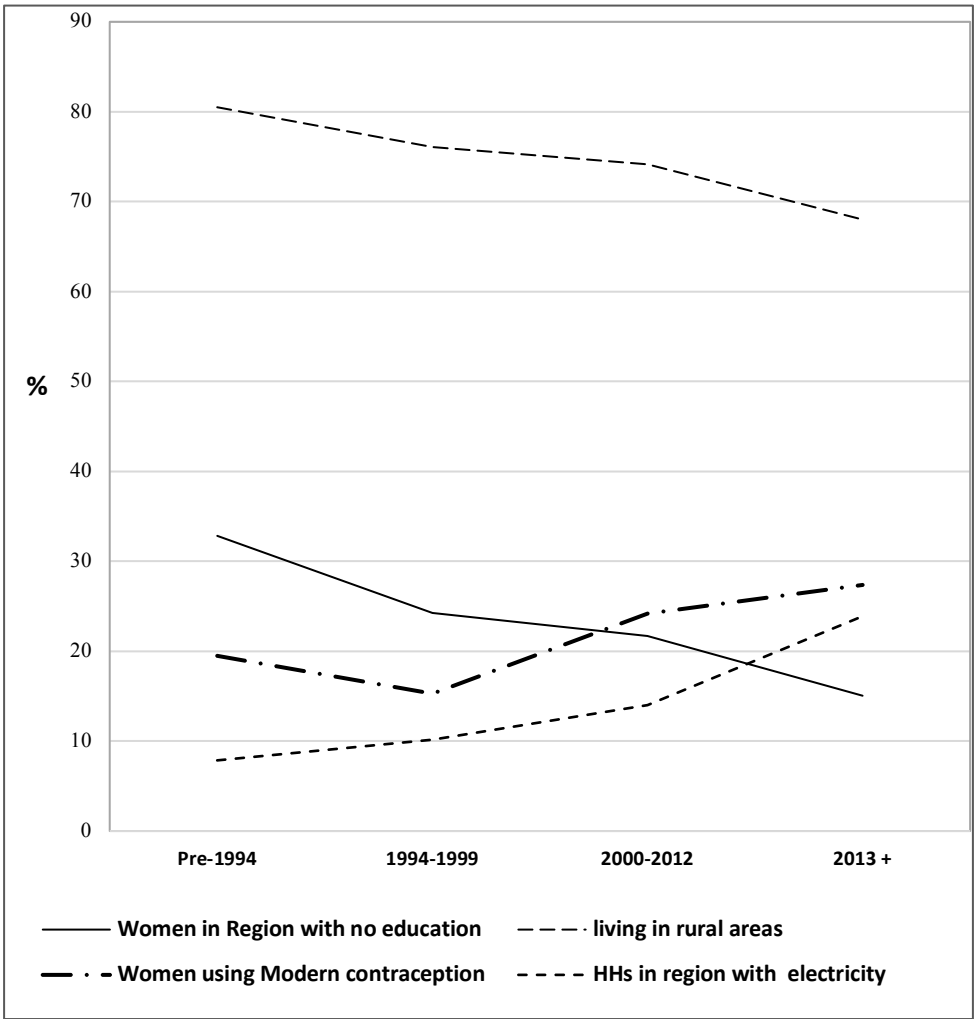


Figure 5. 3: Trends in Selected Developmental Indicators

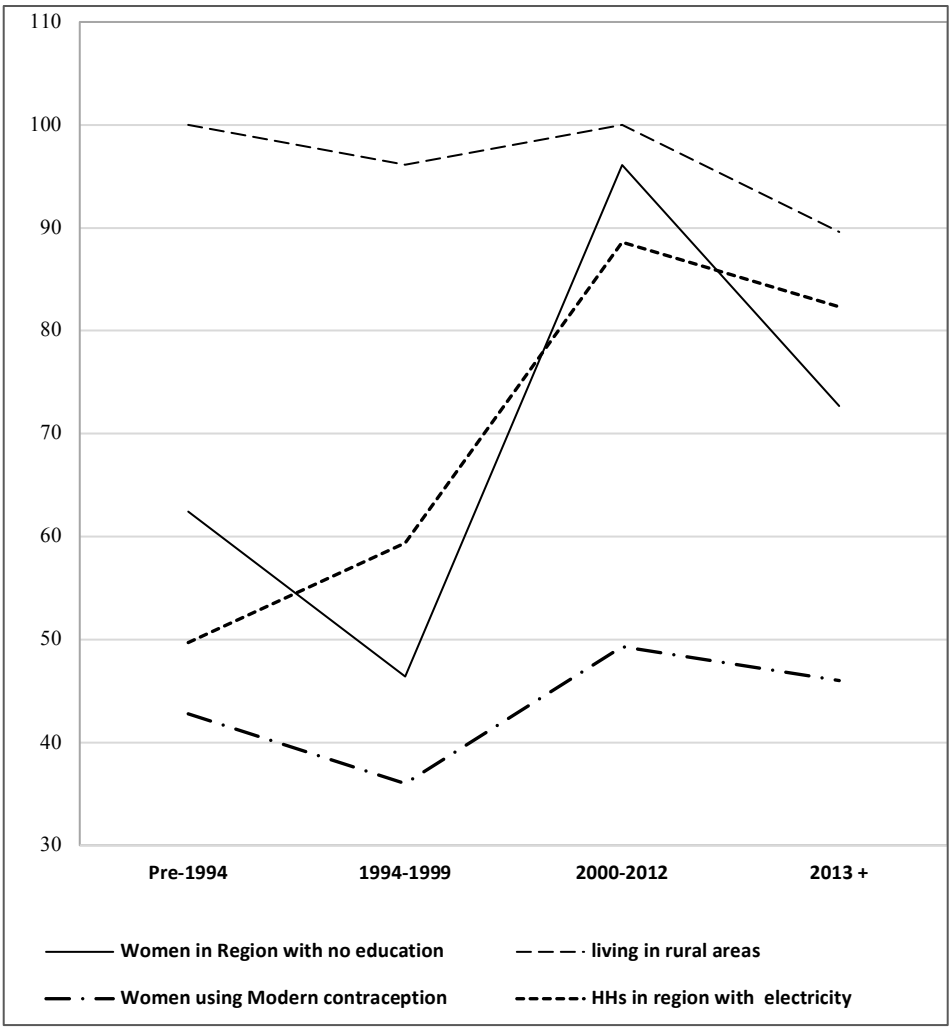


Figure 5. 4: Trends between the minimum and maximum on selected development indicators

5.2.1. Education

Education is widely held with high esteem as a key determinant to fertility change the world over. From a theoretical perspective, several causal channels have been emphasized. First, education raises a woman's permanent income through earnings, tilting her optimal fertility choices toward fewer offspring of higher quality. Second, under positive assortative mating, a woman's education is causally connected to her mate's education (Behrman & Rosenzweig, 2002), so that the effect of education on household permanent income is augmented through a multiplier effect.

Third, education may improve an individual's knowledge of, and ability to process information regarding, fertility options and healthy pregnancy behaviours. It also delays entry into marriage; a key determinant of fertility in society. By implication, maternal education determines the particular mindset and key decisions a woman makes with regards to the number as well as the quality of children she desire to raise. Maternal education exerts the most consistent influence on fertility in developing countries (Caldwell, 1979, 1986; Cochrane, et al., 1980), which persists even after controlling other factors in addition to being a proxy for a household's standard of living. In this study, we proxy education measure by using proportion of women with no education to indicate how much each region's education achievement stands with regards to the proportion non-educated.

Due to the fact that education has been depicted as an integral factor towards fertility variations and to be specific, the reduction of births for a long time now, it has also therefore provided interesting results with this study. From Table 5.1 and Figures 5.3 and 5.4, the range at which the regions exhibit variations in non-education is conspicuously interesting bearing in mind that these countries have only single population policies to guide their fertility implementation in each country. It is also blatantly worth faulting the fact that most studies attempting to address this phenomenon concern themselves with micro-scale country factors forgetting the intra-country disparities with focus always almost targeting the whole completion sphere of education up to the tertiary levels, thereby ignoring the regional variations of non-education proportion category.

Evidently from the table, substantial regional disparities in terms of the non-educated women exist. This is even complicated by the steady natural increase in the region bringing in more absolute numbers of women with no education even though the proportion is decreasing. Some regions exhibit up to beyond 90% non-education while other regions only hit below 1% of non-

education proportion amidst increase in actual numbers overtime. It therefore follows that if education has to still fall within the key drivers of fertility change, then definitely the discourse might flop as quite a huge proportion of the population within the numerous regions still live deficient of the same.

Trend information reveal there's evidently a general reduction on the proportion of women with no education over the period. This implies that as much as there are modest proportions taking responsibility into pursuing education, the skewness reveals an equally vast majority of regions still exhibiting high illiteracy levels. The erratic gap between the regional proportional achievements of education (Figure 5.4) is a key concern to address as well for the universal uptake of education.

5.2.2. Type of Place of Residence

In the analysis, the proportion living in rural areas form the huge chunk of the population across all the regions. This implies that most of the inhabited regions across the countries are dominantly rural. The urbanization level is used as a proxy measure for modernization and characterised with flawless services and advancement across board; including heightened quality of fertility decisions by women. The underlying causes of disparities in the population distribution by urbanization levels may have a more complex structure than previously imagined. There is no doubt that these factors not only play out in the contextual disparities in socio-economic development, and access to services that spur human survival (Opiyo, 2009) but their effect press equally hard on the fertility decisions and eventual prevailing population dynamics.

In a nutshell, within the boundaries of country or intra country studies, development status of a population differentiated by the type of place of residence characterizes class, access to vital services and information that can in turn create a change in the mind sets of the population. The

residence type dichotomy is a container concept that captures the socioeconomic and socio-cultural differentiation of the population rather than being an explanatory factor in itself. It is known that the East African populations are dominantly rural with some regions more cut out from the urbanization dividends than others.

From Table 5.1 and Figure 5.3, the mean urbanization level of these regions is on the incline as evidences show that the rural proportions are reducing over the periods. However, the change is quite marginal with some regions still static and purely 100% rural over the years of the surveys based on the age-old definition. With the digital age on our doors, one might desire to redefine the concept of urbanization with regards to information flows as well. However, under the common definition and with the prevailing urbanization figures, it would certainly be an enormous task therefore to transform the fertility parameter measures of these populations if significant proportions still languish within the mediaeval age lifestyles characterized with near zero modernization so far. This is bound to impact on the speed of progression as well as the level of evolution to warrant the availability of vital services aimed at improving the welfare of populations in general; women fertility decisions among them.

5.2.3. Modern Contraceptive Use

Within the practise of contraception, the underlying assumption is that when contraceptive use is high in a given population then it becomes an anchored behaviour that diffuses into a people through social constructs, thereby defining their attitudes towards practice and conscious utilization. Besides changes in population size, fertility dynamics concern is stronger on the role played by the technological innovations that come along with it. Contraception has withered the discerning voices especially from the religious flock.

It is an unmitigated speculative apprehension among the conservative societies that although contraception has the potential to accentuate hazards associated with promiscuity and even deformities among some births especially within populations where these countries belong too, its merits have not necessarily been complemented as well as any parallel policy shift in approaches for such acts on the prevention side. Actually, literature reveals a surge in the adoption and uptake even amongst the conservative populations themselves (Opiyo, 2009).

In general, contraception has been described as the means through which to control any fertility. Coale (1973) hypothesized that to reduce fertility of a population with all factors remaining constant, a technological means or an innovation of sorts must be availed to become a key prerequisite towards the intended changes assuming populations are generally rational in decision making towards their fertility. Bongaarts equally echoed consistent sentiments from his numerous studies.

The East African countries contraception prevalence is described as unique. In fact, from the Figure 5.3 and 5.4, the uptake of modern contraception by the general population could still be described as below average across regions. Evidence reveals considerably erratic variations and temporal inconsistencies over the years. Even though there are patches of evidence in contraception surge and adoption among the non-educated population, there hasn't indeed been much change in the uptake of modern contraception over the years in general as witnessed from the inconsistent fluctuations and graphical spikes across the periods.

The variation among these regional populations range from between zero uptake of contraception to just below 50%. This implies that some regions either totally lack the knowledge or the access to modern means of contraception through which to influence their fertility desires or even suspected to embark onto the non-significant approaches to fertility control mechanisms always

regarded as archaic. In addition, a shift in the structure of relationships, child bearing practices or changes in the relative importance of nuptiality or marriages has been pointed as weak the world over today. This has in no way reduced the copulations activities among populations.

Literature is replete with suggestions that the relative contribution of contraception technology to overall birth control surpassed many factors in importance in many developing countries due to their direct impact as compared to other factors, provided it's a conscious choice among couples. Worth noting too is that the uptake of family planning commodities being spread through social networks is therefore a proxy to diffusion of their utilization regardless of all the confounding factors thereby creating an effect on the fertility preference parameters and preference implementation too.

One other concern within the contraception dynamics is the drive behind its consumption. It is common knowledge that the prevalence is overestimated if the intention to usage is filtered. Quite a significant proportion is currently using contraception especially the condom use not to plan births but rather to prevent disease contamination with the current scourge of HIV-AIDS among other Sexually Transmitted Infections.

5.2.4. Level of Development

Bongaarts (1993) highlighted the role of socio-economic development in shaping up fertility pathways in any population. The human development index formed the axis variable encompassing a number of underlying composite development milestones. The index revealed positive effect on fertility preference and implementation track as well as the corresponding index of fertility preference implementation over time. In his conclusion, he stated that development level therefore has a highly significant reducing effect on wanted fertility of a population.

Contextual factors therefore will play a major role in determining the differentials in fertility rates, particularly in countries such as these where huge disparities in socio-economic development, distribution of natural resources, access to services and other social amenities exist between regions. Historically, excessive births have been noted among the inhabitants of the numerous parts of the Eastern African countries' regions. These patterns have been equally closely attributed to the low household development indices, high environmental risks as well as the cultural orientation (Ewbank, Henin, & Kekovole, 1986).

A number of variables have been in use to measure improvements in the living conditions in the household by the Demographic and Health Surveys (DHS). However, for purposes of this study, grid electricity connection in households provided a proxy by which the households' welfare and endowment ranking were pegged on. It is a platform on which to rate the advancement patterns of a population overtime in terms of meeting the basic factors of production for holistic advancement. Glaring variations abound, with most regions' grid connection statistics still way below average; slowly taking shape though (Figures 5.6 and 5.7). At the macro scale, the latest figures show that the prevailing household grid connection within the Eastern African countries stand at paltry 24% on average rising from just below 10% within the periods of survey rounds. Unfortunately, quite substantial proportion of regions have household without access to electricity. This dates back up to as recently as the 3 years from the period of the last survey in 2015 (Table 5.1).

In sum, the developmental indicators of educational progress, modernization measured through proportions living in rural, contraception prevalence as well as the household level of development are still regarded as less impressive overtime with very glaring gaps between the highest and the lowest levels. Based on the sample size that has been surveyed across the periods, it therefore implies that by extrapolating these figures to absolute numbers, quite a sizable proportion of up to

over 50% are still registering below average aggregates with regards to the advancement indicators in general. Undeniably, majority of the women population over the years are uneducated, living within the rural set up thereby utilizing contraception only but very minimally due to unmet need to contraception for the demand created among other factors; and further living within households characterised by very low developmental indices.

5.2.5. Sub-Regional Fertility Variations

The classical demographic transition theory provide cursory insights into the phenomenon. However, the reason for the fall in fertility of some countries than others even those within very close proximities and near equivalent policies to each other have been the subject of prolonged discussion among scholars with as much speculation and explanations (Ezeh & Dodoo, 2001; Freedman & Blacker, 2002; Kimani & K'oyugi, 2004).

The understanding of the correlation and the evolution of these parameter measures therefore should provide insightful understanding of the discourse. Among these is why the countries' actual fertility and their preferred fertility vary significantly i.e. the Total Fertility Rate and the desired fertility by women aged 15-49 years in East African countries are still distances apart even with heightened advocacy together with the myriad of subsidies over the years. Why? Do women have resources and full control of their fertility desires? Notable too is that these latest figures are the lowest compared to their corresponding figures compiled by the Demographic and Health Survey (DHS) reports in the previous years – implying slowing of parameter measures (TFR and Desired Fertility) in the subsequent years albeit at different absolute values.

Table 5. 2: National Variations between Wanted and Total Fertility Rate

Country	F_o	F_w	% Gap
Kenyan	3.9	3.6	8%
Rwanda	4.2	3.4	24%
Tanzania	5.4	4.9	10%
Uganda	6.2	4.8	29%

Tables 5.3 and 5.4 highlight the variations in the various fertility indicators within the East African sub national regions. There is indeed glaring country and even regional variations in the various parameters. However, notable from these tables as well are that even with single country policies, regional variations still exist with very large ranges between the highest and the lowest performances. A closer look reveals one prominent zone; - the proportion of women of reproductive age in need of no more children. The high variations within this category of women is important for policy however, the most glaring incentive is the fact that quite a sizable proportion are involved in such thinking.

Another case for example is reflecting on the Haiti experience where in Zanzibar Town west, contraception is low (14.5%) while the proportion wanting no more children is higher (19.7%) while in Mbeya the contraception is more than double that of Zanzibar West (45%) with higher proportion of women (37.2%) not wanting more births yet their fertility is still a birth higher. What is the salient actor? (Table 5.3) This is also reflected in a number of regions within the East African countries.

One could also explain this by pointing that regions with higher urbanization has the lowest proportion of women who want no more children since urbanised settings have characteristic younger women still with child bearing expectation compared to rural regions; with urbanization demands slowing number of children per woman. This could probably be the reason behind the figures compared i.e. Total Fertility Rate and Proportion wanting no more children. This trend is reflected in Nairobi in Kenya, Zanzibar Town West and Dar-es-Salaam in Tanzania, Kigali in Rwanda and Central region in Uganda (Tables 5.3 & 5.4).

By aggregates Kenyan and Rwandan regions are the two countries with high contraceptive prevalence doubling most regions of Tanzania and Uganda. Further, these countries equally have

the highest proportions of women in need of no more children. These two are correlated due to the fact that in situations where births are intentionally not needed, women tend to utilize birth control commodities in order to reduce their chances of unplanned pregnancies. Further, this trend is visible again within the other key fertility measurers of fertility. Regions with low prevalence in contraception have high wanted fertility, mean ideal number of children as well as total fertility rate.

In sum, as the wanted fertility goes down, the total fertility rate follows as the contraceptive prevalence and the corresponding proportion wanting no more children rise. The wanted fertility could hence act as proxy measure of the proportion of women who want no more children with one trend being the converse of the other. This implies that as wanted fertility falls on average, the proportion in need of no more children rise.

Table 5. 3: Fertility Indicators by Regions - Tanzania

Country & Year of survey	Region	Total Fertility rate 15-49 (F)	Total wanted Fertility rate (Fw)	Mean ideal number of children	(%) Married women using modern contraception	(%) Married Women who want no more Children
Tanzania 2015-16	Tabora	6.6	5.7	5.7	20.5	21.08%
	Shinyanga	6.1	5.2	5.1	21.3	23.94%
	Kigoma	6.9	6.2	5.7	17.5	19.94%
	Kilimanjaro	3.4	3.7	2.9	47.8	44.16%
	Tanga	4.4	4.2	4.1	29.6	27.82%
	Dodoma	5.2	4.7	4.5	41.2	25.65%
	Singida	6.2	4.9	5.1	38.4	22.76%
	Mbeya	4.5	4.3	3.9	45.0	37.21%
	Iringa	4.4	3.9	4.0	32.1	39.50%
	Rukwa	6.4	5.0	5.3	32.4	35.93%
	Kagera	5.5	5.1	4.8	38.7	24.83%
	Mwanza	6.0	4.9	5.0	18.4	25.29%
	Mara	6.7	5.1	5.6	29.1	31.66%
	Dar es Salaam	3.3	3.5	3.0	33.5	23.71%
	Pwani	4.6	5.1	4.3	39.1	16.74%
	Morogoro	4.9	4.5	4.6	46.9	24.42%
	Lindi	4.0	4.9	3.7	51.6	17.74%
	Mtwara	3.6	4.3	3.3	49.7	18.92%
	Ruvuma	4.4	4.0	3.7	50.8	22.22%
	Arusha	4.6	4.5	3.9	31.8	29.21%
	Manyara	6.0	5.1	4.7	27.5	25.99%
	Njombe	4.0	3.6	2.9	45.0	42.86%
	Simiyu	7.5	5.7	6.5	16.9	22.54%
	Geita	7.1	5.6	5.5	12.9	21.74%
	Katavi	6.9	5.8	6.1	18.1	26.61%
	Zanzibar North	6.5	6.4	5.4	14.2	17.70%
	Zanzibar South	5.7	5.8	5.5	28.9	14.93%
	Town West	3.6	5.0	3.5	14.5	19.70%
	Pemba North	7.2	7.9	6.7	11.0	16.67%
	Pemba South	6.6	7.7	5.7	6.8	20.56%

With these results, full implementation of these women's intentions is therefore a key delivery point to the fertility discourse across these countries. As clearly seen that some country regions have high intentions of non-child bearing intentions while the prevailing contraception prevalence lags. One would point at the weak links between the actions and the women intentions data by the execution of programs. It is indeed true that governments have been stuck with such figures of

women intentions to stop further child bearing overtime. However, the true actions needs to put clearly the extent by which such intentions are being met by the programs including any corresponding limitations to the course.

Table 5. 4: Fertility Indicator by Regions – Kenya, Uganda and Rwanda

Country & Year of survey	Region	Total Fertility rate 15-49 (F)	Total wanted Fertility rate (Fw)	Mean ideal number of children	(%) Married women on modern contraception	Married Women who want no more Children
Kenya 2014	Nairobi	2.7	3.0	2.3	58.3	36.71%
	Central	2.8	3.2	2.1	66.9	52.99%
	Coast	4.3	4.2	3.8	38.3	49.47%
	Eastern	3.4	3.1	2.5	63.9	52.99%
	Nyanza	4.3	3.4	3.0	53.9	45.41%
	Rift Valley	4.5	3.8	3.4	46.8	50.18%
	Western	4.7	3.7	3.2	56.9	54.08%
	North Eastern	6.4	9.3	6.4	3.4	7.10%
Rwanda 2014-15	Kigali	3.6	3.2	2.7	49.7	42.03%
	South	4.0	3.2	3.0	48.2	51.24%
	West	4.6	3.5	3.1	41.2	45.37%
	North	3.7	3.5	2.8	55.0	49.50%
	East	4.6	3.4	3.5	46.5	45.48%
Uganda 2011	Central	5.1	4.6	4.1	33.2	35.06%
	Eastern	7.3	5.0	5.0	25.0	42.06%
	Western	6.3	4.7	4.8	26.0	32.09%
	Northern	6.5	5.2	5.0	16.9	41.08%

5.3. Factors Associated with Regional Fertility Preference.

Dominant economic interpretations of fertility behaviour posit that the main drivers acting to reduce fertility are structural socioeconomic transformations in a population. These subsequently lead to the increase in the expected costs for as well as diminishing benefits accrued from bearing many children (Muhoza, Broekhuis, & Hooimeijer, 2014). In a modernizing society, there appears to be new forms of investment and insurance replacing the initial conventional function of having a large number of children that erode the expected benefits (Caldwell C, Orubuloye, & Caldwell

P, 1992). The monetization of the economy has increased the awareness of the costs of raising children as a function of food, clothes, health, and education among others including the always non-costed time spend spent on attending to their demands. This also creates increasing employment prospects outside the home for women.

Several measures have been in use over the years by now. The most common measure used across the world is the aggregated total fertility rate together with the complementary measures as wanted or desired fertility rates. These measures though closely tied to each other are unique in their own ways. For example the desired or mean ideal fertility are aimed at measuring the productive norms in a culture thereby providing a quantitative basis for assessing variation in desired and actual fertility (Muhoza et al., 2014). The wanted fertility on the other hand enables the calculation of excess fertility through the comparison of desired and actual fertility.

On the flip side, a criticism emerge regarding these measures. First, it is believed that they reflect unformed, ephemeral views that change during the life course, and the effects of child mortality risks are not explicitly taken into account in the questions. Respondents presumably do not include possible child deaths in their ideal family size and may need to bear additional children in order to achieve that size. Thus, the total number of births in a marriage may exceed the desired family size without any child necessarily being unwanted. This is definitely misleading hence might call for factoring the mortality effect into the subsequent models.

The second criticism is that there could be a rationalization of the desired family size to the actual family size. Despite the likelihood that some rationalization occurs, many respondents report ideal sizes that are lower or higher than their actual number of surviving children and in spite of their persistent importance in informing demographic debates, results of the ideal number of children, as an indicator of the desired fertility, have been faulted regarding their validity and reliability.

This has been even more glaring particularly in the African context. However, no measure has been posed to date that has proved to be more robust than these either. This study therefore utilized the wanted fertility and the mean ideal fertility as the dependent variables for its two models.

From the previous discussion above and together with the developmental and cultural differentials of fertility, it is obvious that the selected Eastern African countries population have varied attitudes toward fertility preference and related decisions. This study hence reveal quite a turbulent period in the history of births in these countries. It is also a period characterized by significantly remarkable declines in fertility across most countries of the Eastern Africa. Although there are variations in pace and magnitude among categories, differences are more pronounced among regions.

Zooming further into the individual country regions, there are equally evidences of differing aspirations regarding family size. The irony with this is the fact that with the obtrusive regional disparities in aspirations on fertility preference, each country still seem to be locked on a single policy platform to tackle fertility outcomes. Switching tempo to the linear regression analysis being applied here, the study selected a number of independent variables corresponding to particular thematic areas believed to be fundamental in fertility decision making and outcomes. The variable themes selected touched on the socio economic, cultural and developmental, modernization as well as technological advancement areas believed to be instrumental in shaping up the population of the region. It takes into consideration, both the socioeconomic and sociocultural factors in the course of studying fertility behaviour; and that relations that hold for one community in a country might be no less important in another.

Firstly, the socio-economic variable education was included through the proportion non-educated, culture then got represented through religion by the proportion of the population Muslim -

commonly regarded as one of the most conservative cultures as modernization got represented by the urbanization level through the proportion of the population still rural as well as the proportion of households having grid electricity. The level of technological advancement was represented by the modern contraception prevalence. The age of fertility transition was characterised by the different Demographic and Health Survey (DHS) datasets gathered overtime from country to country. This study aimed to establish among selected, the factors that significantly influence the wanted fertility as well as the mean ideal family size. The first level of analysis involved pooled data utilising the General Linear Model (GLM) for the two dependent variables run separately.

5.3.1 Factors associated with differentials in Mean Ideal Family Size

This study ran an analysis with the known explanatory variable discussed above to assess their effect on the regional Mean Ideal number of children. The model was run with the mean ideal number of children for all women as the dependent variable with all the above acting as predictors. From the model, it exhibits interesting results. All the dependent variables were significant except the proportion of population living in rural areas. Controlling for other factors, the mean ideal family size was significantly different within the period (2003-2015) compared to the period before 1994.

This implies that there was no significant difference in the mean ideal family size within regions before 2003. As expected regions with lower fertility have lower average family size. The key factors that may explain variations in the mean ideal family size between regions were proportion of women with no education, contraception prevalence, religion and level of development proxied by the proportion of households with access to electricity at 95% level of significance (Table 5.6) Scholars however agree that ideal fertility is usually a rationalized decision quite prone to hypothetical reasoning based on the prevailing circumstances unlike the wanted fertility or total

fertility rate hence the type of place of residence become immaterial and could certainly be insignificant in models. Bongaarts (1990) recognised that there are however two potential sources of bias that come with the ideal family size i.e. non-response and rationalization. This occurs predominantly among women from conservative societies and the fraction of women who report a non-numeric response for instance leaving their fate of child bearing to God is substantially common lowering the data credibility.

Table 5. 5: Regression Results on the Mean Ideal number of children for all women as the dependent Variable (pooled data)

	Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test		
				Lower	Upper	Wald Chi-Square	df	Sig.
	(Intercept)	4.932	.3966	4.155	5.709	154.62	1	.000
Period	[2003-2015] - Post-Stall	.402	.1443	.119	.685	7.75	1	.005
	[1995-2002] - During Fertility stall	.186	.1180	-.045	.418	2.49	1	.114
	[1988-1994] - Pre-stall	0[a]	-	-	-	-	-	-
Stage in Fertility Transition	Advanced (TFR <3)	-1.493	.3504	-2.180	-.806	18.15	1	.000
	Mid Transition (TFR range 3-5.9)	-1.268	.1188	-1.501	-1.035	113.90	1	.000
	Pre-transition (TFR 6+)	0[a]	-	-	-	-	-	-
Education Attainment	[% Women with education - none]	.041	.0046	.032	.050	79.29	1	.000
Urbanization Level	[% Population living in rural areas]	-.001	.0037	-.008	.006	.04	1	.839
Diffusion of Family Planning	[% Married women using modern contraceptive methods]	-.023	.0055	-.034	-.012	17.38	1	.000
Influence of Religion	[% Population who are Muslims]	.007	.0016	.003	.010	16.67	1	.000
Proxy Development Indicator	[% Households with electricity]	-.010	.0053	-.021	5.75	3.79	1	.050
	(Scale)	.304[b]	.0339	.245	.379	-	-	-

Dependent Variable: Mean ideal number of children for all women a. Set to zero because this parameter is redundant. b. Maximum likelihood estimate. @ Number of observations =47- Kenya 2014 (8); Rwanda (5), Tanzania 2014-15(30); Uganda 2011 (4) & Number of observations N= 43- Kenya 2008-09(8); Rwanda (5), Tanzania 2010(26); Uganda 2011(4)

The stated ideal number of children can also be subject of rationalization bias - another data quality threat characterised by women giving ideal family sizes that correspond to her existing number of living children. According to Bongaarts, rationalization and non-response are typically higher

among older women who have been married overtime having large number of living children. The model has hence revealed that the type of place of residence might not necessarily be associated with the ideal number of children a woman desire to bring forth.

5.3.2. Factors associated with Wanted Fertility Rate

Table 5.7 presents the results of analysis using wanted fertility rate as the dependent variable. From the results, the stage of the region in transition, urbanization level, diffusion of family planning, and the influence in religion were the only factors found to significantly affect the wanted fertility across the region. With the pre-transition stage (6+births) as the reference category those regions in the mid (3 to 5.9 births) or advanced (below 3 births) levels of transition have negative effect to the wanted fertility. It is therefore expected that with the advancement in the transition ladder, the wanted fertility will decrease.

Further living in rural areas and being Muslim both had likely positive effects on the wanted fertility. This meant that being Muslim in rural areas implied higher wanted fertility than otherwise. Subsequently, the regional modern contraceptive prevalence exhibited negative effects on the wanted fertility. This implies that regions with high diffusion of family planning were more likely to experience reduced wanted fertility than regions with low diffusion of family planning. Literature is replete with the contraception's tendency to reduce fertility in general. All these tests were carried out at 95% confidence level (Table 5.7).

Controlling for other factors (Table 5.7), the survey period had no significant influence on the wanted fertility among women of the East African region. In fact with the pre-stall survey as the reference category, both the post stall and the stalling survey periods exhibited no significant effects on wanted fertility. Education and regional development level also showed no significant effect on the wanted fertility. Apparently, the period of study, the household level of development

measured through a proxy of proportion of households with access to grid electricity connection as well as regional non-education proportions were also found to be insignificant factors towards wanted fertility at the said confidence level.

The pooled results show that the different measures of fertility preference may display different results. Clearly there is higher normality in Mean ideal number of children compared to the wanted fertility. Studies have always though pointed to the fact that wanted fertility habitually pose challenges, and even more pronounced in conservative populations subjecting women to the point of non-response or rationalization since fertility decisions are left to the powers that be among others. Further on this, even the timing of particular child births could render some births to be classified as unwanted while it is the contrary.

Table 5. 6: Regression Results on Regional Total Wanted Fertility Rate (Fw) for all women as the Dependent Variable (pooled data)

				95% Wald Confidence Interval		Hypothesis Test		
	Parameter	B	Std. Error	Lower	Upper	Wald Chi-Square	df	Sig.
	(Intercept)	5.237	.3750	4.503	5.972	195.10	1	.000
Period	[2003-2015] - Post-Stall	.148	.1364	-.120	.415	1.17	1	.279
	[1995-2002] - During Fertility stall	.013	.1115	-.205	.232	.014	1	.905
	[1988-1994] - Pre-stall	0[a]	-	-	-	-	-	-
Stage in Fertility Transition	Advanced (TFR <3)	-1.02	.3313	-1.671	-.373	9.518	1	.002
	Mid Transition (TFR range 3-5.9)	-1.11	.1123	-1.331	-.890	97.735	1	.000
	Pre-transition (TFR 6+)	0[a]	-	-	-	-	-	-
Education Attainment	[% Women with education none]	.001	.0044	-.007	.010	.072	1	.789
Urbanization Level	[% Population living in rural areas]	.006	.0035	.000	.013	3.305	1	.054
Diffusion of Family Planning	[% Women using modern contraceptive methods]	-.030	.0052	-.040	-.020	32.66	1	.000
Influence of Religion	[% Population who are Muslims]	.018	.0015	.015	.021	138.65	1	.000
Proxy Development Indicator	[% Households with electricity]	-.004	.0050	-.013	.006	.514	1	.473
	(Scale)	.272[b]	.0303	.219	.338	-	-	-

Dependent Variable: Total wanted fertility rate a. Set to zero because this parameter is redundant. b. maximum likelihood estimate. @ Number of observations =47- Kenya 2014 (8); Rwanda (5), Tanzania 2014-15(30); Uganda 2011 (4) & Number of observations N= 43- Kenya 2008-09(8); Rwanda (5), Tanzania 2010(26); Uganda 2011(4)

5.3.3. Factors associated with regional variations in fertility preference controlling for period

A further analysis to assess the factors contributing to the regional variations in fertility preference. Using data for the most recent period and data for the period 2008-2011 for each country, GLIM was run using same variables as in Table 5.6 and 5.7 but omitting stage in fertility transition. The effect of proportion living in rural areas is rather weak and fluctuates. Regions where uptake of contraception is higher have lower family size preference as expected. The observed differentials in fertility preference by region can therefore be said to be associated with penetration of contraceptive use, and level of education of women in the region. Except for the period 2008-2011 and for only the wanted fertility rate, education has effect on regional differences in fertility preference. Regions with higher proportion of women with no education tend to have higher fertility preferences on average.

With the intercept referring to the average when all the other factors are zero and controlling for other factors, regions with higher proportion of women with no education tend to have high average family size preference whereas those regions with high prevalence of modern contraception as dominantly evident in Rwanda tend exhibit characteristics of lower desired family sizes. Other factors appear to hesitate but it is possible that they may be correlated with the two most consistent factors. It is only regions in Rwanda that have consistently lower fertility preferences across the periods.

Table 5.8 answer the questions as to whether factors influencing fertility preference depend on period of measure. This is in response to the question as to whether the factors influencing regional differences are consistent throughout the different periods the regression results were run. Results reveal that time period of measure is significantly of essence when modelling the factors to fertility

preference. Looking at the different time periods with Uganda used as a reference category over the periods, the coefficient significantly changes (Table 5.8)

Further on the results in Table 5.8. The effect of education in sub regional variation declines for both ideal family size and wanted fertility rate. The differences between regions located in Uganda and those in Kenya diminish once education is accounted for including the rural residence as well as the proportion using modern contraceptives. The differences between regions in Rwanda and Uganda remain unchanged even with the accounting for the key factors implying that there exists other factors in Rwanda that cause differences beyond those included in regression. Except for wanted fertility rate in 2011-2015, differences in fertility preference between regions in Tanzania and Uganda disappear once all the factors included in the regression are controlled.

Table 5. 7: Regression results on mean ideal family size and wanted total fertility controlling for period

	Mean Ideal Family Size	Total Wanted Fertility Rate	Mean Ideal Family Size	Total Wanted Fertility Rate
	2011-2015@	2011-2015@	2008-2011&	2008-2011&
Parameter	B	B	B	B
Intercept	5.911***	4.499***	6.709***	4.871***
Percent of education none	.048***	0.015*	.060**	0.006
Percent in rural areas	-.006	0.013*	-.016*	0.012
Modern CPR	-.058***	-0.049***	-.055***	-0.065***
Percent Muslim	.001	0.008***	-.006	0.009***
Percent HHs with electricity	-.020*	-0.003	-.028*	0.005
[Kenya]	.006	0.022	-.489	-0.526*
[Rwanda]	-.878***	-0.799***	-1.398***	-1.069***
[Tanzania]	.301	0.468*	.029	0.319
[Uganda]	Ref	Ref	Ref	Ref
(Scale)	0.248	0.194	0.254	0.198

*Means p-value less 0.1 but greater than 0.05; ** p value < 0.05; *** p value <0.01 @ Number of observations =47- Kenya 2014 (8); Rwanda (5), Tanzania 2014-15(30); Uganda 2011 (4) & Number of observations N= 43- Kenya 2008-09(8); Rwanda (5), Tanzania 2010(26); Uganda 2011(4)

These countries are undergoing modest transitions at varied levels, with factors associated with fertility preference differing by the type of preference measurement in question. If the mean ideal family size is utilised in the model, then the regional variations hinge on the period of the study,

stage in fertility transitions, proportion of women with no education, proportion of women using modern contraception, proportion Muslim and finally the proportion of the population living in households with grid electricity connection.

Consequently, the wanted fertility rate is similarly determined by the same factors including the levels of urbanization of a region with the only exceptions being the proportion of women with no education within regions, period of transition as well as the household development level, measured by the proportion of households with grid electricity. Further, while controlling for the period of transition upon modelling the factors with the mean ideal number of children on the one side and the wanted fertility on the other side as both dependent variables, revealed are that factors leaning towards the wanted fertility and the mean ideal number of children within the sub national units of these countries are not necessarily similar or even the same in significance.

Key conclusion from these regression results therefore points that differences in fertility preference between regions in Uganda, Tanzania and Kenya may be due to differences in proportion of women with no education, use of modern contraception in the region, percent Muslims and to some extent the level of development in the region. However, Rwanda regions differences may be due other additional factors beyond those included in the regression models but somehow points to the extent of family planning program effort (Figure 2.7).

5.4. Trends and Variations in Regional Fertility Preference Implementation

Preliminary analysis of the extent women have been able to implement their preferences reveals glaring results. This section attempts to subsequently provide explanations to the prevalent trends overtime. The key measures under review by this study were the wanted fertility, unwanted fertility together with the prevailing corresponding total fertility rates associated with the periods

of computation. Of concern too are the variations that come along with each of them within the different stages of transition.

Primarily evident is the enormous discrepancies existing across the various dependent variables acting as the fertility preference measurers in this study i.e. the wanted and the mean ideal family size's driving factors. A further gap coupled with variations overtime in the wanted and unwanted fertility across these countries together with their respective regions obviously cause some magnitude of disquiet especially among policy frameworks.

By lowering the unwanted births, the prevailing fertility obviously approach convergence to wanted fertility. Currently, the total fertility rate (TFR) versus their corresponding country wanted fertility are significantly varying (Measure, 2014). Coupled with this is lower average contraceptive prevalence among the general populations pointing at steep levels of unmet need to contraception. The one glaring question to answer is therefore whether with all factors remaining constant, the desired fertility is determined by any slight chance, the direction of the prevailing actual fertility or the vice versa.

With focus strictly on the prevailing trends in the fertility preference and indices of implementation, interesting comprehensions emerge. Since, fertility is a fairly complex phenomenon that results from a series of repeated physical and biological insults to a population, we are therefore indebted to echo in simplistic terms how the significant factors under this study have been able to influence the state of the existing transition based on the faculties of the women's ability to consciously implement their fertility desires over these periods.

5.5. Variations in the Unwanted Fertility and the Wanted Fertility

The Figures 5.5 and 5.6 below highlights the general findings in the gaps existing in the prevailing trends between the total fertility rate, unwanted fertility rate and the wanted fertility rate among

the countries of Eastern Africa under study as measurers of fertility preference. First results from the scatter plot reveal very erratic trend curves that give no clear meaning to the analysis. Nonetheless, the results are useful with attempts to deduce their respective logarithmic versions of the line equations. The log of these line equations therefore helps to provide a deeper understanding to the individual country curves as well as the mean curves overtime.

This is in tandem with preceding previous studies revealing that in a non-closed population with all variables acting within multifactorial pathways to influence births as well as others beyond the scope of this study, a population change does not necessarily follow a straight line. These straight-line equations therefore are hypothetical attempts to provide explanations and give reasonable meaning to the changes that have occurred in these populations overtime. Results of the deduced straight line equations from the respective country curves reveal a general drop in the mean of both the wanted fertility (Figure 5.6) and the unwanted fertility (Figure 5.5).

With the much anticipated trend that these countries' wanted and unwanted fertility measures faced eminent declines, Tanzania and Uganda's unwanted fertility actually rose over the years as Kenya and Rwanda conversely register modest reductions in their unwanted fertility within the same periods. Precisely, Kenya has actually registered a little sharper decline in unwanted fertility between 1989 and 2014 (59.1%) compared to Rwanda's 45.0% between 1992 and 2014.

The wanted and the unwanted fertility merged together form the prevailing Total Fertility Rate. It is therefore plausible to emphasise that every total fertility rate experienced within these countries is a function of composite fertility; one that is wanted and another component that is unwanted. This is projected to be due to either the unmet need to contraception or subsequent low implementation indices as well as the low contraception prevalence. The current fertility therefore is a packed with quite a significant load of unwanted fertility at every inch of it.

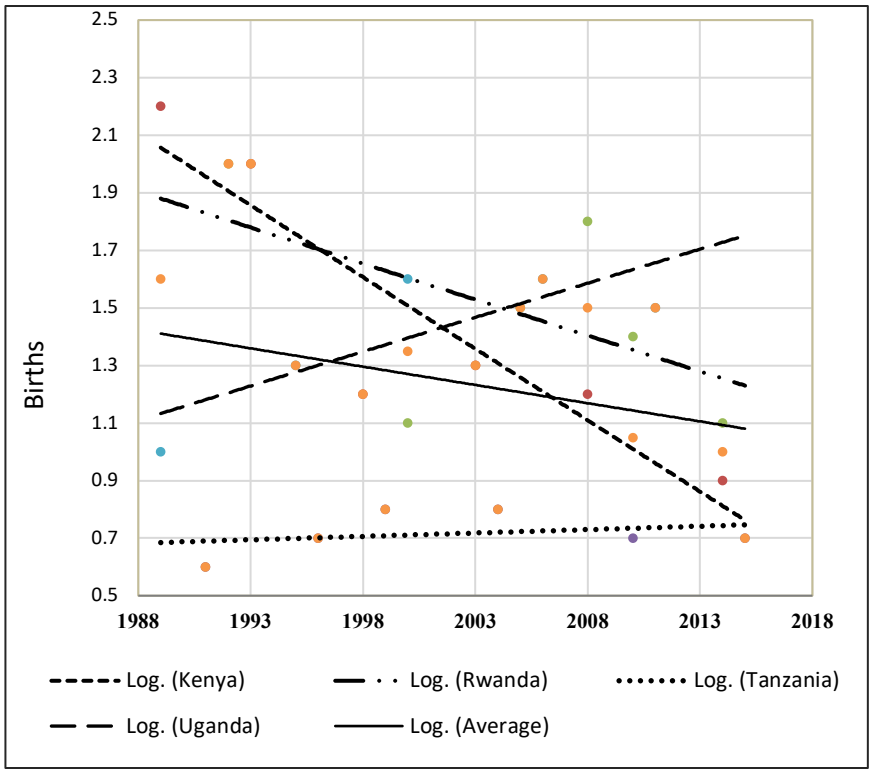


Figure 5. 5: Unwanted Fertility Trend (Fu)

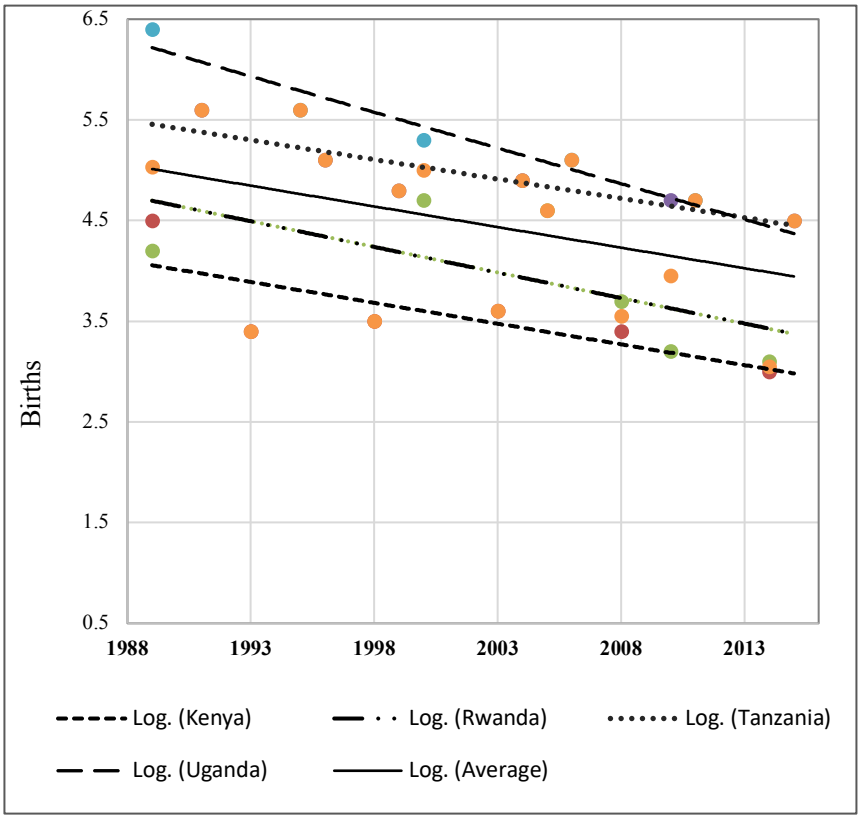


Figure 5. 6: Wanted Fertility Trend (F_w)

Subsequently, further interpretations of these graphs imply that Rwanda recorded the highest change in the desire to have fewer births compared to Kenya. Uganda, though still at the pre-transition stage of fertility decline registered the overall highest change in the desire to reduce its fertility from 6.2 to 4.8 births, conceivably implying a huge deficit characteristic of unimplemented fertility in its population (Table 5.2). As much as this might not be the only concern, Uganda has persistently remained higher on average in its fertility compared to the other countries under this study.

However, Tanzania with its downward trend enumerated the latest record highest wanted fertility on average compared to the rest of the countries at 4.9 births. With the known correlation between the wanted and prevailing fertility, quite a non-tenuous understanding is deemed fit to extrapolate the next trajectory the Tanzanian fertility is bound to take in the coming years. From the unknown to the known, one fact stands out. This is the element that with the high wanted fertility among the Tanzanian women, a slowed progress of fertility decline is anticipated by projection. In fact some regions might as well contribute to this more than others, especially the dominantly agricultural regions exhibiting surge in wanted fertility over the years.

In spite of the immense advocacy to reduce unwanted child bearing by these country policies in general, results of unwanted births in Tanzania and Ugandan remain provocative to discourses. Both of the countries witnessed inclines in the number of unwanted births over the years. It therefore leaves the contemplations to point at the enlightenment of the population against merits scored by the unwanted child bearing on the one part as well as the extent of implementation on the other part, together with the availability of the means under which to achieve the intended fertility of preference.

Uganda has actually made up to 50% increase in the proportion of unwanted births with Tanzanian registering only 16.7% reversal in its quest to reduce or rather eradicate in totality the unwanted child bearing (Table 5.2). Could the case of Uganda be a sign that women have begun to consciously question about their fertility as opposed to the past? In fact, one could generally point at the maturation of the populations to consciously interrogate and analyse their births as either wanted or not at the time of birth.

Further details of analysis provide quite contrasting results as well from the prevailing general trends in fertility declines. A typical case in this study domain is that the regional data sets reveal quite substantial proportion of regions registering inclines in their TFR and even the unwanted fertility. This is dominant across all countries however its prominence is more pronounced and unmatched in Tanzania. In fact, first line of analysis reveal that about 70% of the regions in Tanzania are dominantly rural with very high proportions of women of up to over 80% possessing no reasonable education to fend for themselves within the modern economy.

Going by the gaps in these parameter measures, it is worrying that quite substantial gaps between the wanted and the prevailing total fertility rate exist even with the latest Demographic and Health Survey (DHS) figures. This implies that the total number of children born as unwanted births are by and large enormous. Uganda has the highest unwanted fertility at 29% while Kenya has the least unwanted fertility at standing 8%. Rwanda and Tanzania scored 24% and 10% of their unwanted births respectively in as far as the unwanted fertility gap in concerned (Table 5.2). In general, as much as modest progress is evident, the region still has to fast track their course of fertility progress.

What could be the contributor to these kinds of scenarios? Going by the significant variables from the earlier regression models, a number of observations additionally emerged. It is believed that

populations' aggregate level of advancement dictates fertility as well as its overall welfare. Firstly, electricity connection in households as a proxy measure of household development level is equally low with prevailing figures revealing means of 12%, 33%, 27% and 34% for Uganda, Tanzania, Rwanda and Kenya respectively. This clearly reveals very low household development indices to the extent that only one third of the population actually poses grid connection; of which over 80% proportion of the whole developed households skewed towards urban residents.

Religion too determines a people culture. As a proxy, the study assessed cultural behaviour of these populations by delineating the proportion that was Muslim – a sub population group known to be totally against the Malthusian laws to fertility. Data reveals that most of the regions of these countries are dominantly secular and non-Muslim in culture with another sizable conservative populations. This is complicated further by the fact that quite a significant proportion of the population lack requisite advancement, precisely in education. Islam, being not only a religion but also a people's way of life are characterized by history of strict adherence to faith including child bearing practices.

Due to its dogmatic autonomy on its adherents' behaviour and by diffusion therefore, it is still expected to exhibit an unmatched influence to the population within it as well as its sphere of influence to the proximate non-Muslim population; thanks to the high proportion of non-advancement. This proportion therefore is expected to have a significant detrimental effect with regards to child bearing practices besides an overlap thereby cross pollinating other non-Muslim areas around them with regards to the uptake of birth control technologies as has been

hypothesized and proved overtime. Being Muslim therefore contravenes the expected trajectory associated with contraception use.[1]

The proportion of population using modern contraception across most regions are below 50% with quite a significant proportion of regions' populations dropping to as low as 2% in uptake (Table 5.1). The plain fact therefore could also point at the persistent unmet need to contraception over the years. The latest Demographic and Health Survey (DHS) reports by country imply a significantly low consumption of modern contraception and related technologies across the majority of regions except for the dominantly urban regions. This points on the one part; the extent of the availability of the contraception to the rural folks, the knowledge of the existence of such on the other part as well as the efforts by which the programs operate to ensure uptake of ideas with regards to birth control technologies adoption and usage. A continued low consumption of services therefore will have a devastating effect on the fertility transition of such regions thereby reducing the net effect of the change at the national and regional level as well.

Kenya and Uganda have the lowest and the highest total fertility rate respectively with a gap of beyond 2 births, while Rwanda and Tanzania registered the lowest and highest desired fertility respectively. In comparing the inter and intra country specific measures, there is a substantial variation between the TFR and the desired fertility in Uganda compared to the other countries. Uganda's parameter measure gap truly stands at 1.4 births followed by Rwanda at 0.8. The Kenyan and Tanzanian gaps are the lowest at 0.3 and 0.5 births respectively (Fig 5.7). This disparity implies that a high number of unintended births still exist among women in each of the countries in the region.

[1] No credible source of information on religion could be gathered from the Tanzanian population as the government continuously discourage data collection on religion-based data for the sake of harmony and peaceful coexistence of its population; religion being an emotive issue.

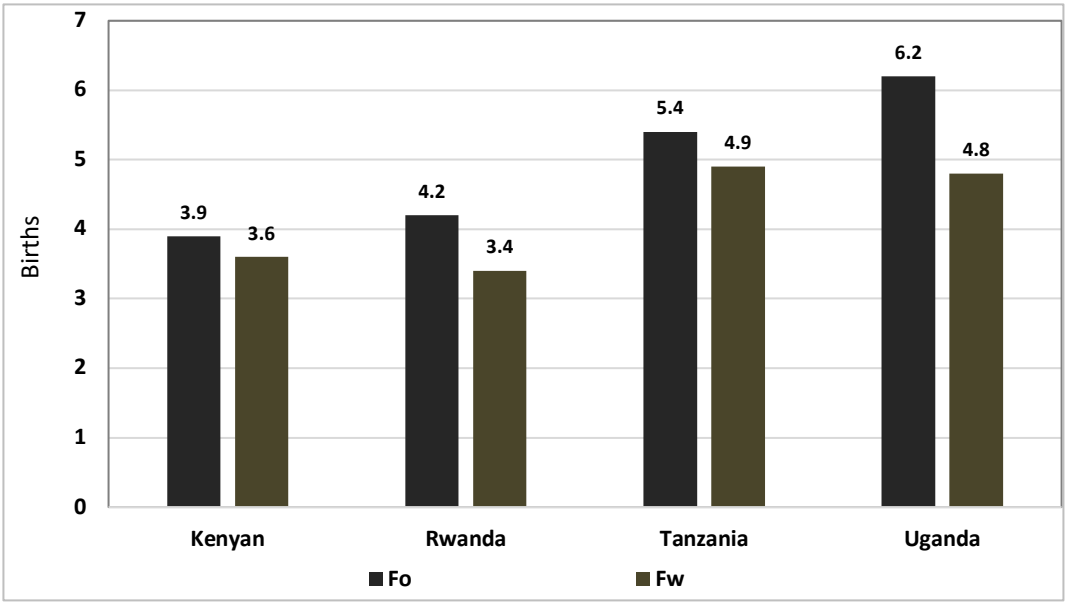


Figure 5. 7 : Total Fertility and Wanted Fertility

Unwanted fertility has been regarded as a sign of unimplemented fertility index ($1-I_p$). The consequence of bearing an unwanted child is expected to be either a net result of the unmet need to contraception with an intention of either limiting or spacing of births appropriately or lack of requisite knowledge of the existence or usage of the available contraceptives among others not in the scope of this study. The fertility control is regarded as a conscious endeavour where women have weighed the cost of fertility regulation as well as the cost of bearing an unwanted child.

This give rise to the balancing act of which a decision is made, to actually avoid the impending birth either totally or postponing the birth after all until the opportune time. The unwanted fertility arise when women's wanted fertility fail to match the prevailing fertility, implying that with the intention to control the number of births by women, the robust means through which to achieve the fertility of desire is unexploited.

The unmet need to contraception on the other hand arise primarily as a result of the unavailability of a requisite contraception technology through which the women are to apply in order to achieve their wanted fertility. Assuming that all women are conscious about the usage of contraception,

and that their demand for the same is satisfied, then it implies that the total proportion of contraceptive satisfaction falls within the 100% prevalence mark as each one of them have an obvious chance to get enough contraceptives at will.

The unwanted fertility, unmet need to contraception, contraceptive prevalence and the satisfaction of demand correlate in an either direct or inverse scale to each other. The low prevalence has a net reciprocal effect to the unmet need to contraception. Subsequently, the higher the unmet need to contraception the higher the chance of bearing an unwanted birth and the lower the proportion of demand satisfied for the respective population planning children bearing.

In sum all the countries are on a downward trend with regards to their wanted fertility while only Uganda and Tanzania is revealing an incline in the unwanted fertility. This drop in the aggregate measures implies a high proportional change in attitude of the sub national populations with the intention to reduce their family sizes. However, particular sub national regions especially in Tanzania still register some inclines in the wanted fertility. Although the focus to reduction is apparent in the course of fast tracking their course of fertility transitions, the inter countries' wanted fertility are still widely varied apart.

The latest figures show that Tanzania and Uganda lead in their wanted fertility while Rwanda and Kenya have the lowest of the same respectively. A revelation on the diverse nature of attitudes among the populations with regards to child bearing practices thereby further pointing at the state and levels of unmet need to contraception across the regions. As transitions continue, so are the changes in the fertility preference parameter measurers.

A closer look at the gradient of change trends reveal that the Tanzanian wanted fertility though on a negative gradient just like the others, have been surpassed by Uganda in the recent past. Among the countries with higher values, Uganda actually registered the sharpest decline compared to the

Tanzania (Figure 6.2). Kenya and Rwanda wanted fertility trend are diving in an almost parallel trend to each other with the former moving within higher values to the latter.

The reversal of the Tanzanian and Ugandan unwanted fertility trend over the years should be a course of concern to the policy implementers and demographers as well. Even though on an incline, Tanzanian unwanted fertility is still the lowest of all time across the periods. Could this be a true state or an artefact of maturation to the extent of identifying patches of their unwanted births? Could this also point at the extent of unmet need to contraception?

Indeed, the fact that some countries registered resurgence in the unwanted fertility brings a lot of worry to the demographic community suspected to either point at the unmet need to contraception with the populations' continuous survival on unsatisfied demand over the years; bearing in mind that their contraception prevalence is the lowest too or the population has consciously began thinking about each of their births as either well timed or out rightly unwanted.

It is the fact that the population have since reasoned out to realize that the number of births they actually bear over the years are indeed more than they want hence the surge in the unwanted fertility dismissing the cultural myths about rationalising births due to calamities that might befall such a birth. A fact that rationalization of births women had were actually wanted all through until recently when they started regarding these births as undeniably unwanted.

5.6. General Interpretation

The region's aggregated average wanted and unwanted fertility have declined overtime as reflected by the variations over the periods of measure. However, there are indeed some regions that are actually having increases in their unwanted and wanted fertility as well. The mixed trends by regions implies that countries wanted and unwanted fertility aspirations are still varied and far wide apart. It is worth noting that some countries and sub national units have performed better than

others with regard to these indicators. Precisely, the rate of change for countries differ with the levels of fertility transition. Uganda with the highest fertility has a recently revealed a steep decline in its wanted fertility compared to the others with lower fertility as the corresponding unwanted births rise. This could be a reflection of the state of conscience amongst the population pointing at the state of desperation amid calls for the measures to expedite reduction to the very least among other things. It also confirms Bongaarts proof that the beginning of reduction in fertility is always steep compared to the further course.

One other notable discourse from the analysis results is that with low prevalence in contraception especially when the wanted fertility is on a decline, the unwanted fertility is likely to take a converse direction since the means to consciously control it is strained. The trend line therefore being negative and positive in gradients respectively cross each other due to the converse nature of the preference measures to each other. On the contrary, this trend might not apply to situations where contraception prevalence is high since the unwanted births will be suppressed by the high uptake of the said contraception assuming it is of high priority to the targeted population. This hence will provide a near paralleling of both the trend curves of negative gradients of wanted and the unwanted births on any prevailing values within scale.

5.7. Summary and Conclusion

Although there are patches of the populations within the sub-national regions of these countries whose fertility are either increasing or stalling, the aggregate figures reveal significant suppression in almost all fertility preference parameters measures including the total fertility rate overtime. However, in as much as the trend is showing some general progress, there are some points of apprehension.

First is the variation in the wanted fertility and the mean ideal number of children over time. The means of these measures reveal that quite a sizable proportion of the population are still for higher number of births compared to the countries that have undergone transition with a corresponding range between the lowest and the highest of the indicator figures glaringly wide over the years. Second, the difference in the significant factors are evident across settings and even stages in transition as well. It is therefore clear that some variables that are significantly correlating with the mean ideal number of children might not necessarily affect the wanted fertility and the extent of the stimulus vary too. Precisely, fertility preference may not necessarily yield similar results and therefore studies must take caution whichever the indicator is used (Mason 1997).

The differences in preference are highly dependent on the penetration of contraceptive use in any particular region. It is only in Rwanda where lower fertility desires are highly anchored in all the regions. Controlling for other factors, most regions in Uganda and Tanzania have similar fertility preferences. In conclusion, as developmental indicators vary across countries and regions, women across the subnational regions equally do not exhibit similar attitudes with regards to child bearing. As much as countries have also shown general intentions to lower their births over the years, the unmet need to contraception is still hampering the satisfaction of the demand for these essential commodities.

CHAPTER 6: TRENDS IN THE DEGREE OF FERTILITY PREFERENCE IMPLEMENTATION INDEX AND DECOMPOSITION OF FERTILITY TRENDS

6.1. Introduction

The purpose of this chapter was to explain the implications of fertility preferences implementation in explaining fertility change. It presents estimates and trends in the degree of fertility preference implementation index. Consequently, a decomposition of fertility changes were made to elucidate the contribution of each of the fertility preference measures and preference implementation to the prevailing fertility changes.

Though the Eastern African countries are neighbouring each other with quite substantial similarities in their socioeconomic orientation as well as their cultural practices, their respective fertility parameter measures reveal a fundamentally different scenario. This is to the fact that in as much as there seem to be a commonality in the direction of the trajectory taken by these trends in most of their respective parameter measures, the levels are wide and varied by country as well as by sub national regions. The section builds on the analysis from the previous sections, and aims to quantify the extent of fertility preference implementation index responsible for each of the observed changes in fertility. Key results from these analysis points to either a general decline in fertility or otherwise across the periods.

6.2. The Degree of Fertility Preference implementation Index (I_p)

As would have been expected based on the earlier discussions on the one hand; and regarding the preliminary parameter measures confirming factual variations, we examined in detail these changes in respect to the current variable; the degree of fertility preference implementation Index (Ip). After a period of remarkable decline marked with patches of sub-category deteriorations as well as stalls among others, sharper articulation of the prevailing facts therefore abound. Despite

the lack of absolute clarity and conclusive statistical evidence, stark differentials observed within the inter-country boundaries are also observed at the intra-country levels too.

Figure 6.1 attempts to provide a general trend regarding the degree of fertility preference implementation by country. A trend line was deduced so as to provide a mode of interpretation of the possible underlying trends from the erratic curves. Results reveal that there are indeed substantial variations between countries in terms of fertility preference implementation. These results clearly indicate the important role played by the changes in fertility preference implementation, wanted fertility and natural fertility (Figures 6.1)

Looking at the contributions by each of the fertility parameters, the wanted fertility and the degree of fertility preference implementation index are the reasons for the significant variations observed in the changes in fertility. All countries have improved on their implementation indices overtime. It is also worth noting that the implementation index of Kenya has been record highest during the period covered by the study as Uganda tails the pool. The degree of fertility preference implementation index is therefore a key marker to the discourse of any prevailing fertility situation in each of these countries.

It is plausible to conclude that countries whose desire to lower their fertility have correspondingly low wanted fertility as an aspiration and subsequent high indices of implementation. With such a firm combination, they thus exhibit the highest transition changes while those with only either the wanted fertility or the implementation index performing better exhibits only but between moderate to limited reduction in fertility. As is evident with the fertility figures across these countries while focusing on the intersection between the TFR and the degree of fertility preference implementation index as fertility parameter measures, it would be conceivable to state that more often, those countries with persistently high fertility have equally congruently registered reciprocal effects on

their corresponding prevailing degree of fertility preference implementation indices holding the wanted fertility constant (Figures 5.7 and 6.1)

The Total Fertility Rate is a function of the proportion between the wanted fertility and the unwanted fertility. As the implementation index increases towards unity, so is the unwanted fertility decline towards zero value leaving the Total Fertility Rate to equal the wanted fertility. As per the Figure 5.7, it is clear that a substantial proportion of unwanted fertility exist; perched in the gap between the prevailing fertility and the wanted fertility. The ideal final result therefore involves sealing the discrepancy which can only be solved through the improvement of fertility prevalence and a propulsion to full degree of fertility preference implementation index equalling unity thereby corresponding to a zero unwanted fertility. At the moment all the country means range from between 65% to 88% implementation (Figure 6.1).

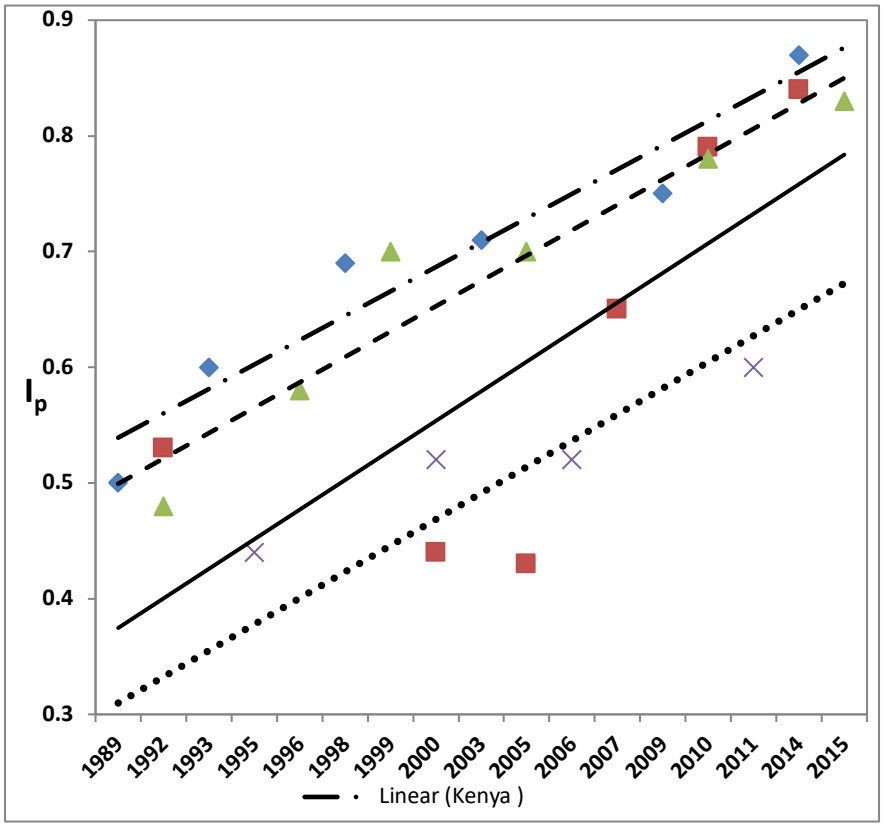


Figure 6. 1: Trends in Ip - All Countries

6.3. Differentials in the Degree of Fertility Implementation Index (I_p)

Sub national variations exist with evidence gathered from the analysis of the patches of underlying data. As much as the general figures reveal that Ugandan overall degree of fertility preference implementation index has been tailing across the periods, its intensity (gradient) of incline is fairly similar to the rest except that the trajectory began a little hesitantly compared to the rest, while Rwanda has since sped up the tempo of incline in its index of implementation playing catch up with Tanzania and Kenya (Figure 6.1). It is evident that there are undeniably particular sub regional categories of each of the country populations that are either stagnating or decreasing their indices. The following are the significant population variable classifications of the populations whose indices of implementation are worth discussing.

6.4. Index (I_p) by Type of place of Residence

Urbanization is an integral factor to child bearing preferences and practice. It should be understood that the level of urbanization of a population influences its underlying fertility keeping other factors constant. With literature replete on the springing up of the urban settlements, the pronatalist tendencies of the population subsequently diminish since the benefits accrued in having many children dwindle. Child rearing merits has therefore undergone series of metamorphosis to the extent it's lately becoming a liability to many as women have since discovered new avenues of fulfilment replacing child rearing practice as well as modern pathways to old age security.

By this study, the type of place of residence within which one lives is classified through a dichotomy; either as urban or rural residence. Although it forms the minority category, the urban women population with regards to the type of place of residence across all countries have shown immense consistency in escalating their fertility preference implementation index performance

compared to their respective rural folks. However, the overall aggregate trajectory is a reduced index due to the dominant proportion of the respective sub national and national populations living within the rural set ups; providing latent overall negative deficit, thereby cancelling out the gains made by their respective urban counterparts when aggregate means are computed. Simply put, the lower levels of implementation indices registered by the rural women populations slows the gains made by their urban counterparts when deducing national benchmarks across these countries.

Further, the rural women population have continuously increased disproportionately with low adoption of fertility control mechanisms due to a multiplicity of factors ranging from the poor accessibility to vital services all the way to the high benefits still derived from more births especially in typical agricultural settings characteristic of the many rural areas. This subsequently lead to a manifestation of high unmet need to contraception coupled with low reach by the rigorous advocacy mechanisms causing low demand for birth control technologies compared to their urbanized counterparts. This therefore slows the gains made by the minority affluent population in urban areas making country progress always lower than would have actually been.

Finally, going by the trend lines in the Figures 6.2 and 6.3, the average degree of Fertility Preference Implementation Index has continued to increase for both urban and rural populations albeit at different levels. Notable here too is that the latest average indices for urban and rural type of place of residence categories fall at within the neighbourhood of 90% and 70% degree of fertility preference implementation index scale respectively. By the percentage change, these latest figures transitioned by over 100% and 29% for rural and urban type of place of residence categories respectively over the period of study.

This implies quite a substantial shift in proportions of conscious decision making among populations especially those living within the rural areas, though not sufficient enough to

ameliorate and subvert the impending consequences of the remaining unimplemented fertility indices. The rural population is by all standards the most improved within the period of this study. Urbanization as a factor therefore counts with regard to fertility preference implementation. This is evident by the countries' consistently higher urban fertility implementation indices compared to their rural counterpart's indices overtime.

Overall, Tanzania has the highest overall index of implementation over the years within the urban category and even recently toppled Kenyan index within the rural category as well to lead, although it would be impossible to rule out rationalization biases. Rwanda equally has the lowest urban implementation index over the years and recently shed off the lowest index tag in the rural category by overtaking Uganda as well (Figures 6.2 and 6.3).

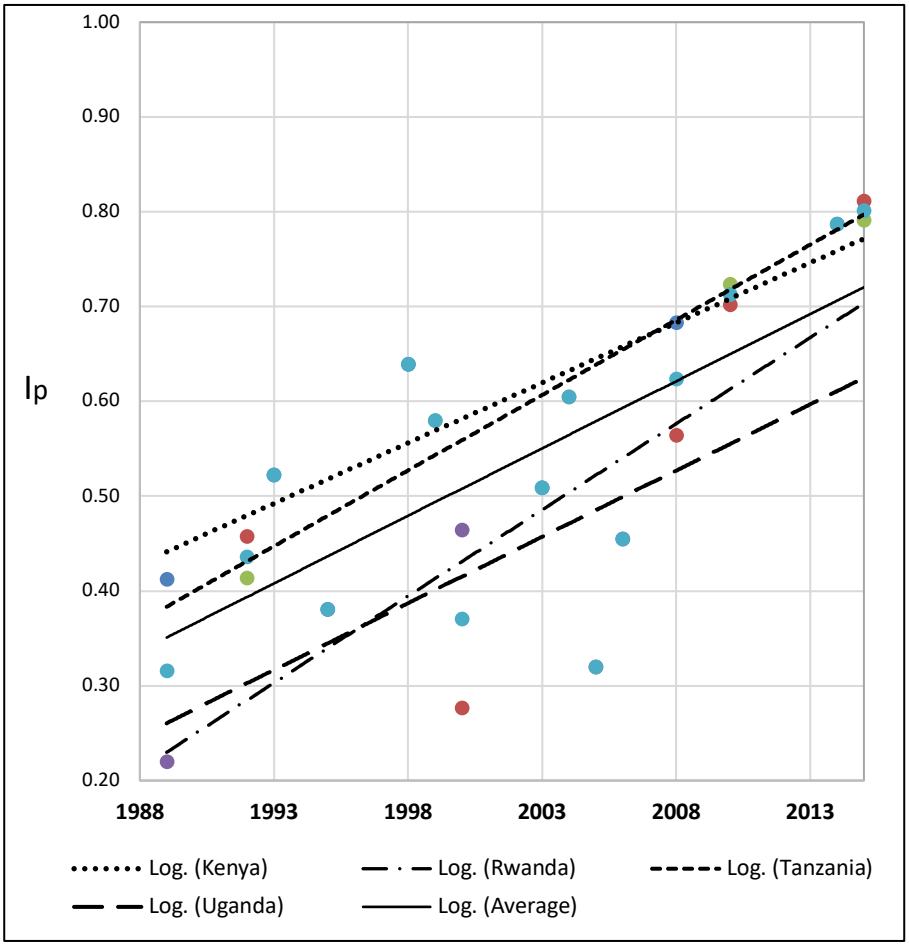


Figure 6. 2: Degree of Fertility Preference Implementation

Index (Ip) Trends - Rural

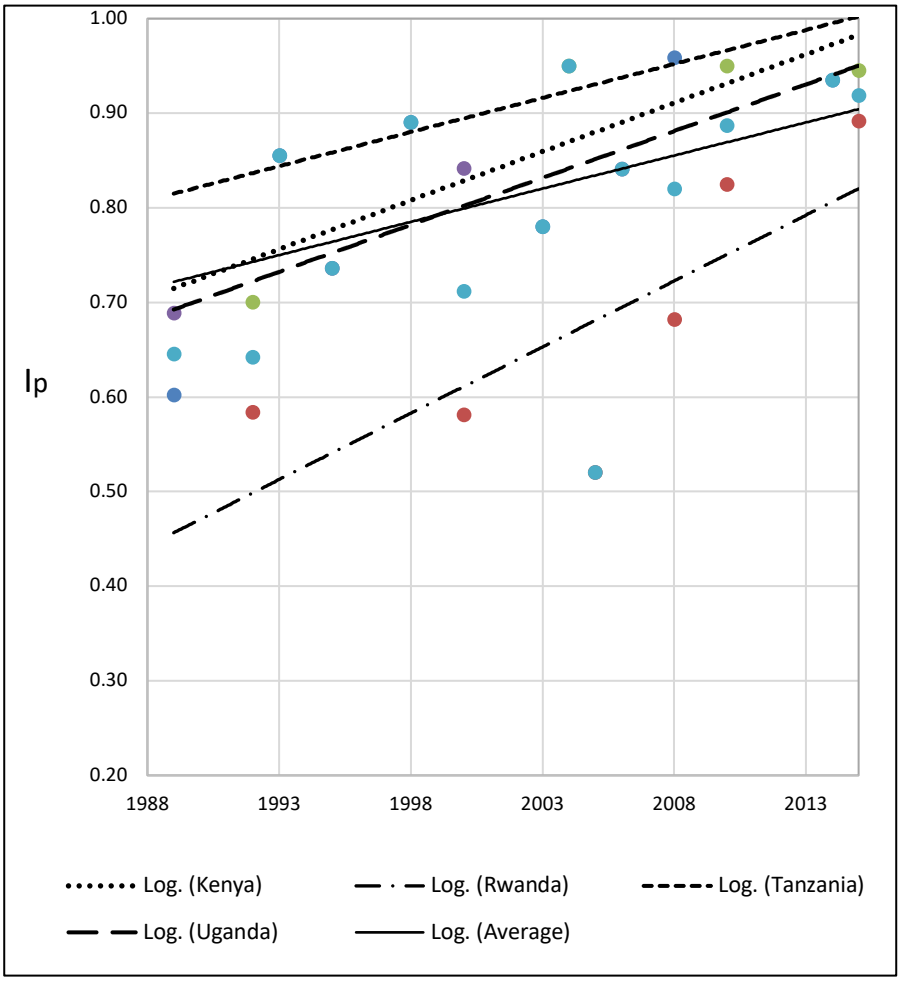


Figure 6. 3: Degree of Fertility Preference Implementation Index (Ip) Trends - Urban

6.5. Index (I_p) by Education Attainment

From these countries, considerable differentials are observed by women's education. From the striking differences as revealed by the Table 6.1, the lower the education attainment of a woman, the lower the extent of deliberate decision making regarding the births they would have. The earlier periods marked low degrees of preference implementation index among women across countries. However, there is a general increase in the degree of fertility preference implementation indices over the years across all the education attainment categories including non-attainment as well. Nonetheless, those populations with no education record the lowest degree of fertility

preference implementation index over the years compared to their highly educated categories in the respective countries.

Table 6.1 further highlights quite interesting differences across the categories of populations without education and those with only primary completed education especially with the latest three rounds of country Demographic and Health Surveys. The no education category and those with primary level completed education attainment are more likely to experience lower fertility implementation indices compared to their counterparts with either secondary or higher-level education.

This therefore implies that with the proportion of non-educated women population forming the bulk of women within the requisite reproduction age brackets (15 - 49) across all these countries in the region, the fertility transition of these countries will still continue to be eminently associated with unwanted births. This is due to the absolute numbers underlying the majority non-educated women driving the indices to perennially lower performance. An upsurge in the uptake of education will most likely change the figures immensely.

Table 6. 1: Country Degree of fertility Preference Implementation Index by Education categories

	Kenya						Rwanda					
	1989	**1993**	**1998**	**2003**	**2008**	**2014**	**1992**	**2000**	**2005**	**2008**	**2010**	**2014**
None	0.30	0.33	0.64	0.25	0.38	0.44	0.38	0.22	0.23	0.46	0.59	0.69
Primary	0.46	0.53	0.87	0.53	0.71	0.82	0.53	0.36	0.38	0.61	0.74	0.82
Secondary	0.72	0.80	0.95	0.79	0.89	0.93	0.77	0.73	0.68	0.80	0.85	0.97
Higher	0.89	0.98	0.96	0.96	0.99	1.00	0.90	0.85	1.00	0.90	1.00	1.00
Higher/None Ratio	2.97	2.97	1.50	3.84	2.61	2.27	2.37	3.86	4.35	1.96	1.69	1.45
	Tanzania						**Uganda**					
	1991	**1999**	**2004**	**2010**	**2015**		**1989**	**1995**	**2000**	**2006**	**2011**	
None	0.21	0.42	0.42	0.60	0.62		0.11	0.29	0.33	0.27	0.30	
Primary	0.62	0.78	0.74	0.79	0.81		0.38	0.48	0.53	0.50	0.52	
Secondary	0.97	1.00	0.94	1.00	1.00		0.72	0.79	0.90	0.85	0.83	
Higher	1.00	1.00	1.00	0.97	1.00		1.00	1.00	1.00	0.90	0.84	
Higher/None Ratio	4.76	2.38	2.38	1.62	1.61		9.09	3.45	3.03	3.33	2.80	

The difference between the population with higher education and those with no education also provides very interesting results. A general trend emerges in an attempt to assess the ratio trend overtime. Evident is that the gap between the population with higher education and those with no education has continued to narrow overtime in all countries. In fact, the population with higher education has made highly significant strides in implementing their fertility preference compared to their non-educated counterparts in the respective countries. However, the non-educated counterparts have made increases of steeper gradients in their implementation indices over the periods based on the ratio trend between the highly educated and the non-educated categories.

By country comparisons, unique is the rapid decline in relative differences between those with higher education and those with no education evident in Rwanda beginning 2005 while Kenya experienced only but slower pace in the difference trend. Comparing also Tanzania to Uganda, the latter's ratio is still higher and slower in pace than the former which has equally stagnated at almost lowest level only comparable to Rwanda. The difference between those with no education and those with higher education in Rwanda began when there was massive change in family planning efforts for Rwanda country just after the last century and precisely around 2005 (May 2017). This is an implication that when family planning gets anchored into a population, differences by the various social strata or socio-economic groups begin to get smaller regardless of their differences in their status.

6.6. Index (I_p) by Regions.

The Eastern Africa countries endured periods of pre-independence partitioning by the colonial powers for administrative purposes in a bid to bring close to the people, vital services as well as to improve service delivery to the populations underlying the vast parts of the numerous colonial boundaries. After independence, these countries underwent from between minimal adjustments of

their regional boundaries all the way to full overhaul as recently evidenced in the Rwandan territory after civil wars just around the turn of the twentieth century.[2]

Most of these boundaries were aligned to a number of variables ranging from the geographical proximity to physical landmarks, urbanization, ethnic alignments as well as the cultural orientation of the dominant groups among others. With the different political orientations and alignments in each of the countries spurring regional developmental progress, welfare and improvement plans, these different boundaries have continued to exhibit huge variations in their developmental achievement and levels thereby influencing as well their fertility dynamics

6.7. Index (I_p) by Regions - Kenya

All the eight regions of Kenya have been able to register progressive increments in their degree of fertility preference implementation indices over the periods. Further, all the regions except the North Eastern province provided data for all the surveys. From among these countries with complete survey data within the current standing, Nairobi have the highest index of preference of implementation overtime while Nyanza and Western regions have held the lowest fertility implementation indices respectively until recently when they surpassed the Rift Valley region (Figure 6.4).

This also shows why the fertility of Nairobi is usually among the lowest while Nyanza and Western regions fall among the highest Total Fertility Rates after North Eastern province. In fact, North Eastern region is the only region that exhibit a pre-transition fertility characteristic of above 6 births per woman regarded as pronatalist in nature – believed to be a culturally inflicted standard and symbol of community future strength as unilaterally dictated by patriarchy and typically anti

[2] Rwanda data has changed overtime due to the transformed regional boundaries with no alignment to the previous regional boundaries hence old data cannot be mapped with the current regional data in DHS. Tanzania on the other hand has undergone a series of subdivisions of some of their initial regional boundaries thereby giving birth to more new regions overtime

neo-Malthusian disposition. The population of the north Eastern region is dominantly Muslim, which advocates for polygamy with power and strength exhibited by the male household head and his corresponding household numbers for every family units he owns.

The contraceptive prevalence therefore sinks to an all-time low in this region as their index is rationalised. It is not by accident that the women of the region have many children. It therefore means that births are deliberate as a result of the conscious decisions made by dominating men rather than the women themselves and influenced by the nature of the conservative culture they live in – an ex post rationalization artefact. In such kinds of environments, one would prompt the involvement of women's spouses so as to deal with such intricate fertility matters dominated through patriarchy.

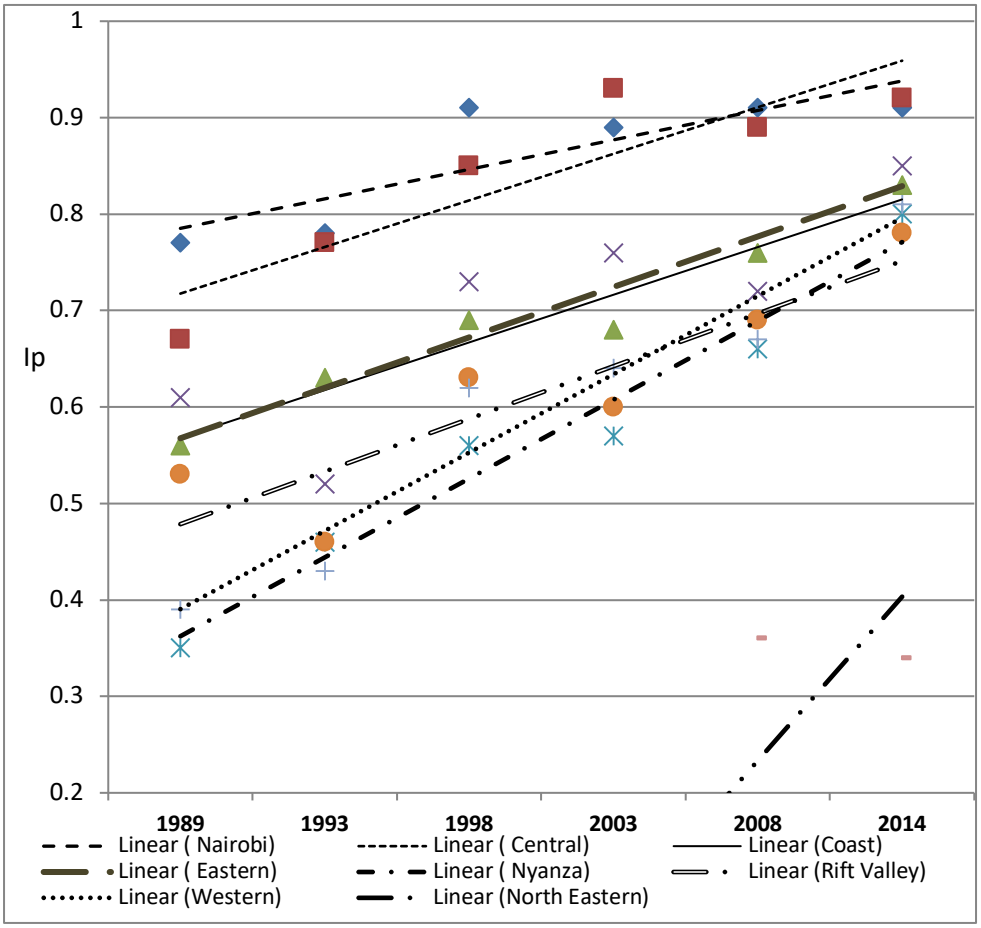


Figure 6. 4: Sub-National Trends in Ip - Kenya

6.8. Index (I_p) by Regions- Rwanda

Rwanda country has the least number of DHS data sets dating back to only from 2005 unlike the other countries of Kenya, Tanzania and Uganda. This is because the country underwent prolonged periods of civil war rendering periodical data collection impossible. At the same time, the country overhauled the initial regional boundaries that dated back to the colonial times faulting these boundaries as ethnically aligned constantly fuelling hatred among the populations form either sides of the existing colonial regions.

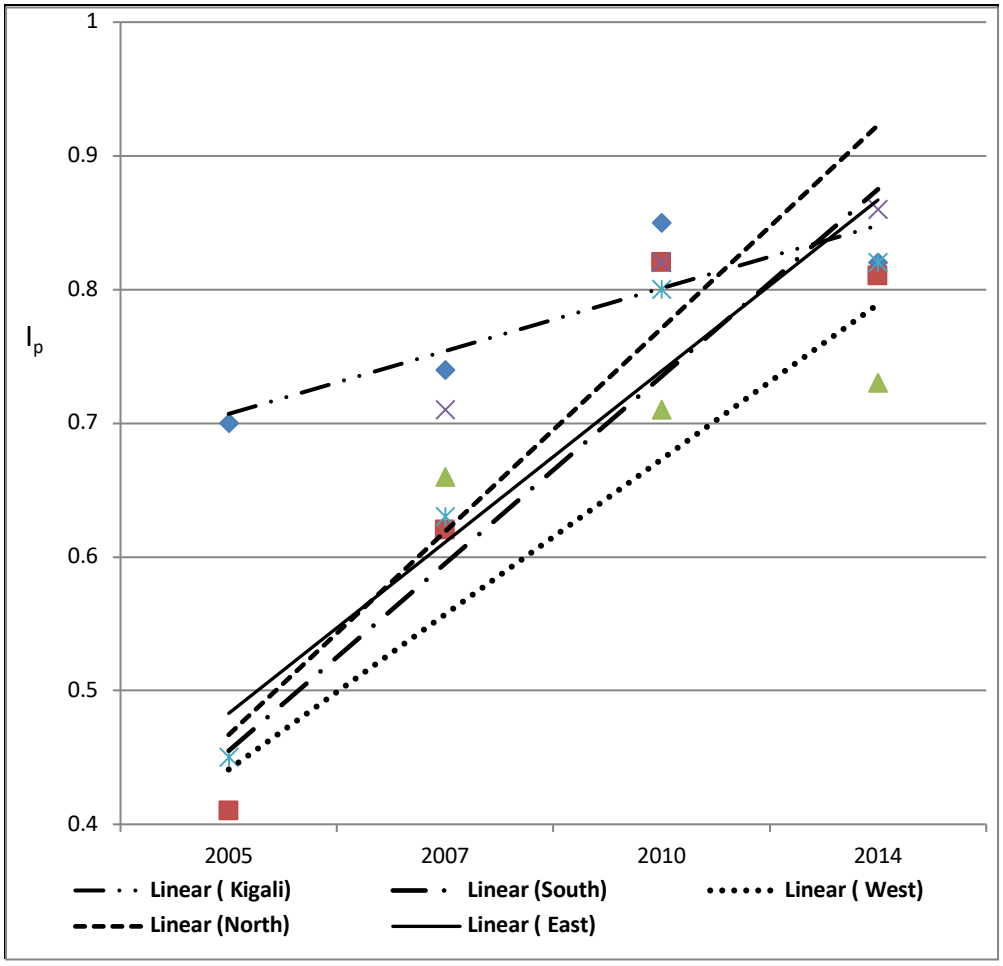


Figure 6. 5: Sub-national Trends in Ip - Rwanda

The new government after the war overhauled and carried out fresh regional sub divisions giving the country only five regions for efficiency in provision of services to its population. These regions

were subsequently adopted by the Demographic and Health Survey (DHS) from 2005 to date. Going by the available trend data, all the regions are on a positive incline albeit at varied levels with regards to the indices of fertility preference implementation. Kigali have for most of the periods had the highest degree of fertility preference implementation index until recently when the other regions caught up with it; as the West region experience recurrently the lowest implementation index overtime (Figure 6.5). It is plausible to say that the country is indeed on course with its fertility transition in general across all the regions.

6.9. Index (Ip) by Regions - Tanzania

Tanzania boast of its largest geographical size of land with the highest population compared to its counterparts under study. The country is divided in to six zones with a total of 29 regions disproportionately distributed within these zones. The regions have existed over the years with some further getting split so as to move services closer to the people. Looking at the household development levels, areas with the highest implementation index also happen to be areas with the highest proportions of household development indices as well as education.

Tanzanian is blessed with a vast country full of untapped resources with only marginal amounts being tapped at the moment. The country population is predominantly peasant agriculture dependent. Looking at the general figures, the country has registered a mix of indices across the years. Tanzania have consistently registered some of the region's highest indices of fertility preference implementation through the years of the surveys as well as registering some record lows too (Figure 6.6). This, from history cuts across also to the island of Zanzibar - a semi-autonomous partner and Tanganyika mainland, which merged leading to the formation of the people's united republic of Tanzania.

Most of the regions have been able to register modest declines in their total fertility rate over the years as well as improving their degree of fertility preference implementation index. The dominantly urban or peri urban regions like Dar-es-salaam, Morogoro, Pwani, Kilimanjaro, Tanga, Zanzibar town West among others have been marked with high degree of fertility implementation index. However, quite a significant proportion too have either equally performed dismally or out rightly failed to deliver their fertility fall course as well as improving their corresponding other fertility parameters like the degree of the fertility preference Implementation index.

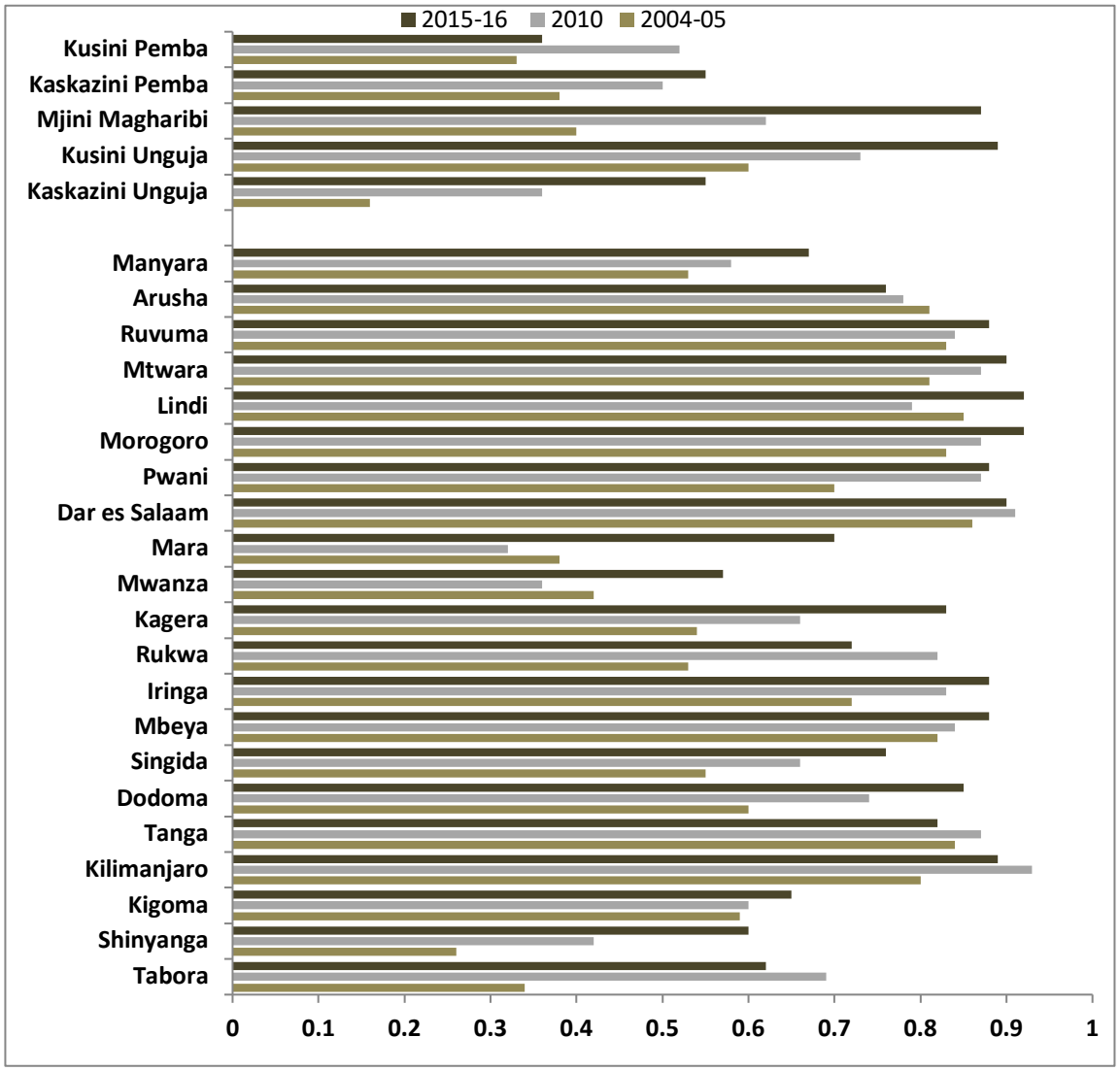


Figure 6. 6: Sub-national Trends in Ip - Tanzania

Rukwa, Kagera, Kigoma, Tabora, Shinyanga, Mara and Mwanza regions of the Tanzanian mainland together with the North Zanzibar, North Pemba and South Zanzibar regions of Zanzibar have registered lower degree of fertility preference implementation over time (Figure 6.6). Similarly, Rukwa, Kagera, Kigoma and Tabora regions are among the areas that have registered slowing indices of implementation. A probable pointer to either the unmet need or changes in child bearing attitudes among others. The country also has patches of regions with stalling fertility preference implementation indices like Kilimanjaro, Dar es Salaam, and Tanga. These have the effect of forcing the country aggregates to dwindle. Looking at these regions, some of their fertility are actually at the pre-transition stage characterized by high births and low implementation index.

6.10. Index (I_p) by Region – Uganda

Uganda is divided into four semi-autonomous administrative regions namely the Central, Eastern, Northern and the Western regions usually headed by the government appointed commissioners. Most of the government planning is pegged on the underlying populations of these regions of which women form the majority. All the regions of Uganda are characterized by high pre-transition fertility to date and the wanted fertility is not any better either.

The latest figures posit that the wanted fertility is still pegged at about five births per woman on average except for the central region where the measure is pulled down by the dominant affluent urban population of women in Kampala and its metropolis, a situation that most other regions don't have the privilege of. In fact, these other areas persistently exhibit overtime, the highest wanted fertility rates only compared to the poorly performing regions of Tanzania as well as the north Eastern Kenya.

Central is the only region of Uganda that has surpassed the 70% mark of the degree of fertility Implementation Index (Figure 6.7). This could be attributed to high population of the affluent

urban women who are capable of planning their fertility due to the disincentives associated with high child bearing in the urban regions as well as their levels of advancement warranting sound decision making with regards to birthing. All the other regions of Uganda have had their degree of fertility preference implementation index dwindling between the 30% and 60% over the years. Trend analysis reveal that Uganda's Western region has registered the lowest index of fertility preference implementation from the respective latest DHSs by sub-national regions after being surpassed by the Northern and the Eastern regions at the turn of the millennium.

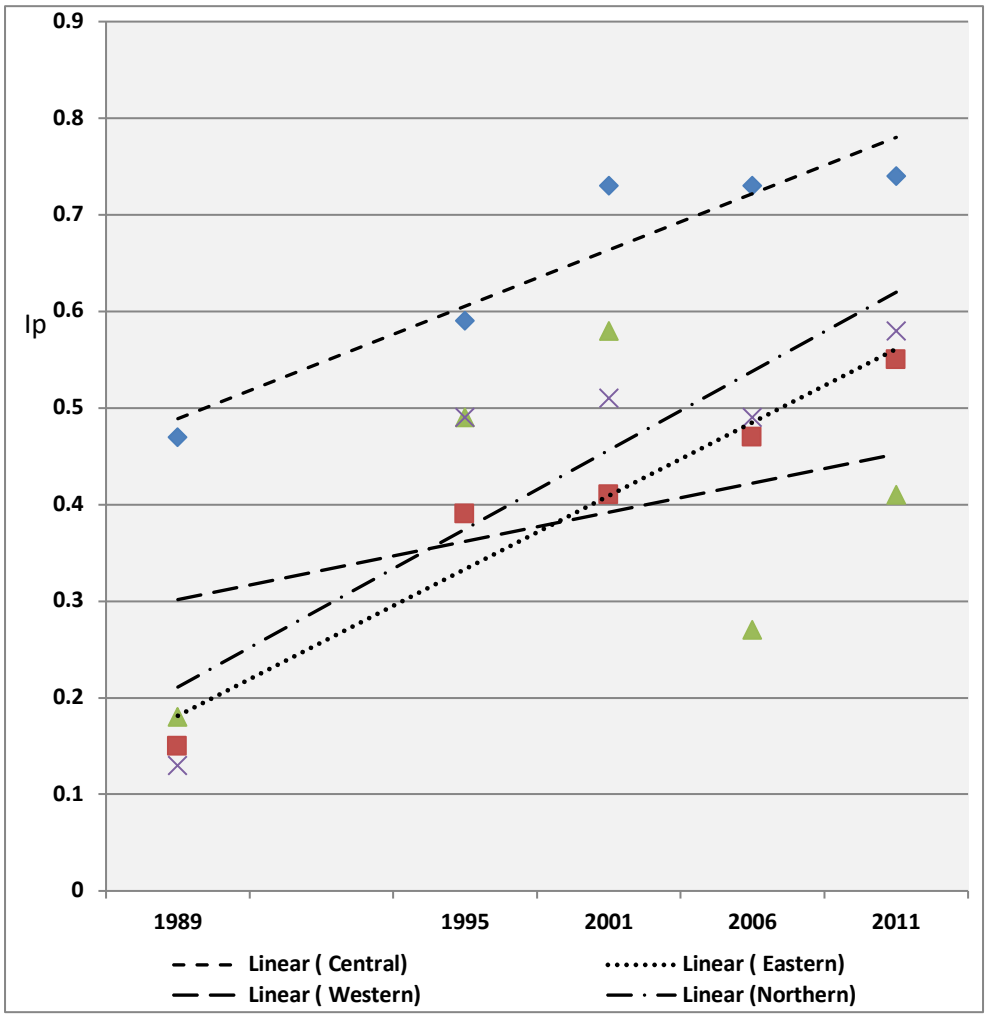


Figure 6. 7. Sub-national Trends in Ip - Uganda

The most probable reason is the possibility that when contraception prevalence was low with heightened advocacy together with near limited to modest supplies of commodities, those who

desired to change their fertility were therefore able to. However, in later years as the surge in usage took shape, their implementation index declined due to the contraceptive demand not being satisfied; an unmet need to contraception therefore emerged. This consequently must put Uganda to the point of re-strategy within its fertility policies so as to catch up with its neighbours hoping that fertility reduction is still a priority to the government.

In comparing variations in inequality, there are number of indicators that can be used to measure inequality ranging from simple differentials to concentration ratios. Differentials are the most basic when comparing indicators across groups either absolute or relative differences in the indicators across groups. In this study, using coefficient of variation squared as a measure of trends in inequality in the degree of fertility preference implementation index (Ip), Rwanda registered the least inequality while Tanzania had the largest inequality in preference implementation. This is contrary to the high levels of income inequality observed in chapter 2 denoting that improved family planning programs can be effective, leading to a greater reach in terms of preference for smaller family sizes and the subsequent efficacious utilization.

6.11. Regional Fertility Preference Clustering

In order to discern the patterns of fertility transition across the regions, a hierarchical cluster analysis was done based on the observed fertility measures and fertility preferences measures. Cluster Analysis (C.A.) is a statistical classification technique for organizing data into meaningful groups or taxonomies based on a set of variables that describe the key features of the observations. The analysis is most often used in cases in which it is unknown, prior to the analysis, the number of groups in the data or which observations belong to which particular groups.

Objects associated with a specific cluster should be quite similar and generally clusters should be distinct, i.e. not overlapping. Hierarchical methods, in which clusters are defined according to

similarity or dissimilarity measures, remain the most popular method of analysis. Each group is homogenous with respect to these characteristics and each group should be different from other groups with respect to the same characteristics. Hierarchical clustering with ward's method was used.

The clustering of the various regions showed their prospects on the path towards fertility transitions. Five clusters were obtained and results presented in Table 6.2. The first cluster contains 12 sub regions, four each from Kenya and Rwanda and 3 from Tanzania. Cluster 2 contains 2 regions from Kenya, one from Rwanda and 7 from Tanzania. Cluster 3 is composed regions mainly from Tanzania while clusters 4 and 5 are mainly from Tanzania and Uganda characterised by regions that are generally rural with very minimal urbanization and advancement.

Table 6. 2: Clustering of sub Regions by various indicators of fertility and fertility preferences

Most recent DHS	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
Kenya	Nairobi Central Eastern Nyanza Western	Coast Rift Valley	North Eastern		
Rwanda	Kigali, South West, North	East			
Tanzania	Kilimanjaro Dar es Salaam Njombe	Mbeya Iringa Lindi Mtwara Ruvuma Arusha Mjini Magharibi	Simiyu Shinyanga Kaskazini Pemba	Tanga Dodoma Kagera Pwani Morogoro Manyara	Tabora Kigoma Singida Rukwa Mwanza Mara Geita Katavi Kaskazini Unguja Kusini Unguja Kusini Pemba
Uganda				Central	Western Northern Eastern

The regional clustering attempts to segregate the regions based on their prevailing fertility preference implementation index. The cluster one comprise of leading perk of regions whose fertilities have reduced to almost replacement level. This is followed by cluster two comprising of regions immediately following cluster one with regards to fertility reduction. Cluster four and five are the last clusters respectively characterised with inherently high fertility. These clusters also follow traits of underlying inequalities associated with the respective regions.

For example, cluster 1 regions from Tanzania reflect highly developed regions starting with the urbanized Dar-es–Salaam, the commercial city and high agricultural and populated potential regions of Kilimanjaro and Njombe. The cluster contains regions that are believed to be ahead of the rest in transition followed by the other clusters respectively. Fertility transition in Kilimanjaro for example compares to that of Central region of Kenya and marked by high population density and high agricultural potential.

Cluster one is dominated by regions of countries who have made significant fertility declines compared to the other clusters while the last clusters comprise of countries still lagging behind in fertility decline. The middle group comprise of a mix of the two extremes. This implies that as one move across the clusters, there is high likelihood that variables are likely to change. The expected variations are the social class, contraceptive prevalence as well as the level of enlightenment through education attainment among other advancement mechanisms.

A closer look at the fertility situation across these clusters reveal very interesting insights. Table 6.3 attempts to assess the clusters by the performance of their fertility preference indicators. One fact stands out. It is the likelihood that the lower the cluster number, the lower the Total Fertility Rate, the lower the wanted fertility rate and the higher the degree of fertility preference implementation index. Subsequently, a general reduction in the wanted fertility is felt across all the clusters. The last two clusters' (i.e. four and five) regions have had some reversal in their total fertility rate if recent data is compared with the previous data sets of the Demographic and Health Survey (DHS). The regions are associated with higher wanted fertility and low index of implementation compared to the others.

However, lower clusters one and two seem to further head for suppression of their wanted fertility compared to higher clusters (Table 6.3). This is reflected at the prevailing extent of

implementation index and the wantedness of their births compared to the higher clusters. Regions with both lower wanted fertility and high implementation index have made significant strides in reducing their total fertility rate compared to areas with only either or both of the indices performing dismally. The change therefore is expected to be highly depended on a mix of the two parameters thereby dictating the direction of the fertility trajectory. This could be the underlying implications behind the various fertility transition trajectories witnessed within regions and countries as well.

In computing the percentage differences in total fertility rate, wanted fertility and the Index of implementation (Ip) between cluster 1 and cluster 5 to show the extent of inequality in their path towards fertility transition. The average fertility in cluster one was found to be lower by 2.8 births per woman in comparison to cluster 5, representing 43 percentage point differences. The average preferred family size in cluster one is about 2.2 births per woman lower than cluster 5. The total fertility rate (TFR) declined by a birth per woman in cluster one while it increased by nearly 2 births on average in cluster 5.

The major distinction between these clusters hence is the level of ability to implement their respective preferences within regions. The percentage point difference in implementation index (Ip) between the first and the last clusters is about 33 percent. The 26 regions within the higher clusters therefore inhibits the pace of fertility decline in Tanzania, with precisely 18 belonging to clusters 4 and 5. These regions' fertility levels are still in the pre-transition stage. Rwanda and Kenya have most of their regions in cluster 1 and 2 implying that these regions fertility transition have been anchored. The fact that all regions in Rwanda are placed in cluster one and two explains the low regional inequality in uptake of contraception and confirms the strength of family planning programs in Rwanda with full penetration to all regions in the country.

Table 6. 3: Average Measures of fertility, wanted fertility and Fertility Preference Change by clusters of sub national regions

	Means for Most Recent Data			Average Change In		
	TFR	F_w	I_P	TFR	I_p	F_w
Cluster 1	3.71	3.38	0.88	1.01	0.25	-0.58
Cluster 2	4.23	4.17	0.89	0.91	0.19	-0.69
Cluster 3	5.44	5.62	0.70	0.90	0.57	-1.22
Cluster 4	5.95	5.55	0.76	-0.13	0.45	-0.19
Cluster 5	6.52	5.55	0.66	-1.71	0.18	-0.09

The clustering attempts also points at the differentials and inequalities exhibited across the regions. Cluster one represents regions that are well endowed with most urbanised regions falling in it. The cluster five is the most unequal, typically rural with very limited performance in the developmental indicators across board.

6.12: Decomposition of Fertility Trends

The decomposition of fertility trends was carried out to elicit the contribution to the course of fertility change; each of the respective fertility parameter measurers with proceeding comparative analysis providing worthwhile insights. This decomposition of the variations in fertility also aimed to abridge the methodological exposition, with trends therefore informing the basis of change between two points in time i.e. T_1 and T_2.

In fact, the fertility changes that have been witnessed within these countries reveal quite enormous progress with each country setting its own pace. The changes that have occurred within the periods reveal that indeed the regions fertility transition is on track though still delicate and hesitating as some are very much at the infantile stage. It is also not possible to precisely project the next trajectory based on these figures alone even though going by the prevailing trend figures, one is able to deduce the change contribution of these drifts to the components of the changes evident.

This being the case, it would therefore only be possible to assess the general changes attributed to the fertility preference and the degree of preference implementation. Notable within the general limits is that there is a decrease in the desire for births with corresponding total fertility rate trailing

but through a lag (Table 6.3). However, there are particular regions that have not been able to lower their fertility parameter measures as would have been expected. A typical example is the Uganda population living in rural areas. This population enclosing over 80% of the overall Uganda population is highly instrumental in the current prevailing trend performance with regards to the general parameter measurers of fertility. This therefore signifies that even with the modest declines in the fertility parameter measures registered by the urban population, the net effect of the majority rural cancels out the gains made at the point of deducing country aggregates.

Although the preceding comparative analysis provided worthwhile insights, it did not achieve this objective. Each of the parameter measures under consideration would be graded by its net contribution towards the current fertility transition. Going by the categories, there is undeniably quite a significant contribution by these measures to the current fertility changes observed within the respective assemblages; either positive or negative implying a suppression or an eventual increase in Fertility (Table 6.4)

Table 6. 4: Decomposition of Fertility change and contributions of wanted fertility rate and preference Implementation index to Fertility Change

Country		Ip	Change in TFR	Contribution to change in TFR			% Contribution to change in TFR		
		Last		Fw	Fn	Ip	Fw	Fn	Ip
Kenya	Urban	0.9	0.2	0	-1.8	-0.13	0	-151	51
	Rural	0.82	0.9	0.5	-1.7	-0.21	35	-118	103
	None	0.75	0.2	0	-0.4	-0.38	-22	-23	60
	Primary	0.83	1.1	0.6	-2.4	-0.26	42	-168	140
	Secondary	0.89	0.3	0	-1.3	-0.12	-8	-105	60
	Higher	0.91	0	0	1	-0.01	-9	93	0
		Last		Fw	Fn	Ip	Fw	Fn	Ip
Rwanda	Urban	0.81	1.3	0.9	-1.3	-0.3	60	-84	113
	Rural	0.78	2	1.6	-1.3	-0.49	85	-70	175
	None	0.74	1.8	1.5	-1.4	-0.52	71	-66	181
	Primary	0.79	1.6	1.3	-2.2	-0.48	71	-120	188
	Secondary	0.84	1.3	0.9	0	-0.2	67	-4	65
	Higher	0.9	0.1	0	0.1	-0.08	-17	6	26
		Last		Fw	Fn	Ip	Fw	Fn	Ip
Tanzania	Urban	0.84	-0.2	0	-0.4	-0.05	-25	-32	12
	Rural	0.75	0.5	0.5	-1	-0.18	33	-66	51
	None	0.76	0	0	-1.6	-0.29	0	-101	62
	Primary	0.78	0.2	0.2	-0.9	-0.09	15	-66	29
	Secondary	0.87	-0.1	0	-0.2	-0.05	-17	-19	10
	Higher	0.85	-0.4	0	1.2	0.09	-36	104	-18
		Last		Fw	Fn	Ip	Fw	Fn	Ip
Uganda	Urban	0.81	0.6	0.4	0.7	-0.04	31	53	14
	Rural	0.56	0.3	0.4	-0.5	-0.11	20	-27	37
	None	0.45	0.8	0.9	0.3	-0.1	36	12	27
	Primary	0.57	0.4	0.3	-0.3	-0.11	15	-17	41
	Secondary	0.77	-0.5	-1	-1.1	-0.04	-37	-79	14
	Higher	0.78	0.2	0.4	-0.3	0.01	32	-27	-4

6.12.1: Contribution of Preference and Preference implementation to Fertility Change since 2000

This was carried out to distinguish the magnitude of the change in the factors of fertility as well as their actual fertility level over the periods. Table 6.4 highlight the general changes that have occurred in the fertility of each countries within two periods. In all the counties aggregates, the degree of fertility preference implementation index of Rwanda registered the highest contribution to fertility change at 97%, with Tanzania coming second at 93.8%. This was followed by Kenya

and Uganda at third and fourth place scoring 83.8% and 50.1% index respectively. The wanted fertility and the Natural fertility also showed signs of contribution to fertility change. Tanzania's natural fertility was the highest at 36% negative contribution with Uganda making the least contribution change of the same at 3.9%. Uganda again made an immense progress to the fertility change by its wanted fertility standing at 46% just a point above Kenya and about 4 points above Tanzania, being the least contributor (Table 6.5).

Table 6. 5: General Contribution to Fertility Change by Fw, Fn and Ip.

				Absolute Contribution to fertility decline			Percent Contribution to fertility decline		
Country	Survey 1	Survey 2	Absolute Change in TFR	Fw	Fn	Ip	Fw	Fn	Ip
Kenya	2003	2014	1.00	0.45	-0.29	0.84	45.1	-28.9	83.8
Rwanda	2005	2014	1.89	0.69	-0.64	1.84	36.6	-33.9	97.4
Tanzania	2004	2015	0.49	0.21	-0.18	0.46	42.2	-36.0	93.8
Uganda	2000	2011	0.68	0.31	0.01	0.34	46.0	3.9	50.1

6.12.2: Contribution of Preference implementation to Fertility Change

Kenya

Table 6.6 shows the contributions made by the wanted fertility, natural fertility and the degree of fertility implementation index of women to the overall fertility change among the respective education and type of place of residence subcategories. Going by the Table 6.6, fertility generally declined over the period among the sub groups except for those with higher level of education which remained unchanged between the two periods. The primary and rural categories made the highest fertility preference implementation index contribution to the fertility change at 140% and 103% respectively.

Table 6. 6: Contribution to Fertility Change by Fw, Fn and Ip - Kenya

			Change in TFR	Contribution to change in TFR			% Contribution to change in TFR		
Country	**Category**	**I_p**		**F_w**	**F_n**	**I_p**	**F_w**	**F_n**	**I_p**
Kenya	Urban	0.9	0.2	0	-1.8	-0.13	0	-151	51
	Rural	0.82	0.9	0.5	-1.7	-0.21	35	-118	103
	None	0.75	0.2	0	-0.4	-0.38	-22	-23	60
	Primary	0.83	1.1	0.6	-2.4	-0.26	42	-168	140
	Secondary	0.89	0.3	0.0	-1.3	-0.12	-8	-105	60
	Higher	0.91	0.0	0.0	1.0	-0.01	-9	93	0

The wanted fertility however made only but a meagre contribution to fertility change across all categories except for the urban population making no contribution at all. Going by the current fertility scenarios, one could conclude that the category of higher education performance measure signals a possibility that those women have reached their preferred family size. It is however expected that those other categories still exhibiting higher levels of fertility will make greater change gradients.

Rwanda

Table 6. 7: Contribution to Fertility Change by Fw, Fn and Ip - Rwanda

		I_p	Change in TFR	Contribution to change in TFR			% Contribution to change in TFR		
Country		**Last**		**F_w**	**F_n**	**I_p**	**F_w**	**F_n**	**I_p**
Rwanda	Urban	0.81	1.3	0.9	-1.3	-0.30	60	-84	113
	Rural	0.78	2.0	1.6	-1.3	-0.49	85	-70	175
	None	0.74	1.8	1.5	-1.4	-0.52	71	-66	181
	Primary	0.79	1.6	1.3	-2.2	-0.48	71	-120	188
	Secondary	0.84	1.3	0.9	0.0	-0.20	67	-4	65
	Higher	0.90	0.1	0	0.1	-0.08	-17	6	26

Rwanda has registered quite impressive performances across all the categories under consideration especially with regard to the degree of fertility preference implementation index. Notable too is that the regions that perennially used to register low performance in fertility took steep trajectories courtesy of the three parameter measures' performances. The average change contribution that Rwanda has registered as country across the type of place of residence category is 144% and 72.5%

for implementation index and the wanted fertility respectively (Table 6.7). Further the population with no education and those with primary education scored beyond 180% implementation index contribution to fertility change; almost three folds and seven folds for the secondary and higher education category contributions respectively.

Tanzania

Table 6.8 shows the change contribution of each of the sub categories of the women population of Tanzania to the fertility change across the period of study. Uniquely, the fertility change of the Tanzanian categories could be described as erratic, emanating from both negative and positive variations within the similar indicator categories. Categories with very low changes or decreases in fertility are also the same areas characteristically associated with insignificant degree of fertility implementation index change.

Further as would be compared to the rest of the other countries, the natural fertility is the highest single most contributor to fertility change cumulatively compared to the other parameter measures in absolute values. Worth observing too is that in as much as all the parameters have always contributed to the fertility change, the category of women with no education in Tanzania is the only one category with its wanted fertility making no contribution at all to the fertility change (Table 6.8).

Table 6. 8: Contribution to Fertility Change by Fw, Fn and Ip Tanzania

		Ip	Change in TFR	Contribution to change in TFR			% Contribution to change in TFR		
Country		**Last**		**Fw**	**Fn**	**Ip**	**Fw**	**Fn**	**Ip**
Tanzania	Urban	0.84	-0.2	0.0	-0.4	-0.05	-25	-32	12
	Rural	0.75	0.5	0.5	-1.0	-0.18	33	-66	51
	None	0.76	0.0	0.0	-1.6	-0.29	0	-101	62
	Primary	0.78	0.2	0.2	-0.9	-0.09	15	-66	29
	Secondary	0.87	-0.1	0.0	-0.2	-0.05	-17	-19	10
	Higher	0.85	-0.4	0.0	1.2	0.09	-36	104	-18

Uganda

Like its neighbor Tanzania, Uganda has quite a substantial change within the time period under consideration. Some regions have actually faced declines while some equally faced inclines. This still points at the nature by which women have different attitudes towards child bearing evident by how particular clusters of the population increase their fertility while the others face absolute modest decreases. Certainly, the contribution to the changes in the Uganda fertility is derived averagely from all the three contributors, the wanted fertility, natural fertility and the degree of fertility preference implementation index follow. Their contribution is not intense and would be described precisely as below average in general (Table 6.9). Together with the mixed nature of the contributions amidst marginal changes of the various parameter measurers, it clearly validates the reasons that have kept the Uganda fertility high over the years; pointing at a distance the strength of programs across board as well.

Table 6.9: Contribution to Fertility Change by F_w, F_n and I_p

		I_p	Change in TFR	Contribution to change in TFR			% Contribution to change in TFR		
Country		**Last**		F_w	F_n	I_p	F_w	F_n	I_p
Uganda	**Urban**	0.81	0.6	0.4	0.7	-0.04	31	53	14
	Rural	0.56	0.3	0.4	-0.5	-0.11	20	-27	37
	None	0.45	0.8	0.9	0.3	-0.10	36	12	27
	Primary	0.57	0.4	0.3	-0.3	-0.11	15	-17	41
	Secondary	0.77	-0.5	-1.0	-1.1	-0.04	-37	-79	14
	Higher	0.78	0.2	0.4	-0.3	0.01	32	-27	-4

In general, the fertility preference implementation index is the major contributor to the current fertility changes across these countries followed closely by the wanted fertility. It is worth noting that these contributors exhibit varied mix of results leading to the prevailing observable fertilities at any given point in time. Rwanda has shown the highest level of consistency in the index of implementation contribution than the rest as Kenya follow while Tanzania and Uganda tail respectively.

Tying these results to the previous studies, it is clear that the family planning index rightfully placed Rwanda above the rest of these countries (May, 2017a; Ross & Smith, 2010). Displaying the variations of desired fertility in terms of wantedness of children, it appears clearly that East Africa countries do not have the same attitude toward fertility and within the same country different populations have different aspirations regarding family size (Muhoza et al., 2014). It is therefore plausible to conclude that the on-going transition in the region is varied across sub-national regions and closely tied to the performance of other developmental indicators.

6.13: Inequality among Countries

Inequality has been a key challenge across the countries and even within the corresponding subnational regions. This is also reflected in the degree of preference implementation index. Over the years, there is however a slowing in the inequality evident within the degree of fertility preference implementation index. This implies that regardless of the different categories, the vast inequality that existed among countries began to narrow making the different categories of the population equal with regards to the implementation index.

Among countries, Tanzania and Kenya consistently registered high values of inequality in their implementation index respectively overtime with Rwanda registering the lowest levels of inequality over the same periods. Further, the countries that had higher inequalities made steep declines in their reduction compared to the countries that had lower inequality values. The inequality is believed to be a function of many factors ranging from advancement in the women, government policies and the will to deliberately supply commodities for an eventual utilization by the general population across the different categories.

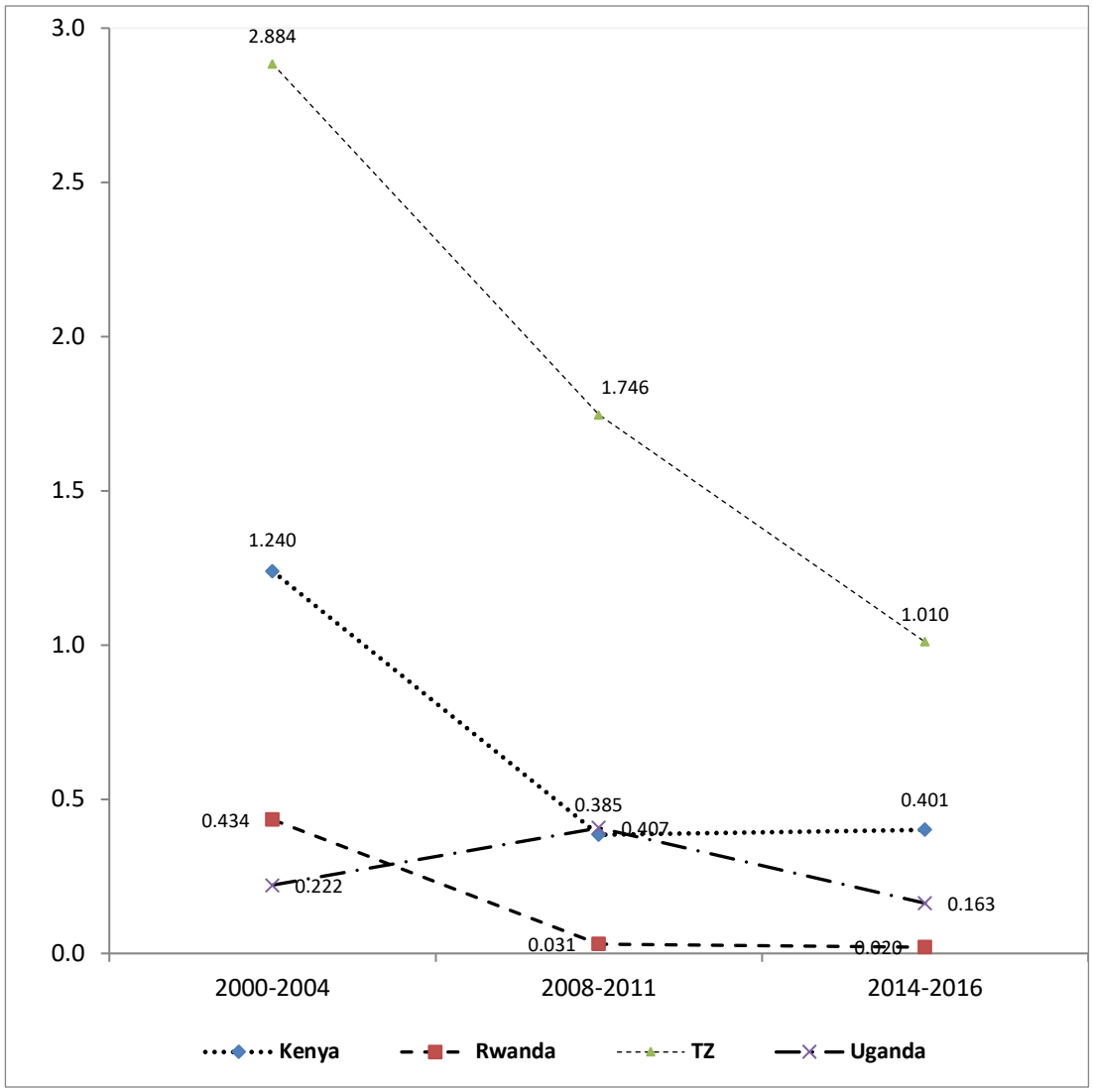


Figure 6. 8: Trends in Inequality in Preference Implementation index (Ip)

6.14. Association between preference implementation and unmet need for family planning

To examine how close preference implementation index is to established measures, the study further ran a correlation technique to investigate the relationship between each of the two quantitative, continuous variables namely the wanted and the unwanted fertility as the two separate dependent variables together with the unmet need to contraception and the demand satisfaction by the family planning as another two sets of separate independent variables. Each of these were run independently. While running this analysis between the fertility preference measures and the respective independent variables, interesting results emerged.

In the first instance the correlation between the wanted fertility as the dependent variable with unmet need to contraception and the demand satisfaction by the family planning each as single predictors, it was established that there is a high correlation between the wanted fertility and the unmet need to contraception. However, results showed no significant correlation between the dependent variable and the demand satisfaction by family planning. Subsequently, a similar analysis with a different dependent variable; unwanted fertility, revealed almost similar results with the unmet need to contraception bearing a significant association with it while the demand satisfaction by the family planning went contrary. All these were done at 95% confidence level.

Figure 6.9 shows the association between implementation index and unmet need for contraception. Countries with low values of fertility preference implementation index (Ip) tend to have higher unmet need for contraception

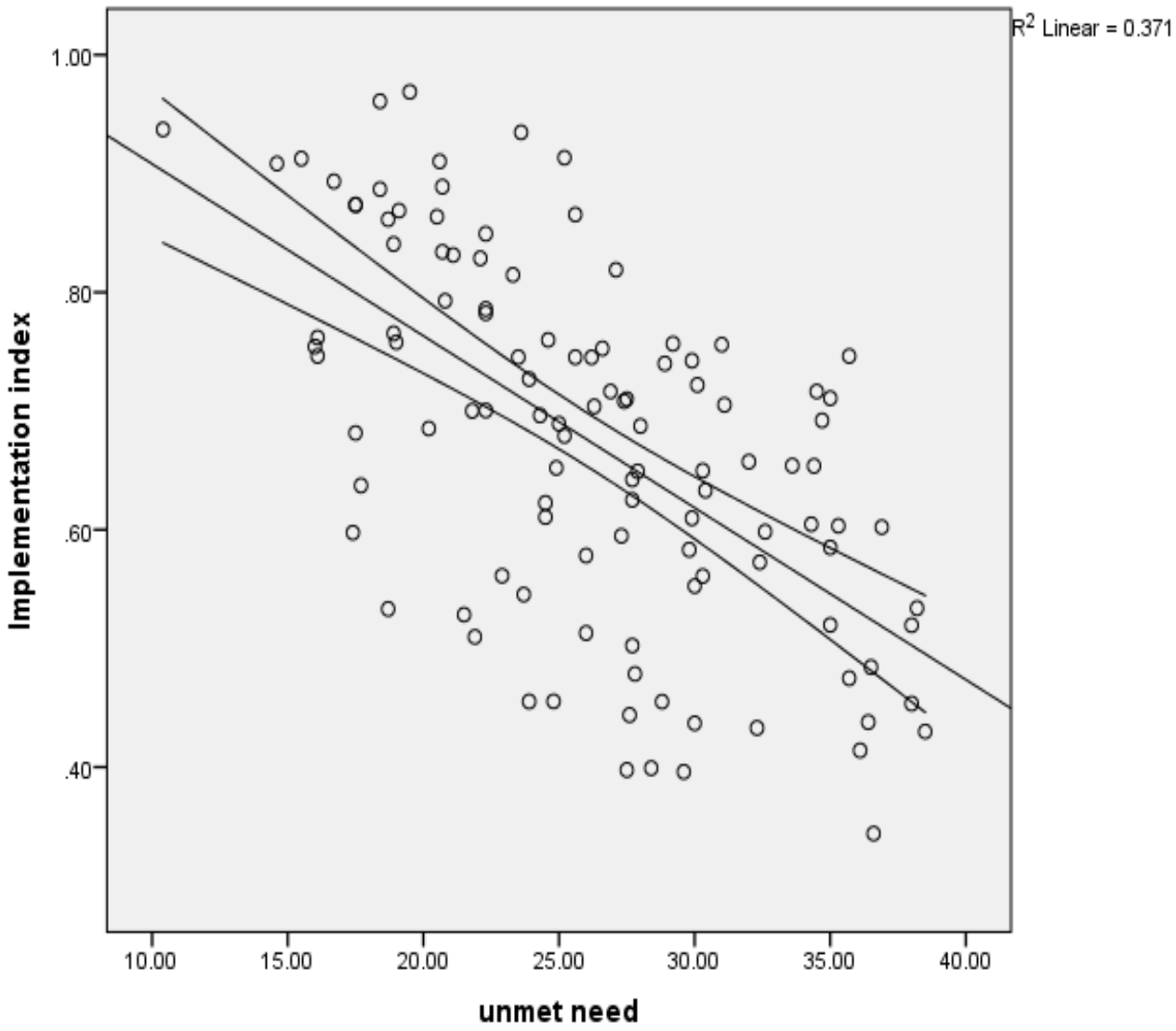


Figure 6. 9: Sub-National Regions Association between Implementation index and the unmet need to contraception

These results further reveal that the wanted fertility has a negative correlation with the demand satisfaction by the family planning and a positive correlation with the unmet need to contraception. By implication, the wanted fertility decrease correspond to the increase in the satisfaction of demand to family planning as the unmet need decreases. Subsequently, the unwanted fertility was equally found to have a significant positive association with the unmet need to contraception. This is that as the unmet need increases, the unwanted fertility correspondingly follow suite.

Because it is in the common domain that improved fertility preference implementation leads to improvement in the wanted fertility as well as freezing the unwanted fertility gap, it therefore implies that the degree of fertility preference implementation depends on the unmet need to contraception as well as the demand satisfaction; both leaning heavily on the contraception prevalence rate. Assuming that the population advocacy is on point and the contraceptive commodities supply stabilize, it is then expected that a reduction in the unmet need will fall with a subsequent improvement in the demand satisfaction. This therefore spurs routine conscious implementation of fertility further assuming sexually active women are always in need of these fertility consumables.

6.15: Summary and Conclusion

This chapter examined the contribution of wanted fertility and preference implementation to fertility transition at sub national regions of the four east African countries. The general conclusion emerging from the results is that the high fertility and slow pace of decline stems from high fertility desires in some sub-national regions however, the most distinguishing element is in the ability to implement fertility desires measured by the implementation index (I_p). Although there is ample evidence of conscious desires to limit family size which applies even to most of the sub regions, the desire to limit family size is far more prevalent in Rwanda and Kenya to some greater extent; but very limited in nearly the 18 sub regions of Tanzania and Uganda.

In Rwanda and to a larger extent Kenya, all the regions except the North Eastern part conform to the conclusion that accelerated fertility decline will occur if there is both substantial decline in desired fertility and increased level of preference implementation as reported by Bongaarts, (2017), Casterline and Agyei-Mensah, (2017) and Bongaarts & Casterline, (2013). Slow fertility

declines in general can be attributed to wide variations in inequalities across the sub-national regions.

There are also indications that Uganda may also have begun fertility decline though not rapid. Towriss and Timæus (2018) report that fertility in Eastern Africa could be changing in a more complex way than any of the current literature suggests. The inequalities in education, urban rural and region in transition may lie in examinations of specific historical contexts of each population (Casterline & Han, 2017) though they also clearly point out at the strength of programs in each country. With near similar single country policies driving the course, the significant differences registered by countries as well as their corresponding sub national regions should be a cause of concern.

By decomposition the wanted fertility and the degree of fertility preference implementation index contribute to fertility change corroborated by the above results of analysis. It is indeed understood that the fertility changes visualized are nevertheless masked with hidden peculiar trends that activate some particular sub categories of the population to increase overtime. These inconsistent variable shifts scenarios coupled with hidden periodicity within some variables and related salient actors evident within the key parameter measures hamper smoother transitions across board; hence cannot be ignored.

It is also undeniable that the extent at which these variables take effect to trigger changes in fertility have to do with a mix of other confounding elements and the extent at which they operate in association. The requirements for each one of the parameter measures to act are only but varied if their quantification is something to go by. Some of the variable measures have to do with the underlying beliefs while others are heavily dependent on populations' level of advancement and secularization among others.

Surrounded by all these while displaying the variations of fertility preference in terms of mean ideal number of children, wanted fertility and the total fertility rate, it is now common knowledge that East Africa countries do not have similar attitudes towards child bearing; and that within the same country, different regions exhibit different aspirations regarding family size. However, one thing stands out; that the factors towards any change including the attitudinal variations cuts across all indicators and influences their decisions with regards to child bearing. The level of population advancement therefore is key in driving the next phase of fertility transition. It is therefore accurate to hypothesize that the factors behind these particular measures be looked into in detail so as to provide a platform for manipulating the intended change trajectory as well as extrapolations and projections.

Improvement in the known change component factors, especially the development indicators believed to propel to better performance, the fertility parameters which eventually influence the degree of fertility preference implementation index and even the wantedness of children is therefore necessary. This will enhance the current transition course to a seamless process of change towards desired fertility. Transition hence becomes a function of fertility preference and implementation, heavily reliant on the various improvements in the developmental indicators. To sum it up within the variable correlations, the ability to implement desires is highest among the most educated and the converse is true. Further, as contraceptive utilization become an anchored behaviour, socio economic differentials narrow in effect.

CHAPTER 7: SUMMARY, CONCLUSSION AND RECOMMENDATION

7.1. Introduction

This thesis aimed to improve the general knowledge and understanding of the contemporary women fertility dynamics at play in the Eastern Africa region. This chapter therefore encapsulates the results with a key discussion of the findings thereby drawing conclusions and recommendations. One visibly outstanding feature across the spectrum of this study is the steady but slow pace in the improvement of the known factors of fertility as well as fertility parameter measures. However, some regions displayed reversals in their unwanted and wanted fertility. The heterogeneously diverse trends by regions implies that various countries and subnational regions do not have similar attitudes with regards to childbearing amid diverse degrees of inequalities. This mix in attitudes determines the prevailing fertility transition underway.

7.2. Fertility Tempo and Country Variations

In sum, the high fertility and slow pace of decline originate from high fertility desires in some sub national regions however, the most distinguishing element is the ability to implement fertility desires measured by the preference implementation index (Ip). Although there is ample evidence of conscious desires to limit family size which applies even to most of the sub regions, the desire to limit fertility is far more prevalent in most regions and to a greater extent Rwanda and Kenya; but very limited in most Tanzania regions and almost insignificant across Uganda. Previous studies hypothesised diffusion as an influencer to the course of fertility change with one region's fertility having implications in the neighbouring region because neighbouring regions share common language and cultural traits that permit shared flow of ideas and eventual spread of new models of behaviour. This has not been evident in totality across the country regions even though some changes points at the influence of diffusion.

For Kenya and Rwanda, and to some extent Uganda, the most important contributor to fertility decline by region, place of residence and socio-economic groups is the ability to implement fertility desires (Ip). Tanzania posted mixed results by different groups with change in wanted fertility as the most important contributor. Uganda is late and hesitating in its transition pointing at the political goodwill towards support to family regulation mechanisms. The latest trends show that Uganda has the steepest decline as confirmed by Bongaarts (2017) that such high fertilities countries initiating declines always provide rapid results in their first instances of drop.

Rwanda had the largest fertility decline due to the contributions by both changes in the wanted fertility and ability to implement fertility desires supported by the universal coverage of programs. Kenya's decline is associated with the long history of family planning programs even though the reach is intermittent. Amid all these results, there's is a definite convergence; fertility declines faster when both wanted fertility and ability to implement desired fertility occur simultaneously. This is evident in regions where pressure for lower births are imminent and with high contraception utilization prevalence.

7.3. Sub-national Fertility Changes

The sub national regions of each of the countries exhibit varied levels of advancement and their corresponding pressures summed as developmental inequality within the regions, equally contributing to the current fertility preference variations. With that in mind too, the study also found enormous heterogeneity in fertility changes within countries. The largest heterogeneity existed in Tanzania and lowest in Rwanda. As indicated by Muhoza et al. (2014) there are not only remarkable differences in desired fertility between the four East African countries and between certain communities within these countries but also the degree to which the different communities are able to implement their desires. It is now clear that even within the rich history

of these countries together with the similarities like near universal languages of communication, diffusion has failed to yield the expected results even among regions within close proximity. Mason (1997) established that there exist many theories of fertility transition, each containing important ideas, but not any single one can provide a unilaterally exhaustive explanation for all the absolute prevailing fertility declines. This seems to be the case with the regional fertility dynamics at play.

Lesthaeghe (1983) highlighted the cultural context in explaining the Coale's RWA hypothesis and concluded that the willingness(W) to lower fertility can exhibit substantial variation across contexts like countries, regions and social groups hence the assumption of complete endogeneity cannot hold. A case for instance involves how counter propagation of gossip about the physical effects and comfort of particular contraception can reduce willingness considerably even among the enlightened modern population regardless of their astronomical readiness (R) and ability (A) components state.

With the East African case, the differences in the path to fertility change may also reflect this among other cultural and contextual variation scales in reproductive behavior as well as effect of development and population density which create resource needs pressures. For Kenya, Tanzania and Uganda, regions with high agricultural potential, high population density and also with highest densities of development inputs have high implementation index and lowest desired family sizes. The sub regional differences in these countries appear to follow the earlier, conventional transition theory which predicts that fertility levels are inversely related to socioeconomic development indicators (Bongaarts & Casterline, 2013).

However, Rwanda shows similar change across all the regions irrespective of which regions are dominated by urban centers. The Rwanda case appears to follow the Bangladesh example where

fertility transition can occur due to strength of the programs and the political will (May 2017). The results here concur with Bongaarts and Casterline (2013) that although each country has a unique fertility trajectory, fertility transitions share similarities.

7.4. Potential Linkages to fertility preference Implementation Index

Despite being convenient model to show how implementation of preferences contribute to fertility change there is need to be cautious in the estimation of degree of fertility preference implementation index (Ip) as evident in the North Eastern region of Kenya and some regions of Tanzania. The degree of fertility preference implementation index (Ip) is dependent on development of a region, but more importantly closely associated with extent of unwanted fertility and hence the unmet need to contraception. A regionally oriented assessment into the cultural factors reveal that Muslim dominated areas may appear to have low degree of fertility preference implementation index (Ip). However, this may be confounded by other factors.

7.5. Conclusions.

This study shows that with the rising aggregate of the degree of fertility preference implementation, continuous declining trends in demand for births and subsequent surge in the contribution made by either or both the wanted fertility and the preference implementation index across categories that fertility transition is certainly on course in all these East African countries albeit at different levels. There is evidence examined here that the pattern of fertility decline in the region is indeed unique. Some sub national regions with relatively slow pace and level of development may imply that the cost of raising children has remained low compared to other developing regions and the benefits of having off springs remain substantial (Bongaarts, 2017). This has created a constant limited desire to have smaller family sizes or slow pace in decline in the wanted fertility. Accelerating fertility decline in such regions may require the drivers of

diffusion processes such as the public media among others. The future pace of fertility decline in the Tanzania where there are a majority of such sub regions will likely be slower than the pace in Kenya or Rwanda at comparable times from the transition onset, unless special interventions are undertaken (Bongaarts & Casterline, 2013). Tying this to the Coale's hypothesis, determining the Readiness, Willingness and Ability mix in particular including setting and identifying the particular contextual factors that influence the mix if family planning policies and programs are to deliver appropriate messages to encourage the adoption of birth control is of critical value to the preference discourse.

7.6. Recommendation for Policy

There are currently the macro approaches gearing towards policy implementation at the national level across these countries. The diversity of the regional populations and their intricate developmental performance levels faults the standard package of policy dispensation offered across board; non-cognisant of the uniqueness of the various underlying populations within regions. This points to a gap within the policy frameworks providing non-specific cabal aligned polices. It is also common knowledge that each country is being guided by single policy dispensation strategy. Although these governments pursue various programs to improve fertility and related issues, the greatest challenge is to integrate them into a comprehensive program that takes due consideration to the multifaceted nature of the factors involved. Owing to the uniqueness of each of the countries and regions as revealed by the statistics, a country and region-specific policy strategy should be able to help mop up the failing sub population categories bringing them to speed in order to match the others.

Further, investing in family planning programs to provide information about and access to contraception in order to permit control of reproductive lives and avoiding unplanned pregnancies

is a key policy option. The key cause of an unmet need for contraception is that contraception is either unavailable or often too costly to the consumers and sometimes the population is ignorant of the existence or usage of the same. In addition, there are significant non-economic costs such as health concerns, social disapproval, and spousal resistance, as well as unnecessary medical barriers requiring higher level expertise for utilization (Casterline & Sinding, 2000). Quality of the commodities have also been faulted in some instances. The unmet need is responsible for most of the unsatisfied demand subsequently aggravating unplanned pregnancies.

These family planning programs therefore must be accompanied by rigorous, consistent sensitization and public education campaigns through media among other modes of communication which in turn trigger demand for contraception in anticipation to lower desired family size by diffusing new ideas about the benefits of smaller families and the role of women (Bongaarts, 2017).

7.7. Recommendations for further Research

First, this study has dealt with the countries performance at the macro scale leading to generalised understanding of the contextual issues within the region. Indeed, the study analysis is based on pooled aggregate data at the macro level. This raises a fundamental flaw of ecological fallacy when the application of such macro level studies attempts to draw conclusions. Secondly, it elicits concerns of whether similar conclusions would be drawn if individual level analysis was to be carried out. The micro focus at the individual level assessment therefore would be essential in providing valuable insights usually masked by larger generalised sets of data at the macro scale.

Finally, the study has equally elicited situations that present themselves with preference implementation indices falling either below zero value or above unity. Further, the index presupposes that the Total Fertility Rate is always higher than the Wanted fertility and the Mean

Ideal family size. This scenario doesn't always hold across other regions. With enhancements and accurate restitution, there is no doubt therefore that utilising this methodology generally across countries and even within the sub population categories of interest could elicit a common pattern to facilitate the development of stronger algorithms that are adaptive to the circumstances. Recommended therefore is the continuous improvements and adaptation of its utilization including considerations regarding the quantification of the impact of these parameter measures in explaining the various transitions in general. The critical sections to look at are the outliers that renders the index meaningless.

Reference

Anasel, M. G. (2017). Family planning programme implementation: Differences in Contraceptive Prevalence Rates across Local Government Authorities in Tanzania [Groningen]: University

Bairagi, R., & Chowdhury, M. (1994). Effects of parental gender preference on fertility and mortality in Matlab. Matlab: Women, children and health.

Becker, G. S. (1960). An economic analysis of fertility Demographic and economic change in developed countries (pp. 209-240): Columbia University Press.

Becker, G. S. (1991). A Treatise on the Family (Revised and enlarged edition): Cambridge, Massachusetts: Harvard University Press.

Behrman, J. R., & Rosenzweig, M. R. (2002). Does increasing women's schooling raise the schooling of the next generation? American Economic Review, 92(1), 323-334.

Bengtsson, T., & Dribe, M. (2014). The historical fertility transition at the micro level: Southern Sweden 1815-1939. Demographic research, 30, 493-534.

Berelson, B. (1966). KAP studies on fertility. Demographic research, 30, 493-534.

Berelson, B. (1976). Social science research on population: A review. Population and development review, 219-266.

Billari, F. C., Kohler, H. P., Andersson, G., & Lundström, H. (2007). Approaching the Limit: Long-Term Trends in Late and Very Late Fertility. Population and development review, 33(1), 149-170.

Blacker, J., Opiyo, C., Jasseh, M., Sloggett, A., & Ssekamatte-Ssebuliba, J. (2005). Fertility in Kenya and Uganda: a comparative study of trends and determinants. Population studies, 59(3), 355-373.

Blanc, A. K., & Tsui, A. O. (2005). The dilemma of past success: insiders' views on the future of the international family planning movement. Studies in family planning, 36(4), 263-276.

Bloom, D., Canning, D., Gunther, F., Finlay, J. E. (2009) Fertility, female labor force participation, and the demographic dividend. Journal of Economic Growth, 14(2), 79-101

Bloom, D, Canning, D., Gunther F., and Finlay J. E. (2007) "Realizing the demographic dividend: Is Africa any different?" Working Paper Series No. 23 Program on the Global Demography of Aging. Harvard University, Cambridge, MA.

Bongaarts, J. (1982). The fertility-inhibiting effects of the intermediate fertility variables. Studies in family planning, 179-189.

Bongaarts, J. (1990). The measurement of wanted fertility. Population and development review, 487-506.

Bongaarts, J. (1993). The supply-demand framework for the determinants of fertility: An alternative implementation. Population studies, 47(3), 437-456.

Bongaarts, J. (2006). The causes of stalling fertility transitions. Studies in family planning, 37(1), 1-16.

Bongaarts, J. (2008). Fertility transitions in developing countries: Progress or stagnation? Studies in family planning, 39(2), 105-110.

Bongaarts, J. (2017). Africa's unique fertility transition. Population and development review, 43(S1), 39-58.

Bongaarts, J., & Bruce, J. (1995). The causes of unmet need for contraception and the social content of services. Studies in family planning, 57-75.

Bongaarts, J., & Casterline, J. (2013). Fertility transition: is sub-Saharan Africa different? Population and development review, 38(s1), 153-168.

Brass, W., & Jolly, C. (1993). Population Dynamics of Kenya. Population Dynamics of Sub-Saharan Africa: Working Group on Kenya: National Academy Press.

Brewster, K. L., & Rindfuss, R. R. (2000). Fertility and women's employment in industrialized nations. Annual review of sociology, 26(1), 271-296.

Bulatao, R. A., Lee, R. D., Hollerbach, P., & Bongaarts, J. (1983). Determinants of fertility in developing countries.

Caldwell, J. C. (1979). Education as a factor in mortality decline an examination of Nigerian data. Population studies, 395-413.

Caldwell, J. C. (1982). Theory of fertility decline. Population and development review, 8(3), 345-357.

Caldwell, J. C. (1986). Routes to low mortality in poor countries. Population and development review, 4(2), 171-220.

Caldwell, J. C. (1986). Routes to low mortality in poor countries. Population and development review, 4(2), 171-220.

Caldwell, J. C., & Schindlmayr, T. (2003). Explanations of the fertility crisis in modern societies: A search for commonalities. Population studies, 57(3), 241-263.

Caldwell, J. C., Orubuloye, I. O., & Caldwell, P. (1992). Fertility decline in Africa: A new type of transition? Population and development review, 211-242.

Casterline, J. B. (2017). Prospects for Fertility Decline in Africa. Population and development review, 43, 3-18.

Casterline, J. B., & Agyei-Mensah, S. (2017). Fertility Desires and the Course of Fertility Decline in sub-Saharan Africa. Population and development review, 43(S1), 84-111.

Casterline, J. B., & El-Zeini, L. O. (2007). The estimation of unwanted fertility. Demography, 44(4), 729-745.

Casterline, J. B., & Han, S. (2017). Unrealized fertility: Fertility desires at the end of the reproductive career. Demographic research, 36, 427-454.

Cleland, J., & Wilson, C. (1987). Demand theories of the fertility transition: An iconoclastic view. Population studies, 41(1), 5-30.

Cleland, J., Bernstein, S., Ezeh, A., Faundes, A., Glasier, A., & Innis, J. (2006). Family planning: the unfinished agenda. The Lancet, 368(9549), 1810-1827.

Coale, A. (1973). The Demographic Transition Reconsidered. International Union for the Scientific Study of Population. Paper presented at the Proceedings of the International Population Conference. Liège: Editions Ordina.

Cochrane, S. H., OHara, D. J., & Leslie, J. (1980). The effects of education on health. National Research Council, 12(5), 7.

Collier, P., & Gunning, J. W. (1999). Explaining African economic performance. Journal of economic literature, 37(1), 64-111.

Dhillon, R. S., & Phillips, J. (2015). State capability and Rwanda's health gains. The Lancet Global Health, 3(6), e308-e310.

Dribe, M., Nystedt, P. 2013. Educational homogamy and gender-specific earnings: Sweden, 1990–2009. Demography, 50(4), 1197-1216

Easterlin, R. A. (1975). An economic framework for fertility analysis. Studies in family planning, 6(3), 54-63.

Easterlin, R. A. (1983). Modernization and fertility: A critical essay.

Easterlin, R. A., & Crimmins, E. M. (1985). The fertility revolution: A supply-demand analysis: University of Chicago Press.

Elder Jr, G. H. (1985). Life course dynamics: Trajectories and transitions 1968-1980.

Eliya Msiyaphazi Zulu, D., Onyango, B., Williams, E. M., & Biaye, M. (2015). Synthesis Report on the Demographic Dividend in Africa.

Eloundou-Enyegue, P., Giroux, S., & Tenikue, M. (2017). African Transitions and Fertility Inequality: A Demographic Kuznets Hypothesis. Population and development review, 43, 59-83.

Ewbank, D., Henin, R., & Kekovole, J. (1986). An integration of demographic and epidemiologic research on mortality in Kenya.

Ezeh, A. C., & Dodoo, F. N.-A. (2001). Institutional change and the African fertility transition: the case of Kenya. Genus, 135-164.

Ezeh, A. C., Mberu, B. U., & Emina, J. O. (2009). Stall in fertility decline in Eastern African countries: regional analysis of patterns, determinants and implications. Philosophical Transactions of the Royal Society of London B: Biological Sciences, 364(1532), 2991-3007.

Fosu, A. K. (2015). Growth, inequality and poverty in Sub-Saharan Africa: recent progress in a global context. Oxford Development Studies, 43(1), 44-59.

Freedman, M. B. (1965). The sexual behavior of American college women: An empirical study and an historical survey. Merrill-Palmer quarterly of behavior and development, 11(1), 33-48.

Freedman, R. (1979). Theories of fertility decline: A reappraisal. Social forces, 58(1), 1-17.

Freedman, R. R., & Blacker, C. M. (2002). Estrogen raises the sweating threshold in postmenopausal women with hot flashes. Fertility and sterility, 77(3), 487-490.

Freedman, R., Coombs, L. C., & Bumpass, L. (1965). Stability and change in expectations about family size: A longitudinal study. Demography, 2(1), 250-275.

Friedman, J. (1994). Cultural identity and global process (Vol. 31): Sage.

Garenne, M. (2008). Fertility changes in sub-Saharan Africa DHS Comparative Reports No. 18 (Vol. 3, pp. 276-288). Calverton, Maryland, USA: Macro International.

Garenne, M. (2009). Sex ratio at birth and family composition in sub-Saharan Africa: inter-couple variations. Journal of biosocial science, 41(3), 399-407.

Garenne, M. (2014). Trends in marriage and contraception in sub-Saharan Africa: A longitudinal perspective on factors of fertility decline DHS Analytical Studies No. 42. Rockville, Maryland, USA: ICF International.

Hagewen, K. J., & Morgan, S. P. (2005). Intended and ideal family size in the United States, 1970–2002. Population and development review, 31(3), 507-527.

Harwood-Lejeune, A. (2001). Rising age at marriage and fertility in Southern and Eastern Africa. European Journal of Population/Revue Européenne de Démographie, 17(3), 261-280.

Henry, L. (1961). Some data on natural fertility. Eugenics quarterly. 8(2) 81-91

Huinink, J., & Kohli, M. (2014). A life-course approach to fertility. Demographic research, 30, 1293-1326.

Ibisomi, L. D. G. (2002). An exploratory study of changes in fertility across developing countries. (2), International Journal of Business and Social Science. (12)

Ibisomi, L. D., & Odimegwu, C. O. (2007). Predictors of unintended pregnancy among South African youth. Eastern Africa Social Science Research Review, 23(1), 61-80.

Ibisomi, L. D., Odimegwu, C. O., Otieno, A. T., & Kimani, M. (2005). Degree of preference implementation and fertility changes in developing countries. Paper presented at the XXVTH IUSSP CONFERENCE. Tours, France.

Ibisomi, L., & Odimegwu, C. (2011). Understanding resolution of differential fertility preferences among couples in Nigeria. International Journal of Business and Social Science, 2(4).

Johnson-Hanks, J. A., Bachrach, C. A., Morgan, S. P., & Kohler, H.-P. (2011). Social class and the timing and context of childbearing Understanding Family Change and Variation (pp. 87-110): Springer.

Johnson-Hanks, J. A., Bachrach, C. A., Morgan, S. P., & Kohler, H.-P. (2011b). The theory of conjunctural action Understanding Family Change and Variation (pp. 1-22): Springer.

Kimani, M., & K'oyugi, B. O. (2004). Regional variations in the use of contraception in Kenya. Genus, 33-53.

KNBS. (2015). Kenya Demographic and Health Survey (KDHS). 2014. Kenya National Bureau of Statistics, 3(1).

Kohler, H.-P. (2012). Copenhagen Consensus 2012: Challenge Paper on" Population Growth". The American Naturalist, 23(7), 143-158.

Korotayev, A., Zinkina, J., Goldstone, J., & Shulgin, S. (2016). Explaining Current Fertility Dynamics in Tropical Africa From an Anthropological Perspective: A Cross-Cultural Investigation. Cross-Cultural Research, 50(3), 251-280.

Lesthaeghe, R. (1983). A century of demographic and cultural change in Western Europe: An exploration of underlying dimensions. Population and development review, 411-435.

Linard, C., Gilbert, M., Snow, R. W., Noor, A. M., & Tatem, A. J. (2012). Population distribution, settlement patterns and accessibility across Africa in 2010. PloS one, 7(2), e31743.

Lloyd, S. A., & Emery, B. C. (2000). The context and dynamics of intimate aggression against women. Journal of Social and Personal Relationships, 17(4-5), 503-521.

Machiyama, K. (2010). A re-examination of recent fertility declines in sub-Saharan Africa. ICF Macro, 5(2), 437-449.

Mahy, M., & Gupta, N. (2002). Trends and differentials in adolescent reproductive behavior in sub-Saharan Africa DHS Analytical Studies No. 3. Calverton, Maryland, USA: ORC Macro.

Malik, K. (2014). Human development report 2014: Sustaining human progress: Reducing vulnerabilities and building resilience: United Nations Development Programme.

Marchant, T., Schellenberg, J., Peterson, S., Manzi, F., Waiswa, P., Hanson, C. . . . Akuze, J. (2014). The use of continuous surveys to generate and continuously report high quality timely maternal and newborn health data at the district level in Tanzania and Uganda. Implementation Science, 9(1), 112.

Mascarenhas, M. N., Flaxman, S. R., Boerma, T., Vanderpoel, S., & Stevens, G. A. (2012). National, regional, and global trends in infertility prevalence since 1990: a systematic analysis of 277 health surveys. PLoS medicine, 9(12), e1001356.

Mason, K. O. (1997). Explaining fertility transitions. Demography, 34(4), 443-454.

May, J. F. (2017a). The Politics of Family Planning Policies and Programs in sub-Saharan Africa. Population and development review, 43, 308-329.

May, J. F. (2017b). The Role of Public Population Institutions on Fertility Outcomes in Sub-Saharan Africa. Population, 14, 1.

May, J. F. (2017a). The Politics of Family Planning Policies and Programs in sub-Saharan Africa. Population and development review, 43, 308-329.

May, J. F., Mukamanzi, M., & Vekemans, M. (1990). Family planning in Rwanda: status and prospects. Studies in family planning, 21(1), 20-32.

McClelland, D. C., & Pilon, D. A. (1983). Sources of adult motives in patterns of parent behavior in early childhood. Journal of Personality and Social Psychology, 44(3), 564.

McDonald, P. (2000). Gender equity in theories of fertility transition. Population and development review, 26(3), 427-439.

Measure, D. (2011). Demographic and Health Surveys STAT compiler [Data file] (Vol. 3, pp. 12-18): ICF Macro.

Measure, D. (2014). ICF International. Demographic and Health Surveys Methodology: Standard Recode Manual for DHS 6. Demographic and Health Survey Toolkit of Methodology for the MEASURE DHS Phase III (2008–2013), 12(3), 1.

Miller, W. B., & Pasta, D. J. (1995). How does childbearing affect fertility motivations and desires? Social Biology, 42(3-4), 185-198.

Montgomery, M. R. (1987). A new look at the Easterlin "synthesis" framework. Demography, 24(4), 481-496.

Montgomery, M. R., & Casterline, J. B. (1993). The diffusion of fertility control in Taiwan: Evidence from pooled cross-section time-series models. Population studies, 47(3), 457-479.

Morgan, S. P. (2003). Is low fertility a twenty-first-century demographic crisis? Demography, 40(4), 589-603.

Morgan, S. P., & Rackin, H. (2010). The correspondence between fertility intentions and behavior in the United States. Population and development review, 36(1), 91-118.

Moultrie, T. A., Sayi, T. S., & Timæus, I. M. (2012). Birth intervals, postponement, and fertility decline in Africa: A new type of transition? Population studies, 66(3), 241-258.

Muhoza, D. N., Broekhuis, A., & Hooimeijer, P. (2014). Variations in desired family size and excess fertility in East Africa. International Journal of Population Research, 2014.

Myrskylä, M., Goldstein, J. R., & Cheng, Y.-H. A. (2012). New cohort fertility forecasts for the developed world. Rostock: Max Planck Institute for Demographic Research (MPIDR working paper, WP–2012–014).

Notestein, F. W. (1953). Economic problems of population change: Oxford University Press London.

Odwe, G. O. (2015). Fertility and Household Poverty in Kenya: a comparative analysis of Coast and Western Provinces. African Population Studies, 29(2), 233-247.

Ogola, F. O., Njenga, G. N., Mhando, P. C., & Kiggundu, M. N. (2015). A Profile of the East African community. Africa Journal of Management, 1(4), 333-364.

Okech, T. C.,Wawire, N. W., Mburu, T. K. (2011). Contraceptive use among women of reproductive age in Kenya's city slums. BMC pregnancy and childbirth. 4(5), 35-50

Ominde, S. H. (1975). The Population of Kenya, Tanzania & Uganda: Heinemann.

Opiyo, C. O. (2009). The recent rise of childhood mortality in Sub-Saharan Africa: The case of Kenya. University of Pennsylvania.

Organization, W. H., & Unicef. (2015). Trends in maternal mortality: 1990-2015: estimates from WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division.

Otieno, A. A., Amani, H. K., & Makbel, A. (2016). Population Dynamics and Social Policy: Economic and Social Research Foundation.

Otieno, A., & Amani, H. (2014). Population growth, structure and momentum in Tanzania: Economic and Social Research Foundation.

Otieno, V. O., Otieno , A., & Khasakhala, A. (2018). Fertility Transition in Selected Sub Saharan African Countries: The Role Family Planning Programs. Asian Academic Research Journal of Social Science and Humanities, 5(5), 54-64.

Otieno, V. O., Otieno , A., & Khasakhala, A. (2018b). Trends in Fertility Preference Implementation among Selected Eastern African Countries. The International Journal of Humanities and Social Sciences, 6(6), 204-213.

Oucho, J. O. (1996). Urban migrants and rural development in Kenya: Nairobi University Press Nairobi.

Philipov, D. (2011). Theories on fertility intentions: A demographer's perspective. Vienna Yearbook of Population Research, 9, 37-45.

Potter, C. J., Tasic, B., Russler, E. V., Liang, L., & Luo, L. (2010). The Q system: a repressible binary system for transgene expression, lineage tracing, and mosaic analysis. Cell, 141(3), 536-548.

Potts, M. (1997). Sex and the birth rate: Human biology, demographic change, and access to fertility-regulation methods. Population and development review, 1-39.

Pritchett, L. H. (1994). Desired fertility and the impact of population policies. Population and development review, 1-55.

Pullum, T. W. (1980). Illustrative analysis: fertility preferences in Sri Lanka.

Pust, R. E., Newman, J. S., Senf, J., & Stotik, E. (1985). Factors affecting desired family size among preliterate New Guinea mothers. International Journal of Gynecology & Obstetrics, 23(5), 413-420.

Ravallion, M. (2001). Growth, inequality and poverty: looking beyond averages. World development, 29(11), 1803-1815.

Ravallion, M. (2017). Poverty comparisons: Routledge.

Ravallion, M., & Chen, S. (2010). The impact of the global financial crisis on the world's poorest. Internet: www. voxeu. org/index. php.

Ravallion, M., Chen, S., & Sangraula, P. (2009). Dollar a day revisited. The World Bank Economic Review, 23(2), 163-184.

Robinson, W., & Cleland, J. (1992). The influence of contraceptive costs on the demand for children. . International family planning perspectives, 234-347

Ross, J., & Smith, E. (2010). The family planning effort index: 1999, 2004, and 2009. Washington DC: Futures Group. Health Policy Initiative. Published on line, 6(23), 308-348.

Ross, J., & Stover, J. (2001). The family planning program effort index: 1999 cycle. International family planning perspectives, 119-129.

Ruzicka, L. T. (1994). Progress in demographic methodology. Journal of the Australian Population Association, 11(1), 21-31.

Schoen, R., Astone, N. M., Kim, Y. J., Nathanson, C. A., & Fields, J. M. (1999). Do fertility intentions affect fertility behavior? Journal of Marriage and the Family, 790-799.

Schoumaker, B. (2009). Stalls in fertility transitions in sub-Saharan Africa: Real or spurious? : Département des sciences de la population et du développement, Université catholique de Louvain Louvain-la-Neuve.

Schultz, T. P. (1973). A preliminary survey of economic analyses of fertility. The American Economic Review, 63(2), 71-78.

Shapiro, D., & Gebreselassie, T. (2013). Fertility transition in sub-Saharan Africa: falling and stalling. African Population Studies, 23(1).

Shapiro, D., & Tenikue, M. (2015). Women's Education, Infant and Child Mortality, and Fertility Decline in Sub-Saharan Africa: A Quantitative Assessment.

Smith, D. S. (1993). American family and demographic patterns and the northwest European model. Continuity and Change, 8(3), 389-415.

Sobotka, T., & Beaujouan, É. (2014). Two Is best? The persistence of a two-child family ideal in Europe. Population and development review, 40(3), 391-419.

Surkyn, J., & Lesthaeghe, R. (2004). Value orientations and the second demographic transition (SDT) in Northern, Western and Southern Europe: An update. Demographic research, 3, 45-86.

Thomson, E., McDonald, E., & Bumpass, L. L. (1990). Fertility desires and fertility: Hers, his, and theirs. Demography, 27(4), 579-588.

Towriss, C. A., & Timæus, I. M. (2018). Modelling period fertility: Schooling and intervals following a birth in Eastern Africa. Population studies, 72(1), 75-90.

UNDESA, (2014). World urbanization prospects, the 2011 revision. Population Division, Department of Economic and Social Affairs, United Nations Secretariat.

Van de Kaa, D. J. (1987). Europe's second demographic transition. Population Bulletin, 42(1), 1-59.

Van de Kaa, D. J. (2004). Is the Second Demographic Transition a useful research concept Questions and answers. Vienna Yearbook of Population Research, 2, 4-10.

answers. Vienna Yearbook of Population Research, 2, 4-10.

Van de Kaa, D. J. (2010). Demographic transition. Encyclopedia of Life Support Systems, 1, 65-103.

Van de Walle, E., & Knodel, J. (1980). Europe's fertility transition: new evidence and lessons for today's developing world. Population Bulletin, 34(6), 3-44.

W. H.O, & UNICEF. (2015). Trends in maternal mortality: 1990-2015: estimates from WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division.

Westoff, C. F. (2006). New estimates of unmet need and the demand for family planning (Vol. 5, pp. 345-360). Calverton, Maryland, USA.

Westoff, C. F. (2013). The recent fertility transition in Rwanda. Population and development review, 38(s1), 169-178.

Westoff, C. F., & Bankole, A. (1999). Mass media and reproductive behavior in Pakistan, India, and Bangladesh DHS Analytical Reports No. 10. Calverton, Maryland, USA: Macro International.

Westoff, C. F., & Cross, A. R. (2006). The stall in the fertility transition in Kenya. Population and development review, 41, 123-138

Westoff, C. F., & Ryder, N. B. (1971). Family limitation in the United States. Proceedings of the International Population Conference. , 4(5), 565-578.

Westoff, C., & Cross, A. (2005). The Kenya stall. DHS Comparative Reports No. 5. Philadelphia Pennsylvania.

Westoff, C., & Cross, A. (2005, April 2005). The Kenya stall, Philadelphia Pennsylvania. Population and development review. 6 (8), 435-448

Zaba, B., Pisani, E., Slaymaker, E., & Boerma, J. T. (2004). Age at first sex: understanding recent trends in African demographic surveys. Sexually transmitted infections, 80(suppl 2), ii28-ii35.

Zafar, A. (2007). The growing relationship between China and Sub-Saharan Africa: Macroeconomic, trade, investment, and aid links. The World Bank Research Observer, 22(1), 103-130.

Appendix A: Maps of the East Africa Region and Country Maps

Kenya Regional Map

Rwanda Regional Map

Tanzania Regional Map

Uganda Regional Map

Appendix B: Trends in Total Fertility Rates

i) **Kenya**

Sub Region	1989	1993	1998	2003	2008	2014
Nairobi	4.2	3.4	2.6	2.7	2.8	2.7
Central	6.0	3.9	3.7	3.4	3.4	2.8
Coast	5.4	5.3	5.0	4.9	4.8	4.3
Eastern	7.2	5.9	4.7	4.8	4.4	3.4
Nyanza	6.9	5.8	5.0	5.6	5.4	4.3
Rift Valley	7.0	5.7	5.3	5.8	4.7	4.5
Western	8.1	6.4	5.6	5.8	5.6	4.7
North Eastern	-	-	-	7.0	5.9	6.4

ii) **Rwanda**

	2005	2008	2010	2014
Kigali	3.4	3.1	2.6	2.7
South	4.4	3.8	3.3	3
West	4.9	4.1	3.5	3.1
North	4.8	3.2	2.7	2.8
East	4.8	3.8	3.5	3.5

iii) **Tanzania**

	1992	1996	2004	2010	2015
Tanzania	6.2	5.8	5.6	5.7	5.4
Zanzibar	6.4	5.9	5.3	5.1	5.1
Iringa	6.2	5.2	4.7	4	4.4
Rukwa	7.4	6.2	6.9	8	6.4
Mwanza	6.5	6.6	6.3	6.5	6
Mara	6.7	7.3	7	7.1	6.7
Kagera	7.1	8.1	5.7	5.5	7.1
Tabora	6.4	5.2	7.2	6.6	6.6
Shinyanga	7.4	6.7	7.3	7.6	6.1
Kigoma	6.8	7.7	7.4	6.6	6.9
Mbeya	5.6	5	6.2	5.5	4.5
Kilimanjaro	5.2	5.3	3.9	3	3.4
Tanga	6.3	5.7	4.7	4.8	4.4
Arusha/ Manyara	6.8	6.2	4.8	4.8	4.6
Dodoma	7.2	5.8	6.3	6.6	5.2
Singida	6.7	6.5	5.8	6.4	6.2
Dar es Salaam	4	3.5	2.5	3.1	3.3
Pwani	5.4	4.6	5.2	5	4.6
Morogoro	6.4	5.5	4.9	4.7	4.9
Southern	5.1	4.9	4.8	4.4	3.8
Lindi	5.7	4.7	4.3	5.1	4
Mtwara	4.1	5	4.9	3.8	3.6
Ruvuma	5.8	5.1	5	4.6	4.4
Pemba South	-	-	7.2	6.1	6.6
Zanzibar North	-	-	5.8	5.6	6.5
Zanzibar South	-	-	4.4	3.9	5.7
Town West	-	-	4.1	4.3	3.6

iv) **Uganda**

	1988	1995	2001	2006	2011
Central	6.9	6.3	5.7	5.2	5.1
Eastern	7.5	7.4	7.4	7.6	7.3
Northern	7.4	6.8	7.9	7.4	6.5
Western	7.8	7.0	6.9	6.8	6.3

Trends in mean Ideal family sizes

i) **Kenya**

	1989	1993	1998	2003	2008	2014
Nairobi	3.4	2.5	2.3	2.3	2.4	2.3
Central	3.7	2.6	2.6	2.8	2.6	2.1
Coast	4.7	4.3	4.4	4.3	4.2	3.8
Eastern	4.3	3.3	3.2	3.3	2.9	2.5
Nyanza	4.9	4.1	3.7	3.8	3.9	3
Rift Valley	4.5	3.6	3.7	4.1	3.5	3.4
Western	6.0	3.6	4.3	4	3.6	3.2
North Eastern	-	-	-	6.5	5.9	6.4

ii) **Tanzania**

	1992	1996	2004	2010	2015
Tanzania	5.6	5.1	4.8	4.9	4.7
Zanzibar	5.7	5.2	4.6	4.8	4.6
Iringa	5.8	4.6	3.8	3.4	4
Rukwa	6.7	5.9	5.8	7.2	5.3
Mwanza	5.6	5	5.8	5.2	5
Mara	5.7	5.9	5.9	5.7	5.6
Kagera	6.5	7.2	5	4.8	6.5
Tabora	5.9	4.8	6	6	5.7
Shinyanga	6.8	6.1	5.9	6.5	5.1
Kigoma	6.3	6.4	7	6.1	5.7
Mbeya	5.3	4.5	5.3	4.7	3.9
Kilimanjaro	3.7	4.3	3	2.6	2.9
Tanga	5.5	4.7	4.3	4.1	4.1
Arusha/ Manyara	5.5	5.5	4.6	4.7	4.3
Dodoma	6.8	5.4	5.2	5.9	4.5
Singida	6.3	5.3	4.9	5.3	5.1
Dar es Salaam	3.7	3.1	2.2	2.9	3
Pwani	4.8	4.1	4.8	4.7	4.3
Morogoro	5.7	5.2	4.6	4.3	4.6
Southern	4.5	4.4	4.5	4	3.5
Lindi	5	4.1	4.1	4.4	3.7
Mtwara	3.7	4.4	4.7	3.6	3.3
Ruvuma	5.1	4.5	4.5	4	3.7
Pemba South	-	-	6.4	5.9	5.7
Zanzibar North	-	-	4.5	5	5.4
Zanzibar South	-	-	4	3.5	5.5
Town West	-	-	3.5	4	3.5

iii) **Rwanda**

	2005	2008	2010	2014
Kigali	3.4	3.1	2.6	2.7
South	4.4	3.8	3.3	3
West	4.9	4.1	3.5	3.1
North	4.8	3.2	2.7	2.8
East	4.8	3.8	3.5	3.5

iv) **Uganda**

	1988	1995	2001	2006	2011
Central	5.9	4.8	4.5	4.1	4.1
Eastern	6.1	5.9	5.3	5.6	5.0
Northern	7.2	6.0	6.3	5.8	5.0
Western	6.9	5.9	5.6	5.2	4.8

Trends in Total Unwanted fertility rates

i) **Kenya**

	1989	1993	1998	2003	2008	2014
Nairobi	0.8	0.9	0.3	0.4	0.4	0.4
Central	2.3	1.3	1.1	0.6	0.8	0.7
Coast	0.7	1.0	0.6	0.6	0.6	0.5
Eastern	2.9	2.6	1.5	1.5	1.5	0.9
Nyanza	2.0	1.7	1.3	1.8	1.5	1.3
Rift Valley	2.5	2.1	1.6	1.7	1.2	1.1
Western	2.1	2.8	1.3	1.8	2.0	1.5
North Eastern	-	-	-	0.5	0.0	0.0
Kenya	**1.90**	**1.77**	**1.10**	**1.20**	**1.14**	**0.91**

ii) **Rwanda**

	2005	2008	2010	2014
Kigali	0.9	1.3	0.9	0.9
South	1.2	1.7	1.3	1
West	1.7	1.7	1.5	1.5
North	1.6	2.2	1.4	0.9
East	1.7	2	1.4	1.1

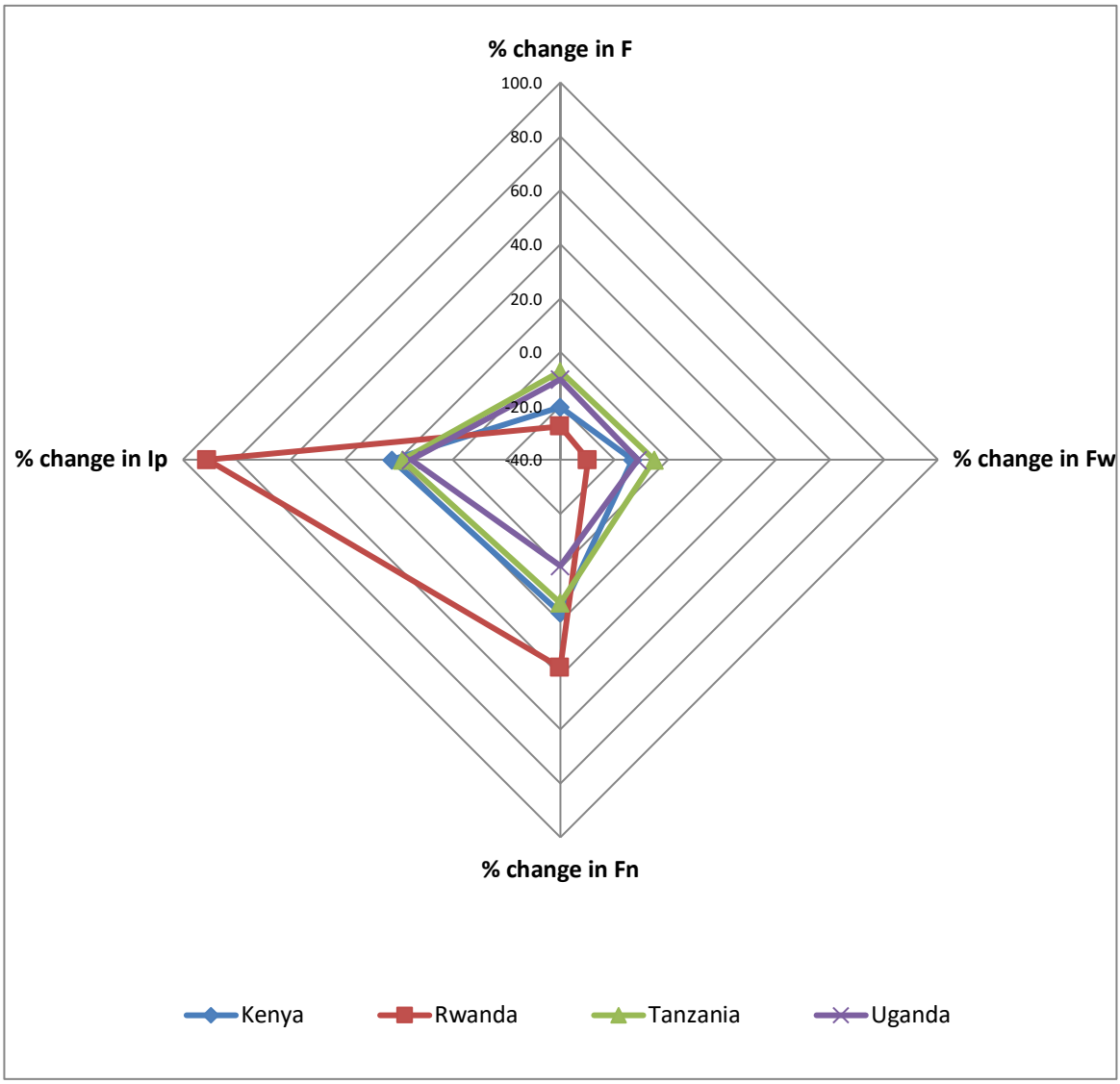
iii) **Uganda**

	1988	1995	2001	2006	2011
Central	1.0	1.5	1.2	1.1	1.0
Eastern	1.4	1.5	2.1	2.0	2.3
Northern	0.2	0.8	1.6	1.6	1.5
Western	0.9	1.1	1.3	1.6	1.5

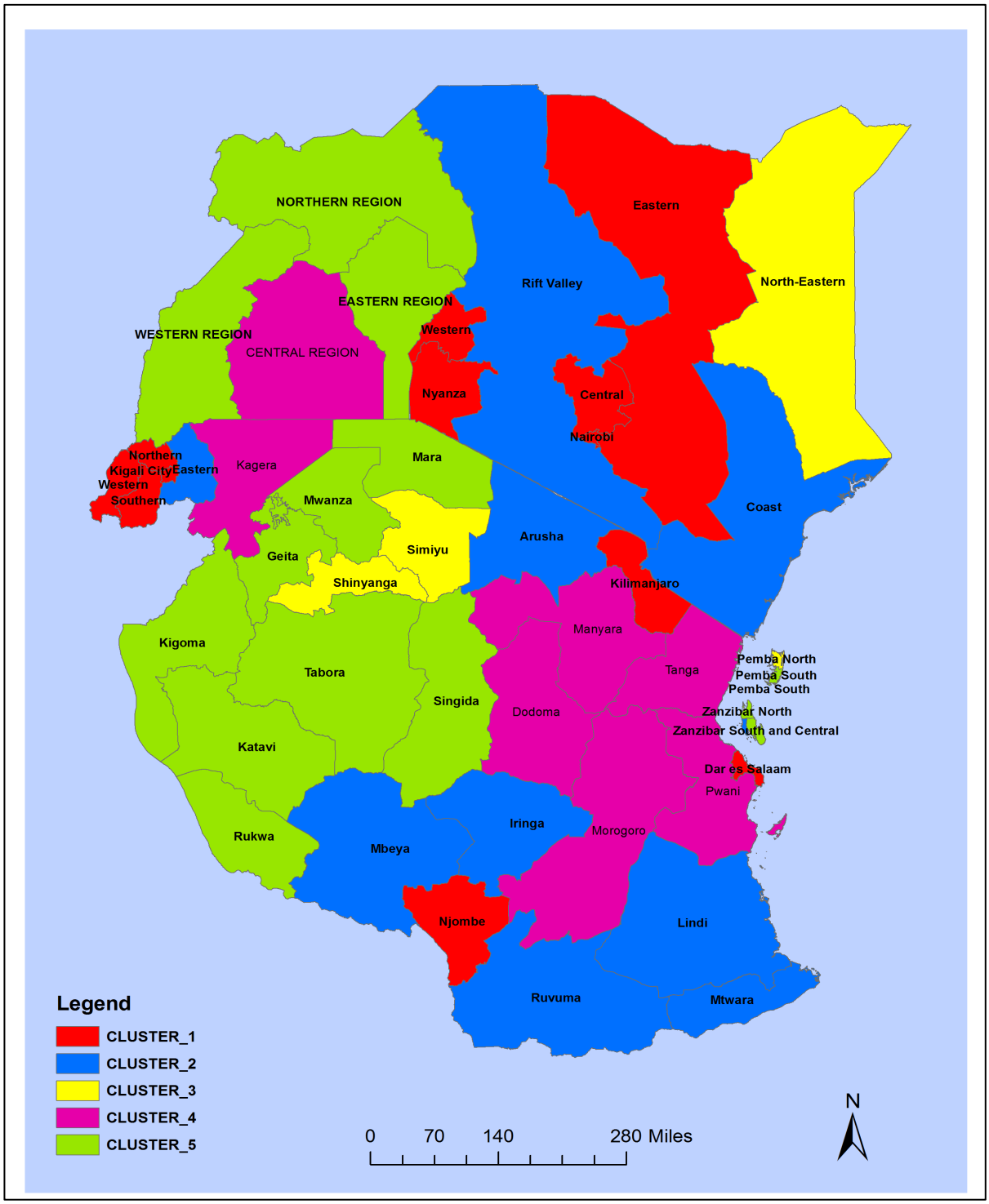
iv) **Tanzania**

	1992	1996	2004	2010	2015
Tanzania	0.6	0.7	0.8	0.8	0.7
Zanzibar	0.7	0.7	0.7	0.3	0.5
Iringa	0.4	0.6	0.9	0.6	0.4
Rukwa	0.7	0.3	1.1	0.8	1.1
Mwanza	0.9	1.6	0.5	1.3	1
Mara	1	1.4	1.1	1.4	1.1
Kagera	0.6	0.9	0.7	0.7	0.6
Tabora	0.5	0.4	1.2	0.6	0.9
Shinyanga	0.6	0.6	1.4	1.1	1
Kigoma	0.5	1.3	0.4	0.5	1.2
Mbeya	0.3	0.5	0.9	0.8	0.6
Kilimanjaro	1.5	1	0.9	0.4	0.5
Tanga	0.8	1	0.4	0.7	0.3
Arusha/ Manyara	1.3	0.7	0.2	0.15	0.3
Dodoma	0.4	0.4	1.1	0.7	0.7
Singida	0.4	1.2	0.9	1.1	1.1
Dar es Salaam	0.3	0.4	0.3	0.2	0.3
Pwani	0.6	0.5	0.4	0.3	0.3
Morogoro	0.7	0.3	0.3	0.4	0.3
Southern	0.6	0.5	0.3	0.4	0.3
Lindi	0.7	0.6	0.2	0.7	0.3
Mtwara	0.4	0.6	0.2	0.2	0.3
Ruvuma	0.7	0.6	0.5	0.6	0.7
Pemba South	-	-	0.8	0.2	0.9
Zanzibar North	-	-	1.3	0.6	1.1
Zanzibar South	-	-	0.4	0.4	0.2
Town West	-	-	0.6	0.3	0.1

Appendix C: %Change in Total Fertility rate (F), Total Wanted fertility rate (Fw), Preference Implementation index (Ip) and natural fertility (F_n)



Appendix D: Clustering of sub Regions by various indicators of fertility and fertility preferences



Appendix E: Correlation Analysis

Wanted fertility and Unmet need to contraception Correlations

		Total wanted fertility rate	Unmet need to Contraception
Total wanted fertility rate	Pearson Correlation	1	.396**
	Sig. (2-tailed)		.000
	N	218	201
Unmet need to Contraception	Pearson Correlation	.396**	1
	Sig. (2-tailed)	.000	
	N	201	201

**. Correlation is significant at the 0.01 level (2-tailed).

Unwanted fertility and Demand for family planning satisfied by modern contraception Correlations

		Total wanted fertility rate	Demand for family planning satisfied by modern
Total wanted fertility rate	Pearson Correlation	1	-.726**
	Sig. (2-tailed)		.000
	N	218	203
Demand for family planning satisfied by modern	Pearson Correlation	-.726**	1
	Sig. (2-tailed)	.000	
	N	203	203

**. Correlation is significant at the 0.01 level (2-tailed).

Unwanted fertility and Unmet need to contraception Correlations

		Unwanted Fertility	Unmet need to Contraception
Unwanted Fertility	Pearson Correlation	1	.328**
	Sig. (2-tailed)		.000
	N	212	197
Unmet need to Contraception	Pearson Correlation	.328**	1
	Sig. (2-tailed)	.000	
	N	197	201

**. Correlation is significant at the 0.01 level (2-tailed).

Unwanted fertility and Demand for family planning satisfied by modern contraception
Correlations

		Unwanted Fertility	Demand for family planning satisfied by modern
Unwanted Fertility	Pearson Correlation	1	-.075
	Sig. (2-tailed)		.298
	N	212	197
Demand for family planning satisfied by modern	Pearson Correlation	-.075	1
	Sig. (2-tailed)	.298	
	N	197	203