

DECLARATION

This research project is my original work and to the best of my knowledge has not been submitted to this or any other University for a ward of a degree.

Signature

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This research proposal has been submitted for examination with our approval as university supervisors:

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DEDICATION

I dedicate this work to my mum, Kulo Kanchora Jillo and my father, Dika Bilala Guyo for supporting me and believing in me throughout my entire school life.

I also dedicate this work to my lovely Aunt Mumina K Jillo, siblings, Jarso, Boru and Aisha for the support and love they have given me. Last, but not the least, I dedicate this work to my Grandmother, Sarapana and Sasura for being my first teachers.

I love you All!

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In The Name of Allah, The Most Beneficent, The Most Merciful

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LIST OF ABBREVIATIONS

AIDS	Acquired immunodeficiency syndrome
ASMR	Age specific mortality rate
ASR	Age specific rate
ASFR	Age specific fertility rate
ECDE	Early Childhood Development and Education
FPE	Free primary education
HIV	Human immunodeficiency virus
MDG	Millennium Development Goal
PCR	Pupil classroom ratio
PTR	Pupil teacher ratio
PToR	Pupil toilet ratio
RUP	Rural urban projection
SCR	Student classroom ratio
STR	Student teacher ratio
SToR	Student toilet ratio
TFR	Total fertility rate

ABSTRACT

The main objective of the study was to carry out the sectoral population projections for Isiolo County between 2010 and 2030. To achieve this goal, the study employed the cohort component method to project population of Kenya and then the population of Eastern Region, and finally the population of Isiolo County.

The study used the 2009 Kenya Population and Housing Census data for projecting populations after subjecting it to data quality assessment to detect the degree of accuracy. From the 2009 census data, Isiolo's population was 143,294 people. The study projected that this population will increase from 146,569 in 2010, to 153,802 in 2015, to 161,631 in 2020, to 169,466 in 2025 and 177,022 by 2030.

After obtaining the projected population for Isiolo County, the study used the projected population to generate projections of school age, youth and labour force for the county. The study found out that in Isiolo County, children of ECDE school-age are projected to increase from 14,807 in 2010 to 16,329 in 2020 and 17,884 by 2030; those of primary school-age will increase from 32,869 in 2010 to 36,247 in 2020 and 39,698 by 2030; while those of secondary school-age will increase from 13,465 in 2010 to 14,848 in 2020 and 16,262 by 2030.

The projected labour force population is set to increase from 76,392 people in 2010 to 84,243 people in 2020 and 92,263 people by 2030. The study also projected that youth population is set to increase from 30,332 youths in 2010 to 33,449 youths in 2020 and to 36,633 youths by 2030.

Based on the findings, there is need for further research which should focus on similar study to this one on the sectoral population projections focusing on other counties in Kenya and comparing their results.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Depended on the existing age-sex structure, along with assumed rates of fertility, mortality and migration in the future, population projection is the estimation of future populations. The purpose of population projections is to anticipate the changes in population size and its characteristics - hence population projections are a real test of demographers' understanding of the major components of population change (USBC, 2011).

The primary needs of people in Kenya cannot be gauged rationally without regard to the expected size and composition of the population, nor can the country resources be appraised enough without considering labour, the supply of which depends mainly on population size and structure. Population projections are important both at the subnational and national levels. There are four distinct areas in which population projections are a valuable input (Kenya, 2012d).

First, population projections help policy makers and planners to distribute the insufficient resources efficiently enabling them plan for future development of a country. Planners of national and subnational require population projections for different reasons, to acquire idea of possible future changes in composition, size and distribution of the population in their respective fields. Planning, whether in the private or public sector, aims at meeting present and future demands of the population in order to improve citizen's standard of living (Kenya, 2012d).

Second, population projections are used for advocacy, especially where there is a negative impact of a particular phenomenon on population or vice versa. People can boost their knowledge on the effects of the population change, like what effect a 20 percent decline in birth rates intend to have on population size and age structure of a country in 50 years, based on population projections. (Tom, 2011).

Third, researchers frequently use projections for research purposes in order to try to answer questions, such as "what would happen if?" However, population change can equally be regarded as being, to some extent, a dependent rather than independent variable in the planning process. As such, population projections can also be used to estimate the possible demographic

impact of planning and policy decisions, planning and policy implications of demographic change as well (Kenya, 2012d).

Fourth, population projections are used for monitoring and evaluation purposes. Population projections become a useful input for programmers not only during target setting, but also for monitoring and evaluation, especially at impact level. They are important in gauging whether a programme is on track in attaining international, national and subnational development targets such as the Millennium Development Goals (MDGs). This is because computation of many of these indicators needs population data (Liberia, 2011).

The main methods of population projections include mathematical methods and the component method. The selection of the method often relies upon data availability. The mathematical methods require less data which entails fitting a linear model to the total population observed in one or two censuses to obtain the projected population for specified date in the future. Also, methods of mathematics only give about future population size and not the age composition information (Liberia, 2011).

The cohort component method is highly accurate in making projections. This method starts with an age/sex distribution of population for a base year and uses its age specific rates (ASRs) which are normally organized in groups of 5-year age and later projected to future years according to the assumptions selected. The assumptions are made about the future course of the fertility, mortality and migration (Lesotho, 2010).

The new structure of devolved governance in Kenya introduces a greater demand for projected population figures at county level like never before. County planners and policy makers often utilize projections of population for research of marketing and mainly want a single most possibly forecast. Planners of county government may be interested with aging of population and its plausible impact of economic and social. Therefore, they want sustained projections to understand the elderly living arrangements and their health status (Isiolo, 2013).

The current Population Policy for National Development is intended to help the realization of Kenya Vision 2030 and thus achieve the Kenyans high quality life by establishing growth of the population at a level that can be sustained using existing resources. In line with this national

development framework, this study projected sectoral populations for Isiolo County between 2010 and 2030.

1.2 Problem Statement

Although population projections from the 2009 Kenya Population and Housing Census were generated at the national and sub-national levels, no sectoral population projections are available at the county level (Kenya, 2012d). Lack of adequate data on sectoral population projections for Isiolo County based on the 2009 Population Census can result in serious oversight, which may lead to poor distribution of resources by the national and county governments.

Hence, there is need for sectoral population projections at the county level from the 2009 Kenya Population and Housing census, thus providing projected sectoral populations for Isiolo County.

1.3 Key Research Questions

The study sought to answer the following key research questions:

- i. What is the projected school-age population for Isiolo County between 2010 and 2030?
- ii. What is the projected labour force population for Isiolo County between 2010 and 2030?
- iii. What is the projected youth population for Isiolo County between 2010 and 2030?

1.4 Objectives of the Study

The general objective of this study was to project the sectoral populations for Isiolo County between 2010 and 2030 to feed the projected population categories into the county integrated planning strategy.

The study aimed to achieve the following specific objectives:

- i. To project the school-age population of Isiolo County up to the year 2030.
- ii. To project the labour force population of Isiolo County up to the year 2030.
- iii. To project the youth population of Isiolo County up to the year 2030.

1.5 Justification of the Study

This study focused on generating sectoral population projections for Isiolo County which is set to become a major part of Kenya's economic development plan (Isiolo, 2013). Isiolo County

inter-censual population growth rate is high at 3.7 percent between 1999 and 2009 (Kenya, 2012a). The county's population growth rate is expected to increase rapidly as the Lamu Port-Southern Sudan and Ethiopia Transport (LAPSSET) projects, including the Resort City and International Airport, flagship projects of Kenya Vision 2030, are expected to attract increased migration into the county. This calls for comprehensive planning for the anticipated changes (Isiolo, 2013). Results of this study will make a contribution to improved planning through the county integrated development plan.

1.6 Scope and Limitations of the Study

The study used the 2009 Kenya Population and Housing Census data. Census enumerations are not always perfect; the reported data may be affected by coverage and content errors. Adjustments for coverage errors were not possible since results of the post-enumeration survey have not been published by the Kenya National Bureau of Statistics.

Not all sectoral areas are covered in this study. This study focus on education, labour force and youths only. Education does not include tertiary level of education. This is because there is no official age for tertiary education according to the Ministry of Education Policy. Migration can be unpredictable hence may not be captured on the ground.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The literature review in this section is organized under the titles: Concepts of population projections, Relevance of population projections, Methods of population projections and Population projections.

2.2 Concepts of Population Projections

There is a distinction between projections, forecasts, predictions and estimates. Population estimates are generally described as being of three types; inter-censal estimates, immediate post-censal estimates and future estimates or projections (Bryan, 2004b). The term estimate is generally used for inter-censal or immediate post-censal periods where there is a higher degree of confidence that results obtained are likely to be very close to actual figures. Projections are end result of a certain assumptions concerning values of future population, while forecasts are clearly defined projections that are likely to give the exact predictions of those values (Shryock, 1976).

The projections reliability and suitability depend on their proximity to substantiality and the assumptions. In the end, the parameters of policy are to be added in the projections. The possibly impacts of changes of policy are to be determined and projections made consequently. Hence, shifts to a forecast, when judgement element is incorporated to the projections (George et al, 2004).

The purpose of population projections is to anticipate the changes in population size and characteristics, hence population projections are a real test of demographers' understanding of the major components of population change. In the public and private sectors, population projections are important for planning at the national, provincial and county levels. Planners and policy makers want to know the future size, structure of a country's population and their characteristics (USBC, 2011).

2.3 Relevance of Population Projections

Population projections are generally utilized in certain processes of policy making. Forecasts of demography have established knowledge of ageing of population and eventuated in pension, health care and other public policies changes. Projections of demography are fundamental in

the design and realization of national, provincial and county level issues of policy like usage of land and planning of infrastructure, health, housing policy and educational services (NSD, 2004).

Population projections provide a mechanism for confining dependable data on the reasonable population future size, structure and distribution to give information on MDGs monitoring and give information on MDGs monitoring and evaluation and other development agenda of national in the course of the inter-censal years (Lesotho, 2010).

Groups of advocacy would want substitutes to a specific likely event, inclusive of projections that match the influence of policy. Similarly, those interested with the population growth environmental impacts may be concerned in potential for minimizations in equivalent growth via policies related to population (O'Neill et al, 1999).

Projections are frequently used by Global change researchers as exogenous recommendations to researches on titles like global warming, supply of food and consumption. Projections having elongated time scope, a centurial or over, and a magnitude of events in place of a specific highest anticipated projection are required by these studies (O'Neill et al, 1999).

2.4 Methods of Population Projections

The main methods of population projections include mathematical methods and the component method. Mathematical methods are those in which the evolution of population is assumed to be described by some fairly mathematical simple formulae. Mathematical methods are quick, simple and require little in terms of data. Mathematical methods are the approach of choice for many projections of total population of countries (USBC, 2011).

The component method is much more cumbersome, has heavy data requirements, hence time consuming. The component method's advantage is that detailed aspects of the population structure can be forecast (USBC, 2011).

2.4.1 Mathematical Methods

Mathematical methods are applied mainly for projecting populations of small areas within a country; they are seldom used for projecting the population of a country as a whole. These methods do not provide the population age structure. Although each sex total can be obtained,

projections for each sex are made independently and thus are not necessarily consistent. However, the technique is useful for projecting populations of small areas without vital statistics. The most commonly mathematical functions used are linear, exponential and logistic functions. Such projections are usually formed by anticipating past trends of population forward and when such a procedure is applied to the population of the whole country, the projections may be subject to errors due to lack of control over changes in the components of population growth and age structure (USBC, 2011).

For small areas, the results are more acceptable because the projections can be constrained by an overall projection pertaining to an aggregated total of the small areas. For example, a country with a population projection prepared by the component method at the state level can use a mathematical function to project the population of small areas within each state under the condition that populations total of the small boundary will be equivalent to projection of the state. Once the mathematical projection for each small area has been made, the population of each area can be adjusted proportionally to the state population. Then, the state population serves as a control total for the projections of the small areas (USBC, 2011).

Linear function

One of the simplest ways to project the population of an area is to assume that the average annual increase that occurred during a recent period of time will be repeated in the future (Eduardo et al, 1994). The simplest curve to use is a straight line given by;

$$P^{t+n} = P^t + n \cdot Y$$

Where,

P^t represents the population at year t

n is the years number to project from year t and

Y is the population average annual increase.

However, actual observations have shown that population does not always grow linearly, hence the use of other functions.

Exponential function

Under conditions of constant mortality and fertility with the absence of migration, human populations tend to grow exponentially. Thus, it has been suggested that an exponential rather than a linear function would better represent the growth of a population (Eduardo et al, 1994).

The formula used for an exponential projection is:

$$P^{t+n} = P^t e^{nr}$$

Where,

P, t, and n represent the same concepts as above, r is the average annual exponential growth rate, and e is the base of the natural logarithm.

Logistic function

A logistic function can be used for projecting total populations. The linear and exponential functions imply that there is no limit to ultimate population size. Consequently, they should only be used on a restricted range. Therefore, it becomes necessary to use a logistic curve which assumes the rate of growth does not stay constant but gradually drops to near zero so that population approaches towards a finite size. The logistic curve suggests after some period the rate of growth slows down and the size of population will never go above a certain level. However, since most populations have not yet reached zero rate of growth, the exponential curve still gives realistic estimates although a logistic curve would be useful when one might expect a limit to the ultimate population (Eduardo et al, 1994). The formula used for logistic function is:

$$Y_x = a + bY_x^s$$

Where,

Y_x is the life table survivor's logit transformation, l_x .

Y_x^s is the corresponding logit of the standard life table.

2.4.2 Ratio Share Method

The ratio method is the most reliable method of projecting population at lower geographic levels, like, when the fundamental fertility, mortality and migration information are not accessible. This method is depended on sub-national population ratio to that of the national population. After the ratio of the sub-national population is obtained, assumptions are made on future values of this ratio. Once future values of the ratio are fixed, the projected population of the sub-national is obtained by applying the ratio to the projected national population in that year. This procedure is then replicated for other sub-national populations at lower levels (Kenya, 2012d).

2.4.3 Component Method

For many reasons, the interest in population projections is more to do with the future population structure than the future population size, therefore, the component method comes in handy since it allows us to project the whole population structure over a given future period. The key to understanding how the population structure changes over time is to remember that changes in the population size and structure can only occur if and only if any of the fertility, mortality and migration takes place. A higher favourable method for population projection is to reproduce how the population changes in accordance to fertility, mortality and migration (Eduardo et al, 1994).

2.5 Population Projections

Depending on the objective of the research there are various procedures that can be utilized for population projection given. Wekesa (1989) projected the population of Kenya and studied its educational sector implications and specifically school enrolment using the four parameter logit system. Ondieki (1989) in his thesis, utilized the exponential equation $P_t = P_0 e^{rt}$ to project the Nairobi population and its housing implications and observed that needs of housing were maximizing with time like the population.

While using the model for stable population an 18 by 18 matrix method, Bwila (2004) in his findings, projected that the Kenya population will stabilize by the year 2090. Kodiko (2014) applied sub-national projection methods like growth model share, population model share, model of growth difference and models for shortcut cohort to the counties in the former province of Nyanza, Kenya. The study observed that the projected school-age population will increase in all the sub-counties in the region. Mwangi (2012) used the cohort component method in projecting the national and provincial populations and ratio method to project the county populations in his study of primary school-age population projections for counties in Central province, Kenya.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter outlines the data analysis method utilized in this study. The study utilized the cohort component method. Explanation on the quality of data and smoothing procedure is highlighted first.

3.2 Quality of the 2009 Kenya Population and Housing Census Data

It was necessary to assess the quality of the data as provided by the 2009 census before using it to generate population projections. This is because enumerations of census are not accurate, and the age and sex structure data reported are normally influenced by coverage and content errors. In the course of the initial years of period of the projection, errors in the composition of age and sex of the base population may have a big effect on the projected population. By following people's cohorts all through their lifetimes, the component method projects the base population. If the projection begins with errors in the base year, similar errors will be performed during the projection period and also will have an effect on the number of births projected. Presuppose, 0 to 4 years children were under enumerated in the base population. Moreover would the surviving cohorts of these children be lesser than they should be, but also when the female cohorts reach ages of reproduction, there would be underestimation of births they have (CBS, 2002).

Appropriately, assessment of the enumeration completeness and the misreporting of age should be carried out and adjustments made as needed, before obtaining a base population for the projections. It is essential for the population by age and sex information to be as exact as feasible. Specifically known pockets of the population omission will lead into coverage errors while events content relate to misreporting of events. If not rectified, the errors will have facts biasness or distortion in the estimates from similar data. Accordingly, it becomes imperative to assess both the content and coverage errors (CBS, 2002).

3.2.1 Coverage Errors

Coverage errors are errors that emerge because of the duplications or omissions of people hence resulting to under-enumeration or over-enumeration. Some common coverage errors include; incomplete or inaccurate maps or household listings, failure of field staff to cover all households or persons in their assigned areas, duplicate counting, persons who refuse to be

counted, erroneous treatment of some categories of people (refugees, aliens and visitors), and completed enumeration forms lost. Sex ratios are used for checking coverage errors (Kenya, 2012d).

Sex ratio is an analytical mechanism, which involve dividing the male population by the female population in the similar age group and multiplying the outcome by 100. The more the departure of this ratio from values near to 100, the more the likelihood of errors in the data. Sex ratios below 100 denote under-coverage while those above 100 would imply double counting (Kenya, 2012d).

3.2.2 Content Errors

One of the basic important information provided by a census is the age profile of the population. Age misreporting is often subjected to the population data in developing countries. Irregularities in the age distribution may be a result of the interviewer who estimates the age of a respondent who does not know his/her age or a respondent's incorrect age declaration. Therefore, it is important to gauge the precision of the age distribution and correct for deficiencies wherever necessary. The principal approaches for evaluating age misreporting are digit preference and age ratios (Kenya, 2012d).

Myers index and Whipple's index are used to detect digit preference which is another common error that occurs in reporting of ageing. Whipple's index is given by adding the returns of age between 23 and 62 years comprehensive and determining what percentage is carried by the sum of the returns of years ending with 5 and 0 to the one-fifth of the sum of the total. The index differs between 100, showing no choice for 0 or 5, and 500, illustrating that only digits 0 and 5 were recorded. This index is a very efficient measure of accuracy of age as far as digit preference is involved, and has the superiority that it can be computed without difficulty (United Nations, 1989a).

Myers index assesses digit preference in all the 10 terminal digits (0-9). Every one of the ten terminal digits takes 10 percent out of 100. In an ideal situation where there is no digit preference, the terminal digit will score a total of 10 percent. A deviation from 10 percent shows either digit preference (a positive deviation value), or digit avoidance (a negative deviation value). Positive values indicate digit preference, that people prefer reporting their age ending with those digits (Kenya, 2012d).

Whipple’s main drawbacks are that it is used for measuring only digit-preference for only two digits, 0 and 5 to be precise. Hence, the study utilized Myers index in assessing the quality of the 2009 Population and Housing Census data.

Age ratios for 5-year age groups provide an alternative for detecting possible age misreporting. Age ratios are expected to be similar throughout the age distribution in a population where there is no age misreporting, and all of them should be close to a value of 100. Large fluctuations of these ratios and their departure from 100 results to great probability of errors in the data (Kenya, 2012d).

3.2.3 Age sex- Accuracy Index

This is also a technique used to test census data accuracy. Based on the empirical analysis of the declaration of age and sex in censuses from different countries, the United Nations came up with an age-sex accuracy index as summarized in Table 3.1 below.

Table 3.1: United Nations Age-Sex Accuracy Index

Value of index	Judgment
Less than 20	Accurate
Between 20 and 40	Inaccurate
Over 40	Highly Inaccurate

Data is accurate if the index obtained is less than 20, inaccurate if between 20 and 40, and highly inaccurate if over 40. If the data is adjusted as inaccurate, light smoothing is required. However, strong smoothing is required if data is highly inaccurate.

3.2.4 Smoothed Population

Smoothing techniques are utilized to adjust any irregularities recorded in content errors in the data for population. Smoothing procedures are utilized for adjusting age misreporting data and mostly concern the usage of a formula to the original data. The smoothing of age distributions by such formulas gives acceptable results (Kenya, 2012d). Depending on the results obtained from United Nations age sex accuracy index, smoothing will be done accordingly.

3.3 Component Projections

The main population components include fertility, mortality and migration. Because these components experience respective changes, it becomes necessary to project each component separately.

3.3.1 Fertility Projections

Fertility pertains to the number of children borne by a woman in her life span. Fertility has the greatest effect more than any other demographic process to a country's population growth. Fertility assumptions are commonly expressed as period total fertility rate (TFR). TFR refers to the number of children a woman awaits to have after going through her reproductive life. Projections of fertility are made by projecting the course of the TFR gradually and adapting it into age specific fertility rates (ASFRs). It is essential to understand that the TFR projection is divided into assumptions concerning an assumed resulting fertility level, and the path followed from the current to the eventual level. Both assumed eventual fertility level and projected pace of fertility change are essential to driving population structure and size trends (Kenya, 2012d).

3.3.2 Mortality Projections

Mortality projection is the lifetime of a child if prevailing age specific mortality rates (ASMRs) were held fixed in the course of time (Kenya, 2012d). Life expectancy is a period measure and doesn't show the specific experience of an individual person. However, it gives important highlights of the current ASMRs to which population shown at a particular time. Projections of mortality also identify how mortality is assigned over different groups of age for males and female and how these assignments may change gradually. For instance, infant mortality rates declines and lower age groups mortality can lead to rise in life expectancy at birth. Mortality changes at different ages have different consequences for population size and age structure even though they have exact effects on life expectancy at birth (O'Neill et al, 2001).

3.3.2.1 HIV/AIDS

The striking rise in life expectancy at birth in the least developed countries (LCDs) in the past have been slowed or reversed in many countries (especially Sub-Saharan Africa) due to the AIDS impact. For instance, in Botswana, life expectancy at birth has decreased from about 63 to below 50 years in the late 1980s and 1990s respectively. In Zimbabwe also life expectancy at birth decreased from 57 to 44 years over the similar period (United Nations, 1999c).

AIDS is striking a tremendous economic and social toll in the world by directing economically active group's members to an unanticipated death. The impacts of AIDS on age structure and population growth could be significant in countries affected. The United Nations (1999b) estimates population size will be on average 8.1 percent lower in 2015 than it would be outside AIDS for the 29 African countries in which it adjusted its projections to AIDS accountancy. This reflects a difference of 5.4 percent in the Africa total population. The effect is projected

to be about 15 percent in the nine most affected countries. The United Nations recommends that mortality be projected to incorporate the HIV/AIDS impact in populations where HIV prevalence is greater than one percent (Murdock et al, 1995).

3.3.3 Migration Projections

Migration is strongly influenced by policies unlike fertility and mortality where the policy impact is similarly less clear. Due to the migration regulations and practices of different countries, migration is probably the most challenging demographic component to predict. Also, international migration is the most difficult growth component to assess because data are usually inadequate (Kenya, 2012d).

Considering short-term changes in political, economic or social factors frequently show an essential role, migration can be unpredictable. In addition, projections are mainly depended on current policies and past trends although historical migration data are inadequate, after all no particular imperative theory of migration present. In spite of the fact that fertility mainly has a larger long-term population growth impact, also migration can make use of a strong significance. For example in the beginning of 1990s, net international migration represented for about half of the population growth rate in the more developed countries (MDCs) (United Nations, 1989b).

3.4 Data Analysis

The method of data analysis used in this study is the cohort component method of population projections.

3.4.1 The Cohort Component Method

The cohort component method is the most commonly used tool in population projections and is superior to mathematical and ratio methods because it involves a separate analysis of the changes affecting each component of the population (fertility, mortality and migration) (Kenya, 2012d).

The components of population change are:

$$(\text{Births} - \text{Deaths}) + (\text{In-migrants} - \text{Out-migrants})$$

The cohort component method is utilized to project the population forward into future years where by the population change components are projected separately for each birth cohort.

The cohort component method normally presents a set of scenarios chosen to represent plausible, possible or relevant future paths of fertility, mortality, and migration. This method leads to the high, medium, and low scenarios of population projections. The medium variant among the three scenarios is treated as the 'most likely' outcome, as it gives a sense of neutrality and consequently an apparent plausibility in future development (Kenya, 2012d).

The cohort component method takes path of each cohort of people throughout its lifetime according to its exposure to the components of population change. The population at single age is disclosed to the chances of dying as driven by projected mortality levels and patterns by age and sex beginning with a base population by age and sex, leading to deaths estimation in the cohort. The deaths are then deducted from the surviving population and those staying alive become older. On the other hand, fertility rates are projected and related to the women of reproductive ages to estimate the number of births each year and single children born cohort is as well followed through time by disclosing it to the appropriate rates mortality rates (Kenya, 2012d).

Finally, the cohort component method of population projections considers net-migrants who are included at every specific age. Subsequently, the full procedure is done again for every year of the projection period, which results in the projected population by age and sex for each year, for each particular cohort of people (CBS, 2002).

The cohort method of population projections was used in this study to project the national, provincial and county populations, by inputting the components of population change including HIV.

CHAPTER FOUR

POPULATION PROJECTIONS

4.1 Introduction

This section gives the findings of this study on sectoral population projections for Isiolo County and their interpretation. The analysis begins with the assessment of the 2009 census data quality and then projections for the components of population, and then the findings of the population projections of Kenya, Eastern region and Isiolo County using the cohort component method. Finally, the projected school age, labour force and youth populations for Isiolo County are presented.

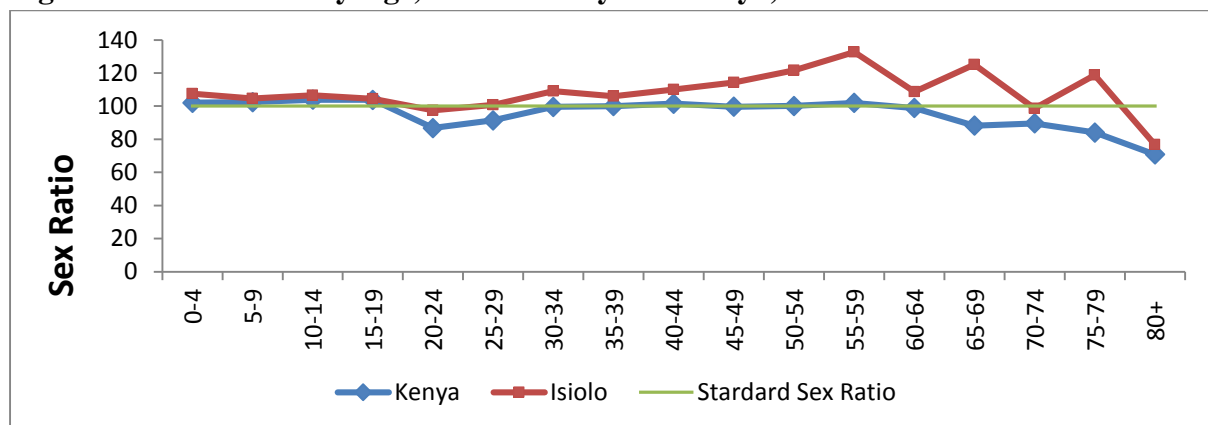
4.2 Assessment of the Quality of the 2009 Kenya Population and Housing Census Data

The quality of the 2009 population and housing census data was assessed. Coverage and content errors are evaluated.

4.2.1 Coverage Errors

Figure 4.1 below depicts sex ratios for Kenya and Isiolo County. It is evident that the sex ratios at both national and Isiolo County level do not reflect any serious irregularities. Sex ratios for Kenya indicate irregularities with a minimum sex ratio of 71 for those aged 80+ while those for Isiolo County indicate irregularities with a maximum sex ratio of 133 for those aged 55-59.

Figure 4.1: Sex Ratios by Age, Isiolo County and Kenya, 2009



4.2.2 Content Errors

Results of digit preference in Isiolo County, using Myers index, for the 2009 population and housing census data are shown in Figure 4.2 below. Terminal digits 0 and 5 were highly preferred with zero having the highest preference. Females had more preference compared to males, with an index of 11.3 and 6.1 for terminal digits 0 and 5 respectively; while males have

an index of 9.8 and 4.9 for terminal digits 0 and 5 respectively. Most people avoided reporting their ages ending with digit 7 with an index of -4.6 and -5.3 for males and females respectively followed by digit 1 with an index of -3.7 for both males and females. Age heaping is non-existent for ages ending in 2.

Figure 4.2: Digit Preference by Sex, Isiolo County, 2009

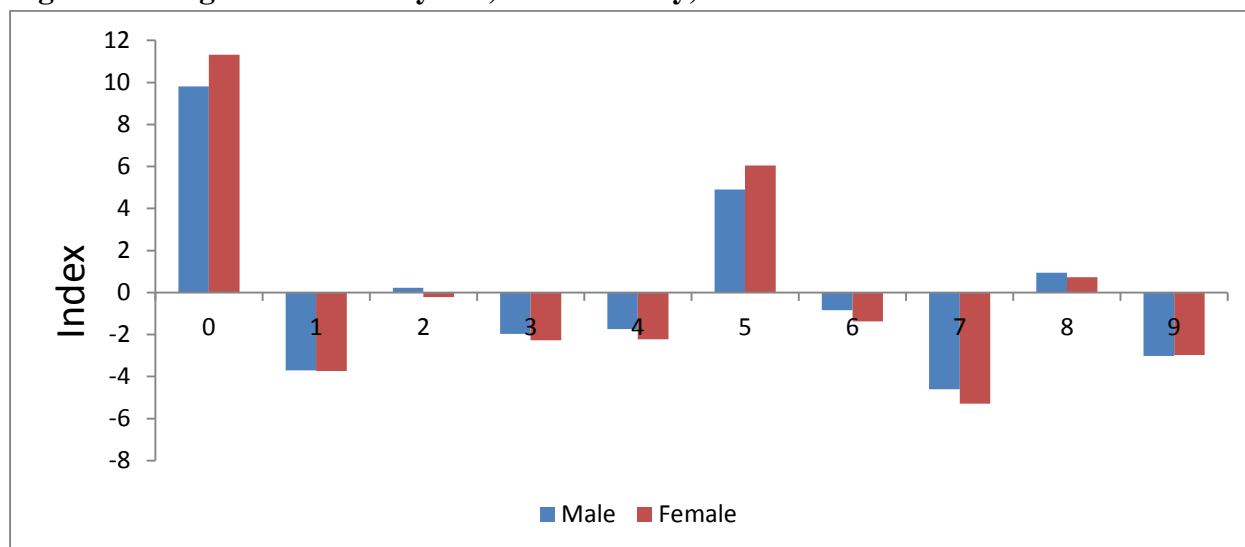
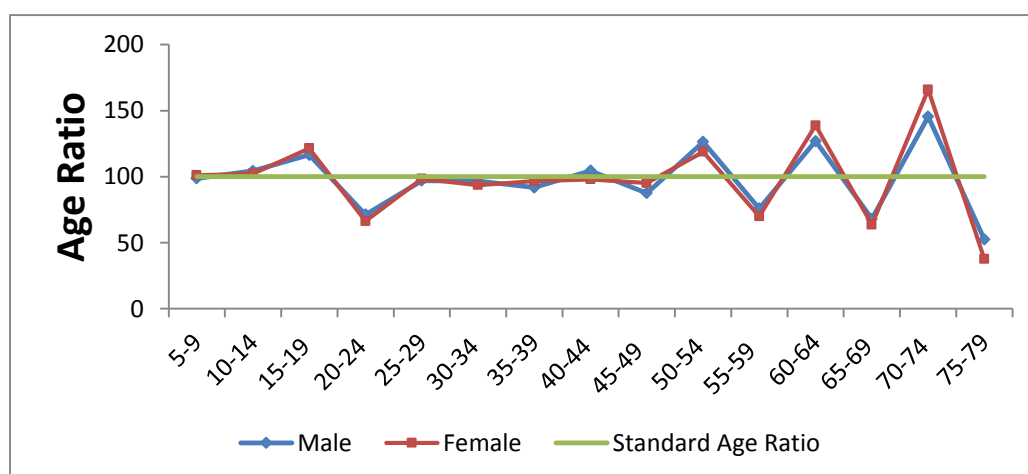


Figure 4.3 below shows age ratios by sex. The age ratios show fluctuations for both sexes but most prominent in older ages, among those aged 60 and above. Such fluctuations were ascribed to the quality of the age-reporting originating from differential age shifting by sex because they cannot be completely explained by demographic factors and therefore demanding graduation of the recorded age-sex distribution.

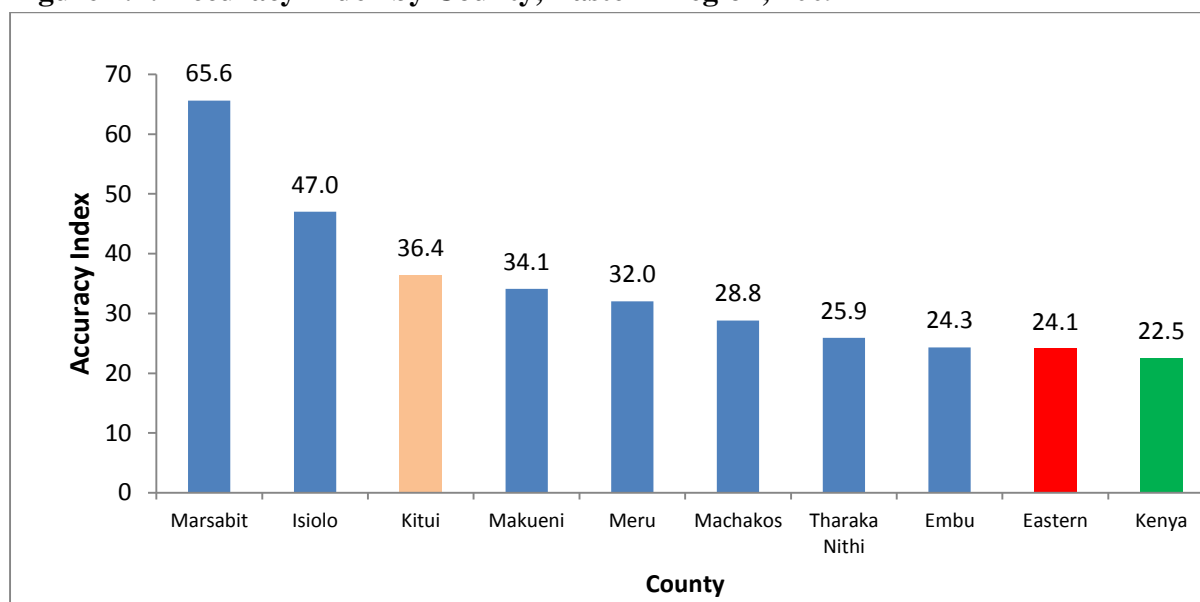
Figure 4.3: Age Ratios by Age and Sex, Isiolo County, 2009



4.2.3 Age-sex Accuracy Index

A closer scrutiny of the accuracy index from the 2009 population and housing census data admits differentials by county of Eastern region. The accuracy indices by county are as indicated in Figure 4.4 below.

Figure 4.4: Accuracy Index by County, Eastern Region, 2009



From Figure 4.4, Marsabit County reflects the highest index of 65.6, followed by Isiolo County at 47.0 denoting highly inaccurate reporting. Kenya, Eastern region and the rest of the counties in the region fell in the category of inaccurate reporting, with an index of between 22.5-36.4. Consequently, data for Kenya and Eastern region required light smoothing while that of Isiolo County required a strong smoothing procedure.

The Isiolo County literacy level is very low as 85 percent of the community members can neither read nor write. There are 63 adult literacy classes in the entire county with an enrolment of only 1,835 students out of which 649 are males and 1,186 are females (Isiolo, 2013). This high level of illiteracy in the county may have contributed to highly inaccurate reporting of the 2009 census data.

4.2.4 Smoothed Population

The particular reason for procedures of smoothing is to adjust any irregularities recorded in content errors in the data for the population. This technique include the use of a formula of the authentic data and often used for correcting data for age misreporting. Isiolo County recorded highly inaccurate reporting, hence a strong smoothing procedure was applied.

The comparison between the county enumerated and smoothed population is shown in Figure 4.5 below.

Figure 4.5: Enumerated versus Smoothed Population, Isiolo County, 2009

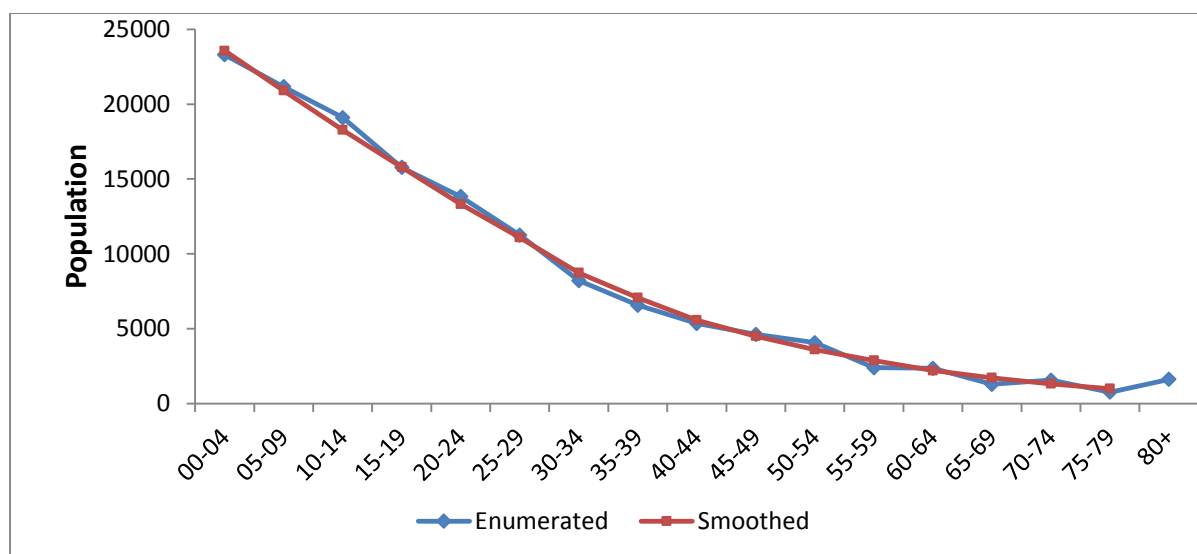


Figure 4.5 shows a pattern of slight inconsistency when the enumerated and smoothed populations are compared.

To generate the base populations for projection purposes involved moving the smoothed populations belonging to 24/25 August 2009 to those belonging to the mid-year 2010. Therefore, the start year of the projections became 2010 while the final year is 2030. After obtaining the base populations, the next step was to compute projections for the population components (fertility, mortality-including HIV prevalence, and net migration).

4.3 Component Projections

The main population components include fertility, mortality and migration. Because these components experience respective changes, it becomes necessary to project each component separately.

4.3.1 Fertility Projections

The 1999 and 2009 Population and Housing Censuses, and the 2008/09 and 2014 Kenya Demographic and Health Survey (KDHS) estimates are used as inputs for observation of the fertility trend. At national level, the study assumed that the fall in TFR would continue till the final year of the projection period. The TFR was assumed to decrease from 4.4 in 2010 to 4.1 in 2015 to 3.7 in 2020 to 3.4 in 2025 and finally reach 3.2 in 2030 (Kenya, 2012d). The TFR for Isiolo County was assumed to decline from 5.2 in 2010 to 4.9 in 2015 to 4.5 in 2020 and finally reach 3.7 in 2030 (Kenya, 2012e).

4.3.2 Mortality Projections

Expectation of life at birth for Kenya was assumed to increase from 58.5 (males) and 61.6 (females) in 2010 to 65.3 and 69.5 in 2030 respectively; for Eastern region from 62.4 (males) and 67.2 (females) in 2010 to 69.7 and 75.8 in 2030 respectively; and for Isiolo County from 65.4 (males) and 69.1 (females) in 2010 to 73.0 and 78.0 in 2030 respectively, based on the 2009 census data which had reflected advancement in infant and child mortality (Kenya, 2012f).

4.3.3 Migration Projections

The 2009 census also recorded a low rate of migrants with less than one percent of international migration like the preceding censuses, therefore not included into the projections of the national population. However, in the 2009 census, migration among provinces was accounted for, guaranteeing that the total of all provincial internal flows by age and sex have to be zero. Caution was ensured to exclude migration between districts belonging to the same province (Kenya, 2012d). Isiolo County net migration was -1069 persons (0.75% of total population) based on the 2009 census. This has a negligible effect on population size, hence not incorporated in the county population projections. The study assumed that the rate of net migration would remain negligible for the entire projection period, 2010-2030.

After projecting each component of the population, the next stage was to project the required populations using the component method.

4.4 Population Projections

The study projected populations for Kenya, Eastern region and Isiolo County. Then the projected Isiolo County population was used in generating the projected school age, labour force and youth populations for Isiolo County.

4.4.1 Kenya Population Projections

The Rural-Urban Projection (RUP) program by the US Census Bureau was used for projecting the population. The RUP utilizes the cohort component method for projecting the population by age and sex. The RUP estimates the number of deaths and deducts them from every cohort by utilizing central death rates interpolated values from life tables. This program also considers internal and international migration. Every year, births are estimated utilizing fertility rates and the female population in child bearing ages. The each year number of births comprise new population cohorts that are followed through in the future. In the RUP, the cohort component method is able to follow a group of people in an age group of people at a point in time as they survive, while accounting for births, deaths and migration (Kenya, 2012d). Table 4.1 below gives a brief of the projected Kenya's population between 2010 and 2030.

Table 4.1: Projected Population by Sex, Kenya, 2010-2030

Sex	2010	2015	2020	2025	2030
Male	19,047,448	21,886,677	24,996,431	28,270,071	31,667,814
Female	19,426,445	22,269,900	25,322,822	28,728,823	32,191,733
Total	38,473,893	44,156,577	50,319,253	56,998,894	63,859,547

Starting with a population of 38.5 million in 2010, Kenya's population is projected to reach 44.1 million by 2015, 50.3 million by 2020, 57.0 million by 2025, and 63.9 million by 2030.

4.4.2 Eastern Region Population Projections

Also the Eastern region population projections were carried out using the RUP program.

Table 4.2 shows a brief of the projection of Eastern region's population between 2010 and 2030.

Table 4.2: Projected Population by Sex, Eastern Region, 2010-2030

Sex	2010	2015	2020	2025	2030
Male	2,847,239	3,019,370	3,200,889	3,380,640	3,553,202

Female	2,950,521	3,064,337	3,192,478	3,322,698	3,448,848
Total	5,797,560	6,085,707	6,393,367	6,703,338	7,002,050

Starting with a population of 5.8 million in 2010, Eastern region's population is projected to reach 6.1 million by 2015, 6.4 million by 2020, 6.7 million by 2025, and 7.0 million by 2030.

4.4.3 Isiolo County Population Projections

Like the Kenya and Eastern region population projections, Isiolo County population projections were carried out using the RUP program which uses the cohort component method of population projection. Table 4.3 below shows a brief of the projection of Isiolo County's population between 2010 and 2030.

Table 4.3: Projected Population by Sex, Isiolo County, 2010-2030

Sex	2010	2015	2020	2025	2030
Male	75,385	79,106	83,132	87,163	91,047
Female	71,184	74,697	78,499	82,305	85,973
Total	146,569	153,802	161,631	169,466	177,022

Starting with a population of 146,569 in 2010, Isiolo County's population is projected to reach 153,802 by 2015, 161,631 by 2020, 169,466 by 2025, and 177,022 by 2030. Detailed Isiolo County projections by age and sex are presented in Appendix 1. The Isiolo county projected population indicate that the young population (0-14) account for 44.2 percent of the population while the aged 65 and above account for 3.7 percent, for the period of study, 2010-2030. Both groups add up 47.9 percent of the population

Having obtained the projected Isiolo County population, the next step was to get Isiolo County projected school-age, labour force and youth populations for the period of study, 2010-2030.

4.4.4 Projected School-Age Population, Isiolo County, 2010-2030

According to the Ministry of Education Policy, the official age of formal schooling is 3-5 years for Early Childhood Development and Education (ECDE), 6-13 years for primary school education, and 14-17 years for secondary school education.

Education is a basic right of human as contained in the UN Declaration of the Rights of the Child (1959), the International Covenant on Economic, Social and Cultural Rights, 1966 (Articles 13 and 14), the Convention on the Elimination of All Forms of Discrimination against Women, 1979 (Article 10), the Convention on the Rights of the Child, 1989 (Articles 28 and 29), and the Kenya Constitution 2010 (Article 43:1) (Kenya, 2012b).

Research findings indicate that education builds human capital, fosters economic growth, reduces poverty, improves income distribution and employability and promotes gender equality. Education delivers improved health and survival rates of infants and children, reduced fertility rates and increased use of modern contraceptives, and are also a powerful tool to increase support for democracy, build civic attitudes and reduce conflict. Education is a key element in Kenya's plans for development of socio-economic and is one of the pillars and prerequisites for achievement of Kenya Vision 2030 and the MDGs (Kenya, 2012b).

The provision of quality education to all people of Kenya regardless of sex, region and socio-economic status has been fundamental to the Government's overall development strategy. Analysis of contexts of policy development indicates three important issues. First, the long term Government objective has been to give each Kenyan fundamental quality education, comprising 3 years of ECDE, 8 years of primary, and 4 years of secondary education. Second, quality human resource development is principal to the achievement of national goals for national unity, economic growth and development and social progress. Third, implementation of universal availability to fundamental education and training guarantees fair access to further universal education comprising girls, persons with disability and other disadvantaged groups. Education in Kenya is governed by the Education Act (1980, revised 2009) and other related Acts of Parliament including Teachers Service Commission Act, Kenya National Examinations Council Act, University Act (1985) and various Acts and Charters for various public universities (Kenya, 2012b).

The Government of Kenya introduced the Free Primary Education (FPE) programme in January, 2003 and adopted a Sector Wide Approach to planning for education in September, 2004. The two frameworks led to the development and launch of a realistic, comprehensive and affordable Kenya Education Sector Support Programme (KESSP) in July 2005. Free Day Secondary Education was introduced in 2008 to improve access to basic education. To enhance an all-inclusive and equitable basic education, the Ministry of Education established sub-sector based policy frameworks that include: HIV and AIDS in Education Policy; Gender in Education Policy (2007); Non-Formal Education Policy (2008); Special Needs Education Policy (2008); and Nomadic Education Policy (2010) (Kenya, 2012b).

The 2009 enumerated Isiolo County population distributions by age were used to obtain respective proportionate shares of the school-age population projections. The detailed 2009 enumerated Isiolo County population distribution by age and sex is given in Appendix 2. The study reveals the following results as tabulated in Table 4.4 below.

Table 4.4: Projected School-Age Population, Isiolo County, 2010-2030

Level	Sex	2010	2015	2016	2017	2018	2019	2020	2025	2030
ECDE (3-5 years)	Male	7,599	7,974	8,065	8,158	8,251	8,646	8,380	8,786	9,178
	Female	7,209	7,565	7,651	7,739	7,828	7,917	7,949	8,335	8,706
	Total	14,807	15,539	15,716	15,897	16,079	16,563	16,329	17,121	17,884
Primary (6-13 years)	Male	16,858	17,689	17,893	18,097	18,305	18,516	18,590	19,491	20,360
	Female	16,012	16,802	16,995	17,190	17,387	17,586	17,657	18,514	19,338
	Total	32,869	34,491	34,888	35,287	35,692	36,102	36,247	38,005	39,698
Secondary (14-17 years)	Male	6,920	7,262	7,345	7,429	7,515	7,601	7,631	8,002	8,358
	Female	6,544	6,867	6,946	7,026	7,106	7,187	7,216	7,566	7,904
	Total	13,465	14,129	14,291	14,455	14,621	14,788	14,848	15,568	16,262

The study reveals that children of ECDE school-age in Isiolo County are projected to increase from 14,807 in 2010 to 16,329 in 2020 and 17,884 by 2030. Those of primary school-age will increase from 32,869 in 2010 to 36,247 in 2020 and 39,698 by 2030; while those of secondary school-age will increase from 13,465 in 2010 to 14,848 in 2020 and 16,262 by 2030.

The projected school-age population indicate that children of ECDE account for 10.1 percent of the population in 2010, 11.7 in 2020 and 12.2 and 2030. Those of primary school-age account for 22.4 percent of the population in 2010, 26.0 in 2020 and 27.1 in 2030; while those of secondary school-age account for 9.2 percent of the total population in 2010, 10.6 in 2020 and 11.1 in 2030.

The primary school enrolment target of 98 percent and secondary school enrolment target of 87 percent for 2013 by the Ministry of Education (Kenya, 2014) were applied to the projected school-age populations.

The projected enrolment figures in Table 4.5 were obtained by multiplying the projected school-age populations by the respective enrolment targets (these targets were assumed to remain constant throughout the study period).

Table 4.5: Projected Primary and Secondary School Enrolment, Isiolo County, 2010-2030

Level	Sex	2010	2015	2016	2017	2018	2019	2020	2025	2030
Primary (6-13 years)	Male	16,520	17,336	17,535	17,735	17,939	18,145	18,218	19,101	19,952
	Female	15,692	16,466	16,655	16,846	17,039	17,234	17,304	18,144	18,951
	Total	32,212	33,801	34,190	34,582	34,978	35,380	35,522	37,245	38,904
Secondary (14-17 years)	Male	6,021	6,318	6,391	6,463	6,538	6,613	6,639	6,961	7,271
	Female	5,693	5,974	6,043	6,112	6,182	6,253	6,278	6,583	6,876
	Total	11,714	12,292	12,433	12,576	12,720	12,866	12,917	13,544	14,148

From Table 4.5 above, the projected enrolment population in Isiolo County is set to increase from 32,212 pupils in 2010, to 33,801 pupils in 2015, to 35,522 pupils in 2020, to 37,245 pupils in 2025 and finally reach 38,904 pupils by 2030 for primary schools and 11,714 students in 2010, to 12,292 students in 2015, to 12,917 students in 2020, to 13,544 students in 2025 and finally reach 14,148 students by 2030 for secondary schools.

The quality of education suffers in crowded classrooms with a large number of pupils/students per teacher. It is difficult for pupils/students to master the curriculum content and teachers dedicate less time to the needs of each individual pupil/student. Hence, the results of such overcrowded classroom are lower academic achievement and high dropout rates.

Therefore, one of the most essential factors in education is class size. Class refers to the number of pupils in the classroom and the fewer the number, the better for teaching and learning process to take place adequately. Class size is important because if a teacher has too many pupils in a class, it is not possible to give each student individual attention.

Smaller class sizes are better because teachers pay attention that is more individual to students with smaller class sizes leading to improved performance by students in their schoolwork and also better because of issues of safety and discipline. It is much easier for a teacher to keep order in a class of 40 pupils/students than one with 65 or more pupils/students.

The number of teachers is also an important educational indicator because, together with the projected enrolment population, one can get the pupil/student teacher ratio. A pupil teacher ratio (PTR) of 40:1 and student teacher ratio (STR) of 35:1 are recommended by the Ministry of Education (Kenya, 2012g). These ratios were applied to obtain the projected number of teachers and classrooms required for the respective projected enrolments obtained earlier.

The analysis shows that a total of 888 primary school and 369 secondary school teachers will be required in 2020 and 973 primary school and 404 secondary school teachers in 2030. The study also reveals that an increase of classrooms from 805 in 2010 to 888, 931 and 973 classrooms in 2020, 2025 and 2030 respectively will be required for primary schools. In secondary schools, an increase of classrooms from 335 in 2010 to 369, 387 and 404 classrooms in 2020, 2025 and 2030 respectively will be required. This data translates into 21 percent increase in the number of primary and secondary classrooms in a period of 20 years in Isiolo County. This is a high percentage increase and educational planners in the County need to pay more attention to it by constructing enough classrooms.

The pupil/student toilet ratio (PToR/SToR) is also an important educational parameter for it is a measure of the level of sanitation and hygiene in a school. To generate the projected number of toilets, the projected primary/secondary school-age enrolments were divided by the respective PToR norms.

The Ministry of Education suggests a pupil/student toilet ratio of 30:1 and 25:1 for boys and girls respectively. The study reveals that 1299, 1362 and 1423 toilets in 2020, 2025 and 2030

respectively for primary schools and 472, 475 and 517 toilets in 2020, 2025 and 2030 respectively for secondary schools will be required.

It is important to note that when the PToR/SToR of the county is beyond the recommended norm, then the quality of sanitation and hygiene will be found wanting. Since the quality of sanitation and hygiene plays an important role in ensuring a good learning environment, then it will be important for the county to meet the toilets demand over the projection period. This can be achieved by constructing the number of toilets for girls and boys as projected.

4.4.5 Projected Labour Force, Isiolo County, 2010-2030

The United Nations System of National Accounts defines labour force as all persons aged 15-64 who supply labour for the production of goods and services (Kenya, 2012c). The labour force was projected as shown in Table 4.6 below.

Table 4.6: Projected Labour Force Population, Isiolo County, 2010-2030

Sex	2010	2015	2016	2017	2018	2019	2020	2025	2030
Male	39,318	41,259	41,732	42,210	42,694	43,184	43,359	45,461	47,487
Female	37,074	38,904	39,350	39,801	40,257	40,719	40,884	42,866	44,776
Total	76,392	80,163	81,082	82,011	82,951	83,903	84,243	88,327	92,263

From the above results, the study reveals that Isiolo County projected labour force will increase from 76,392 people in 2010 to 84,243 people in 2020 and 92,263 people by 2030. The projected labour force population indicate that the labour force population account for 52.1 percent of the population in the period of study, 2010-2030.

4.4.6 Projected Youth Population, Isiolo County, 2010-2030

According to the Constitution of Kenya 2010, the youth are defined as persons in the age bracket 15-30 years (Kenya, 2010). However, without prepossession to more meanings by Member States, according to the United Nations, youth means those persons between the ages of 15 and 24 years for statistical purposes. Youth are faced with multiple social, political and cultural exclusion issues among which unemployment is key. Youth are the force for today's nation building and the keepers of the future. Kenya has introduced and implemented programmes targeted at developing skills and creating employment for youth like Uwezo Fund. For the purpose of this study, youth as persons in the bracket 15-24 years are adopted since this

age group has been identified by the county. The youth population was projected as shown in Table 4.7 below.

Table 4.7: Projected Youth Population, Isiolo County, 2010-2030

Sex	2010	2015	2016	2017	2018	2019	2020	2025	2030
Male	15,255	16,008	16,191	16,377	16,565	16,755	16,823	17,638	18,424
Female	15,077	15,821	16,003	16,186	16,372	16,559	16,626	17,433	18,209
Total	30,332	31,829	32,194	32,563	32,936	33,314	33,449	35,071	36,633

From the above results, the study reveals that Isiolo County projected youth population will increase from 30,332 youths in 2010 to 33,449 youths in 2020 and 36,633 youths by 2030. The projected youth population indicate that the youth population account for 20.7 percent of the population in the period of study, 2010-2030.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This section highlights the study findings, creates conclusion and recommendations depended on the findings. The general research objective was to project the sectoral populations (school age, labour force and youth) for Isiolo County for the period 2010-2030.

5.2 Summary of the findings

According to the projections, the population size of Kenya is set to increase from 38.5 million, 44.1 million, 50.3 million, 57.0 million and 63.9 million in the years 2010, 2015, 2020, 2025 and 2030 respectively. This reflects a rapid population increase (about 1 million people every year). In Eastern region, the population size was projected to be 5.8 million in 2010, 6.1 million in 2015, 6.4 million in 2020, 6.7 million in 2025 and 7.0 million by 2030. In Isiolo County, the population size was projected to be 146,569 in 2010, 153,802 in 2015, 161,631 in 2020, 169,466 in 2025 and 177,022 by 2030.

The study also observed that the projected ECDE school-age population would increase from 14,807 children in 2010 to 16,329 children in 2020 and 17,884 children by 2030, those of primary school-age will increase from 32,869 in 2010 to 36,247 in 2020 and 39,698 by 2030 while those of secondary school-age population will increase from 13,465 in 2010 to 14,848 in 2020 and 16,262 by 2030.

Some education indicators were also projected. The projection of the number of teachers revealed that primary school teachers should increase from 805 in 2010, to 845 teachers in 2015, to 888 teachers in 2020, to 931 teachers in 2025, and finally 973 teachers by 2030 while secondary teachers should increase from 335 in 2010, to 351 teachers in 2015, to 369 teachers in 2020, to 387 teachers in 2025, and finally 404 teachers by 2030. For the number of classrooms in the county, it is projected that the demand for primary classrooms will increase from 805 classrooms in 2010, to 845 classrooms in 2015, to 888 classrooms in 2020, to 931 classrooms in 2025, and 973 classrooms by 2030.

The final parameter to consider was the number of toilets. The number of toilets in primary schools should increase from 551 toilets in 2010, to 637 toilets in 2020, and 665 toilets 2030 for males while for females, it was found to increase from 628 toilets in 2010, to 692 toilets in 2020, and 758 toilets by 2030. The number of toilets in secondary schools should increase from 201 toilets in 2010, to 221 toilets in 2020, and 242 toilets by 2030 for males while for females, it was found to increase from 288 toilets in 2010, to 251 toilets in 2020, and 275 toilets by 2030. The number of teachers and classroom size are indicators that determine the quality and access of education while the number of toilets measures the level of hygiene and sanitation.

The study also found out that the projected labour force would increase from 76,392 people in 2010 to 84,243 people in 2020 and 92,263 people by 2030 and the projected youth population would increase from 30,332 youths in 2010 to 33,449 youths in 2020 and 36,633 youths by 2030.

5.3 Conclusion

The study indicated that the population of school-age for Isiolo County will increase. Taking stock of the educational requirements and plan to mobilize the necessary to acquire them within a given time span should be done by the Ministry of Education, with the county governance structures.

The study indicated labour force population accounts 52.1 percent of the population. Dependent groups add up 47.9 percent of the population giving a dependency ratio of 100:92.

The study also indicated that the population of youth for Isiolo County will increase. The information provided on youth should assist the Isiolo County government to address issues related to unemployment and underemployment of youth.

5.4 Recommendations

The study has recommendations for planners and researchers based on the findings. In so doing, the stakeholders can benefit from this study by having good sanitation and hygiene in schools and manageable pupil/teacher ratios. The end product will be quality education in Isiolo County.

5.4.1 Recommendations for planners

Under the current fertility and mortality rates the study observed that the study found out that the population of primary school age will increase swiftly over the study period. The County Government should plan for the requisite education needs such as the number of teachers, classrooms and toilets for conducive learning environment and good sanitation.

The large numbers of dependents to the labour force population leads to low savings and places a strain on the existing education and health facilities. Therefore, appropriate measures should be taken to mitigate this.

The study also indicated that the youth populations of Isiolo County should increase. The County Government should explore modalities creating more job opportunities that will absorb the ever increasing number of youths.

5.4.2 Recommendations for Further Research

Based on the findings, there is need for further research. Further research should focus on similar study to this one on the sectoral population projections focusing on other counties in Kenya and comparing their results.

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Appendix I: Projected Population by Age and Sex, Isiolo County, 2010-2030

Age	2010			2015			2016			2017			2018		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
00-04	12,272	11,423	23,695	12,878	11,987	24,865	13,025	12,124	25,150	13,175	12,263	25,438	13,326	12,404	25,730
05-09	11,042	10,560	21,602	11,587	11,081	22,668	11,720	11,208	22,928	11,854	11,337	23,191	11,990	11,467	23,457
10-14	10,076	9,445	19,521	10,573	9,911	20,484	10,695	10,025	20,719	10,817	10,140	20,957	10,941	10,256	21,197
15-19	8,256	7,906	16,162	8,663	8,296	16,960	8,763	8,391	17,154	8,863	8,488	17,351	8,965	8,585	17,550
20-24	6,999	7,171	14,170	7,344	7,525	14,869	7,429	7,611	15,040	7,514	7,698	15,212	7,600	7,787	15,387
25-29	5,802	5,767	11,569	6,088	6,052	12,140	6,158	6,121	12,279	6,229	6,191	12,420	6,300	6,262	12,562
30-34	4,399	4,028	8,427	4,616	4,227	8,843	4,669	4,275	8,944	4,723	4,324	9,047	4,777	4,374	9,151
35-39	3,478	3,268	6,746	3,650	3,429	7,079	3,692	3,469	7,160	3,734	3,508	7,242	3,777	3,549	7,325
40-44	2,880	2,614	5,494	3,022	2,743	5,765	3,057	2,774	5,831	3,092	2,806	5,898	3,127	2,838	5,966
45-49	2,546	2,225	4,771	2,672	2,335	5,006	2,702	2,362	5,064	2,733	2,389	5,122	2,765	2,416	5,181
50-54	2,291	1,875	4,166	2,404	1,968	4,372	2,432	1,990	4,422	2,460	2,013	4,472	2,488	2,036	4,524
55-59	1,408	1,063	2,471	1,477	1,115	2,593	1,494	1,128	2,623	1,512	1,141	2,653	1,529	1,154	2,683
60-64	1,259	1,157	2,416	1,321	1,214	2,535	1,336	1,228	2,564	1,352	1,242	2,594	1,367	1,256	2,623
65-69	735	592	1,327	771	621	1,392	780	628	1,408	789	636	1,425	798	643	1,441
70-74	799	802	1,601	838	842	1,680	848	851	1,699	858	861	1,719	868	871	1,738
75-79	422	355	777	443	373	815	448	377	825	453	381	834	458	385	844
80+	721	933	1,654	757	979	1,736	765	990	1,756	774	1,002	1,776	783	1,013	1,796
Total	75,385	71,184	146,569	79,104	74,698	153,802	80,013	75,552	155,566	80,932	76,420	157,351	81,859	77,296	159,155

Appendix I: Projected Population by Age and Sex, Isiolo County, 2010-2030 (Continued)

Age	2019			2020			2025			2030		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
00-04	13,479	12,546	26,025	13,533	12,597	26,130	14,189	13,208	27,397	14,822	13,796	28,618
05-09	12,128	11,598	23,726	12,177	11,645	23,822	12,767	12,210	24,977	13,336	12,754	26,090
10-14	11,067	10,374	21,440	11,111	10,416	21,527	11,650	10,921	22,571	12,169	11,407	23,577
15-19	9,068	8,683	17,751	9,104	8,718	17,823	9,546	9,141	18,687	9,971	9,549	19,520
20-24	7,687	7,876	15,563	7,718	7,908	15,626	8,092	8,291	16,384	8,453	8,661	17,114
25-29	6,372	6,334	12,706	6,398	6,360	12,758	6,708	6,668	13,376	7,007	6,965	13,973
30-34	4,831	4,424	9,255	4,851	4,442	9,293	5,086	4,657	9,744	5,313	4,865	10,178
35-39	3,820	3,589	7,409	3,835	3,604	7,439	4,021	3,779	7,800	4,201	3,947	8,148
40-44	3,163	2,871	6,034	3,176	2,883	6,059	3,330	3,022	6,352	3,478	3,157	6,635
45-49	2,796	2,444	5,240	2,808	2,454	5,261	2,944	2,573	5,516	3,075	2,687	5,762
50-54	2,516	2,059	4,576	2,526	2,068	4,594	2,649	2,168	4,817	2,767	2,265	5,032
55-59	1,546	1,168	2,714	1,553	1,172	2,725	1,628	1,229	2,857	1,701	1,284	2,984
60-64	1,383	1,271	2,654	1,388	1,276	2,664	1,456	1,338	2,793	1,521	1,397	2,918
65-69	807	650	1,457	811	653	1,463	850	684	1,534	888	715	1,603
70-74	878	881	1,758	881	884	1,766	924	927	1,851	965	969	1,934
75-79	463	390	853	465	391	857	488	410	898	510	429	938
80+	792	1,025	1,817	795	1,029	1,824	834	1,079	1,912	871	1,127	1,998
Total	82,796	78,183	160,978	83,130	78,500	161,631	87,162	82,305	169,466	91,048	85,974	177,022

Appendix II: Distribution of Population by Age and Sex, Isiolo County, 2009

Age	Male	Female	Total				Age	Male	Female	Total
0	2,328	2,211	4,539				42	537	430	967
1	2,124	1,841	3,965				43	359	243	602
2	2,557	2,371	4,928				44	260	234	494
3	2,588	2,441	5,029				40-44	2,802	2,545	5,347
4	2,478	2,364	4,842				45	870	834	1,704
0-4	12,075	11,228	23,303				46	394	341	735
5	2,400	2,273	4,673				47	333	298	631
6	2,218	2,130	4,348				48	504	409	913
7	2,173	2,077	4,250				49	364	275	639
8	2,199	2,133	4,332				45-49	2,465	2,157	4,622
9	1,826	1,732	3,558				50	1,081	1,009	2,090
5-9	10,816	10,345	21,161				51	244	190	434
10	2,458	2,279	4,737				52	359	241	600
11	1,337	1,414	2,751				53	265	200	465
12	2,360	2,074	4,434				54	282	193	475
13	1,927	1,838	3,765				50-54	2,231	1,833	4,064
14	1,770	1,637	3,407				55	455	368	823
10-14	9,852	9,242	19,094				56	316	204	520
15	1,835	1,790	3,625				57	220	148	368
16	1,632	1,609	3,241				58	228	172	400
17	1,520	1,352	2,872				59	151	141	292
18	1,960	1,791	3,751				55-59	1,370	1,033	2,403
19	1,110	1,169	2,279				60	715	707	1,422
15-19	8,057	7,711	15,768				61	112	109	221
20	2,066	2,265	4,331				62	149	129	278
21	1,008	1,015	2,023				63	132	86	218
22	1,401	1,408	2,809				64	120	99	219
23	1,145	1,174	2,319				60-64	1,228	1,130	2,358
24	1,204	1,140	2,344				65	281	269	550
20-24	6,824	7,002	13,826				66	98	57	155
25	1,832	2,036	3,868				67	142	54	196
26	1,039	942	1,981				68	107	104	211
27	968	873	1,841				69	89	89	178
28	1,112	1,121	2,233				65-69	717	573	1,290
29	694	635	1,329				70	488	483	971
25-29	5,645	5,607	11,252				71	53	75	128
30	1,924	1,862	3,786				72	99	84	183
31	565	511	1,076				73	70	70	140
32	831	769	1,600				74	65	74	139
33	475	407	882				70-74	775	786	1,561
34	491	382	873				75	140	107	247
30-34	4,286	3,931	8,217				76	82	70	152
35	1,315	1,377	2,692				77	53	40	93
36	617	532	1,149				78	79	78	157
37	470	378	848				79	59	53	112
38	617	584	1,201				75-79	413	348	761
39	361	317	678				80+	702	914	1,616
35-39	3,380	3,188	6,568				NS	56	27	83
40	1,388	1,463	2,851				TOTAL	73,694	69,600	143,294
41	258	175	433							