

COMPLIMENTARY

POPULATION PROJECTION OF BANGLADESH: DYNAMICS AND TRENDS 2011-2061

November 2015



**BANGLADESH BUREAU OF STATISTICS (BBS)
STATISTICS AND INFORMATICS DIVISION (SID)
MINISTRY OF PLANNING
GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH**

ISBN- 978-984-33-9960-1

Formatting:

SOMPADONA, an editing and indexing house
Email- sompadona@gmail.com

Cover design:

Buzzuuka Marketing Communications
House # 398-A, Road # 29, New DOHS
Mohakhali, Dhaka-1206
Email- info@buzzuuka.com

Published by:

Bangladesh Bureau of Statistics (BBS)
Statistics and Informatics Division (SID)
Ministry of Planning
Website: www.bbs.gov.bd

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Minister
Ministry of Planning
Government of the People's Republic of
Bangladesh

Message

I am delighted to know that Population and Housing Census 2011 Project of Bangladesh Bureau of Statistics (BBS), Statistics and Informatics Division (SID) has prepared fourteen Population Monographs using the census data of different years. This is the first time BBS is publishing population monographs with in-depth analysis of the population census data. The present report on 'Population Projection of Bangladesh: Dynamics and Trends' is a special monograph in addition to fourteen population monographs.

Each monograph deals in a particular issue related to population and housing where census data have been used in multidimensional approaches. In addition, cross country comparison and in country comparison have also been made to oversee the representativeness of data with other national sources. It is expected that the monographs will be useful in national planning and policy making particularly in the field of population and development.

I would like to thank concerned officials of SID and BBS and also authors of the monographs for their relentless effort in preparing these monographs and publication thereof. Special thanks to European Union (EU) and United Nations Population Fund (UNFPA) for their generous support in conducting 5th decennial census of Bangladesh and preparing the population monographs.

Dhaka
November, 2015

AHM Mustafa Kamal, FCA, MP



State Minister
Ministry of Finance
and
Ministry of Planning
Government of the People's Republic of
Bangladesh

Message

I have come to learn that Population and Housing Census 2011 Project of Bangladesh Bureau of Statistics, Statistics and Informatics Division has prepared fourteen Population Monographs and one special monograph on 'Population Projection of Bangladesh: Dynamics and Trends' using census data of different years. Population is the main ingredient for national planning and policy making. Therefore, Population Monographs are of vital importance in the field of population planning of the country.

Each monograph has been prepared with a particular issue related to population and housing. To prepare these Monographs census data have been used widely in multidimensional way where secondary data from other sources have also been used. The monographs are a new dimension in the wide use of data generated through national censuses of the country.

My sincere thanks and gratitude to the honorable Minister, Ministry of Planning for his dynamic leadership and active guidance in implementing all our activities including census undertaking. I would like to thank Secretary, Statistics and Informatics Division, Director General, BBS for their relentless effort in preparing these monographs and publication thereof. Special thanks to European Union (EU) and United Nations Population Fund (UNFPA) for their generous support in conducting 5th decennial census of Bangladesh and preparing the population monographs.

Dhaka
November, 2015

M.A. Mannan, MP



Secretary

Statistics and Informatics Division (SID)
Ministry of Planning
Government of the People's Republic of
Bangladesh

Foreword

Population Census is the single most important statistical undertaking in any country. Bangladesh Bureau of Statistics of the Statistics and Informatics Division has conducted the 5th decennial census of the country during 15-19 March, 2011. In order to supplement the main census a large scale sample survey was conducted in October 2011 which covered detailed information on Population & Housing. The report on 'Population Projection of Bangladesh: Dynamics and Trends' is special Monograph in addition Monograph is mainly based on the findings of main census and sample census conducted during 2011. Data from other secondary sources have also been used to prepare the Monograph.

It may be mentioned that Bangladesh Bureau of Statistics (BBS) has been publishing a number of Population Monograph series and Population Monograph on 'Population Projection of Bangladesh: Dynamics and Trends' is a special monograph in addition to fourteen monographs being published by BBS using Population Census Data. Monographs are the in depth analysis of a particular topic of interest. Population Projection of Bangladesh: Dynamics and Trends has highlighted the future population of Bangladesh under different assumptions.

'Population Projection of Bangladesh: Dynamics and Trends' will be useful for proper planning of the country considering the future trends of population. This monograph has forecasted future population of the country by age-sex and residence under different assumptions.

I like to express my sincere thanks to Director General, Deputy Director General of BBS, Project Director of Population and Housings Census 2011 Project and his team for preparing this Monograph. I acknowledge with gratitude the support of European Union (EU) and United Nations Population Fund (UNFPA) for successful completion of the Population and Housing Census 2011 and preparing the Monograph.

Dhaka
November, 2015

Kaniz Fatema ndc



Director General

Bangladesh Bureau of Statistics (BBS)
Statistics and Informatics Division (SID)
Ministry of Planning
Government of the People's Republic of
Bangladesh

Preface

The fifth population and housing census of Bangladesh was conducted during 15th March to 19th March, 2011. The main objective of the census was to collect information on the basic characteristics related to housing, households and population for developing a comprehensive database for development planning and human resource development programmes as well as economic management.

Population and Housing Census 2011 were conducted in three phases. In the First Phase, basic data about all households and individual members of the households were collected through ICR formatted questionnaire during 15th March to 19th March, 2011. In the Second Phase, quality and coverage of the main count were verified through a Post Enumeration Check (PEC) survey during 10th April to 14th April, 2011. For the first time in the census history of Bangladesh, PEC was conducted by an independent organization, namely Bangladesh Institute of Development Studies (BIDS). In the Third Phase, detailed socio-economic information was collected by administering a long machine readable questionnaire in a sample survey held during 15th October to 25th October, 2011.

One of the objectives of the Population and Housing Census 2011 Project was in-depth analysis of census data and preparation of Population Monograph series. Monographs are useful to the users to know the detailed information about the related area for taking appropriate policy measures and further research.

The Monograph on 'Population Projection of Bangladesh: Dynamics and Trends' is a special monograph in addition to 14 monograph series which covered the future population of Bangladesh by age-sex and residence under different assumption.

I express my heartfelt gratitude to the Honorable Minister for Planning for his effective guidance and significant cooperation in making the census a success. I express my deepest gratitude to Secretary, Statistics and Informatics Division (SID) for her whole-hearted support and cooperation to the census. Moreover, members of 'Steering Committee', 'Standing Technical Committee', Consultants and the participants of the Seminar-cum-Expert Consultation deserve special thanks for their valuable contributions for finalizing the questionnaire and the census programme. I am thankful to the researchers of Institute of Statistical Research and Training (ISRT) for preparing this special monograph. Thanks to European Union (EU) and United Nations Population Fund (UNFPA) for their technical and financial support to the Population and Housing Census 2011 Project.

Finally, I like to thank Deputy Director General, BBS, Project Director, Population and Housing Census 2011 Project, members of the Technical Committee and other officers & staff members of BBS for bringing out this monograph.

Mohammad Abdul Wazed

Dhaka
November, 2015



Representative
UNFPA Bangladesh

Message

This report entitled 'Population Projection: Dynamics and Trends' is a special monograph in addition to 14 monograph series developed by the Bangladesh Bureau of Statistics (BBS) with support from the United Nations Population Fund (UNFPA). UNFPA has supported the BBS since the very first census in 1974, a cooperation that has grown stronger with each census. Through the "Support to 2011 Bangladesh Population and Housing Census" project UNFPA has been working closely with the BBS to ensure that best use is made out of the resources invested in the census. The project has put a major emphasis on in-depth analysis of census data and the production of thematic reports in the form of these monographs. This series will provide its readers a better and clearer understanding of the trends, the current country scenarios and the gaps indicating where targeted interventions are necessary.

The availability of quality, reliable and timely data, as well as a thorough, methodologically sound and user-friendly analysis of data is more important than ever before. The information generated by population and housing census, the numbers of people, their distribution, their living conditions, are all critical for development. Without accurate data, policymakers do not know where to invest in schools, hospitals or roads and the most in need remain invisible. The implementation and monitoring of the Sustainable Development Goals, the guiding framework for the development agenda 2030, will require the production and analysis of a large amount of data, big data, requiring strong and independent National Statistics Offices, which UNFPA will continue to support.

I would like to take this opportunity to congratulate and thank the Statistics and Informatics Division and the Bangladesh Bureau of Statistics' authority and the project team for their efforts to produce this series, as well as the experts who contributed to the development of the monographs. My special gratitude goes to the Delegation of European Union in Bangladesh for their generous support and co-operation in implementing the "Support to Bangladesh Population and Housing Census 2011" project and in the preparation of these monographs.

Dhaka
November, 2015



Argentina Matavel Piccin
Representative
UNFPA Bangladesh



Project Director

Population and Housing Census 2011 Project
Bangladesh Bureau of Statistics
Statistics and Informatics Division
Ministry of Planning

Acknowledgements

It is my great pleasure to acknowledge the contributors who were engaged in preparing the special Monograph on 'Population Projection of Bangladesh: Dynamics and Trends' under Population and Housing Census 2011 Project of Bangladesh Bureau of Statistics (BBS). This initiative of BBS is a new dimension with regard to the wide use of census data in the country and the abroad.

This special monograph has been prepared by the BBS in collaboration with Institute of Statistical Research and Training (ISRT), Dhaka University. A series of review meetings were organized to finalize the draft monograph.

I would like to express my profound regards and deep sense of gratitude to the Secretary, Statistics and Informatics Division and Director General, Bangladesh Bureau of Statistics for their valuable suggestions, continuous guidance and all out support in smooth completion of all the activities of this project and bringing out this special monograph.

It is worth mentioning that European Union (EU) has provided generous support in the implementation of the Population and Housing Census 2011 Project. I take this opportunity to express my indebtedness to United Nations Population Fund (UNFPA) for the partnership of this project of BBS.

I am extremely grateful to the Institute of Statistical Research and Training (ISRT) and the authors who were engaged in preparing this special monograph. My sincere thanks to Mr. Md. Shamsul Alam, local consultant of this project and Dr. Sadananda Mitra, ex-consultant, UNDP for their whole hearted co-operation in the preparation of this special monograph.

Thanks are also due to Mr. Iori Kato, Deputy Representative, Dr. Shantana R. Halder, Chief PPR and Mr. Mahboob-E-Alam, NPO, UNFPA for their kind support and help. I am grateful to Mr. Md. Mostafa Ashrafuzzaman, Deputy Director, Mr. Md. Khorshed Alam, Assistant Statistical Officer, Mr. Mohammad Abdullah, Assistant Statistical Officer and all other officials of Population and Housing Census 2011 project of BBS who worked hard to conduct the census and to prepare this special monograph.

Md. Mashud Alam

Dhaka
November, 2015

Executive Summary

This study aims to analyze the population trends and impact to provide options for policy makers in Bangladesh. In the last few years Bangladesh is possessing remarkable GDP growth including increased life expectancy and levels of literacy, and an improvement over the maternal and child mortality rates, immunization or vaccination program and even a drastic reduction of poverty rate. Population dynamics is now one of the important factors of this country's development, planning and success, and projection is one important tool.

The population of Bangladesh has been increased rapidly since its independence. This large increase in Bangladesh's population, notably from the late 20th century, is mainly due to the improvement of literacy rate, reduction of gender disparity, declination of maternal and child mortality rates, better medical technology and immense public health campaigns. This study adopts three realistic scenarios (Scenarios I, II and III) comparing with the trends of various countries, and their socio-economic and demographic components based on the adjusted 2011 census population and age-sex distribution. Scenarios I, II and III could be labeled as high, medium and low variant accordingly. Here the keen interest is on the policy makers' choices in attaining and implanting different sets of intervention. It is to be recommended that the scenario II is more feasible, whereas scenario III could be preferred for policy implication. In every three different scenarios (I, II and III) has an increased population. In 2061, the population of Bangladesh is estimated to be 251.45 million under high variant fertility assumption (scenario I), 223.39 million under medium variant fertility assumption (scenario II) and 209.42 million under low variant fertility assumption (scenario III). In high variant (scenario I) about 68 percent of population is shown to be increased, ranges from 149 to 251 million. The total population will remain in the range of 209 to 224 millions in 2061 in scenarios II and III. The age structure of projected population shows a curvature pattern for all age groups, there are ups and downs in total numbers and proportion changes. A sharp increase of urbanization has been depicted in all three scenarios. The age-specific projected values show that at the age of 30-34 and onwards, population increases sharply. This indicates movement of the population towards the older age groups. An interesting output of this study is the population projection considering international migration, according to scenario II the total population is going to be 219.70 million. For a country like Bangladesh the net migration rates at middle ages are always negative, more people leave the country for work and education than the number that comes in. This fact is also reflected in the estimated net migration rates.

1. INTRODUCTION

1. Introduction

In this age of globalization, Bangladesh has achieved significant progress in many areas of human development and economic growth. Since last few years Bangladesh is possessing over 6 percent GDP growth including increased life expectancy and levels of literacy, and an improvement over the maternal and child mortality rates, immunization or vaccination program and even drastic reduction of poverty rate at 24.8% (MDG 2015). This country has been improved its Gross National Income per capita (GNI) and positioned as one of the lower-middle income countries (World Bank 2015). About 30 percent of the total population in Bangladesh is comprised within the youth ages between 10 years to 24 years (UNFPA 2014b). Population dynamics is now one of the striving factors of this country to peep on and projection is one important tool.

The history of population projection is old. The earliest systematic global population projection dates to Notestein (1945). Since the 1950s, the United Nations has taken a leadership role in the population projections and dissemination of their results. Nowadays most national governments make population projections for their own countries. Campbell (1996) projected U.S. population from 1995 to 2025 by age, sex, race and Hispanic origin. Colby and Ortman (2014) projected U.S. population from 2014 to 2060. In addition, a few international organizations prepare population projections for the world, regions, and individual countries. The United Nations (UN) and the U.S. Census Bureau issue revised global and national projections on a regular basis. The UN (2014) published projected population from 2010 to 2100 for a total of 233 countries and areas. The UN projections are the most widely used worldwide. Many national governments, international agencies, the media, researchers, and academic institutions rely on UN projections. The World Bank and the International Institute for Applied Systems Analysis (IIASA) also prepare population projections for the world, major regions, and (especially the World Bank) for individual countries. World Bank projections generally are used for planning and for managing projects, while IIASA projections have been used primarily to assess various projection assumptions and methods. Each of these international organizations uses slightly different projection methodologies, makes varying assumptions about future demographic trends, and begins with slightly different estimates of population size.

Population projections can be used for a number of purposes. They provide a tool for analysing the components of growth and the sensitivity of underlying assumptions. Projections can raise our understanding of the determinants of population change. Projections also can be used to provide information on possible future scenarios. The most important use of population projections is in the role they can play as a rational basis for decision making. Changes in population size and composition have many social, economic, environmental, and political implications; for this reason, population projections often serve as a basis for

producing other projections (e.g., households, families, school enrolment, income, and labour force etc.). Population projections help decision makers in both the public and private sectors make informed choices.

National population projections, for example, can be used to plan for future Social Security and Medicare obligations (Lee and Tuljapurkar, 1997; Miller, 2001). State projections can be used to determine future water demands (Texas Water Development Board, 1997) and need for welfare expenditures (Opitz and Nelson, 1996). Local projections can be used to determine the need for new public schools (Swanson *et al.*, 1998) and to select sites for fire stations (Tayman *et al.* 1994). Business enterprises use forecasts to predict demands for their products (Thomas, 1994) and to anticipate the health care costs of current and retired employees (Kintner and Swanson, 1994). Population projections can be used to forecast the demand for housing (Mason, 1996), the number of people with disabilities (Michaud *et al.* 1996), and the number of sentenced criminals (Oregon Office of Economic Analysis, 2000). Population projections take advantage of the two strong points of demography: (i) the accurate recording of demographic processes over a period of years and (ii) the momentum that links demographic processes for one time period with those for another. Because the future is intimately tied to the past, projections based on past trends and relationships raise our understanding of the dynamics of population growth, and often serve as forecasts of population change that are sufficiently accurate to support good decision making. The diverse and increasingly influential roles played by population projections make them an important part of modern demographic analysis.

1.1 Population Projections of Bangladesh: A Short Review

A small number of studies have been attempted population projection for Bangladesh over the past decades. Recently UNFPA (2014a) conducted population projection of Bangladesh using the 2011 census population as the base for the period from 2016 to 2061. Three alternative assumptions about trends in fertility are considered in UNFPA (2014a) projection: TFR unchanged at 2.3 over the entire projection period, TFR declining to 1.9 by 2016-21 and remaining at that level thereafter, and TFR declining to 1.6 by 2016-21 and remaining at that level thereafter. In this study gradual increase in expectation of life is assumed for both male and female, and net international migration is assumed to be zero. The lowest figure for the 2061 population is 201 million in the low projection and about 265 million in the high projection have been figured out. UNFPA (2014a) projection was based on the cohort-component method which was carried out by the user friendly *DemProj* (Stover and Kirmeyer 2005) computer program. Another study on Bangladesh population projection was conducted by Uddin (2014) that also considered the recent population census 2011 by as the base population to estimate the target population for the forecasting period. The BDHS and SVRS data sources were used to retrieve the necessary inputs. Author assumed an under enumeration of 15-19 years age groups in 2011 population census and a comparative simulation was formulated with age structure of the contemporary BDHS (2011) and census

population (2011). The UN model life table was used in the projection and assume international migration to be zero. Sprague's multipliers were used to convert the population into single years. Cohort-component method was used to determine the projected population and found to be about 172 million for the year 2021.

El-Saharty et al. (2014) estimated the population of Bangladesh is to be 218.1 million under a Laissez-Faire fertility assumption (LF scenario) and 201.3 million under an accelerated fertility transition (AFT) scenario in 2051. The authors considered two scenarios. LF scenario assumes that TFR drops to 2.0 by 2016 and remains there until 2051. On the other hand, AFT assumes that TFR reduces to 1.7 by 2016 and remains there until 2051. Mahsin and Hossain (2012) used Bayesian approach for population projection, and also investigated the usefulness of cohort component method in making the population projection for Bangladesh. Firstly, they made fertility forecasting based on Bayesian fertility model. Under this approach they followed the time-series tradition in developing a method to forecast TFR and then convert it to the age-specific fertility rates on the basis of base-year age-specific fertility rates. Secondly, they made forecasting for the life expectancies and then for age specific survival probabilities. Finally, they followed the cohort method to forecast the population. Haque et al. (2012) made a population projection based on logistic population model and non-linear model that incorporated the growth rate as a function of time. Firstly, they tested the numerical method for Bangladesh population data (1991-2006) and then they found a fitted population projection. Finally, they implemented the logistic model that gave future population projection for Bangladesh during 1996 to 2035. BBS (2006) prepared a population projection based on the 2001 Population Census. According to their study the projected population would be 218 million in 2050 if replacement level fertility ($NRR=1$) could be attained in 2011. Islam (2000) envisaged the population momentum in Bangladesh for the period 1991-2051. Assuming the CPR would increase to 63 percent in the year 2006 and remain so till 2051, the medium variant projected population was 188.1 million in the year 2051. Using data from UN World Population Prospects (1990), Biswas and Paul (1996) projected Bangladesh's population, with the assumptions of TFR to be 2.7 children per woman by 2020 from 5.1 in 1990. The medium variant projected population figured as 212 million in the year 2020 from the base population of 115.6 million in 1990. Kabir and Chowdhury (1982) investigated the relationship between population growth and food production in Bangladesh. Recognizing the difficulties of feeding the growing population even with considerable increase in food production, they suggested giving priority to population policy for reduction in population. Rabbani and Hossain (1981) projected the population of Bangladesh for the period 1975-2025 using the cohort-component method with the assumption of no migration. The medium variant ($NRR=1$ during the period 1995-2000) projected population in 2025 would be 178 million. Obaidullah (1976) presented a model termed as '*Expo-linear Model*' which is claimed better than either an exponential or a linear model in describing population growth over time. But he agreed that there was a difficulty in his model in interpreting its parameter unlike those of exponential or linear one. Revelle et al. (1973) have made the population projection of Bangladesh for the period 1972 to 2003, based

on demographic data available for the 1960s and assumed that fertility rate would drop to a NRR of 1 by the year 2003. Their medium variant projection in the year 2003 was 170 million people.

1.2 Population Policy of Bangladesh

Population projection and its policy implication have been driven as the foremost national issues in Bangladesh. The population growth was identified as one of the major national problems in the first Five Year Plan (1973 – 1978). A population policy was developed and approved formally in 2004. The main objective of Bangladesh Population Policy 2004 was to achieve Net Reproductive Rate (NRR) = 1 by 2010 in order to have a stable population by 2060. But it has not been possible to achieve NRR = 1 by 2010 as targeted originally, so it has become a striving need to update the population policy to accelerate the related activities. In 2012, an updated version of population policy was proposed. One of the major objectives of the Bangladesh population policy 2012 (BPP) was to lower the TFR to 2.1 by increasing the rate of prevalence of the contraceptive users to 72%, and achieve NRR = 1 by the year 2015. Other important aspects of BPP 2012 was to ensure the availability of family planning methods to the eligible couples by providing easy access to reproduction health services, to reduce infant and maternal mortality, to ensure gender and women's empowerment.

1.3 Objectives

Development of any country may depend on the size of its population. As Bangladesh has a large population, to plan about any future development, consequently we need to know the size of the population on that time, i.e. projected population. The population of a geographic area grows or declines through the interaction of three main factors: fertility, mortality, and migration. To project population size at a future date, demographers make assumptions about levels of fertility and mortality, and about how many people will move (migration) in or out of an area before that date. The net population increase or decrease over the period is added to the 'baseline' (beginning) population to project future population. The population projection is the best guess calculation of the number of people expected to be alive at a future date, based on assumptions about the base population size, births, deaths and migration. The population projections are always set on a conditional future because we can never be certain about the assumptions considered in the projection. Accurate baseline data on population size and age structure, as well as on predicted fertility, mortality, and net migration rates, are critical to produce accurate population projections (Keilman, 1998). Few specific objectives below are reaped in accordance with the BPP (Bangladesh Population Policy) 2012.

Specific objectives of the project on population projection are:

- To make projection of the future size of the population at national and district level.
- To make population projection of urban rural (residential level) composition to insight into future needs of different local government facilities.
- To make further projection considering the age and sex composition of population of Bangladesh.
- To explain broadly how population projections can be useful decision-making tools.

2. METHODOLOGY

A projection may be conceptualized as the numerical outcome of a particular set of assumptions regarding the future population. Projection does not attempt to predict whether those assumptions actually will hold true in future. Only a silly mathematical error can mislead its calculation. A given projection can be judged by the merits of its assumptions. It can never be proven right or wrong by future events. In broad, there are two ways for population projection: subjective and objective. Subjective approach is judgmental and incurred with bias. According to Smith et al. (2001), objective methods are classified into three broad categories: (1) trend extrapolation, (2) cohort-component method, and (3) structural model. Trend extrapolation methods are based on the calculation and assumptions of observable historical trends. For methods of this type, future values of a variable are found solely by its historical values. The cohort-component method segments the population into age-sex groups or birth cohorts and accounts for the fertility, mortality, and migration behavior of each cohort. A mixture of techniques can be used to project each of the three components of population growth. Structural models are based on observed relationships between demographic and other variables (e.g., land uses, employment etc.). The population changes based on projected changes in those other variables. The functioning of structural models are typically developed using regression analysis and variants thereof. In application, methods in these three categories are not always mutually exclusive. For example, applications of the cohort-component method may incorporate trend extrapolations of one type or another and structural models are often used in conjunction with the cohort-component method (Siegel and Swanson 2004). The cohort-component method is widely used and relatively easy to explain. It uses the available data and theoretical knowledge on the dynamics of population growth, and it takes into account causal factors, as its basic components and compositional factors. It can produce consistent and comparable national and sub-national projections that are easy to update involving the in-depth analysis and development of assumptions for each of the components of change. Due to its advantages this study applies the cohort component method.

The cohort component summary equation is defined for the population at time $(t+n)$ as

$$P_{t+n} = S[t, t+n] + B[t, t+n] + NM[t, t+n], \quad (2.1)$$

where $S[t, t+n]$ is the survived population at time $t+n$, $B[t, t+n]$ is the number of births observed in the period $[t, t+n]$ and $NM[t, t+n]$ is the net migration observed in the period $[t, t+n]$.

To project the total population size, and the number of males and females by 5-year age groups, this study found the number of people who survive or are expected to be alive in the future. Then the survived population number, the number of births that took place and the number of net migrants are added.

2.1 Inputs and Outputs of the Cohort Component Method

To apply cohort component method we need base year population by age and sex, proportion of population by age and sex in urban, rural and other areas in which we want to project the population; assumptions on mortality: survival ratios by age and sex; or expectations of life at birth by sex; assumptions on fertility: fertility rates by age; or total fertility rates and proportionate fertility rates by age, sex ratio at birth; assumptions on international migration (if population is open to international migration): net international migration rates by age and sex.

We expect to get a number of outputs from a population projection using cohort component method: age and sex structure of the population; population aggregates: population size, population in selected broad age groups, mid-interval population size, number of person-years lived, population growth, births, deaths, net change due to migration, indicators of the population structure: proportions by broad age groups, dependency ratios, median age of the population, proportion of women in childbearing ages, sex ratio of the population; indicators of the population distribution (national; if urban and rural populations are being projected): proportion urban, proportion rural; rates of population change: crude birth rate, crude death rate, rate of natural increase, crude net migration rates, rate of population growth.

2.2 Steps of the Cohort Component Method

The cohort component method consists of a number of steps, which are described below.

Step 1: Collecting Information

The cohort component method requires information from both the most recent and the prior census of the locale. Information on the number of births during the past 10 years is also required. Ideally information on births is compiled by the age of the mother, so that age-specific fertility rates can be calculated. These rates are used to project the number of births that occur during the projection period. This study uses the total fertility rates and proportionate distribution of births among women at different childbearing age groups to find the age-specific fertility rates. A life table or calculated survival rates are also needed to calculate the mortality rates in the projected years.

Step 2: Aging a Population into the Future

The cohort component method takes each age group of the population and updates it over the time using the assumed survival rates (Siegel and Swanson 2004). More specifically, for a specific age group the population at time $(t+n)$ is obtained by multiplying the population at time t with n -year survival rates.

Step 3: Adding Births

Next the number of births taking place during the projection interval is calculated. Age-specific fertility rates are multiplied by the number of women in their reproductive age groups to obtain the annual number of expected births for each age group per year. They are

then multiplied by the projection period n to obtain the total number of births that take place over the time $[t, t+n]$. Pre-specified sex ratio is used to obtain the number of male and female births from the total births. At the end, age-specific survival rates are used to obtain the number of survived male and female births.

Method for Calculating Number of Births at a TFR

Fertility assumptions can be specified by either age-specific fertility rates or a summary fertility measures (e.g. total fertility rate along with proportionate age-specific fertility rates). In this report, TFR and proportionate age specific fertility rates have been used for calculating age specific fertility rates. The age-specific fertility rate for the age group a is expressed as

$$ASFR(a) = (TFR/n) \times PFR(a), \quad a=15-19, \dots, 45-49, \quad (2.2)$$

where $PFR(a)$ is the proportionate fertility rate of age group a , n is the projection interval.

The number of births observed during the interval of length n can be calculated using age specific fertility rates and the mid-year female population of the childbearing span as

$$B_n = n \times \sum_{a=15-19, 20-24, \dots, 45-49} ASFR(a) \times MWPOP(a),$$

where $MWPOP(a)$ is the mid-year female population for age group a . The total numbers of male and female births are obtained by multiplying B_n by the corresponding sex ratio at birth.

Calculating Mortality Rates using Life Tables

Usually survival rates are derived from model life tables based upon levels of expectation of life. At first the current survival rates obtained from the life table of a country are compared to the survival rates of different model life tables for the same level of life expectancy. Then the life table that shows the best match is used to derive survival rates for different projection years.

Let x denote the age, $5L_x$ denote life table number of persons between ages $(x, x+5)$ at time t , $5L_x/5L_{x-5}$ survival ratio from age group $(x-5, x)$ to age group $(x, x+5)$. Life table number of persons between ages $(x, x+5)$ is given by the following formula:

$$P_{x, x+5, t+5} = P_{x-5, t} \times 5L_x/5L_{x-5}.$$

The open interval of the age group requires special treatment. According to Keyfitz's method, the population in the open interval at time $(t+5)$ is given by,

$$P_{w+t+5} = 5P_{w-5, t} \times 5L_w/5L_{w-5} + P_{w+t} \times T(w+5)/T_w,$$

where $w+$ refers to the oldest age group. In stationary population this population is given by,

$$P_{w+t+5} = 5P_{w-5, t} \times T_w/5L_w,$$

since, $5P_{w-5} = 5L_w/T_w$ for stationary population.

Getting Population in Age Group 0-4 at Time $t+5$

Let $5F_x$ is the female fertility rate for age group $(x, x+5)$, α is the beginning age of reproduction, β is the end of reproductive age. Then the population for the age group 0-4 at the time $t+5$ can be obtained as

$$5P_{0t+5} = 5L_{0t} \times x = \alpha - 5\beta - 5(5P_x + 5L_x + 55L_x \times 5P_x + 5) \times 5F_x.$$

Step 4: Adding Net Migrants

Migrations are movements across political boundaries that are semi-permanent or permanent in nature. The calculation of the number of net migrants consists of two stages, first estimating the net migration rate and then obtaining the migration adjusted population total. It is recommended to use net migration rate from reliable sources, if possible, otherwise indirect methods can be used to estimate net migration rate. Two methods of indirect estimation of the number of net migrants will be reviewed in this section, where both the methods rely on survival rates and census information.

Net migration rate (NMR) can be defined as the number of in-migrants minus the number of out-migrants divided by the population exposed to the possibility (or risk) of migration, as shown in equation (2.2).

$$NMR = I - EP \times 100, \quad (2.2)$$

where NMR is the net migration rate, I is the immigrants, E is the emigrants and P is the population.

There are two methods for estimating net migration, which are direct and indirect methods. Direct method uses either continuous registration system or census information; whereas the indirect method can be implemented either by vital statistics or by survival ratio method. There are two approaches to implement direct method that include continuous registration system, where individuals report their change in residence immediately to a local government office, and the use of census information (e.g. a census question like "Where were you living 5 years ago"? can give information on whether a person migrated or not). Indirect method can be implemented based on the population counts in different age groups from the two most recent consecutive censuses. Detail on these two methods of estimating net migration can be found from Siegel and Swanson 2004.

2.3 Limitations of this Projection

The cohort component population projection method follows the process of demographic change and is viewed as a more reliable projection method than those that primarily rely on census data or information that reflects population change. It also provides the type of information needed to plan for services to meet the future demands of different segments of the population. However, like most projection tools, there are disadvantages to using the cohort component method. First, it is highly dependent on reliable birth, death and migration data. Thus, it may be difficult to collect the information to apply this tool. Second, it assumes that survival and birth rates and estimates of net migration will remain the same throughout

the projection period. In addition it does not consider the non-demographic factors that influence population growth or decline. Even though problems exist, this projection method is the most widely used tool by planners since it provides information on the potential growth or decline of a locale by age and sex.

3. ASSUMPTIONS IN RECENT PROJECTIONS

This section attempts to cover the assumptions that were implemented in different projections.

3.1 Projection by UNFPA

The United Nations Population Fund (UNFPA 2014a) carried out a population projection for Bangladesh for the period 2011-2061. Based on the assumptions regarding the future course of fertility, three projection scenarios are considered, which are labeled as ‘high’, ‘medium’ and ‘low’ variants. The high scenario assumes that TFR would remain constant at 2.3 (current level) for the entire projection period. The medium scenario assumes that TFR first drops to 2.1 (replacement level) in the 2011-2016 period, then to 1.9 (below replacement level) by 2016-21, and remains there until 2061. The low scenario is similar to the medium scenario except that it drops to 2.0 (below replacement) instead of 2.1 in the period 2011-2016, and 1.6 instead of 1.9 in the period 2016-2021. The high scenario considered in this projection is to see the possible consequences if fertility continues at its present level, the medium scenario is the most likely to happen, and the low scenario is the wanted fertility rate as reported in the Bangladesh Demographic and Health Survey (BDHS 2011).

Table 3.1: Assumptions on TFR and life expectancy at birth and UNFPA Population Projection (2014)

Year	Assumption on TFR			Assumption on Life Expectancy			Total Population (in millions)		
	High	Medium	Low	Male	Female	Total	High	Medium	Low
2011	2.3	2.1	2.0	69.1	71.4	70.3	149.8	149.8	149.8
2016	2.3	1.9	1.6	70.4	72.6	71.5	161.3	160.3	160.2
2021	2.3	1.9	1.6	71.6	73.9	72.7	173.6	170.2	168.7
2026	2.3	1.9	1.6	72.8	75.1	74.0	186.6	180.2	176.3
2031	2.3	1.9	1.6	74.1	76.2	75.2	199.6	190.0	183.8
2036	2.3	1.9	1.6	75.4	77.4	76.4	212.0	198.9	190.4
2041	2.3	1.9	1.6	76.6	78.7	77.6	223.5	206.5	195.6
2046	2.3	1.9	1.6	77.8	80.0	78.9	234.5	212.9	199.1
2051	2.3	1.9	1.6	77.8	80.0	78.9	245.6	218.4	201.3
2056	2.3	1.9	1.6	77.8	80.0	78.9	256.0	222.8	202.0
2061	2.3	1.9	1.6	77.8	80.0	78.9	265.2	225.7	201.1

In this projection, mortality assumptions are based on the expected future trends in life expectancy, which is assumed to increase approximately 0.25 years per year over the projection periods. The age-specific mortality is assumed to follow United Nations general model life table. The net migration is assumed to be zero. The cohort-component method is employed and the projection is carried out by using Demographic Projection, popularly

known as *DemProj* (Stover and Kirmeyer, 2005). The *DemProj* is a computer program for making population projections for countries or regions. The program requires information on the number of people by age and sex in the base year, as well as current year data and future assumptions about the total fertility rate (TFR), the age distribution of fertility, life expectancy at birth by sex, the most appropriate model life table, and the magnitude and pattern of international migration. This information are used to project the size of the future population by age and sex for as many as 150 years.

3.2 Projection by El-Saharty et al. (2014)

El-Saharty et al. (2014) conducted a population projection for Bangladesh for the period 2001-2051. The TFR estimates for the period 1971-2007 (obtained from different sources) demonstrate that from the level of 6.2 children per woman, fertility in Bangladesh declined rapidly (by 45 percent) during 1975-1991, and reached a plateau of around 3.3 children for nearly a decade. After 2001, fertility started to fall again and reached at the level of 2.7 children per woman in 2006. Despite the plateau, the exponential trend fitted well to Bangladesh's TFR. The fitted exponential model forecasts that Bangladesh will attain the level of 2.0 children per woman by 2016, and will continue to go beyond to reach TFR=1.7 by 2021. On the basis of these forecasts, the authors consider two scenarios. The Laissez-Faire (LF) scenario assumes that TFR drops to 2.0 by 2016 and remains there until 2051. The Accelerated Fertility Transition (AFT) assumes that TFR reduces to 1.7 by 2016 and remains there until 2051. These assumed scenarios are very close to the 'medium' and 'low' variants of the UNFPA (2014) projection, respectively. These assumptions are summarized as in Table 3.2 along with the projected population total. No high scenario is considered, as it is very unlikely to happen in the presence of continuous efforts of different government agencies to reduce fertility.

Table 3.2: Assumptions regarding TFR and population projection in El-Saharty et al. (2014)

Year	Assumption on TFR		Total Population (in millions)	
	LF	AFT	LF	AFT
2011	2.3	2.3	153.9	154.3
2016	2.0	1.7	164.7	165.4
2021	2.0	1.7	174.8	174.3
2026	2.0	1.7	184.5	181.8
2031	2.0	1.7	193.5	188.7
2036	2.0	1.7	201.3	194.4
2041	2.0	1.7	208.0	198.4
2046	2.0	1.7	213.5	200.5
2051	2.0	1.7	218.4	201.3

In this projection UN South Asian model life table is considered. Since reliable estimates of net migration rate are not available in Bangladesh, the rates are obtained from the *United Nations World Population Prospects: The 2010 Revision (medium variant)*. The *DemProj* software was used for projecting the population.

3.3 Projection by Islam (2000)

Islam (2000) considered three scenarios to show the possible consequences that may arise due to various policy measures by the government. The projection was made for the period 1991-2051 based on the 1991 population census and assumed one scenario as: High Fertility Variant (HFV) with no change in mortality (scenario I). This variant assumes that the contraceptive prevalence rate (CPR) will increase to 55 percent in the year 2000 and it will remain constant thereafter. It is assumed that the proportion never married will not change from that of the 1991 census and the infant mortality rate will remain the same. Medium Fertility Variant (MFV) with no change in mortality (scenario II). This variant assumes that the CPR will increase to 63 percent in the year 2006 and it will remain so till 2051. Low Fertility Variant (LFV) with reduction in mortality (scenario III) assumed that the CPR will increase to 63 percent in 2006. In addition, it is also assumed that the infant mortality rate will be decreased by 50 percent during the 1991-2021 period. Since the success of family planning programs will reduce the future level of fertility, the FamPlan model, which is based on the proximate determinants options introduced by Bongaart, is used in the projection (Stover et al., 1999).

Table 3.3: TFR and projected population in Islam (2000)

Year	Assumption on TFR			Total Population (in millions)		
	Scenario I	Scenario II	Scenario III	Scenario I	Scenario II	Scenario III
2011	2.86	2.32	2.32	159.4	148.1	148.6
2016	2.70	2.23	2.23	173.1	158.5	159.3
2021	2.37	1.93	1.93	185.2	167.9	169.1
2026	2.26	1.77	1.77	195.7	175.3	176.9
2031	2.48	1.66	1.66	205.9	180.4	182.3
2036	2.68	1.70	1.73	216.6	183.2	185.5
2041	2.70	1.97	2.00	227.2	185.5	188.4
2046	2.54	1.91	1.94	236.3	187.4	191.0
2051	2.44	1.81	1.83	243.9	188.1	192.3

3.4 Projection by UN

The Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat produces projections covering all countries of the world. These projections are routinely published in the World Population Prospects series. The World Population Prospects: The 2012 Revision is one such latest series and covers a 150 year time

horizon (UN, 2013). This can be subdivided into past estimates (1950-2010) and future projections (2010-2100). The past estimates of demographic variables were taken either directly from national statistical sources, or estimated by staff within the Population Division on the basis of the best available national or international estimates at the time. The year 2010, separating the past estimates from the projections, is called the base year of the projections. The projection period of this revision covers 90 years and ends in 2100.

The fertility assumptions that are made include high, medium, low, constant and instant-replacement-fertility. A probabilistic method for projecting total fertility rate has been used in the 2012 Revision. This new method was developed in collaboration with the Probabilistic Projections Group of the Center for Statistics and the Social Sciences (CSSS) of the University of Washington. The method is based on empirical fertility trends estimated for all countries of the world for the period 1950 to 2010. The projected values are used in the medium fertility assumption.

Under the high variant, fertility is projected to remain 0.5 children above the fertility in the medium variant over most of the projection period. By 2020-2025, fertility in the high variant is therefore half a child higher than that of the medium variant. That is, countries reaching a total fertility rate of 2.1 children per woman in the medium variant have a total fertility rate of 2.6 children per woman in the high variant. Under the low variant, fertility is projected to remain 0.5 children below the fertility in the medium variant over most of the projection period. By 2020-2025, fertility in the low variant is therefore half a child lower than that of the medium variant. That is, countries reaching a total fertility rate of 2.1 children per woman in the medium variant have a total fertility rate of 1.6 children per woman in the low variant. As the name implies, under the constant-fertility variant, fertility in all countries remains constant at the level estimated for 2005-2010. For each country, fertility is set to the level necessary to ensure a net reproduction rate of 1 starting in 2010-2015. Fertility varies over the remainder of the projection period in such a way that the net reproduction rate always remains equal to one thus ensuring, over the long-run, the replacement of the population.

Assumptions regarding mortality are made in terms of life expectancy at birth by sex. Mortality is assumed to be either normal or constant. Under the normality assumption, life expectancy is generally assumed to rise over the projection period for most countries. The 2012 Revision of the World Population Prospects uses new probabilistic methods for projecting life expectancy at birth. Under the constant mortality assumption, mortality over the projection period is maintained constant for each country at the level estimated for 2005-2010. The impact of HIV/AIDS on mortality is also considered as a variant. For the countries which have experienced prevalence rates of five per cent or more, a different approach for the estimation and projection of mortality was used.

The international migration is assumed as either normal or zero. Under the normal migration assumption, the future path of international migration is set on the basis of past international migration estimates and consideration of the policy stance of each country with regard to future international migration flows. Projected levels of net migration are generally kept

constant over the next decades. Under zero migration assumption, for each country, international migration is set to be zero starting in 2010-2015. The 2012 Revision includes eight different projection variants. Five of those variants differ only with respect to the level of fertility. All these make normal mortality and normal international migration assumptions. In addition to the five fertility variants, a constant-mortality variant, a zero-migration variant and a 'no change' variant (i.e., both fertility and mortality are kept constant) are considered. The constant-mortality variant and the zero-migration variant both use the medium fertility assumption. Furthermore, the constant-mortality and 'no change' variant both use the normal international migration assumption.

3.5 Other Projections

The Bangladesh Bureau of Statistics (BBS) prepared a projection in 2006 based on the population census in 2001. Four projection scenarios are considered. In one of the scenarios fertility remains constant during the projection period 2001-2050. The other three scenarios assume that net reproduction rate (NRR) will drop to 1 in 2011, 2016 and 2021, respectively. The other notable sources in which projected values for Bangladesh are available include the World Bank, the US Census Bureau, the Population Reference Bureau, and the International Institute for Applied Systems Analysis (IIASA).

4. POPULATION PROJECTION FOR THE PERIOD 2016-2061

The world population follows nearly one percent growth rate for a long time with the ups and downs of its various components. Since the late 18th century, the population seems to increase with the sharp decline in mortality and rapid increase in the size of women population at childbearing ages (Islam 2000). The population replacement level reaches when the number of women at reproductive ages is replaced by the same number of daughters, assuming a stationary population where birth and death rates remain constant, and moreover population age composition remains unchanged over time. In real world, due to rapid growth of young age composition, the population increases with a great pace.

Bangladesh has been going through a crucial demographic transition, keeping its third generation after the liberation war in 1971. It is expected that during next decades it would possibly attain the replacement level with its stagnant fertility rates around 2.3 and a sharp decline in mortality rates. However, a short term population projection (5-10 years) of Bangladesh may not be disrupted from any dramatic policy changes, and could be illustrated from its past trend with the help of underlying assumptions. But a long term (about 50 years) population projection can be deviated from a small shift of policies and socio-economic factors. Again Bangladesh may face different patterns of age at marriage and childbearing stage. Though age-specific fertility rate is still high in the age group of 20-24 (BDHS 2011, 2014) but it could turn into the older ages due to women empowerment and increasing literacy rate (Islam 2000; Stover and Kirmeyer 2005;).

4.1 Assumptions for Population Projection

The most important assumption for any population projection is the assumption on the pattern of future age-specific fertility. Age-specific fertility can be obtained from the summary fertility measures like total fertility rate (TFR) and proportionate age-specific fertility (proportion of births by females of different age groups). The projection is based on the assumptions on both TFR and proportionate age-specific fertility for entire projection period. The TFR and proportionate age-specific fertility values have been considered here after a series of discussion and consultation meetings with the renowned demographers and policy makers in Bangladesh, organized by BBS and UNFPA. Based on the assumed TFR values, three scenarios, namely Scenario I, II, and III, are adopted in this study that are described below.

Scenario I: The high variant assumes the TFR would remain constant at the present level 2.3 (BDHS 2011, 2014) over the projection period.

Scenario II: A steady decline of TFR employs in the medium variant fertility level. Initiating from 2.3 in 2011, it assumes to be dropped to 2.1 in 2021, from 2026 TFR is assumed to be 1.9 and continued thereafter.

Scenario III: A sharp decline of TFR is assumed in the low variant scenario, beginning with TFR 2.3 in 2011, 2.1 in 2021, 1.9 (below replacement level) in 2026 and after two decades from 2011 it is assumed to be 1.6 and remains constant till 2061.

Scenarios I, II and III could be labeled as *high*, *medium* and *low* variant fertility, respectively (see Table 4.1 for the assumed TFR values for different years). Here the keen interest is on the policy makers' choices in attaining and implanting different sets of intervention. It is to be recommended that the scenario II is more feasible, whereas scenario III could be preferred for policy implication. High variant (scenario I) assumes the highest fertility level, whereas the low variant (scenario III) possesses the lowest fertility level. The population projections are delineated for the period 2016 to 2061 based on the adjusted census population 2011. In this report, projections are made with and without considering net migration.

We have assumed different proportionate fertility rate (PFR) by age groups for the years 2011-31, 2031-51, and 2051-61 (Table 4.2). Table 4.2 shows that due to decreasing TFR, the proportions of mothers in the younger age groups decline as time grows. But due to the current heavy tailed distribution of younger mothers, the middle age groups observe an increase in the proportions with time. Using the assumed TFR (Table 4.1) and proportionate age-specific fertility, age-specific fertility rates are obtained (using Equation 2.2) for different years of projected period, which are shown in Table 4.2 for three different scenarios. Note that the same proportionate age-specific fertility is assumed for all three scenarios.

Life expectancy (for both males and females) is another important factor of population projection, which helps to obtain survival probability of different age groups from the selected life table. In recent years, life expectancy is getting high in Bangladesh, asymptotically a developing country like Bangladesh may experience a 0.25 years of longer lifespan in each year with all its socio-economic development and improvement of healthcare facilities (UNFPA 2014a). This study assumes an increased life expectancy from the year 2011 to 2061 for all three scenarios (Table 4.1).

Table 4.1: Assumed TFR and life expectancy

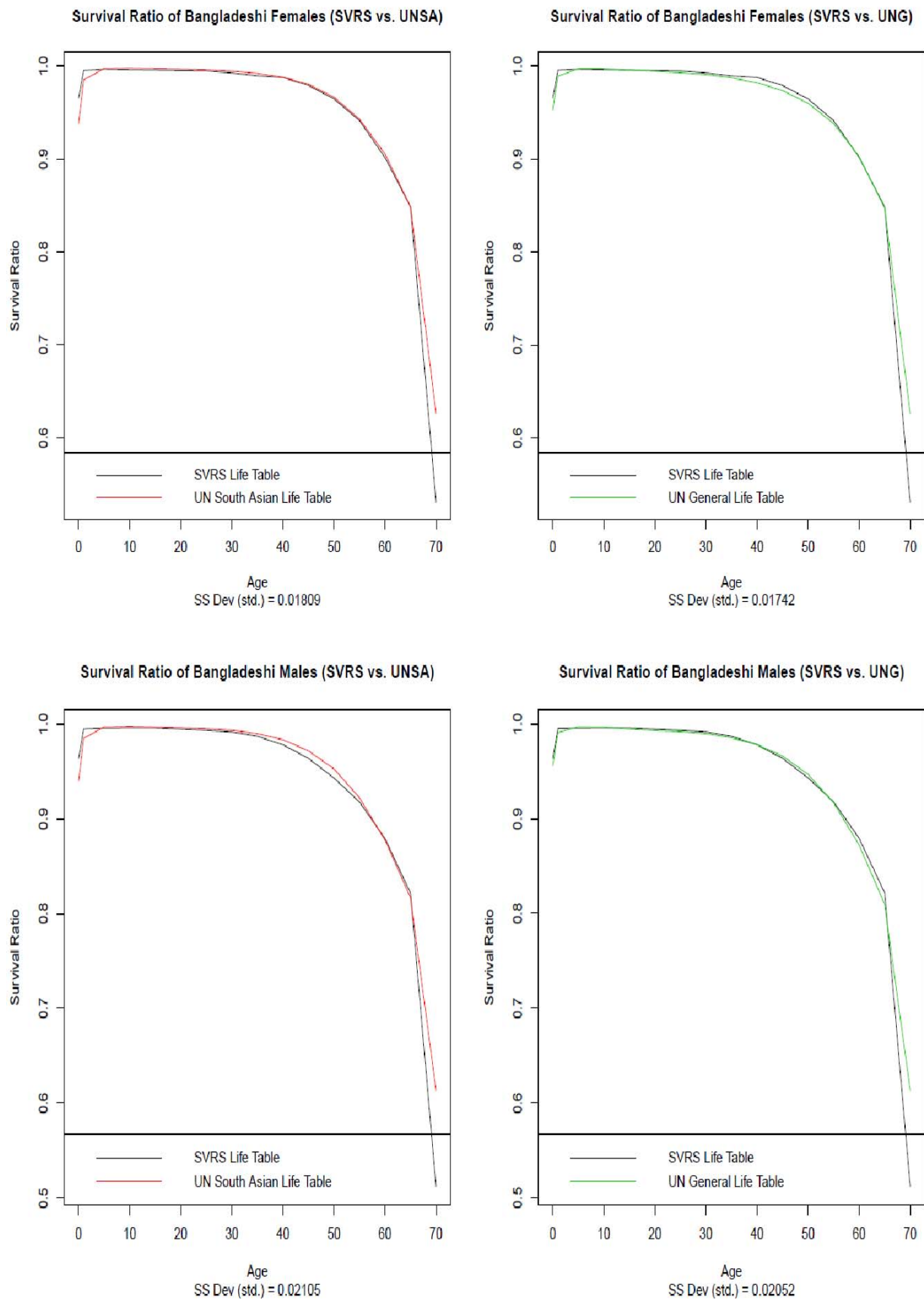
Year	Assumed TFR			Projected Life Expectancy	
	Scenario I	Scenario II	Scenario III	Male	Female
2011	2.3	2.3	2.3	67	68
2016	2.3	2.3	2.3	68	69
2021	2.3	2.1	2.1	69	70
2026	2.3	1.9	1.9	70	72
2031	2.3	1.9	1.6	71	73
2036	2.3	1.9	1.6	73	74
2041	2.3	1.9	1.6	74	75
2046	2.3	1.9	1.6	75	76
2051	2.3	1.9	1.6	77	78
2056	2.3	1.9	1.6	78	79
2061	2.3	1.9	1.6	79	80

Table 4.2: Proportionate Fertility Rate (PFR) for all Scenarios

Age Group	2011-31	2031-51	2051-61
15-19	0.254	0.212	0.180
20-24	0.330	0.320	0.310
25-29	0.231	0.252	0.262
30-34	0.121	0.142	0.161
35-39	0.045	0.053	0.064
40-44	0.013	0.015	0.016
45-49	0.006	0.006	0.007

Life table plays an important role in population projection because it brings the age-specific mortality pattern in the calculation. To select the most appropriate life table for obtaining age-specific mortality rates for the entire projected period, the current life table of SVRS 2011 is compared with several available model life tables. Among the available model life tables, the Coale-Demeny and West model life tables were based on European mortality experience. Later UN developed some model life tables for developing countries. Since Bangladesh is a South Asian country, the SVRS 2011 life table is analytically compared with both the UN South Asian and UN General model life table. It is found that although very similar, but UN General model life table shows a much closer fit to the SVRS 2011 life table (Figure 1). The standardized sum of squared deviations measures also show a slight improvement from UN General model life table (UNG) over the UN south Asian model life table (UNSA).

Figure 1: Comparative survival ratio of UN South Asia and UN General Life Tables



4.2 Population Projection without International Migration

Table 4.3 shows projected population for three scenarios corresponding to different assumed TFRs and life expectancy values. It shows that population has increased over the projection duration in all three scenarios. In high variant (scenario I) about 68 percent of population is shown to be increased, ranges from 149,764 to 251,450 thousands. The total population will remain in the range of 209,415 to 223,390 thousands in 2061 in scenarios III and II accordingly. Only the scenario I meets the population size assumed by Bongaarts (1996), which is 239 millions in 2050. TFR is assumed to be constant at 2.3 for entire projection period under scenario I. Total projected population is about 42,035 thousands higher in scenario I than that of scenario III. However, the increasing pattern of projected population shows a diminishing rate from the year 2041 in scenarios II and III. Nonetheless all three scenarios figured out an alarming large population after five decades, which could create new challenges for current infrastructure and future development of Bangladesh.

Table 4.3: Baseline and projected total population for different assumption on TFR and life expectancy, Bangladesh (in thousands)

Year	Assumed TFR			Projected Life Expectancy		Projected Total Population (in thousands)		
	Scenario I	Scenario II	Scenario III	Male	Female	Scenario I	Scenario II	Scenario III
2011	2.3	2.3	2.3	67	68	149764	149764	149764
2016	2.3	2.3	2.3	68	69	160221	160221	160221
2021	2.3	2.1	2.1	69	70	171684	171684	171684
2026	2.3	1.9	1.9	70	72	183593	182096	182096
2031	2.3	1.9	1.6	71	73	195176	190735	190735
2036	2.3	1.9	1.6	73	74	205793	198503	196299
2041	2.3	1.9	1.6	74	75	215899	205638	201314
2046	2.3	1.9	1.6	75	76	225386	211663	205255
2051	2.3	1.9	1.6	77	78	234382	216465	207869
2056	2.3	1.9	1.6	78	79	243287	220559	209466
2061	2.3	1.9	1.6	79	80	251450	223390	209415

4.2.1 Projected Population by Age Group

We have divided the age groups into four categories, namely, 0-14, 15-59, 60-64, 65+. The labor force is defined by age group 15-59 which is very important for measuring a country's workforce. Table 4.4 states that labor force participation is quite high in all three scenarios over the projected years. In 2061, the projected labor force seems to be near about the total population of 2011. The age structure of projected population shows a curvature pattern for all age groups, there are ups and downs in total numbers and proportion changes. Under-15

age group delineates a steady decline in scenarios II and III, it is about a difference of 21,374 thousands from 2011 to 2061 at the low variant scenario III. The labor force (15-59 age group) of Bangladesh illustrates an absolute increasing pattern under the high fertility variant (scenario I). Also scenarios II and III display an augmented labor force up to 2041 and experience a bit shortfall thereafter. Most importantly the projected age structure displays over a fivefold increase of elderly population of ages 65 year and above in all three scenarios.

Table 4.4: Baseline and projected population by three scenarios for selected age-groups, Bangladesh (in thousands)

Year	Scenario I				Scenario II				Scenario III			
	0 - 14	15 - 59	60 - 64	65+	0 - 14	15 - 59	60 - 64	65+	0 - 14	15 - 59	60 - 64	65+
2011	51868	86708	4089	7100	51868	86708	4089	7100	51868	86708	4089	7100
2016	48986	99417	3374	8443	48986	99417	3374	8443	48986	99417	3374	8443
2021	45817	111711	5129	9028	45817	111711	5129	9028	45817	111711	5129	9028
2026	47453	119378	5776	10985	45957	119378	5776	10985	45957	119378	5776	10985
2031	49550	124930	7439	13256	45109	124930	7439	13256	45109	124930	7439	13256
2036	50232	130408	8621	16531	42942	130408	8621	16531	40739	130408	8621	16531
2041	49984	135975	9520	20418	41166	134531	9520	20418	36843	134531	9520	20418
2046	49965	138776	12316	24330	40582	134436	12316	24330	34174	134436	12316	24330
2051	50588	141495	12251	30045	39863	134304	12251	30045	33411	132160	12251	30045
2056	51613	144660	11953	35060	39045	134502	11953	35060	32214	130240	11953	35060
2061	52574	144428	15623	38824	38121	130821	15623	38824	30494	124475	15623	38824

4.2.2 Projected Population by Sex

Male-female ratio is about fifty-fifty in Bangladesh population, this seems to be a plateau for decades. Yearly male-female ratio may not depict any significant message; however the population pyramids (Appendix 3) for medium variant will bring some lights for policy makers. The maximum number of populations in 2011 was observed in the younger age groups. Then gradually it shifts to middle and older age groups due to increased childbearing age and higher life expectancy. The projected total populations by sex are presented in Table 4.5.

Table 4.5: Baseline and projected population by three scenarios and sex, Bangladesh (in thousands)

Year	Scenario I			Scenario II			Scenario III		
	Male	Female	National	Male	Female	National	Male	Female	National
2011	74980	74784	149765	74980	74784	149765	74980	74784	149765
2016	80033	80186	160219	80033	80186	160219	80033	80186	160219
2021	85800	85884	171684	85800	85884	171684	85800	85884	171684
2026	91784	91807	183591	91053	91042	182095	91053	91042	182095
2031	97692	97484	195176	95520	95214	190734	95520	95214	190734
2036	103104	102689	205793	99539	98963	198502	98461	97838	196299
2041	108130	107767	215897	103118	102518	205636	101007	100305	201312
2046	112802	112584	225386	106103	105560	211663	102977	102279	205255
2051	117169	117211	234380	108425	108038	216463	104232	103635	207868
2056	121420	121867	243287	110329	110230	220560	104919	104548	209466
2061	125221	126229	251450	111528	111862	223390	104712	104704	209416

4.2.3 Population Projection in Different Scenarios

The size of population by 5-year age groups during the period 2011-2061 is presented in the Tables 4.6-4.8. Table 4.6 gives the projected values for Scenario I. Except age groups 5-9 and 10-14, population in the groups up to 25-29 in 2061 increases by around 15% relative to that of the base year 2011. The increase is much higher in the remaining age groups.

Table 4.6: Baseline and projected total population by 5-year age-group, Bangladesh (in thousands): Scenario I

Age group	Year										
	2011	2016	2021	2026	2031	2036	2041	2046	2051	2056	2061
0-4	15659	15175	16311	17206	17211	16893	16824	17069	17440	17754	17946
5-9	18894	14981	14571	15716	16658	16714	16474	16446	16723	17153	17491
10-14	17314	18831	14935	14532	15681	16625	16687	16450	16425	16707	17137
15-19	13375	17268	18785	14903	14505	15656	16603	16667	16433	16411	16694
20-24	13829	13328	17214	18733	14868	14475	15629	16578	16645	16415	16395
25-29	14017	13772	13278	17156	18680	14831	14445	15599	16550	16622	16395
30-34	10918	13945	13708	13223	17095	18620	14792	14410	15566	16522	16597
35-39	9945	10843	13858	13630	13158	17020	18552	14743	14368	15529	16486
40-44	8590	9843	10741	13740	13530	13069	16921	18455	14673	14312	15475
45-49	6628	8453	9699	10596	13576	13384	12944	16773	18308	14577	14227
50-54	5767	6453	8244	9476	10378	13319	13162	12743	16534	18091	14420
55-59	3640	5512	6184	7921	9140	10034	12928	12808	12420	16181	17740
60-64	4089	3374	5129	5776	7439	8621	9520	12316	12251	11953	15623
65-69	2194	3615	2997	4583	5202	6739	7884	8758	11403	11479	11247
70-74	2314	1805	2997	2502	3873	4433	5818	6871	7703	10211	10373
75-79	914	1713	1350	2267	1922	3012	3510	4667	5588	6429	8637
80+	1677	1310	1683	1633	2260	2348	3206	4033	5352	6941	8567
Total	149764	160221	171684	183593	195176	205793	215899	225386	234382	243287	251450

Table 4.7: Baseline and projected total population by 5-year age-group, Bangladesh (in thousands): Scenario II

Age group	Year										
	2011	2016	2021	2026	2031	2036	2041	2046	2051	2056	2061
0-4	15659	15175	16311	15709	14218	13955	13773	13529	13162	12858	12520
5-9	18894	14981	14571	15716	15210	13807	13609	13464	13255	12945	12668
10-14	17314	18831	14935	14532	15681	15180	13785	13589	13446	13242	12933
15-19	13375	17268	18785	14903	14505	15656	15160	13769	13575	13435	13232
20-24	13829	13328	17214	18733	14868	14475	15629	15136	13750	13560	13422
25-29	14017	13772	13278	17156	18680	14831	14445	15599	15111	13731	13544
30-34	10918	13945	13708	13223	17095	18620	14792	14410	15566	15085	13710
35-39	9945	10843	13858	13630	13158	17020	18552	14743	14368	15529	15052
40-44	8590	9843	10741	13740	13530	13069	16921	18455	14673	14312	15475
45-49	6628	8453	9699	10596	13576	13384	12944	16773	18308	14577	14227
50-54	5767	6453	8244	9476	10378	13319	13162	12743	16534	18091	14420
55-59	3640	5512	6184	7921	9140	10034	12928	12808	12420	16181	17740
60-64	4089	3374	5129	5776	7439	8621	9520	12316	12251	11953	15623
65-69	2194	3615	2997	4583	5202	6739	7884	8758	11403	11479	11247
70-74	2314	1805	2997	2502	3873	4433	5818	6871	7703	10211	10373
75-79	914	1713	1350	2267	1922	3012	3510	4667	5588	6429	8637
80+	1677	1310	1683	1633	2260	2348	3206	4033	5352	6941	8567
Total	149764	160221	171684	182096	190735	198503	205638	211663	216465	220559	223390

Table 4.8: Baseline and projected total population by 5-year age-group, Bangladesh (in thousands): Scenario III

Age group	Year										
	2011	2016	2021	2026	2031	2036	2041	2046	2051	2056	2061
0-4	15659	15175	16311	15709	14218	11751	11598	11393	10926	10317	9594
5-9	18894	14981	14571	15716	15210	13807	11460	11338	11162	10746	10164
10-14	17314	18831	14935	14532	15681	15180	13785	11443	11323	11151	10736
15-19	13375	17268	18785	14903	14505	15656	15160	13769	11431	11314	11142
20-24	13829	13328	17214	18733	14868	14475	15629	15136	13750	11419	11303
25-29	14017	13772	13278	17156	18680	14831	14445	15599	15111	13731	11405
30-34	10918	13945	13708	13223	17095	18620	14792	14410	15566	15085	13710
35-39	9945	10843	13858	13630	13158	17020	18552	14743	14368	15529	15052
40-44	8590	9843	10741	13740	13530	13069	16921	18455	14673	14312	15475
45-49	6628	8453	9699	10596	13576	13384	12944	16773	18308	14577	14227
50-54	5767	6453	8244	9476	10378	13319	13162	12743	16534	18091	14420
55-59	3640	5512	6184	7921	9140	10034	12928	12808	12420	16181	17740
60-64	4089	3374	5129	5776	7439	8621	9520	12316	12251	11953	15623
65-69	2194	3615	2997	4583	5202	6739	7884	8758	11403	11479	11247
70-74	2314	1805	2997	2502	3873	4433	5818	6871	7703	10211	10373
75-79	914	1713	1350	2267	1922	3012	3510	4667	5588	6429	8637
80+	1677	1310	1683	1633	2260	2348	3206	4033	5352	6941	8567
Total	149764	160221	171684	182096	190735	196299	201314	205255	207869	209466	209415

The age-specific projected values for Scenario II are displayed in Table 4.7. Unlike in scenario I, here we observe a decrease in the population up to the age group 25-29 relative to that of the base year. In group 30-34 and onwards, population increases sharply. This indicates movement of the population towards the older age groups.

Similar pattern is seen for Scenario III in Table 4.8. Up to the age group 25-29, population decreases more rapidly in Scenario III than in Scenario II. Like the previous scenarios, population increases in the age groups 30-34 and later. It is interesting to note that population in the older age groups are almost identical across the scenarios.

4.2.4 Projected Rural-Urban Population

Urbanization has become a key striving factor in Bangladesh economy. There is huge labor and temporary migration in mega cities like: Dhaka, Chittagong etc. only for job opportunities and degradation of arable land. Still it is an agro-economy based country and rural areas have much

Table 4.9: Baseline and projected total population by three scenarios and residences, Bangladesh (in thousands)

Year	Scenario I			Scenario II			Scenario III		
	Urban	Rural	National	Urban	Rural	National	Urban	Rural	National
2011	35095	114678	149765	35095	114678	149765	35095	114678	149765
2016	44701	115518	160219	44701	115518	160219	44701	115518	160219
2021	50990	120694	171684	50990	120694	171684	50990	120694	171684
2026	58198	125393	183591	57724	124371	182095	57724	124371	182095
2031	65969	129206	195176	64468	126266	190734	64468	126266	190734
2036	74291	131502	205793	71659	126843	198502	70864	125435	196299
2041	83121	132777	215897	79170	126466	205636	77505	123807	201312
2046	92408	132978	225386	86782	124881	211663	84155	121100	205255
2051	102658	131721	234380	94811	121652	216463	91046	116822	207868
2056	113615	129672	243287	103001	117558	220560	97821	111646	209466
2061	125222	126228	251450	111248	112142	223390	104289	105127	209416

higher proportion of total population, but diminishing marginal income and low opportunity cost play an important role for today's urbanization. In this report, the projected urban population is obtained from the projected national population using estimated proportion of the urban population in projection years. The estimated proportion of urban population is obtained using a log-linear model fitted to the observed proportion (obtained from SVRS reports) over the years 1997-2011. The detail on the urban-rural projection is given in appendix 1. Table 4.9 depicts a sharp increase in urban projected population in all three scenarios. Scenario I consists the constant TFR at 2.3 all through the projection period and eventually shows the higher trend in rural areas that is quite different from other two scenarios, where the rural population is starting to lessen from the year 2036-41. Initiating

from 35,095 thousand population in 2011 urban population has a drastic growth in 2061 that is more than twofold from the base year.

4.2.5 District-wise Projected Population

One of the objectives of this report is to project population of 64 districts of Bangladesh over the period 2016-2061. The commonly used cohort component method is applied for projection of different districts separately, where total population for male and female are obtained from 2011 population census, the proportion of populations in different age groups are obtained from long questionnaire census data, the same life expectancy values that were used for national projection are also used for district projections. Ideally we need to assume TFR values for 64 districts for the years of the period 2011-2061, which is not easy. The detail list of districts of three categories is given in Appendix 2. Instead of this, 64 districts are divided into three groups based on the corresponding TFR estimates obtained from 2011 population census.

For each group of districts, TFR values are assumed for the years over the period 2011-2061 (Table A3) and then cohort component method is applied for each district separately to obtain projected district-wise total population. The main limitation of this approach of projecting district-wise population is that it may give a different national projected population than that was obtained in Table 4.3. To overcome this problem the proportion of national population total for each district is estimated for the years of the period 2016-2061 and then district-specific population are obtained by using the previously obtained national population for different years.

According to BDHS (2014), only Dhaka division shows the increasing pattern of TFR, still Chittagong and Sylhet divisions have high TFR, 2.5 and 2.9 respectively. Table 4.10a-4.10g illustrates an increasing pattern of projected population in all 64 districts from the base-year 2011 to 2061, only scenario II is shown here. To be noted here, though we have made district-wise projection, but for presentation purpose we grouped the districts within different divisions. Division did not play any role in district-wise projection.

Table 4.10a: Baseline and projected total population by district and age-group, Barisal division (in thousands): Scenario II

District	Year										
	2011	2016	2021	2026	2031	2036	2041	2046	2051	2056	2061
Total	8652	9145	9713	10241	10663	11020	11327	11568	11738	11865	11915
Barguna	928	969	1013	1054	1083	1104	1119	1125	1123	1116	1101
Barisal	2415	2583	2776	2950	3094	3224	3346	3454	3544	3625	3685
Bhola	1846	1941	2057	2173	2267	2342	2401	2442	2466	2477	2469
Jhalokati	710	741	778	812	836	854	867	874	876	874	866
Patuakhali	1596	1703	1823	1934	2028	2113	2191	2259	2315	2364	2401
Pirojpur	1157	1208	1266	1318	1355	1383	1403	1414	1414	1409	1393

Table 4.10b: Baseline and projected total population by district and age-group, Chittagong division (in thousands): Scenario II

District	Year										
	2011	2016	2021	2026	2031	2036	2041	2046	2051	2056	2061
Total	29555	31980	34747	37307	39495	41532	43480	45245	46778	48167	49280
Bandarban	404	434	469	503	533	560	584	605	622	637	649
Brahmanbaria	2953	3255	3617	3978	4313	4649	4995	5338	5676	6013	6338
Chandpur	2514	2707	2929	3129	3299	3456	3606	3740	3855	3958	4037
Chittagong	7914	8440	8990	9460	9805	10080	10295	10429	10474	10456	10343
Comilla	5603	6046	6559	7033	7442	7820	8176	8495	8769	9014	9204
CBazar	2382	2655	2979	3295	3580	3865	4158	4450	4732	5010	5272
Feni	1496	1619	1754	1872	1971	2064	2153	2233	2300	2358	2401
Khagrachari	639	685	738	789	832	871	907	937	962	984	1000
Lakshimpur	1798	1995	2223	2435	2625	2818	3022	3227	3424	3620	3807
Noakhali	3232	3491	3799	4090	4346	4581	4802	5002	5175	5331	5453
Rangamati	620	653	690	723	749	768	782	789	789	786	776

Table 4.10c: Baseline and projected total population by district and age-group, Khulna division (in thousands): Scenario II

District	Year										
	2011	2016	2021	2026	2031	2036	2041	2046	2051	2056	2061
Total	16308	17252	18217	19017	19609	20082	20462	20698	20777	20769	20622
Bagerhat	1534	1601	1675	1739	1783	1814	1834	1841	1835	1820	1793
Chuadanga	1175	1237	1299	1349	1384	1408	1424	1427	1419	1402	1376
Jessore	2876	3029	3182	3307	3391	3451	3492	3504	3486	3452	3390
Jhenaidha	1843	1976	2111	2223	2314	2395	2471	2533	2578	2614	2634
Khulna	2407	2528	2650	2750	2818	2867	2898	2907	2891	2862	2812
Kushtia	2024	2170	2318	2439	2538	2626	2708	2773	2821	2859	2882
Magura	955	1020	1091	1153	1205	1251	1294	1330	1358	1382	1399
Meherpur	681	716	750	777	794	806	813	813	805	794	778
Narail	750	801	856	906	949	987	1022	1053	1077	1099	1115
Satkhira	2063	2174	2285	2374	2433	2477	2506	2517	2507	2485	2443

**Table 4.10d: Baseline and projected total population by district and age-group, Dhaka division (in thousands):
Scenario II**

District	Year										
	2011	2016	2021	2026	2031	2036	2041	2046	2051	2056	2061
Total	49318	52539	56064	59289	61943	64294	66416	68157	69489	70587	71275
Dhaka	12516	13142	13798	14366	14777	15081	15291	15372	15323	15193	14936
Faridpur	1989	2088	2201	2304	2381	2441	2484	2509	2516	2512	2489
Gazipur	3548	3809	4046	4230	4358	4458	4534	4569	4556	4510	4418
Gopalganj	1218	1277	1346	1412	1462	1501	1530	1549	1556	1556	1545
Jalalpur	2385	2541	2713	2873	3013	3137	3249	3342	3417	3483	3532
Kishoregonj	3028	3311	3648	3985	4295	4605	4923	5237	5544	5852	6150
Madaripur	1212	1295	1393	1483	1560	1628	1692	1748	1796	1838	1871
Manikganj	1447	1542	1640	1724	1794	1857	1916	1964	2002	2034	2056
Munshiganj	1502	1583	1669	1743	1797	1839	1870	1887	1889	1881	1858
Mymensingh	5314	5807	6378	6932	7438	7947	8472	8990	9492	9993	10477
Narayanganj	3074	3284	3490	3662	3786	3883	3956	3995	3996	3972	3910
Narshingdi	2314	2489	2685	2866	3022	3164	3294	3407	3501	3584	3646
Netrokona	2317	2516	2759	3005	3235	3462	3695	3924	4148	4374	4592
Rajbari	1091	1144	1201	1252	1290	1318	1339	1349	1349	1342	1326
Shariatpur	1202	1284	1385	1481	1563	1639	1709	1772	1826	1876	1915
Sherpur	1412	1504	1607	1707	1794	1872	1943	2003	2052	2095	2128
Tangail	3749	3923	4105	4264	4378	4462	4519	4540	4526	4492	4426

**Table 4.10e: Baseline and projected total population by district and age-group, Rajshahi division (in thousands):
Scenario II**

District	Year										
	2011	2016	2021	2026	2031	2036	2041	2046	2051	2056	2061
Total	19225	20412	21607	22621	23398	24037	24559	24903	25056	25102	24977
Bogra	3539	3724	3903	4050	4151	4224	4270	4280	4254	4208	4129
CNwabganj	1714	1854	2003	2133	2242	2341	2432	2511	2574	2627	2666
Joypurhat	950	998	1042	1076	1097	1111	1118	1116	1104	1087	1062
Naogaon	2702	2844	2977	3082	3151	3198	3227	3228	3201	3159	3093
Natore	1775	1866	1956	2031	2082	2119	2142	2148	2134	2110	2070
Pabna	2625	2818	3019	3195	3345	3480	3606	3710	3791	3858	3903
Rajshahi	2699	2853	3000	3116	3193	3247	3282	3290	3267	3226	3159
Sirajgonj	3221	3455	3707	3938	4137	4317	4482	4620	4731	4827	4895

Table 4.10f: Baseline and projected total population by district and age-group, Sylhet division (in thousands): Scenario II

District	Year										
	2011	2016	2021	2026	2031	2036	2041	2046	2051	2056	2061
Total	10296	11291	12463	13601	14642	15669	16711	17727	18702	19656	20556
Habiganj	2171	2386	2640	2891	3125	3358	3598	3834	4065	4294	4516
Maulavibazar	1994	2148	2324	2486	2626	2753	2870	2973	3059	3135	3192
Sunamganj	2564	2800	3091	3392	3677	3960	4245	4526	4802	5077	5343
Sylhet	3567	3957	4408	4832	5214	5598	5998	6394	6776	7150	7505

Table 4.10g: Baseline and projected total population by district and age-group, Rangpur division (in thousands): Scenario II

District	Year										
	2011	2016	2021	2026	2031	2036	2041	2046	2051	2056	2061
Total	16412	17602	18868	20015	20986	21867	22678	23368	23925	24412	24770
Dinajpur	3110	3268	3430	3571	3672	3746	3795	3814	3801	3770	3711
Gaibandha	2472	2718	2975	3212	3424	3640	3865	4085	4294	4501	4700
Kurigram	2151	2301	2464	2613	2743	2860	2967	3057	3129	3193	3238
Lalmohirhat	1305	1398	1500	1595	1676	1748	1814	1870	1916	1955	1984
Nilphamari	1907	2049	2204	2346	2469	2579	2679	2763	2832	2892	2935
Panchagar	1026	1104	1188	1264	1328	1386	1438	1482	1517	1547	1567
Rangpur	2996	3211	3439	3643	3816	3972	4113	4231	4324	4403	4457
Thakurgaon	1445	1553	1668	1771	1858	1936	2007	2066	2112	2151	2178

4.2.6 Projected Labor Force and Dependency Ratio

It is interesting to note that the labor force and dependency ratio in all the three scenarios have similar pattern: they decrease initially and then increase again, illustrated in table 4.11. In Tables 4.6-4.8 we have seen the population to be shifted from early age groups to older age groups. Therefore, the dependency ratio also starts to increase as the population in the middle age groups increases gradually with time. Towards the end, it begins to increase as the population in older age groups increases.

Table 4.11: Baseline and projected labor force (in percentage of total population) and dependency ratio by three scenarios, Bangladesh

Year	Labor Force (15-59)			Dependency Ratio (0-14 and 65+)		
	Scenario I	Scenario II	Scenario III	Scenario I	Scenario II	Scenario III
2011	0.579	0.579	0.579	0.649	0.694	0.649
2016	0.621	0.621	0.621	0.559	0.559	0.559
2021	0.651	0.651	0.651	0.469	0.469	0.469
2026	0.650	0.656	0.656	0.467	0.455	0.455
2031	0.640	0.655	0.655	0.474	0.441	0.441
2036	0.634	0.657	0.664	0.480	0.428	0.412
2041	0.630	0.654	0.668	0.484	0.428	0.398
2046	0.616	0.635	0.655	0.492	0.442	0.399
2051	0.604	0.620	0.636	0.524	0.477	0.439
2056	0.595	0.610	0.622	0.553	0.506	0.473
2061	0.574	0.586	0.594	0.571	0.525	0.495

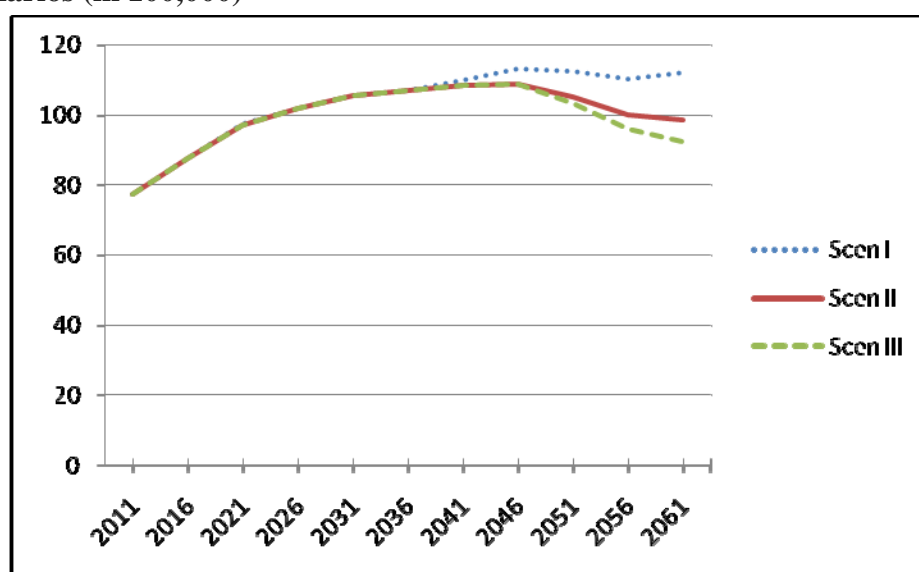
4.2.7 Projected Women in Reproductive Age

Table 4.12 delineates the future mothers at reproductive age. An efficient future generation is only possible from an efficient group of mothers. If the future mothers (ranges from 39,939 to 54,798 thousands) are nurtured with proper health care, nourishment and education, then Bangladesh may opt for the rapid development with large population turning into a large manpower. Figure 2 shows a comparison of projected female population at reproductive ages for three scenarios.

Table 4.12: Projected Female Population Aged 15-49 Years (mothers accounted for TFR) in Three Scenarios (in thousands)

Year	Female Population (15-49) (Thousands)		
	Scenario I	Scenario II	Scenario III
2011	39939	39939	39939
2016	44903	44903	44903
2021	49729	49729	49729
2026	51874	51874	51874
2031	53242	53242	53242
2036	53349	53349	53349
2041	53686	52981	52981
2046	55258	53137	53137
2051	55014	51500	50453
2056	53957	48997	46918
2061	54798	48158	45063

Figure 2: Projected female population aged 15-49 years (mothers accounted for TFR) in three scenarios (in 100,000)



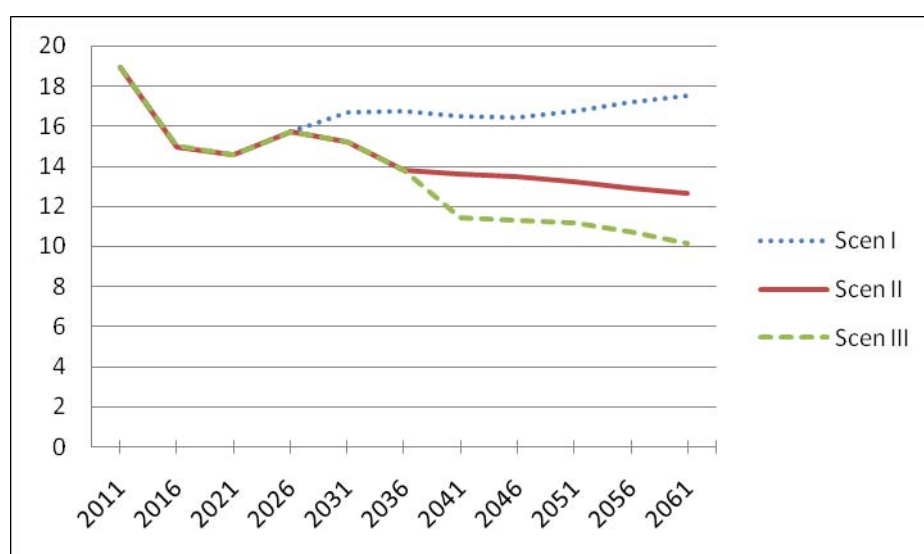
4.2.8 Projection of Primary School Enrollment

Projection on the primary school enrollment is a key factor for policy research. It can provide the basis of resource allocation for the primary schools, infrastructures, curriculum of the future generation. Table 4.13 shows about 12,411 to 15,288 thousands projected primary students in next five decades by the scenarios III and II. There is an apparent sharp decline in the primary school enrollment, where TFR is assumed to be lower than replacement level, country may prioritize on the technological development rather than the infrastructural. Figure 3 shows a comparison of projected population at primary school enrollment ages for three scenarios.

Table 4.13: Projected primary school enrollment (6-11 years old in thousands) in three scenarios

Year	School Population (Thousands)		
	Scenario I	Scenario II	Scenario III
2011	19496	19496	19496
2016	19496	19496	19496
2021	17249	17249	17249
2026	18346	18418	18418
2031	19683	18564	18564
2036	20076	17034	17140
2041	19830	16294	14524
2046	19691	16198	13486
2051	19923	15975	13477
2056	20408	15637	13057
2061	20864	15288	12411

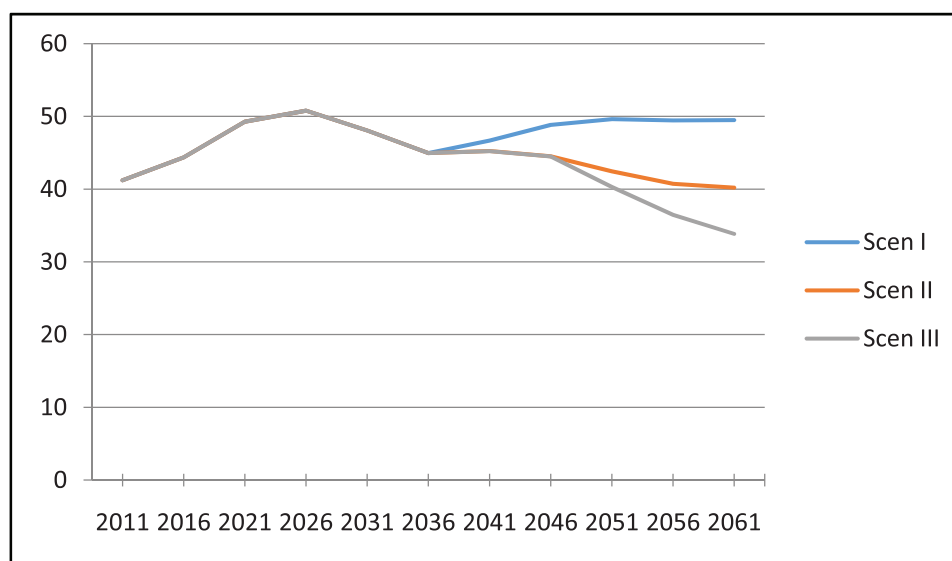
Figure 3: Projected primary school enrollment (6-11 years old in millions) in three scenarios



4.2.9 Projected Youth Population

Figure 4 shows an optimistic future trend of Bangladesh. Youth population aged between 15 to 29 years would lead the country in front and about 40,198 thousand youth is projected by the scenario II in 2061. It is obvious that total population is projected to be increased in an alarming way, but still youth can make an offset beyond the limitations.

Figure 4: Projected youth population (15-29 years of age) in three scenarios (in 100,000)



4.3 Population Projection with International Migration

International migration is an important component of population change for almost every country. When projecting population further in time, this component must be tried to be acknowledged. However, sometimes the international migration data are not quite reliable due to asylums, refugees and human trafficking. In some countries migration data are not available at all. In Bangladesh we don't have a reliable data on in-migration to our country available from any government agency. But BBS has collected data on out-migration in their long questionnaire survey. The head of the household was asked to provide information about the international migrants of his/her household who were aged more than 5 years. The information also included the ages and sexes of the migrants- which enables us to find an estimate of international out-migration for Bangladesh.

For the sake of finding a more reasonable estimate of the net migration rate, we tried to search for a reliable international source of in-migration information in Bangladesh. However, no direct measure of in-migration for Bangladesh does exist. But United Nations Population Division has information on the estimated number of international migrants for Bangladesh up to year 2013. This number is called "estimated" because it is not exactly the number of in-migrants. Rather this is the number of foreign born population living in

Bangladesh in a given year- which is also called the “international migration stock”. The source tells that the number of foreign born male population in Bangladesh was 1.2 million, whereas the number of foreign born female population was almost 0.19 million in 2013. It also provides age and sex specific numbers and the proportions look more realistic compared to the age and sex specific proportion of out-migration. In lieu of using indirect method of projecting migration, we used the data on international migration stock by *United Nations Population Division* as an estimate of in-migration and the data obtained from the module 9 of long questionnaire survey of BBS in the base year 2011 as the estimate of out-migration. This study ignored the net migration rate for the age group 0-4 years because the out-migration for this age-group was not available. Table 4.14 shows net migration rate and absolute number of migrants by age and sex.

Table 4.14: Estimated net migration rate and number of net migrants by age-group by sex (per 100,000)

Age Group	Net Migration Rate		Number of net migrants	
	Female	Male	Female	Male
0-4	-	-	-	-
5-9	0.00164	0.00294	1643	2937
10-14	0.00198	0.00826	1975	8263
15-19	-0.00235	-0.06168	-2350	-61680
20-24	-0.00544	-0.16486	-5440	-164860
25-29	-0.00188	-0.11695	-1880	-116950
30-34	-0.00187	-0.07463	-1870	-74630
35-39	0.00014	-0.06115	143	-61150
40-44	0.00156	-0.03633	1562	-36330
45-49	0.00162	-0.01738	1617	-17380
50-54	0.00140	-0.00337	1395	-3370
55-59	0.00122	-0.00127	1223	-1270
60-64	0.00070	-0.00043	696	-430
65+	0.00058	0.00213	581	2134

Projected population considering international migration has been made for scenario II and presented in Table 4.15. It shows that if we consider international migration, then the total population is going to be 219.70 million. For a country like Bangladesh the net migration rates at middle ages are always negative. More people leave the country for work and education than the number that comes in. This fact is also reflected in our estimated net migration rates. Here is a representation of the age and sex specific net migration rates that we have derived from the above mentioned sources. The rates were available only up to the age group 65+.

Table 4.15: Baseline and projected total population by 5-year age-group including international migration, Bangladesh (in thousands), Scenario II

Age Group	Year										
	2011	2016	2021	2026	2031	2036	2041	2046	2051	2056	2061
0-4	15659	15175	16311	15709	14218	13955	13773	13529	13162	12858	12520
5-9	18938	15015	14604	15752	15245	13839	13640	13495	13286	12975	12697
10-14	17405	18929	15013	14607	15762	15259	13856	13660	13516	13310	13000
15-19	12942	16697	18169	14419	14030	15143	14664	13319	13131	12995	12798
20-24	12796	12180	15700	17099	13584	13214	14267	13819	12555	12380	12251
25-29	13246	13057	12480	16102	17542	13937	13566	14650	14193	12898	12721
30-34	10513	13451	13249	12711	16420	17891	14218	13847	14957	14495	13175
35-39	9646	10523	13468	13270	12752	16483	17972	14286	13919	15044	14583
40-44	8435	9676	10562	13521	13329	12839	16617	18125	14414	14057	15199
45-49	6572	8384	9624	10516	13479	13295	12840	16636	18159	14460	14112
50-54	5760	6445	8235	9468	10368	13309	13154	12730	16517	18072	14406
55-59	3639	5512	6183	7920	9140	10034	12929	12810	12419	16180	17739
60-64	4089	3374	5130	5776	7440	8622	9521	12318	12254	11954	15625
65+	7110	8455	9040	11000	13274	16554	20446	24362	30084	35105	38874
Total	146750	156873	167768	177870	186583	194374	201463	207586	212566	216783	219700

4.4 Population Projection with International Migration

A comparative picture of projected population is shown in table 4.16 from four different institutions based on the different base years.

Table 4.16: Baseline and projected total population by 5-year age-group, Bangladesh 2050-51 (in millions)

Age group	UN Census Bureau (in 2050)	World Bank (in 2050)	BBS (2007) (in 2051)	ISRT (2015): scenario II (in 2051)
0-4	15.79	11.21	14.53	13.16
5-9	15.80	11.63	14.19	13.26
10-14	16.01	12.07	13.82	13.45
15-19	16.07	12.45	13.92	13.58
20-24	15.86	12.86	14.60	13.75
25-29	15.57	13.38	15.11	15.11
30-34	15.33	13.71	14.84	15.57
35-39	15.40	13.84	13.55	14.37
40-44	16.14	13.69	13.31	14.67
45-49	16.81	14.34	14.82	18.31
50-54	15.97	14.24	15.69	16.53

Contd.

Age group	UN Census Bureau (in 2050)	World Bank (in 2050)	BBS (2007) (in 2051)	ISRT (2015): scenario II (in 2051)
55-59	14.53	13.51	16.18	12.42
60-64	12.85	12.27	14.52	12.25
65-69	10.58	10.72	10.03	11.40
70-74	9.09	8.53	7.93	7.70
75-79	6.27	6.06	6.08	5.59
80+	5.52	7.41	5.55	5.35
Total	233.59	201.95	218.64	216.46

5. CONCLUSION

In this study, an attempt has been made to project the population in Bangladesh and explore the distributions among various sectors. Three different scenarios have been chosen on the basis of policy options that may emerge in the socio-economic setting of Bangladesh. In 2061, the population of Bangladesh is estimated to be 251,450 thousand under high variant fertility assumption (scenario I), 223,390 thousand under medium variant fertility assumption (scenario II) and 209,415 thousand under low variant fertility assumption (scenario III). The obtained population has been split into different sectors like school going children, youth, labour force, dependents, etc. The figures there can help government and non-government agencies in formulating their policies. The population at national level is also presented in single-years to make it suitable to different stakeholders.

The age structure of projected population shows a curvature pattern for all age groups, there are ups and downs in total numbers and proportion changes. A sharp increase of urbanization has been depicted in all three scenarios. The age-specific projected values show that at the age of 30-34 and onwards, population increases sharply. This indicates movement of the population towards the older age groups, the increase in the old age population will pose a formidable challenge to the policy makers if necessary measures to take care of the old age population are not considered with top priority. This increased projected population could create implementation and institutional challenges.

Appendixes

Appendix 1: Assumptions for urban-rural population projection

In Section 4, the projected national population is reported for 10 different years over the period 2016-2061. In this section, the methods of projecting urban and rural populations are described for the same 10 years. Given the national projected population, the urban projected population of a specific year is obtained by using the estimated proportion of urban population of the same year. To obtain the estimated proportion of urban population for the entire projected years 2016–2061, the SVRS estimates of the proportion of urban population over the years 1997–2011 (Table A1) are used to construct a model.

Table A1: Time series of percentage of urban population

Year	Urban population
1997	21.71
1998	22.12
1999	22.43
2000	22.89
2001	23.08
2002	23.02
2003	23.22
2004	23.73
2005	24.24
2006	24.61
2007	25.04
2008	25.09
2009	25.49
2010	25.91
2011	25.90

Using the fitted model for the proportion of urban population at time t , $pu = \exp(-22.68 + 0.0129t)$, the predicted percentage of urban population for different years are given in the Table A2.. Using this proportion, the projected urban and rural populations of a year are obtained from the corresponding projected national population.

Table A2. Projected percentage of urban population for different years over the period 2016-2061

Year	2011	2016	2021	2026	2031	2036	2041	2046	2051	2056	2061
pu	26.1	27.9	29.7	31.7	33.8	36.1	38.5	41.0	43.8	46.7	49.8

Appendix 2: Assumptions for district-wise population projection

Below the list of Group-A districts for which the TFR estimates range from 1.51 to 1.99.

Bagerhat, Barguna, Bhola, Bogra, Chittagong, Chuadanga, Dhaka, Dinajpur, Faridpur, Gazipur, Gopalganj, Jhalokati, Jessore, Joypurhat, Khulna, Manikganj, Meherpur, Munshiganj, Naogaon, Narayanganj, Natore, Pirojpur, Rajbari, Rajshahi, Rangamati, Satkhira, and Tangail.

The districts of Group-B for which the TFR estimates range from 2.02 to 2.5 are:

Bandarban, Barisal, Chapai-nwabganj, Chandpur, Comilla, Feni, Jamalpur, Jhenaidha, Khagrachari, Kurigram, Kushtia, Lalmonirhat, Madaripur, Magura, Maulavibazar, Narail, Narshingdi, Nilphamari, Noakhali, Pabna, Panchagar, Patuakhali, Rangpur, Shariatpur, Sherpur, Sirajgonj, and Thakurgaon.

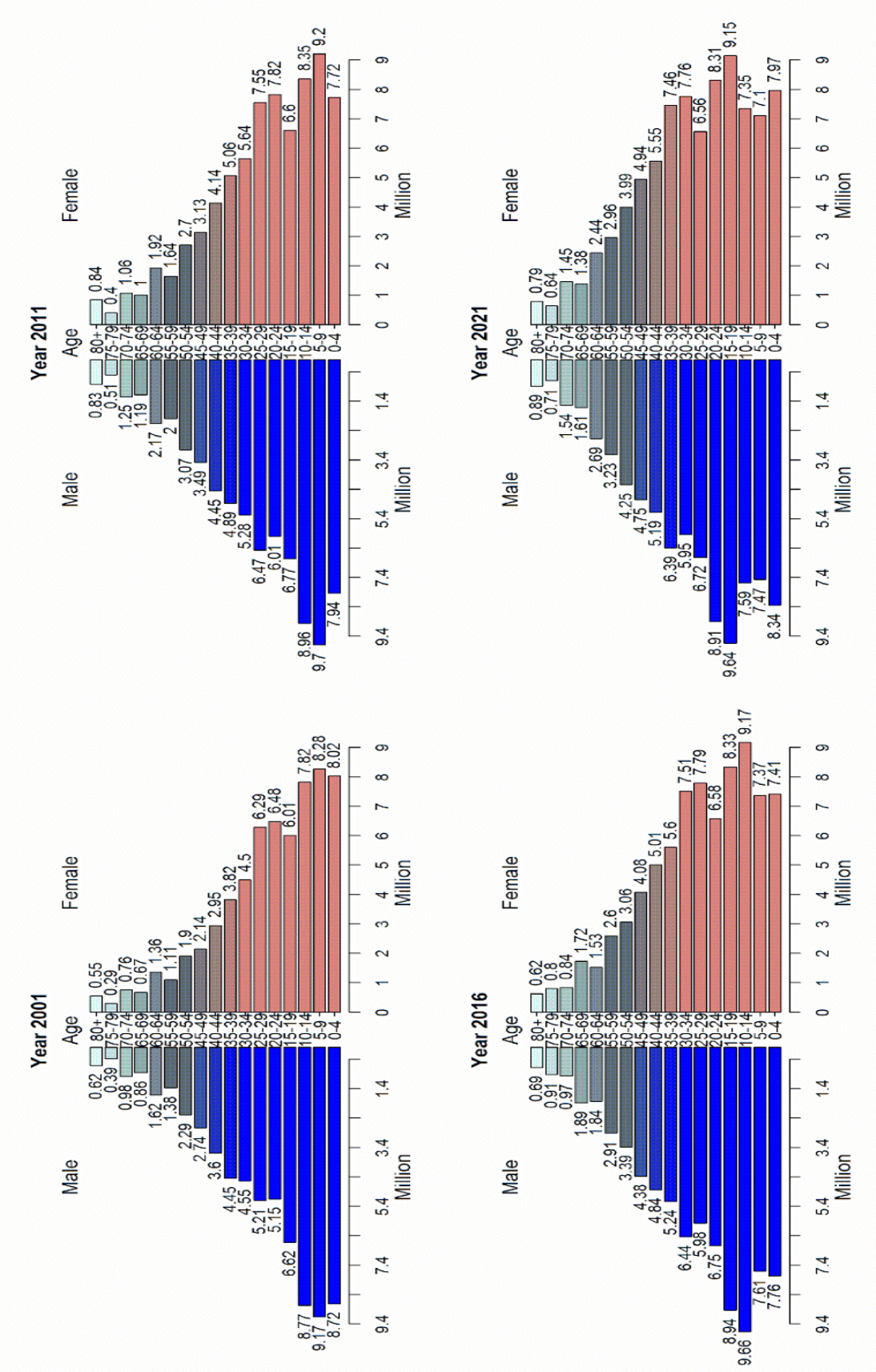
And the districts of Group-C for which the TFR estimates range from 2.54 to 3.48 are:

Brahmanbaria, Coxes Bazar, Gaibandha, Habiganj, Kishoregonj, Lakshimpur, Mymensingh, Netrokona, Sunamganj, and Sylhet.

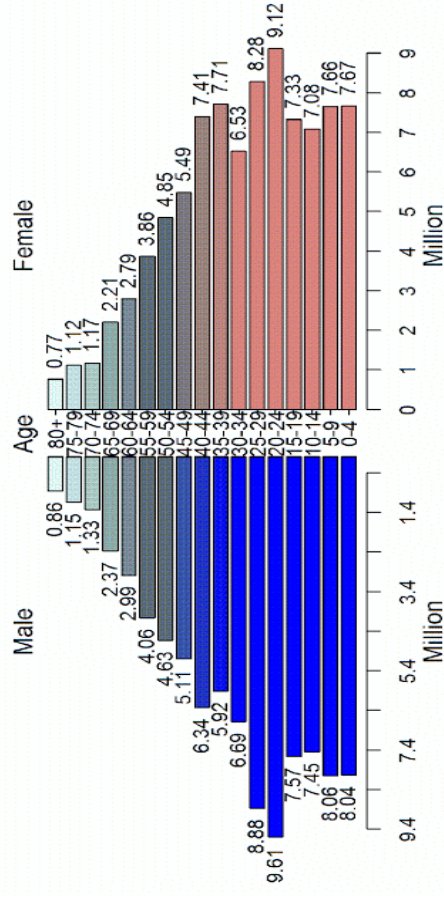
Table A3: Assumed TFR values for three groups of districts

Year	Groups of districts		
	Group A	Group B	Group C
2011	1.80	2.30	3.00
2016	1.80	2.30	3.00
2021	1.70	2.10	2.70
2026	1.50	1.90	2.40
2031	1.50	1.90	2.40
2036	1.50	1.90	2.40
2041	1.50	1.90	2.40
2046	1.50	1.90	2.40
2051	1.50	1.90	2.40
2056	1.50	1.90	2.40
2061	1.50	1.90	2.40

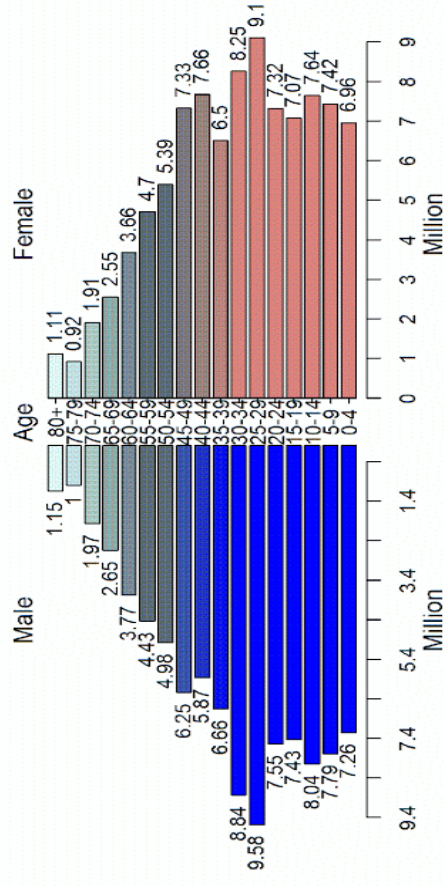
Appendix 3: Age-specific Male-Female Distribution Pyramids



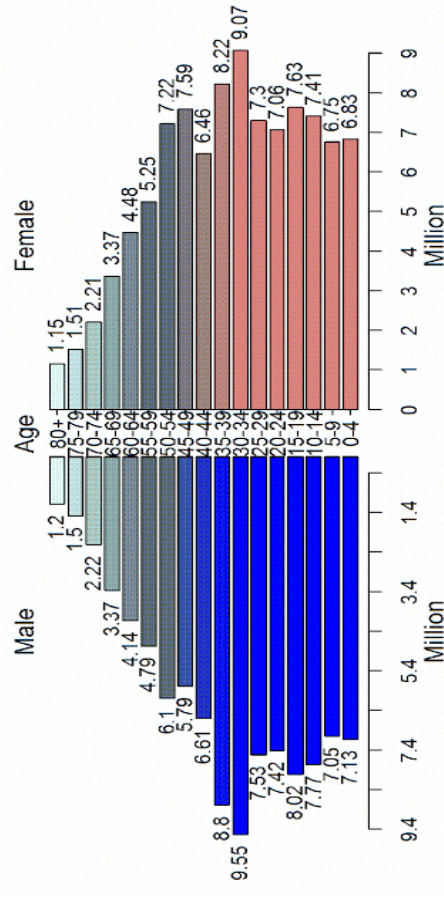
Year 2026



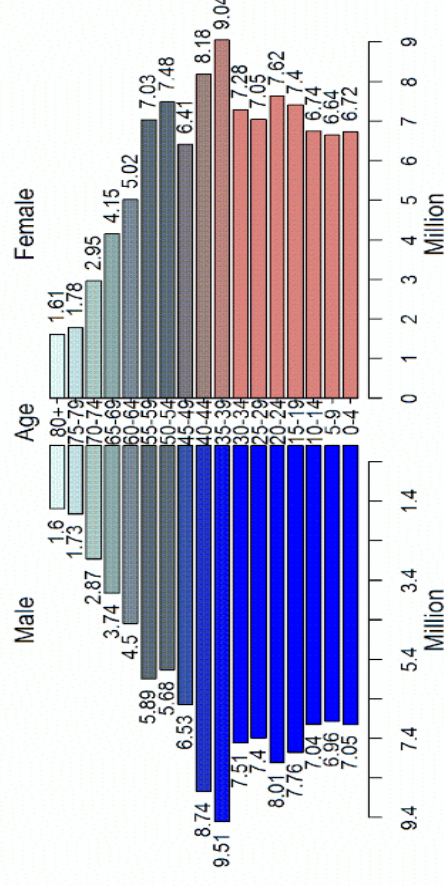
Year 2031

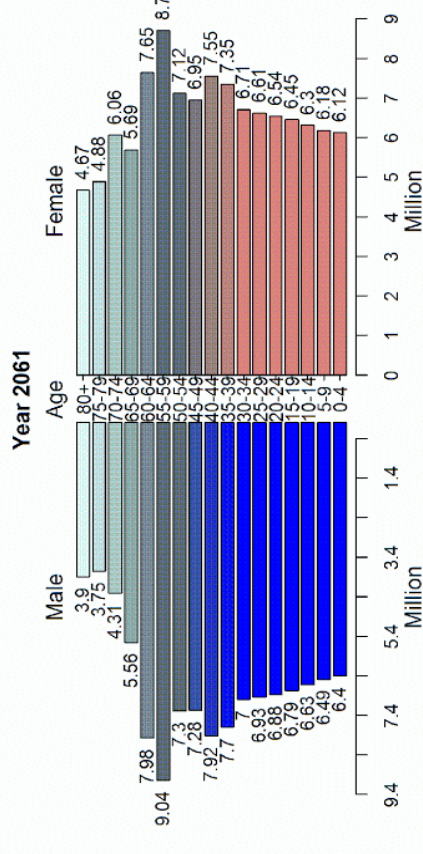
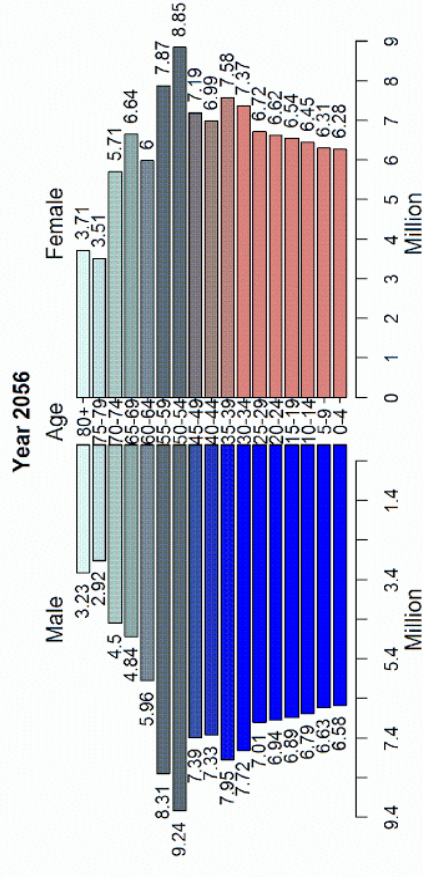
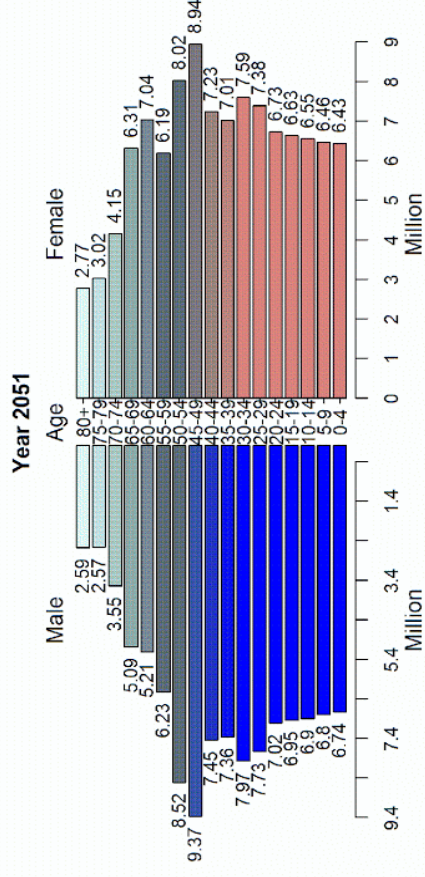
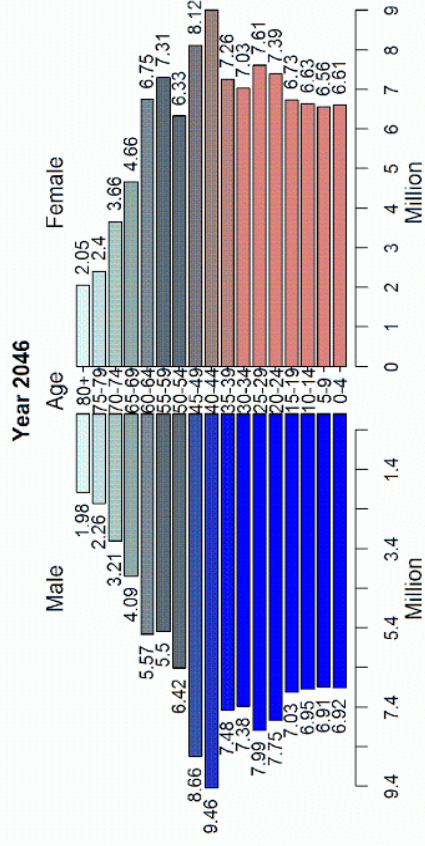


Year 2036



Year 2041





Appendix 4: Baseline and projected population by three scenarios, 5-year age-group and sex, Bangladesh (in thousands)

Year	Age group	Scenario I			Scenario II			Scenario III		
		Female	Male	Total	Female	Male	Total	Female	Male	Total
2011	0-4	7719	7940	15659	7719	7940	15659	7719	7940	15659
	5-9	9199	9695	18894	9199	9695	18894	9199	9695	18894
	10-14	8354	8960	17314	8354	8960	17314	8354	8960	17314
	15-19	6604	6771	13375	6604	6771	13375	6604	6771	13375
	20-24	7823	6006	13829	7823	6006	13829	7823	6006	13829
	25-29	7547	6471	14017	7547	6471	14017	7547	6471	14017
	30-34	5639	5279	10918	5639	5279	10918	5639	5279	10918
	35-39	5056	4889	9945	5056	4889	9945	5056	4889	9945
	40-44	4136	4454	8590	4136	4454	8590	4136	4454	8590
	45-49	3134	3494	6628	3134	3494	6628	3134	3494	6628
	50-54	2700	3067	5767	2700	3067	5767	2700	3067	5767
	55-59	1638	2002	3640	1638	2002	3640	1638	2002	3640
	60-64	1922	2167	4089	1922	2167	4089	1922	2167	4089
	65-69	1002	1192	2194	1002	1192	2194	1002	1192	2194
	70-74	1062	1252	2314	1062	1252	2314	1062	1252	2314
	75-79	404	510	914	404	510	914	404	510	914
	80+	845	832	1677	845	832	1677	845	832	1677
2016	0-4	7413	7762	15175	7413	7762	15175	7413	7762	15175
	5-9	7370	7611	14981	7370	7611	14981	7370	7611	14981
	10-14	9169	9662	18831	9169	9662	18831	9169	9662	18831
	15-19	8332	8935	17268	8332	8935	17268	8332	8935	17268
	20-24	6581	6747	13328	6581	6747	13328	6581	6747	13328
	25-29	7791	5980	13772	7791	5980	13772	7791	5980	13772
	30-34	7509	6436	13945	7509	6436	13945	7509	6436	13945
	35-39	5602	5241	10843	5602	5241	10843	5602	5241	10843
	40-44	5009	4835	9843	5009	4835	9843	5009	4835	9843
	45-49	4078	4375	8453	4078	4375	8453	4078	4375	8453
	50-54	3064	3389	6453	3064	3389	6453	3064	3389	6453
	55-59	2598	2914	5512	2598	2914	5512	2598	2914	5512
	60-64	1534	1839	3374	1534	1839	3374	1534	1839	3374
	65-69	1723	1891	3615	1723	1891	3615	1723	1891	3615
	70-74	839	967	1805	839	967	1805	839	967	1805
	75-79	799	914	1713	799	914	1713	799	914	1713
	80+	621	689	1310	621	689	1310	621	689	1310

Year	Age group	Scenario I			Scenario II			Scenario III		
		Female	Male	Total	Female	Male	Total	Female	Male	Total
2021	0-4	7966	8344	16311	7966	8344	16311	7966	8344	16311
	5-9	7103	7467	14571	7103	7467	14571	7103	7467	14571
	10-14	7348	7587	14935	7348	7587	14935	7348	7587	14935
	15-19	9148	9637	18785	9148	9637	18785	9148	9637	18785
	20-24	8307	8907	17214	8307	8907	17214	8307	8907	17214
	25-29	6557	6721	13278	6557	6721	13278	6557	6721	13278
	30-34	7756	5951	13708	7756	5951	13708	7756	5951	13708
	35-39	7464	6394	13858	7464	6394	13858	7464	6394	13858
	40-44	5554	5188	10741	5554	5188	10741	5554	5188	10741
	45-49	4944	4755	9699	4944	4755	9699	4944	4755	9699
	50-54	3993	4251	8244	3993	4251	8244	3993	4251	8244
	55-59	2955	3229	6184	2955	3229	6184	2955	3229	6184
	60-64	2442	2687	5129	2442	2687	5129	2442	2687	5129
	65-69	1382	1614	2997	1382	1614	2997	1382	1614	2997
	70-74	1452	1545	2997	1452	1545	2997	1452	1545	2997
	75-79	638	713	1350	638	713	1350	638	713	1350
	80+	790	893	1683	790	893	1683	790	893	1683
2026	0-4	8402	8803	17206	7671	8038	15709	7671	8038	15709
	5-9	7660	8056	15716	7660	8056	15716	7660	8056	15716
	10-14	7085	7447	14532	7085	7447	14532	7085	7447	14532
	15-19	7333	7570	14903	7333	7570	14903	7333	7570	14903
	20-24	9123	9610	18733	9123	9610	18733	9123	9610	18733
	25-29	8280	8876	17156	8280	8876	17156	8280	8876	17156
	30-34	6531	6691	13223	6531	6691	13223	6531	6691	13223
	35-39	7714	5916	13630	7714	5916	13630	7714	5916	13630
	40-44	7405	6335	13740	7405	6335	13740	7405	6335	13740
	45-49	5487	5108	10596	5487	5108	10596	5487	5108	10596
	50-54	4847	4629	9476	4847	4629	9476	4847	4629	9476
	55-59	3860	4061	7921	3860	4061	7921	3860	4061	7921
	60-64	2787	2989	5776	2787	2989	5776	2787	2989	5776
	65-69	2211	2371	4583	2211	2371	4583	2211	2371	4583
	70-74	1173	1329	2502	1173	1329	2502	1173	1329	2502
	75-79	1116	1151	2267	1116	1151	2267	1116	1151	2267
	80+	769	864	1633	769	864	1633	769	864	1633

Year	Age group	Scenario I			Scenario II			Scenario III		
		Female	Male	Total	Female	Male	Total	Female	Male	Total
2031	0-4	8423	8788	17211	6959	7259	14218	6959	7259	14218
	5-9	8130	8528	16658	7423	7787	15210	7423	7787	15210
	10-14	7644	8037	15681	7644	8037	15681	7644	8037	15681
	15-19	7073	7432	14505	7073	7432	14505	7073	7432	14505
	20-24	7317	7551	14868	7317	7551	14868	7317	7551	14868
	25-29	9100	9580	18680	9100	9580	18680	9100	9580	18680
	30-34	8254	8841	17095	8254	8841	17095	8254	8841	17095
	35-39	6503	6656	13158	6503	6656	13158	6503	6656	13158
	40-44	7664	5866	13530	7664	5866	13530	7664	5866	13530
	45-49	7330	6246	13576	7330	6246	13576	7330	6246	13576
	50-54	5395	4983	10378	5395	4983	10378	5395	4983	10378
	55-59	4705	4434	9140	4705	4434	9140	4705	4434	9140
	60-64	3665	3774	7439	3665	3774	7439	3665	3774	7439
	65-69	2550	2652	5202	2550	2652	5202	2550	2652	5202
	70-74	1906	1967	3873	1906	1967	3873	1906	1967	3873
	75-79	922	1000	1922	922	1000	1922	922	1000	1922
	80+	1110	1150	2260	1110	1150	2260	1110	1150	2260
2036	0-4	8266	8627	16893	6829	7126	13955	5750	6001	11751
	5-9	8174	8540	16714	6753	7055	13807	6753	7055	13807
	10-14	8115	8510	16625	7410	7770	15180	7410	7770	15180
	15-19	7633	8022	15656	7633	8022	15656	7633	8022	15656
	20-24	7060	7415	14475	7060	7415	14475	7060	7415	14475
	25-29	7301	7530	14831	7301	7530	14831	7301	7530	14831
	30-34	9075	9546	18620	9075	9546	18620	9075	9546	18620
	35-39	8222	8798	17020	8222	8798	17020	8222	8798	17020
	40-44	6465	6605	13069	6465	6605	13069	6465	6605	13069
	45-49	7593	5790	13384	7593	5790	13384	7593	5790	13384
	50-54	7216	6103	13319	7216	6103	13319	7216	6103	13319
	55-59	5248	4786	10034	5248	4786	10034	5248	4786	10034
	60-64	4483	4138	8621	4483	4138	8621	4483	4138	8621
	65-69	3371	3368	6739	3371	3368	6739	3371	3368	6739
	70-74	2215	2218	4433	2215	2218	4433	2215	2218	4433
	75-79	1515	1497	3012	1515	1497	3012	1515	1497	3012
	80+	1151	1196	2348	1151	1196	2348	1151	1196	2348

Year	Age group	Scenario I			Scenario II			Scenario III		
		Female	Male	Total	Female	Male	Total	Female	Male	Total
2041	0-4	8213	8611	16824	6723	7049	13773	5662	5936	11598
	5-9	8043	8431	16474	6644	6965	13609	5595	5865	11460
	10-14	8161	8526	16687	6742	7043	13785	6742	7043	13785
	15-19	8105	8498	16603	7400	7759	15160	7400	7759	15160
	20-24	7621	8008	15629	7621	8008	15629	7621	8008	15629
	25-29	7047	7398	14445	7047	7398	14445	7047	7398	14445
	30-34	7283	7509	14792	7283	7509	14792	7283	7509	14792
	35-39	9043	9509	18552	9043	9509	18552	9043	9509	18552
	40-44	8178	8743	16921	8178	8743	16921	8178	8743	16921
	45-49	6410	6534	12944	6410	6534	12944	6410	6534	12944
	50-54	7484	5678	13162	7484	5678	13162	7484	5678	13162
	55-59	7034	5894	12928	7034	5894	12928	7034	5894	12928
	60-64	5018	4502	9520	5018	4502	9520	5018	4502	9520
	65-69	4146	3737	7884	4146	3737	7884	4146	3737	7884
	70-74	2952	2866	5818	2952	2866	5818	2952	2866	5818
	75-79	1782	1728	3510	1782	1728	3510	1782	1728	3510
	80+	1610	1596	3206	1610	1596	3206	1610	1596	3206
2046	0-4	8334	8735	17069	6605	6923	13529	5562	5830	11393
	5-9	8011	8435	16446	6558	6905	13464	5523	5815	11338
	10-14	8032	8418	16450	6635	6954	13589	5587	5856	11443
	15-19	8152	8515	16667	6734	7034	13769	6734	7034	13769
	20-24	8093	8484	16578	7390	7747	15136	7390	7747	15136
	25-29	7608	7992	15599	7608	7992	15599	7608	7992	15599
	30-34	7031	7380	14410	7031	7380	14410	7031	7380	14410
	35-39	7260	7483	14743	7260	7483	14743	7260	7483	14743
	40-44	8999	9455	18455	8999	9455	18455	8999	9455	18455
	45-49	8115	8658	16773	8115	8658	16773	8115	8658	16773
	50-54	6325	6417	12743	6325	6417	12743	6325	6417	12743
	55-59	7311	5497	12808	7311	5497	12808	7311	5497	12808
	60-64	6748	5568	12316	6748	5568	12316	6748	5568	12316
	65-69	4665	4093	8758	4665	4093	8758	4665	4093	8758
	70-74	3661	3210	6871	3661	3210	6871	3661	3210	6871
	75-79	2405	2263	4667	2405	2263	4667	2405	2263	4667
	80+	2052	1980	4033	2052	1980	4033	2052	1980	4033

Year	Age group	Scenario I			Scenario II			Scenario III		
		Female	Male	Total	Female	Male	Total	Female	Male	Total
2051	0-4	8516	8924	17440	6427	6735	13162	5335	5591	10926
	5-9	8148	8575	16723	6458	6797	13255	5438	5724	11162
	10-14	8001	8424	16425	6550	6896	13446	5516	5807	11323
	15-19	8024	8409	16433	6628	6947	13575	5582	5850	11431
	20-24	8142	8503	16645	6726	7024	13750	6726	7024	13750
	25-29	8081	8469	16550	7378	7733	15111	7378	7733	15111
	30-34	7592	7974	15566	7592	7974	15566	7592	7974	15566
	35-39	7011	7357	14368	7011	7357	14368	7011	7357	14368
	40-44	7229	7445	14673	7229	7445	14673	7229	7445	14673
	45-49	8936	9372	18308	8936	9372	18308	8936	9372	18308
	50-54	8017	8517	16534	8017	8517	16534	8017	8517	16534
	55-59	6190	6229	12420	6190	6229	12420	6190	6229	12420
	60-64	7036	5215	12251	7036	5215	12251	7036	5215	12251
	65-69	6308	5095	11403	6308	5095	11403	6308	5095	11403
	70-74	4154	3549	7703	4154	3549	7703	4154	3549	7703
	75-79	3019	2568	5588	3019	2568	5588	3019	2568	5588
	80+	2766	2586	5352	2766	2586	5352	2766	2586	5352
2056	0-4	8673	9081	17754	6281	6577	12858	5040	5277	10317
	5-9	8360	8792	17153	6309	6635	12945	5238	5508	10746
	10-14	8140	8567	16707	6452	6790	13242	5433	5718	11151
	15-19	7995	8416	16411	6545	6890	13435	5512	5802	11314
	20-24	8015	8399	16415	6621	6939	13560	5576	5843	11419
	25-29	8131	8491	16622	6717	7014	13731	6717	7014	13731
	30-34	8068	8454	16522	7366	7719	15085	7366	7719	15085
	35-39	7575	7954	15529	7575	7954	15529	7575	7954	15529
	40-44	6986	7326	14312	6986	7326	14312	6986	7326	14312
	45-49	7187	7390	14577	7187	7390	14577	7187	7390	14577
	50-54	8846	9245	18091	8846	9245	18091	8846	9245	18091
	55-59	7874	8307	16181	7874	8307	16181	7874	8307	16181
	60-64	5995	5958	11953	5995	5958	11953	5995	5958	11953
	65-69	6645	4835	11479	6645	4835	11479	6645	4835	11479
	70-74	5707	4503	10211	5707	4503	10211	5707	4503	10211
	75-79	3511	2918	6429	3511	2918	6429	3511	2918	6429
	80+	3712	3229	6941	3712	3229	6941	3712	3229	6941

Year	Age group	Scenario I			Scenario II			Scenario III		
		Female	Male	Total	Female	Male	Total	Female	Male	Total
2061	0-4	8769	9177	17946	6118	6403	12520	4688	4906	9594
	5-9	8530	8961	17491	6178	6490	12668	4957	5207	10164
	10-14	8353	8784	17137	6304	6629	12933	5233	5503	10736
	15-19	8134	8560	16694	6447	6785	13232	5429	5713	11142
	20-24	7987	8408	16395	6539	6883	13422	5506	5796	11303
	25-29	8006	8389	16395	6614	6930	13544	5570	5836	11405
	30-34	8120	8477	16597	6707	7003	13710	6707	7003	13710
	35-39	8051	8435	16486	7351	7702	15052	7351	7702	15052
	40-44	7550	7924	15475	7550	7924	15475	7550	7924	15475
	45-49	6949	7278	14227	6949	7278	14227	6949	7278	14227
	50-54	7121	7300	14420	7121	7300	14420	7121	7300	14420
	55-59	8702	9037	17740	8702	9037	17740	8702	9037	17740
	60-64	7646	7977	15623	7646	7977	15623	7646	7977	15623
	65-69	5689	5558	11247	5689	5558	11247	5689	5558	11247
	70-74	6060	4314	10373	6060	4314	10373	6060	4314	10373
	75-79	4884	3753	8637	4884	3753	8637	4884	3753	8637
	80+	4670	3898	8567	4670	3898	8567	4670	3898	8567

Appendix 5: Baseline and projected population for medium variant, single age and sex, Bangladesh (in thousands)

Year	2011			2016			2021		
Age	Female	Male	Total	Female	Male	Total	Female	Male	Total
0	1266	1293	2559	1725	1837	3562	1700	1755	3455
1	1436	1470	2906	1550	1633	3183	1642	1712	3354
2	1574	1616	3190	1432	1495	2927	1588	1668	3256
3	1682	1735	3417	1365	1414	2779	1539	1625	3164
4	1762	1826	3588	1341	1382	2723	1497	1583	3080
5	1816	1893	3709	1354	1392	2746	1461	1545	3006
6	1848	1937	3785	1396	1436	2832	1432	1512	2944
7	1858	1959	3817	1459	1505	2964	1412	1485	2897
8	1851	1961	3812	1538	1591	3129	1400	1467	2867
9	1826	1945	3771	1623	1687	3310	1398	1458	2856
10	1792	1915	3707	1720	1795	3515	1399	1451	2850
11	1753	1876	3629	1829	1917	3746	1396	1438	2834
12	1694	1815	3509	1895	1995	3890	1427	1466	2893
13	1607	1728	3335	1890	2000	3890	1508	1555	3063
14	1508	1625	3133	1836	1954	3790	1617	1679	3296
15	1408	1520	2928	1791	1913	3704	1719	1794	3513
16	1297	1411	2708	1749	1872	3621	1825	1913	3738
17	1244	1323	2567	1688	1809	3497	1889	1988	3877
18	1281	1271	2552	1601	1722	3323	1883	1993	3876
19	1374	1245	2619	1503	1620	3123	1831	1949	3780
20	1458	1216	2674	1404	1516	2920	1786	1908	3694
21	1544	1183	2727	1293	1406	2699	1744	1866	3610
22	1604	1174	2778	1239	1318	2557	1682	1803	3485
23	1618	1196	2814	1276	1266	2542	1596	1716	3312
24	1599	1236	2835	1369	1240	2609	1498	1614	3112
25	1587	1277	2864	1452	1211	2663	1399	1510	2909
26	1578	1326	2904	1538	1179	2717	1288	1401	2689
27	1542	1342	2884	1598	1169	2767	1235	1313	2548
28	1468	1301	2769	1611	1191	2802	1271	1261	2532
29	1371	1225	2596	1592	1231	2823	1364	1235	2599
30	1273	1156	2429	1579	1271	2850	1446	1206	2652
31	1166	1083	2249	1571	1320	2891	1531	1173	2704
32	1088	1028	2116	1534	1335	2869	1591	1164	2755
33	1057	1006	2063	1461	1294	2755	1604	1185	2789
34	1055	1006	2061	1364	1218	2582	1584	1224	2808
35	1048	999	2047	1266	1148	2414	1571	1263	2834
36	1042	990	2032	1159	1076	2235	1562	1312	2874
37	1026	980	2006	1081	1021	2102	1525	1326	2851
38	993	968	1961	1049	999	2048	1451	1285	2736
39	948	952	1900	1047	997	2044	1355	1209	2564
40	908	938	1846	1039	990	2029	1257	1139	2396

Year	2011			2016			2021		
Age	Female	Male	Total	Female	Male	Total	Female	Male	Total
41	871	927	1798	1033	980	2013	1150	1066	2216
42	830	905	1735	1017	970	1987	1071	1010	2081
43	786	866	1652	983	956	1939	1039	987	2026
44	741	818	1559	937	939	1876	1037	985	2022
45	695	770	1465	897	924	1821	1028	976	2004
46	647	719	1366	859	912	1771	1020	966	1986
47	610	680	1290	819	889	1708	1004	954	1958
48	594	664	1258	774	849	1623	969	939	1908
49	588	661	1249	729	800	1529	923	920	1843
50	583	656	1239	683	752	1435	882	903	1785
51	583	656	1239	634	700	1334	843	888	1731
52	565	638	1203	597	660	1257	802	864	1666
53	517	591	1108	579	642	1221	757	823	1580
54	452	527	979	572	636	1208	710	773	1483
55	391	466	857	564	629	1193	663	723	1386
56	325	401	726	563	625	1188	614	670	1284
57	288	363	651	544	606	1150	576	629	1205
58	298	369	667	496	559	1055	556	608	1164
59	337	402	739	432	496	928	546	598	1144
60	371	430	801	372	436	808	536	587	1123
61	412	464	876	307	373	680	531	580	1111
62	424	472	896	270	334	604	510	558	1068
63	389	433	822	276	335	611	463	511	974
64	325	368	693	309	360	669	401	451	852
65	268	308	576	337	381	718	343	393	736
66	206	244	450	371	408	779	282	333	615
67	168	204	372	380	411	791	244	294	538
68	168	205	373	347	375	722	245	289	534
69	192	230	422	287	315	602	269	305	574
70	212	251	463	234	261	495	290	319	609
71	236	276	512	180	206	386	318	339	657
72	241	281	522	142	168	310	322	338	660
73	211	249	460	135	160	295	289	303	592
74	162	196	358	147	172	319	233	247	480
75	124	154	278	153	177	330	188	202	390
76	95	121	216	157	181	338	152	166	318
77	72	93	165	161	184	345	120	134	254
78	58	74	132	164	186	350	96	111	207
79	55	67	122	164	185	349	82	99	181
80+	845	832	1677	621	689	1310	790	893	1683

Year	2026			2031			2036		
Age	Female	Male	Total	Female	Male	Total	Female	Male	Total
0	1462	1530	2992	1361	1416	2777	1446	1511	2957
1	1515	1586	3101	1374	1431	2805	1390	1451	2841
2	1550	1623	3173	1389	1449	2838	1351	1409	2760
3	1570	1645	3215	1407	1470	2877	1326	1384	2710
4	1576	1653	3229	1427	1493	2920	1316	1372	2688
5	1571	1649	3220	1447	1516	2963	1316	1374	2690
6	1557	1636	3193	1467	1538	3005	1327	1385	2712
7	1536	1616	3152	1487	1560	3047	1345	1405	2750
8	1511	1591	3102	1504	1579	3083	1369	1431	2800
9	1484	1563	3047	1518	1595	3113	1396	1461	2857
10	1456	1534	2990	1532	1610	3142	1428	1495	2923
11	1427	1506	2933	1548	1627	3175	1462	1532	2994
12	1406	1482	2888	1549	1628	3177	1491	1563	3054
13	1397	1466	2863	1526	1605	3131	1509	1584	3093
14	1399	1458	2857	1489	1567	3056	1520	1596	3116
15	1400	1451	2851	1456	1534	2990	1532	1609	3141
16	1394	1435	2829	1425	1503	2928	1547	1624	3171
17	1423	1461	2884	1403	1478	2881	1546	1624	3170
18	1503	1550	3053	1393	1462	2855	1523	1601	3124
19	1613	1674	3287	1396	1455	2851	1486	1564	3050
20	1715	1790	3505	1397	1447	2844	1454	1531	2985
21	1821	1908	3729	1391	1432	2823	1423	1500	2923
22	1883	1983	3866	1420	1457	2877	1400	1475	2875
23	1878	1987	3865	1500	1545	3045	1391	1458	2849
24	1826	1943	3769	1609	1669	3278	1394	1451	2845
25	1781	1902	3683	1711	1784	3495	1394	1444	2838
26	1739	1860	3599	1816	1902	3718	1388	1428	2816

Year	2026			2031			2036		
Age	Female	Male	Total	Female	Male	Total	Female	Male	Total
27	1677	1797	3474	1879	1976	3855	1417	1453	2870
28	1591	1710	3301	1873	1981	3854	1496	1541	3037
29	1493	1608	3101	1821	1936	3757	1605	1664	3269
30	1394	1504	2898	1776	1895	3671	1707	1779	3486
31	1284	1395	2679	1734	1853	3587	1811	1896	3707
32	1230	1307	2537	1671	1790	3461	1874	1970	3844
33	1266	1256	2522	1585	1703	3288	1868	1973	3841
34	1358	1229	2587	1488	1601	3089	1815	1928	3743
35	1439	1200	2639	1389	1497	2886	1770	1887	3657
36	1524	1167	2691	1279	1388	2667	1727	1844	3571
37	1582	1157	2739	1225	1300	2525	1665	1781	3446
38	1595	1177	2772	1260	1248	2508	1579	1694	3273
39	1574	1215	2789	1351	1222	2573	1481	1592	3073
40	1560	1254	2814	1431	1192	2623	1383	1488	2871
41	1550	1300	2850	1515	1158	2673	1272	1378	2650
42	1513	1314	2827	1572	1147	2719	1217	1290	2507
43	1439	1272	2711	1584	1166	2750	1252	1238	2490
44	1342	1195	2537	1562	1203	2765	1341	1210	2551
45	1244	1125	2369	1547	1239	2786	1420	1179	2599
46	1138	1051	2189	1536	1284	2820	1502	1146	2648
47	1058	995	2053	1498	1295	2793	1558	1133	2691
48	1025	971	1996	1423	1252	2675	1568	1150	2718
49	1022	966	1988	1326	1175	2501	1545	1183	2728
50	1011	956	1967	1228	1104	2332	1528	1216	2744
51	1002	943	1945	1121	1028	2149	1514	1258	2772
52	984	929	1913	1041	970	2011	1474	1266	2740
53	948	911	1859	1006	944	1950	1399	1221	2620

Year	2026			2031			2036		
Age	Female	Male	Total	Female	Male	Total	Female	Male	Total
54	901	890	1791	1000	937	1937	1301	1142	2443
55	858	870	1728	987	923	1910	1202	1069	2271
56	818	852	1670	976	908	1884	1094	992	2086
57	775	825	1600	956	891	1847	1012	932	1944
58	728	783	1511	918	869	1787	975	902	1877
59	681	731	1412	868	843	1711	965	890	1855
60	633	680	1313	823	819	1642	950	873	1823
61	583	626	1209	780	798	1578	935	853	1788
62	543	582	1125	735	767	1502	911	832	1743
63	520	557	1077	687	722	1409	870	805	1675
64	507	544	1051	639	669	1308	817	774	1591
65	493	528	1021	590	617	1207	769	745	1514
66	484	516	1000	539	562	1101	723	718	1441
67	461	492	953	497	517	1014	676	684	1360
68	416	446	862	471	488	959	626	637	1263
69	357	389	746	453	469	922	576	584	1160
70	303	336	639	436	450	886	527	532	1059
71	247	283	530	423	435	858	478	481	959
72	209	244	453	399	409	808	435	435	870
73	202	231	433	353	364	717	401	399	800
74	213	234	447	295	308	603	373	371	744
75	219	234	453	247	262	509	346	343	689
76	222	232	454	208	223	431	322	318	640
77	226	231	457	175	191	366	300	296	596
78	226	229	455	152	168	320	281	277	558
79	223	225	448	140	156	296	265	262	527
80+	769	864	1633	1110	1150	2260	1151	1196	2347

Year	2041			2046			2051		
Age	Female	Male	Total	Female	Male	Total	Female	Male	Total
0	1347	1408	2755	1334	1391	2725	1288	1347	2635
1	1348	1412	2760	1326	1387	2713	1286	1346	2632
2	1346	1412	2758	1319	1384	2703	1284	1346	2630
3	1343	1410	2753	1315	1382	2697	1284	1347	2631
4	1339	1406	2745	1312	1380	2692	1285	1349	2634
5	1335	1401	2736	1310	1380	2690	1286	1352	2638
6	1331	1396	2727	1310	1380	2690	1288	1355	2643
7	1327	1392	2719	1311	1380	2691	1291	1359	2650
8	1325	1388	2713	1313	1382	2695	1294	1363	2657
9	1325	1387	2712	1315	1383	2698	1298	1367	2665
10	1326	1386	2712	1320	1386	2706	1302	1372	2674
11	1325	1384	2709	1327	1392	2719	1307	1377	2684
12	1335	1393	2728	1331	1395	2726	1311	1381	2692
13	1360	1421	2781	1330	1393	2723	1314	1383	2697
14	1395	1459	2854	1328	1389	2717	1316	1384	2700
15	1428	1495	2923	1326	1386	2712	1320	1386	2706
16	1460	1530	2990	1324	1382	2706	1326	1391	2717
17	1488	1560	3048	1333	1391	2724	1329	1392	2721
18	1506	1581	3087	1358	1418	2776	1328	1390	2718
19	1518	1593	3111	1393	1457	2850	1326	1387	2713
20	1530	1607	3137	1426	1493	2919	1325	1384	2709
21	1544	1622	3166	1458	1528	2986	1322	1381	2703
22	1543	1621	3164	1485	1558	3043	1331	1389	2720
23	1520	1598	3118	1504	1578	3082	1356	1416	2772
24	1484	1561	3045	1516	1591	3107	1391	1454	2845
25	1451	1527	2978	1527	1604	3131	1424	1490	2914
26	1420	1497	2917	1542	1619	3161	1456	1525	2981

Year	2041			2046			2051		
Age	Female	Male	Total	Female	Male	Total	Female	Male	Total
27	1397	1471	2868	1540	1618	3158	1483	1555	3038
28	1388	1455	2843	1517	1594	3111	1502	1575	3077
29	1391	1448	2839	1481	1557	3038	1513	1588	3101
30	1391	1440	2831	1448	1524	2972	1525	1600	3125
31	1385	1424	2809	1417	1493	2910	1539	1615	3154
32	1413	1449	2862	1394	1468	2862	1537	1614	3151
33	1492	1536	3028	1385	1451	2836	1514	1591	3105
34	1601	1659	3260	1387	1444	2831	1478	1553	3031
35	1701	1773	3474	1388	1436	2824	1445	1520	2965
36	1806	1889	3695	1381	1420	2801	1413	1489	2902
37	1867	1962	3829	1409	1444	2853	1390	1463	2853
38	1861	1965	3826	1487	1531	3018	1380	1446	2826
39	1808	1920	3728	1595	1652	3247	1383	1439	2822
40	1762	1878	3640	1695	1765	3460	1383	1430	2813
41	1719	1834	3553	1798	1880	3678	1376	1413	2789
42	1656	1770	3426	1858	1951	3809	1403	1437	2840
43	1570	1682	3252	1851	1953	3804	1480	1522	3002
44	1472	1580	3052	1798	1906	3704	1586	1642	3228
45	1373	1476	2849	1751	1863	3614	1685	1752	3437
46	1263	1365	2628	1706	1818	3524	1786	1865	3651
47	1207	1276	2483	1643	1752	3395	1846	1935	3781
48	1240	1223	2463	1556	1664	3220	1837	1934	3771
49	1327	1194	2521	1459	1561	3020	1782	1885	3667
50	1404	1162	2566	1360	1455	2815	1734	1839	3573
51	1483	1127	2610	1248	1344	2592	1688	1791	3479
52	1537	1112	2649	1192	1253	2445	1623	1724	3347
53	1543	1125	2668	1221	1198	2419	1535	1633	3168

Year	2041			2046			2051		
Age	Female	Male	Total	Female	Male	Total	Female	Male	Total
54	1517	1153	2670	1305	1167	2472	1438	1529	2967
55	1497	1182	2679	1378	1133	2511	1338	1422	2760
56	1480	1219	2699	1453	1096	2549	1226	1309	2535
57	1437	1223	2660	1502	1077	2579	1167	1216	2383
58	1360	1175	2535	1504	1085	2589	1192	1158	2350
59	1261	1094	2355	1473	1106	2579	1269	1124	2393
60	1161	1019	2180	1448	1128	2576	1336	1087	2423
61	1052	940	1992	1425	1157	2582	1405	1047	2452
62	968	876	1844	1378	1156	2534	1448	1023	2471
63	926	842	1768	1298	1104	2402	1443	1023	2466
64	912	825	1737	1198	1022	2220	1404	1035	2439
65	891	802	1693	1096	944	2040	1371	1048	2419
66	872	778	1650	986	863	1849	1341	1067	2408
67	843	752	1595	899	796	1695	1288	1058	2346
68	798	720	1518	853	756	1609	1205	1003	2208
69	742	684	1426	831	734	1565	1103	919	2022
70	691	651	1342	805	708	1513	1002	842	1844
71	644	622	1266	784	683	1467	895	764	1659
72	594	584	1178	750	651	1401	806	695	1501
73	539	533	1072	695	609	1304	745	644	1389
74	483	475	958	627	560	1187	705	605	1310
75	432	423	855	569	518	1087	664	566	1230
76	387	377	764	519	480	999	627	532	1159
77	348	338	686	474	447	921	597	506	1103
78	318	306	624	436	419	855	574	487	1061
79	297	285	582	407	398	805	557	477	1034
80+	1610	1596	3206	2052	1980	4032	2766	2586	5352

Year	2056			2061		
Age	Female	Male	Total	Female	Male	Total
0	1265	1320	2585	1223	1277	2500
1	1258	1316	2574	1223	1278	2501
2	1254	1313	2567	1223	1280	2503
3	1252	1313	2565	1224	1282	2506
4	1252	1314	2566	1225	1285	2510
5	1254	1317	2571	1228	1289	2517
6	1257	1321	2578	1231	1293	2524
7	1261	1326	2587	1235	1298	2533
8	1266	1332	2598	1239	1303	2542
9	1272	1339	2611	1244	1308	2552
10	1278	1345	2623	1249	1314	2563
11	1286	1353	2639	1255	1319	2574
12	1292	1359	2651	1260	1326	2586
13	1296	1364	2660	1266	1332	2598
14	1299	1368	2667	1273	1339	2612
15	1303	1372	2675	1279	1345	2624
16	1306	1376	2682	1285	1352	2637
17	1309	1379	2688	1290	1358	2648
18	1312	1381	2693	1295	1363	2658
19	1315	1383	2698	1298	1367	2665
20	1319	1385	2704	1301	1371	2672
21	1324	1389	2713	1305	1374	2679
22	1327	1391	2718	1308	1377	2685
23	1327	1389	2716	1311	1380	2691
24	1324	1385	2709	1314	1381	2695
25	1323	1383	2706	1317	1383	2700
26	1321	1379	2700	1323	1387	2710

Year	2056			2061		
Age	Female	Male	Total	Female	Male	Total
27	1329	1387	2716	1326	1389	2715
28	1354	1414	2768	1325	1387	2712
29	1390	1452	2842	1323	1383	2706
30	1422	1488	2910	1322	1381	2703
31	1454	1523	2977	1319	1377	2696
32	1481	1552	3033	1327	1385	2712
33	1499	1572	3071	1352	1411	2763
34	1510	1584	3094	1387	1450	2837
35	1522	1597	3119	1420	1485	2905
36	1535	1611	3146	1451	1520	2971
37	1534	1610	3144	1478	1549	3027
38	1510	1586	3096	1496	1568	3064
39	1474	1549	3023	1507	1580	3087
40	1440	1515	2955	1518	1592	3110
41	1409	1483	2892	1531	1606	3137
42	1385	1457	2842	1529	1604	3133
43	1375	1440	2815	1505	1580	3085
44	1377	1432	2809	1468	1542	3010
45	1377	1422	2799	1434	1507	2941
46	1369	1405	2774	1402	1475	2877
47	1395	1427	2822	1378	1447	2825
48	1471	1510	2981	1367	1429	2796
49	1575	1626	3201	1368	1420	2788
50	1671	1734	3405	1367	1409	2776
51	1771	1843	3614	1359	1391	2750
52	1828	1909	3737	1383	1411	2794
53	1817	1906	3723	1456	1489	2945

Year	2056			2061		
Age	Female	Male	Total	Female	Male	Total
54	1760	1853	3613	1556	1600	3156
55	1709	1804	3513	1649	1703	3352
56	1660	1752	3412	1745	1807	3552
57	1593	1681	3274	1799	1868	3667
58	1505	1588	3093	1785	1859	3644
59	1407	1483	2890	1725	1801	3526
60	1306	1373	2679	1670	1746	3416
61	1193	1258	2451	1617	1689	3306
62	1130	1162	2292	1546	1613	3159
63	1149	1101	2250	1456	1518	2974
64	1217	1064	2281	1357	1411	2768
65	1276	1023	2299	1255	1299	2554
66	1337	979	2316	1141	1181	2322
67	1370	950	2320	1074	1083	2157
68	1355	941	2296	1082	1018	2100
69	1307	942	2249	1137	977	2114
70	1267	946	2213	1186	934	2120
71	1233	961	2194	1244	895	2139
72	1173	944	2117	1265	861	2126
73	1076	875	1951	1223	827	2050
74	959	777	1736	1141	797	1938
75	854	695	1549	1076	773	1849
76	762	627	1389	1021	756	1777
77	683	568	1251	969	745	1714
78	623	525	1148	925	739	1664
79	589	502	1091	893	739	1632
80+	3712	3229	6941	4670	3898	8568

Appendix 6: Baseline and projected population for medium variant, single year-single age, females, Bangladesh (in thousands)

Age	Year							
	2011	2012	2013	2014	2015	2016	2017	2018
0	1266	1360	1453	1547	1641	1724	1719	1714
1	1436	1459	1483	1506	1529	1552	1571	1589
2	1574	1545	1516	1487	1458	1435	1467	1499
3	1682	1617	1553	1488	1423	1369	1404	1440
4	1762	1676	1590	1504	1418	1344	1376	1408
5	1816	1722	1627	1533	1439	1356	1378	1400
6	1848	1756	1664	1571	1479	1397	1404	1411
7	1858	1777	1695	1614	1532	1458	1448	1439
8	1851	1787	1723	1659	1595	1535	1507	1479
9	1826	1785	1743	1702	1660	1618	1572	1527
10	1792	1777	1763	1748	1733	1713	1648	1582
11	1753	1769	1784	1800	1815	1820	1732	1643
12	1694	1735	1776	1817	1858	1885	1790	1694
13	1607	1665	1723	1780	1838	1882	1804	1726
14	1508	1575	1642	1709	1776	1832	1787	1742
15	1408	1486	1564	1642	1721	1790	1775	1760
16	1297	1389	1481	1574	1666	1751	1766	1782
17	1244	1335	1425	1516	1606	1692	1733	1774
18	1281	1346	1412	1477	1542	1607	1664	1722
19	1374	1400	1427	1453	1479	1510	1577	1644
20	1458	1447	1436	1425	1414	1412	1490	1568
21	1544	1493	1442	1390	1339	1302	1394	1486
22	1604	1530	1455	1381	1306	1248	1338	1429
23	1618	1548	1478	1409	1339	1283	1348	1413
24	1599	1552	1505	1458	1411	1372	1398	1424
25	1587	1559	1532	1504	1477	1451	1440	1429
26	1578	1570	1562	1554	1545	1533	1482	1431
27	1542	1553	1565	1576	1588	1591	1517	1442
28	1468	1497	1526	1556	1585	1604	1535	1465
29	1371	1416	1461	1506	1551	1587	1541	1494
30	1273	1335	1398	1460	1523	1576	1549	1522
31	1166	1249	1331	1414	1497	1570	1562	1554
32	1088	1179	1270	1361	1452	1535	1547	1558
33	1057	1139	1222	1304	1387	1464	1493	1522
34	1055	1118	1181	1244	1307	1368	1413	1458
35	1048	1092	1137	1181	1226	1272	1334	1397
36	1042	1066	1090	1114	1138	1167	1249	1332
37	1026	1037	1048	1060	1071	1090	1181	1271
38	993	1004	1016	1027	1039	1057	1139	1221
39	948	968	988	1009	1029	1053	1116	1179
40	908	935	961	988	1015	1043	1088	1132

Age	Year							
	2011	2012	2013	2014	2015	2016	2017	2018
41	871	904	937	970	1003	1035	1059	1083
42	830	868	906	944	983	1018	1029	1040
43	786	826	866	907	947	984	996	1007
44	741	781	821	861	901	939	959	980
45	695	736	777	819	860	900	926	953
46	647	690	734	777	820	862	895	928
47	610	653	695	738	781	823	861	898
48	594	631	667	704	741	778	818	858
49	588	617	646	674	703	733	773	812
50	583	603	624	644	665	687	728	768
51	583	593	604	614	625	638	681	724
52	565	572	578	585	591	601	643	685
53	517	530	542	555	568	583	619	655
54	452	476	501	525	550	575	603	631
55	391	426	462	497	532	566	586	606
56	325	374	422	471	519	564	574	585
57	288	340	392	445	497	545	551	558
58	298	338	379	419	460	497	509	522
59	337	356	376	395	415	434	458	481
60	371	371	371	372	372	375	409	442
61	412	391	369	348	326	312	357	403
62	424	393	361	330	298	275	324	373
63	389	366	343	320	297	280	318	356
64	325	322	318	315	312	311	330	348
65	268	282	296	310	324	337	338	340
66	206	240	273	307	341	369	351	333
67	168	211	255	298	341	377	349	322
68	168	205	241	278	314	345	324	303
69	192	211	231	250	270	287	283	279
70	212	216	221	225	230	235	247	258
71	236	225	213	202	190	183	211	239
72	241	221	201	180	160	146	182	219
73	211	195	180	164	149	138	170	201
74	162	159	156	153	150	149	166	184
75	124	130	136	142	148	154	161	168
76	95	108	120	133	146	157	156	155
77	72	90	108	126	145	160	152	143
78	58	80	101	123	145	163	149	135
79	55	77	99	122	144	162	146	129
80+	845	799	754	708	662	624	659	693

Age	Year						
	2019	2020	2021	2022	2023	2024	2025
0	1709	1704	1690	1642	1593	1545	1496
1	1608	1627	1637	1611	1585	1559	1533
2	1531	1563	1586	1579	1571	1563	1555
3	1475	1511	1540	1547	1553	1559	1566
4	1440	1472	1500	1516	1532	1549	1565
5	1422	1444	1465	1488	1510	1533	1555
6	1419	1426	1437	1463	1488	1514	1539
7	1429	1420	1417	1442	1468	1493	1518
8	1451	1423	1405	1427	1450	1472	1495
9	1481	1435	1402	1419	1437	1454	1472
10	1517	1451	1401	1413	1425	1436	1448
11	1555	1467	1397	1404	1410	1416	1423
12	1599	1503	1426	1422	1418	1413	1409
13	1648	1570	1503	1481	1458	1436	1413
14	1697	1653	1608	1564	1519	1475	1430
15	1745	1731	1706	1641	1576	1511	1446
16	1797	1813	1807	1719	1631	1544	1456
17	1815	1856	1870	1775	1680	1585	1490
18	1779	1837	1867	1790	1712	1635	1557
19	1711	1777	1822	1778	1733	1689	1644
20	1646	1724	1783	1769	1754	1740	1725
21	1578	1670	1747	1763	1779	1794	1810
22	1519	1610	1690	1731	1772	1813	1854
23	1478	1544	1608	1665	1723	1780	1838
24	1451	1477	1511	1578	1645	1712	1779
25	1418	1408	1415	1493	1571	1648	1726
26	1380	1329	1306	1398	1490	1583	1675
27	1368	1294	1253	1343	1433	1524	1614
28	1396	1327	1284	1349	1415	1480	1545
29	1448	1401	1369	1396	1422	1448	1475
30	1495	1468	1444	1433	1423	1412	1401
31	1546	1538	1521	1471	1420	1370	1319
32	1570	1582	1576	1503	1429	1355	1282
33	1551	1581	1590	1521	1452	1383	1314
34	1503	1548	1575	1529	1483	1436	1390
35	1459	1521	1566	1539	1512	1485	1458
36	1414	1496	1560	1553	1545	1537	1529
37	1362	1453	1527	1539	1551	1562	1574
38	1303	1385	1457	1486	1516	1545	1574
39	1242	1305	1364	1409	1453	1498	1543
40	1177	1221	1269	1331	1393	1455	1517
41	1107	1131	1166	1248	1330	1411	1493
42	1051	1062	1089	1179	1269	1360	1450
43	1018	1030	1055	1137	1219	1300	1382
44	1000	1021	1049	1112	1174	1236	1298

Age	Year						
	2019	2020	2021	2022	2023	2024	2025
45	980	1007	1037	1081	1125	1169	1213
46	961	994	1025	1049	1073	1097	1121
47	936	974	1006	1017	1028	1039	1050
48	897	937	971	983	994	1006	1017
49	852	891	927	947	967	988	1008
50	809	850	887	914	940	966	993
51	766	809	849	882	914	947	979
52	727	769	809	847	884	921	958
53	692	728	765	804	843	882	921
54	659	687	718	757	796	835	874
55	627	647	671	711	751	790	830
56	595	606	622	664	706	747	789
57	564	571	584	625	665	706	747
58	534	546	563	598	633	668	703
59	504	527	552	579	607	634	662
60	476	509	540	560	580	599	619
61	449	494	533	544	554	565	576
62	422	471	511	518	525	532	538
63	394	432	465	477	489	500	512
64	367	386	405	427	449	470	492
65	341	342	349	380	410	441	472
66	315	297	290	331	373	414	455
67	294	266	253	297	341	386	430
68	282	262	252	287	322	357	392
69	276	272	273	291	309	326	344
70	269	281	291	293	296	298	301
71	267	295	315	301	286	272	257
72	256	293	317	294	271	248	225
73	232	264	285	268	250	232	214
74	201	219	232	228	224	220	216
75	175	182	189	196	202	208	215
76	154	153	155	169	183	198	212
77	135	127	124	146	168	189	211
78	121	107	101	128	154	181	207
79	112	95	88	117	145	174	203
80+	728	762	789	785	781	776	772

Appendix 7: Baseline and projected population for medium variant, single year-single age, males, Bangladesh (in thousands)

Age	Year							
	2011	2012	2013	2014	2015	2016	2017	2018
0	1293	1404	1515	1626	1737	1835	1819	1802
1	1470	1503	1537	1570	1603	1635	1651	1667
2	1616	1591	1567	1542	1517	1499	1534	1569
3	1735	1669	1604	1538	1473	1418	1461	1504
4	1826	1735	1645	1554	1464	1386	1427	1468
5	1893	1791	1689	1586	1484	1395	1426	1458
6	1937	1835	1733	1630	1528	1438	1453	1469
7	1959	1866	1774	1681	1588	1505	1501	1496
8	1961	1885	1810	1734	1659	1588	1563	1538
9	1945	1892	1840	1787	1734	1682	1636	1589
10	1915	1891	1866	1842	1817	1788	1718	1648
11	1876	1884	1893	1901	1909	1907	1809	1712
12	1815	1852	1888	1925	1962	1984	1876	1768
13	1728	1784	1839	1895	1950	1991	1900	1809
14	1625	1692	1759	1826	1894	1948	1892	1836
15	1520	1600	1680	1761	1841	1911	1886	1862
16	1411	1505	1599	1693	1787	1873	1881	1890
17	1323	1422	1521	1621	1720	1813	1849	1886
18	1271	1363	1455	1547	1639	1728	1783	1838
19	1245	1322	1398	1475	1551	1627	1694	1761
20	1216	1277	1338	1400	1461	1524	1604	1684
21	1183	1229	1274	1320	1365	1415	1509	1603
22	1174	1203	1233	1262	1292	1328	1427	1526
23	1196	1210	1225	1239	1253	1275	1367	1459
24	1236	1237	1238	1238	1239	1248	1324	1400
25	1277	1264	1250	1237	1223	1217	1278	1339
26	1326	1296	1266	1236	1206	1184	1229	1274
27	1342	1307	1271	1236	1201	1172	1201	1231
28	1301	1279	1256	1234	1211	1192	1207	1221
29	1225	1226	1227	1229	1230	1231	1232	1233
30	1156	1179	1203	1226	1250	1270	1256	1243
31	1083	1131	1180	1228	1276	1317	1287	1257
32	1028	1091	1153	1216	1279	1332	1297	1262
33	1006	1065	1124	1182	1241	1292	1270	1247
34	1006	1049	1093	1136	1179	1218	1219	1221
35	999	1029	1060	1090	1121	1150	1174	1197
36	990	1008	1025	1043	1060	1081	1129	1177
37	980	988	997	1005	1013	1027	1089	1152
38	968	974	981	987	993	1005	1063	1122
39	952	961	970	980	989	1001	1045	1088
40	938	949	959	970	980	993	1023	1054

Age	Year							
	2011	2012	2013	2014	2015	2016	2017	2018
41	927	938	949	959	970	982	999	1017
42	905	918	932	945	958	971	979	987
43	866	884	903	921	939	957	963	969
44	818	843	867	892	917	940	949	959
45	770	801	833	864	896	925	936	946
46	719	758	798	837	877	913	924	935
47	680	723	765	808	851	890	904	917
48	664	702	740	777	815	851	869	888
49	661	689	718	746	774	802	827	851
50	656	676	695	715	734	755	786	817
51	656	665	674	683	692	704	742	781
52	638	642	647	651	656	664	706	747
53	591	601	612	622	633	646	683	720
54	527	549	571	594	616	639	667	695
55	466	499	533	566	599	631	650	669
56	401	447	492	538	584	626	635	644
57	363	413	462	512	561	606	611	616
58	369	408	447	485	524	560	570	580
59	402	421	440	460	479	498	519	540
60	430	431	432	434	435	439	470	501
61	464	445	427	408	390	377	419	462
62	472	444	416	388	359	339	384	430
63	433	413	393	373	353	339	375	410
64	368	366	365	363	361	362	380	399
65	308	323	338	353	368	381	384	386
66	244	277	311	344	378	406	391	376
67	204	246	288	331	373	409	385	361
68	205	240	274	309	344	373	356	338
69	230	247	265	282	299	315	313	311
70	251	253	255	257	259	262	274	286
71	276	262	247	233	219	209	236	263
72	281	258	235	212	189	171	206	241
73	249	231	213	195	176	163	192	221
74	196	191	186	181	176	174	189	204
75	154	159	163	168	173	178	183	188
76	121	133	145	158	170	181	178	175
77	93	112	130	149	167	183	173	163
78	74	97	120	143	165	184	169	154
79	67	91	115	139	163	183	166	148
80+	832	803	774	744	715	693	735	776

Age	Year						
	2019	2020	2021	2022	2023	2024	2025
0	1785	1768	1746	1700	1654	1608	1562
1	1683	1699	1707	1681	1655	1630	1604
2	1604	1640	1666	1657	1648	1639	1629
3	1547	1591	1626	1630	1634	1638	1642
4	1509	1550	1586	1600	1614	1629	1643
5	1489	1520	1549	1570	1592	1613	1634
6	1484	1500	1517	1542	1568	1593	1618
7	1492	1488	1490	1517	1544	1571	1597
8	1513	1487	1472	1497	1523	1548	1573
9	1542	1495	1462	1484	1505	1527	1548
10	1577	1507	1454	1471	1488	1505	1522
11	1614	1516	1441	1455	1469	1482	1496
12	1660	1552	1467	1470	1473	1476	1480
13	1718	1628	1551	1533	1515	1497	1479
14	1780	1724	1670	1625	1580	1535	1490
15	1838	1813	1780	1710	1640	1570	1500
16	1898	1906	1893	1796	1698	1601	1503
17	1922	1959	1966	1859	1751	1644	1536
18	1893	1949	1975	1885	1794	1704	1613
19	1828	1895	1938	1882	1826	1769	1713
20	1764	1844	1903	1879	1855	1831	1807
21	1697	1791	1868	1876	1885	1893	1902
22	1625	1724	1810	1847	1884	1921	1957
23	1551	1643	1727	1782	1838	1893	1948
24	1477	1553	1627	1695	1762	1829	1896
25	1400	1461	1526	1606	1686	1766	1846
26	1319	1365	1420	1513	1607	1701	1794
27	1260	1289	1333	1432	1530	1629	1728
28	1235	1250	1279	1371	1463	1554	1646
29	1234	1234	1250	1326	1402	1479	1555
30	1230	1217	1218	1279	1340	1401	1461
31	1227	1197	1182	1227	1273	1318	1363
32	1227	1192	1170	1199	1228	1257	1287
33	1225	1203	1188	1202	1217	1231	1246
34	1222	1223	1224	1225	1226	1227	1228
35	1221	1244	1260	1248	1235	1222	1209
36	1225	1273	1306	1276	1247	1217	1188
37	1214	1276	1319	1285	1250	1216	1181
38	1180	1238	1281	1259	1237	1214	1192
39	1131	1174	1209	1210	1212	1213	1214
40	1084	1115	1144	1167	1191	1214	1238
41	1034	1052	1076	1123	1171	1219	1267
42	995	1003	1022	1084	1146	1209	1271
43	976	982	999	1057	1115	1173	1231
44	968	977	994	1036	1079	1122	1165

Age	Year	Age	Year	Age	Year	Age	Year
	2019		2019		2019		2019
45	957	968	982	1012	1043	1073	1104
46	946	957	969	987	1004	1022	1039
47	930	943	956	964	972	981	989
48	906	924	940	947	953	960	966
49	876	900	922	931	941	950	959
50	848	878	905	916	927	938	948
51	819	857	890	901	913	924	935
52	789	831	867	880	893	906	920
53	757	793	827	845	863	880	898
54	723	751	778	802	826	849	873
55	688	708	729	759	789	819	849
56	653	663	677	715	752	789	826
57	621	625	637	677	717	757	797
58	590	600	615	651	687	722	758
59	561	581	603	631	658	685	712
60	532	562	591	610	629	648	667
61	504	546	582	591	601	610	619
62	476	521	559	564	569	574	579
63	446	482	513	522	532	541	550
64	418	436	455	474	493	512	531
65	389	391	399	426	454	481	509
66	361	345	340	378	415	453	490
67	337	313	302	342	383	423	464
68	321	303	295	327	359	392	424
69	309	307	308	326	343	360	377
70	298	310	320	323	327	330	334
71	290	317	337	325	314	302	291
72	276	310	334	315	296	277	257
73	250	280	300	285	271	256	241
74	219	235	246	244	241	239	236
75	193	198	203	210	216	223	229
76	172	168	169	182	196	209	223
77	152	142	138	158	178	197	217
78	139	123	116	140	164	188	212
79	131	113	104	130	156	181	207
80+	818	860	892	886	880	874	868

Appendix 8: Baseline and projected total population for medium variant, single year-single age, Bangladesh (in thousands)

Age	Year							
	2011	2012	2013	2014	2015	2016	2017	2018
0	2586	2808	3030	3252	3474	3670	3638	3604
1	2940	3006	3074	3140	3206	3270	3302	3334
2	3232	3182	3134	3084	3034	2998	3068	3138
3	3470	3338	3208	3076	2946	2836	2922	3008
4	3652	3470	3290	3108	2928	2772	2854	2936
5	3786	3582	3378	3172	2968	2790	2852	2916
6	3874	3670	3466	3260	3056	2876	2906	2938
7	3918	3732	3548	3362	3176	3010	3002	2992
8	3922	3770	3620	3468	3318	3176	3126	3076
9	3890	3784	3680	3574	3468	3364	3272	3178
10	3830	3782	3732	3684	3634	3576	3436	3296
11	3752	3768	3786	3802	3818	3814	3618	3424
12	3630	3704	3776	3850	3924	3968	3752	3536
13	3456	3568	3678	3790	3900	3982	3800	3618
14	3250	3384	3518	3652	3788	3896	3784	3672
15	3040	3200	3360	3522	3682	3822	3772	3724
16	2822	3010	3198	3386	3574	3746	3762	3780
17	2646	2844	3042	3242	3440	3626	3698	3772
18	2542	2726	2910	3094	3278	3456	3566	3676
19	2490	2644	2796	2950	3102	3254	3388	3522
20	2432	2554	2676	2800	2922	3048	3208	3368
21	2366	2458	2548	2640	2730	2830	3018	3206
22	2348	2406	2466	2524	2584	2656	2854	3052
23	2392	2420	2450	2478	2506	2550	2734	2918
24	2472	2474	2476	2476	2478	2496	2648	2800
25	2554	2528	2500	2474	2446	2434	2556	2678
26	2652	2592	2532	2472	2412	2368	2458	2548
27	2684	2614	2542	2472	2402	2344	2402	2462
28	2602	2558	2512	2468	2422	2384	2414	2442
29	2450	2452	2454	2458	2460	2462	2464	2466
30	2312	2358	2406	2452	2500	2540	2512	2486
31	2166	2262	2360	2456	2552	2634	2574	2514
32	2056	2182	2306	2432	2558	2664	2594	2524
33	2012	2130	2248	2364	2482	2584	2540	2494
34	2012	2098	2186	2272	2358	2436	2438	2442
35	1998	2058	2120	2180	2242	2300	2348	2394
36	1980	2016	2050	2086	2120	2162	2258	2354
37	1960	1976	1994	2010	2026	2054	2178	2304
38	1936	1948	1962	1974	1986	2010	2126	2244
39	1904	1922	1940	1960	1978	2002	2090	2176
40	1876	1898	1918	1940	1960	1986	2046	2108

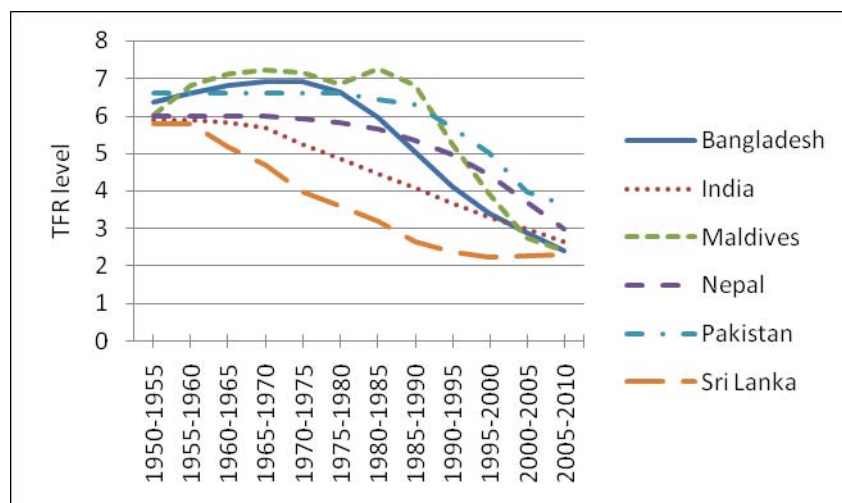
Age	Year							
	2011	2012	2013	2014	2015	2016	2017	2018
41	1854	1876	1898	1918	1940	1964	1998	2034
42	1810	1836	1864	1890	1916	1942	1958	1974
43	1732	1768	1806	1842	1878	1914	1926	1938
44	1636	1686	1734	1784	1834	1880	1898	1918
45	1540	1602	1666	1728	1792	1850	1872	1892
46	1438	1516	1596	1674	1754	1826	1848	1870
47	1360	1446	1530	1616	1702	1780	1808	1834
48	1328	1404	1480	1554	1630	1702	1738	1776
49	1322	1378	1436	1492	1548	1604	1654	1702
50	1312	1352	1390	1430	1468	1510	1572	1634
51	1312	1330	1348	1366	1384	1408	1484	1562
52	1276	1284	1294	1302	1312	1328	1412	1494
53	1182	1202	1224	1244	1266	1292	1366	1440
54	1054	1098	1142	1188	1232	1278	1334	1390
55	932	998	1066	1132	1198	1262	1300	1338
56	802	894	984	1076	1168	1252	1270	1288
57	726	826	924	1024	1122	1212	1222	1232
58	738	816	894	970	1048	1120	1140	1160
59	804	842	880	920	958	996	1038	1080
60	860	862	864	868	870	878	940	1002
61	928	890	854	816	780	754	838	924
62	944	888	832	776	718	678	768	860
63	866	826	786	746	706	678	750	820
64	736	732	730	726	722	724	760	798
65	616	646	676	706	736	762	768	772
66	488	554	622	688	756	812	782	752
67	408	492	576	662	746	818	770	722
68	410	480	548	618	688	746	712	676
69	460	494	530	564	598	630	626	622
70	502	506	510	514	518	524	548	572
71	552	524	494	466	438	418	472	526
72	562	516	470	424	378	342	412	482
73	498	462	426	390	352	326	384	442
74	392	382	372	362	352	348	378	408
75	308	318	326	336	346	356	366	376
76	242	266	290	316	340	362	356	350
77	186	224	260	298	334	366	346	326
78	148	194	240	286	330	368	338	308
79	134	182	230	278	326	366	332	296
80+	1664	1606	1548	1488	1430	1386	1470	1552

Age	Year						
	2019	2020	2021	2022	2023	2024	2025
0	3570	3536	3492	3400	3308	3216	3124
1	3366	3398	3414	3362	3310	3260	3208
2	3208	3280	3332	3314	3296	3278	3258
3	3094	3182	3252	3260	3268	3276	3284
4	3018	3100	3172	3200	3228	3258	3286
5	2978	3040	3098	3140	3184	3226	3268
6	2968	3000	3034	3084	3136	3186	3236
7	2984	2976	2980	3034	3088	3142	3194
8	3026	2974	2944	2994	3046	3096	3146
9	3084	2990	2924	2968	3010	3054	3096
10	3154	3014	2908	2942	2976	3010	3044
11	3228	3032	2882	2910	2938	2964	2992
12	3320	3104	2934	2940	2946	2952	2960
13	3436	3256	3102	3066	3030	2994	2958
14	3560	3448	3340	3250	3160	3070	2980
15	3676	3626	3560	3420	3280	3140	3000
16	3796	3812	3786	3592	3396	3202	3006
17	3844	3918	3932	3718	3502	3288	3072
18	3786	3898	3950	3770	3588	3408	3226
19	3656	3790	3876	3764	3652	3538	3426
20	3528	3688	3806	3758	3710	3662	3614
21	3394	3582	3736	3752	3770	3786	3804
22	3250	3448	3620	3694	3768	3842	3914
23	3102	3286	3454	3564	3676	3786	3896
24	2954	3106	3254	3390	3524	3658	3792
25	2800	2922	3052	3212	3372	3532	3692
26	2638	2730	2840	3026	3214	3402	3588
27	2520	2578	2666	2864	3060	3258	3456
28	2470	2500	2558	2742	2926	3108	3292
29	2468	2468	2500	2652	2804	2958	3110
30	2460	2434	2436	2558	2680	2802	2922
31	2454	2394	2364	2454	2546	2636	2726
32	2454	2384	2340	2398	2456	2514	2574
33	2450	2406	2376	2404	2434	2462	2492
34	2444	2446	2448	2450	2452	2454	2456
35	2442	2488	2520	2496	2470	2444	2418
36	2450	2546	2612	2552	2494	2434	2376
37	2428	2552	2638	2570	2500	2432	2362
38	2360	2476	2562	2518	2474	2428	2384
39	2262	2348	2418	2420	2424	2426	2428
40	2168	2230	2288	2334	2382	2428	2476

Age	Year						
	2019	2020	2021	2022	2023	2024	2025
41	2068	2104	2152	2246	2342	2438	2534
42	1990	2006	2044	2168	2292	2418	2542
43	1952	1964	1998	2114	2230	2346	2462
44	1936	1954	1988	2072	2158	2244	2330
45	1914	1936	1964	2024	2086	2146	2208
46	1892	1914	1938	1974	2008	2044	2078
47	1860	1886	1912	1928	1944	1962	1978
48	1812	1848	1880	1894	1906	1920	1932
49	1752	1800	1844	1862	1882	1900	1918
50	1696	1756	1810	1832	1854	1876	1896
51	1638	1714	1780	1802	1826	1848	1870
52	1578	1662	1734	1760	1786	1812	1840
53	1514	1586	1654	1690	1726	1760	1796
54	1446	1502	1556	1604	1652	1698	1746
55	1376	1416	1458	1518	1578	1638	1698
56	1306	1326	1354	1430	1504	1578	1652
57	1242	1250	1274	1354	1434	1514	1594
58	1180	1200	1230	1302	1374	1444	1516
59	1122	1162	1206	1262	1316	1370	1424
60	1064	1124	1182	1220	1258	1296	1334
61	1008	1092	1164	1182	1202	1220	1238
62	952	1042	1118	1128	1138	1148	1158
63	892	964	1026	1044	1064	1082	1100
64	836	872	910	948	986	1024	1062
65	778	782	798	852	908	962	1018
66	722	690	680	756	830	906	980
67	674	626	604	684	766	846	928
68	642	606	590	654	718	784	848
69	618	614	616	652	686	720	754
70	596	620	640	646	654	660	668
71	580	634	674	650	628	604	582
72	552	620	668	630	592	554	514
73	500	560	600	570	542	512	482
74	438	470	492	488	482	478	472
75	386	396	406	420	432	446	458
76	344	336	338	364	392	418	446
77	304	284	276	316	356	394	434
78	278	246	232	280	328	376	424
79	262	226	208	260	312	362	414
80+	1636	1720	1784	1772	1760	1748	1736

Appendix 9: TFR series of SAARC countries

A comparative chart is illustrated below to show the trend analysis of TFR, in historical point of view Bangladesh has the second highest TFR from its early stage compare to its neighboring countries, After the years 1980-85, its TFR falls down drastically and experience a stagnant fertility rate for few years, in recent years TFR starts falling again and positioned as the second lowest country among SAARC.



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