



Paper 7

POPULATION MOMENTUM IN BANGLADESH

Ataharul Islam

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CENTRE FOR POLICY DIALOGUE

House No 40/C, Road No 11, Dhanmondi R/A, GPO Box 2129, Dhaka-1205, Bangladesh

Tel: 8124770, 017521580; E-mail: cpd@bdonline.com

Website: www.cpd-bangladesh.org

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It is now widely recognised that there is a need to take the scope of the population policy in Bangladesh beyond the confines of achieving population stabilisation through reduction of fertility. Although in recent years the approach to reduction of fertility has changed from narrow family planning to a broad based reproductive health approach, it is being increasingly felt that Bangladesh's population policy should encompass other equally important issues which have wide implications for the development process and the quality of life of people of Bangladesh. To address some of the related pertinent issues the Centre for Policy Dialogue has initiated a programme which aims at undertaking a series of studies covering the broad area of **Population and Sustainable Development**. The major objective of these studies is to enhance national capacity to formulate and implement population and development policies and programmes in Bangladesh, and through close interaction with the various stakeholder groups, to promote advocacy on critical related issues. The programme which is scheduled to be implemented by the CPD between 1999 and 2002 shall address, *inter alia*, such issues as population dynamics and population momentum and their implications for education and health services, the nexus between population correlates, poverty and environment, impacts of urbanisation and slummisation and migration, as well as human rights. The study has benefited from generous support provided by the United Nations Population Fund (UNFPA). The programme also envisages organisation of workshops and dialogues at divisional and national levels and also holding of international thematic conferences.

As part of the above mentioned CPD-UNFPA collaborative programme the CPD has planned to bring out a series of publications in order to facilitate wider dissemination of the findings of the various studies to be prepared under the aforementioned CPD-UNFPA programme. The present paper on the theme of ***Population Momentum in Bangladesh*** has been prepared by Dr Ataharul Islam, Professor, Department of Statistics, University of Dhaka.

Assistant Editor: *Ms Ayesha Banu*, Coordinator (Dialogue & Communication), CPD.

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Population Momentum in Bangladesh

1. Introduction

The population of the world had followed periods of increase and decrease simultaneously that kept the growth rate nearly zero for a long time in the history. However, since the late 18th century, the population has started to increase initially in the Europe and North America continents followed by other regions. The process is still far from the end which is seemed to be an irreversible process, never experienced in the history. This can be identified as the modern era in the growth of human population and such a rapid increase in the population all over the world is mostly attributable to the sharp decline in the level of mortality. The decline in mortality was followed by a similar decline after a time lag in various countries in different time periods. During the period of decline in fertility from high to low, the population increased with a great pace, attributing to a sharp increase in the size of population, and more importantly in the size of women population at childbearing ages. Thus the populations started to reproduce at much higher numbers even if the level of fertility have been reduced eventually. In other words, the base population size has increased to an extent that even with a relatively lower level of fertility, the population size increases at a much higher number at the end of the demographic transition than that with a higher level of fertility before the transition began.

The population reaches replacement level if the number of women who start their reproductive life are replaced by the same number daughters. This measure is based on number of girls per woman during a reproductive span. However, this measure is based on a stationary population where the birth and death rates are assumed to be constant and equal and the population age composition does not change over time. In reality, though, even if the population attains replacement level fertility, due to relatively heavy young age composition, the population still continues to grow at a fast pace. Due to a lack of balance in the birth and death rates (birth rates remain higher than the death rates), an increased number of births than that of deaths continue to favour a younger age

composition for several decades. Hence the absolute number increases even after attaining replacement level of fertility. This process is known as the population momentum. This may be called as an echo effect of a high level fertility. The population momentum is phased off after the young age population becomes stable and is not subject to year to year variation in the number of births, in other words, the total number of births is matched with the total number of deaths in a year and the age composition does not change with time any more. The impact of population is reduced if the level of fertility drops much below replacement level at a fast pace.

The process of population momentum has been observed in the developed countries after the completion of demographic transition. During the demographic transition, a large increase in the size of population has been evident until it reaches replacement level fertility. However, the contribution of increase due to population momentum, nonetheless, is also quite remarkable. This will be more pronounced in case of countries with higher level of fertility which are still passing through different stages of demographic transition. This is simply attributable to the fact that the base size of the population has already reached to a size in these developing countries due to late starting of the demographic transition that the absolute increase in the share of population momentum will be much higher.

In this paper, the population momentum situation will be displayed for different scenarios. The population of Bangladesh has been undergoing the demographic transition and it is expected that during the next 5 to 15 years it would be possible to attain replacement level. However, there might be some other factors such as the recent shifts in the population policies that can have far reaching impact on the population projections. Without any data, we are unable to guess the impact of such shifts but it can have depressing effect on the past trend of successful campaign of the family planning programs in Bangladesh. Islam (1995, 1997, 1998) has indicated such possibility in the background papers in the past. As the long-term projections mostly depend on the policies of the governments as well as on the reproductive behavior of the generations yet to born, we

have considered different scenarios for representing different options. This is necessary to examine different scenarios, because the population of Bangladesh has been passing through very crucial stages in order to reduce the fast pace of population growth, without attaining socio-economic goals that are necessary to sustain such programs. As the population policies as well as funding for implementing such policies are donor-driven, sustainability of the programs are at stake (see Islam, 1997, 1998). Hence, the option of different scenarios can produce results that will help the policy makers understand the reality that is facing Bangladesh in the near future that requires adequate planning from now at all levels. We have considered different scenarios for another important reason. We know that short-term projections for five years or ten years do not vary much in terms of absolute numbers from the reality due to the fact that past trend continues to hold for the short-term. However, the long-term projections can be affected by some shifts in policies, change in socio-economic factors, etc. that can not be based only on the past trend. Hence, with the help of different underlying assumptions, impact of such changes can be examined. Any deviation from such assumptions can also be projected. Hence, this paper highlights the impact of population momentum under different scenarios, so that the policy makers can adopt realistic options in attaining specific goals. In other words, this provides the policy makers with sets of options that can be achieved through implementing different sets of interventions.

2. Different Scenarios to Assess the Impact of Population Momentum

Instead of only one set of projections, in this paper, we have considered three sets of projections in order to display the likely consequences that may arise due to various policy measures adopted by the government. The projections are obtained for the period 1991-2051. These projections will help the policy makers to develop a sustainable policy on the basis of emerging scenarios.

This paper shows projections for the population of Bangladesh for the period 1991-2050. The scenarios taken into consideration in this paper are: (i) high fertility variant with no

change in mortality, (ii) low fertility variant and no change in mortality, and (iii) low fertility variant and reduction in mortality. The inputs for different scenarios are discussed in the next section. The FAMPLAN model is employed in these projections due to the fact that the success of family planning programs will be detrimental in the reduction of level of fertility in the future, like the past. Hence the FAMPLAN model which is based on the proximate determinants options introduced by Bongaarts appears to be a natural choice for long or short term projections in Bangladesh. The major differences among these three different variants are listed below:

- (i) Scenario I: High Fertility Variant (HFV) with no change in mortality: 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 same.
- (ii) Scenario II: Low Fertility Variant (MFV) with no change in mortality: This variant assumes that the CPR will increase to 63 percent in the year 2006 and it will remain so till 2051. This variant assumes that other inputs remain same as that of High Fertility Variant.
- (iii) Scenario III: Low Fertility Variant (LFV) with reduction in mortality: It is assumed in this variant 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.

3. Inputs

There are debates about the utility and validity of long-term projection. In a long term projection, the choice of inputs can influence the projection to a large extent. Hence, we have employed three different sets of inputs as presented in section 2, in order to identify the potential source and extent of variations attributable to such inputs in the long run. The input data employed for projecting the population for the period 1991-2051 are: (i) the age-sex composition of the base year population, (ii) index of marriage, (iii) base year fertility rates, (iv) acceptor and user method mix, (v) twelve month continuation rates, (vi) contraceptive effectiveness, (vii) mean duration of breastfeeding, (viii) sterility coefficients and (ix) age specific abortion rates. Other than age-sex composition of the population in the base year, all other inputs are shown in the appendix.

The number of males and females in 1991 by age groups are displayed in Table 3.1 (GOB, 1994). It is worth mentioning that the FamPlan model disaggregates 5-year age group data into single-year age groups using cubic spline interpolation to fit a smooth curve through a set of points derived from the grouped data (Chao, 1993, Islam and Chakraborty, 1999).

Table 3.1 Age-sex Composition of Population of Bangladesh, 1991

Age group	Census 1991 (in '000)	
	Male	Female
0-4	9482	9213
5-9	9505	8886
10-14	7175	6267
15-19	4818	4681
20-24	4356	5009
25-29	4537	4934
30-34	3495	3301
35-39	3367	2782
40-44	2519	2215
45-49	1958	1669
50-54	1687	1537
55-59	1117	898
60-64	1251	1128
65-69	653	514
70-74	691	549
75+	702	556
Total	57314	54141

The proportion of currently married women is shown in the Appendix (Table 3.2). According to Islam (1995, 1997) the proportion of currently married women had declined

during the period 1991-94 for the age groups 15-19 and 20-24. A further decline in the proportion of currently married women can accelerate the decline in the total fertility rates and thus the replacement level fertility can be achieved sooner. However, we have not assumed any such decline due to the fact that the preliminary findings of BDHS 1999-2000 revealed no decline in the level of fertility during the 1996-1999 period. According to 1991 Census, almost 50 percent of the 15-19 women were currently married in 1991. The proportion increased to about 87 percent in the age group 20-24 and more than 90 percent in the age group 25-39.

The base year fertility rates are obtained from the Contraceptive Prevalence Surveys. As the fertility rates are estimated for the past years since the date of interview, we had to interpolate the rates from 1991 and 1993 Contraceptive Prevalence Surveys (Table 3.3 in the Appendix).

Bangladesh has achieved a remarkable success in declining the level of fertility mainly due to the success in increasing the level of contraceptive prevalence rates during the past two decades. Hence, in our projection we use the family planning inputs that can explain the future directions of the population growth. In other words, family planning inputs, as the major contributor in explaining the decline in the level of fertility, can provide more realistic projections than that of other models for projection of population. Tables 3.4 and 3.5 (see Appendix) display the acceptor and user method of contraceptives for 1996 respectively. These estimates are obtained from BDHS 1996-97. It may be noted here that for the period 1991-95, the FamPlan estimates of acceptor and user method mix are employed in our projection.

An increase in the level of contraceptive prevalence rate does not imply a subsequent decrease in the level of total fertility rate. The decline in the level of fertility depends on the continuation of a method of contraception as well. In other words, instead of increased level of contraceptive prevalence, if we increase the continuation rates of contraceptives, then we can observe a further decline in the level of fertility. Twelve-month continuation

rates (Table 3.6 in the Appendix) for different methods of contraception indicate that the users of modern reversible and traditional methods discontinue the use of contraception in large proportions. The preliminary findings from a recent survey indicate that the continuation rates remained similar during the past years.

The effectiveness of different methods of contraception are displayed in Table 3.7 (Appendix). The effectiveness of oral pills is assumed to be 0.90 and standard estimates are considered for all other methods of contraception.

The mean duration of breastfeeding for different methods are obtained by using the product-limit method (Islam and Chakraborty, 1999) from the 1996-97 BDHS data.

The mean duration of breastfeeding is observed to be more than two years for all the age groups of mothers. More precisely, the mean duration of breastfeeding is observed in the range of 27-31 months.

The reciprocal of the proportion fecund is defined as the estimate for sterility coefficient. There can be either primary causes of sterility attributable mainly to the physiological causes and the secondary causes of sterility are due to non-physiological causes. In our estimates of sterility, based on the BDHS 96-97, we have considered women as being infecund if they are not menopausal and not postpartum amenorrhoeic and not pregnant, have had no births in the five years preceding the survey and have been continuously married and have not used contraception in the five years preceding the survey (Islam and Chakraborty, 1999).

Islam and Chakraborty (1999) used estimates of abortions from BDHS 1996-97. It is worth noting that the estimate the number of abortions in Bangladesh vary from 80,000 to 8,00,000. Singh et al. (1997) estimated the total number of abortions to be around 7,30,000 to 7,83,000. The total number of abortions is believed to be even higher than the estimate provided by Singh et al.

4. Projection of Population for the Period 1991-2051 and Population Momentum

In this section, the projection of population for different scenarios are shown and the impact of population momentum is examined for different segments of the population. The time to achieve the replacement level fertility has been shown in this section for the selected scenarios and the impact of delaying replacement level fertility on the population momentum is examined.

4.1 Projected Size of Total Population

The projected total population sizes for the period 1991-2051 for three selected scenarios are shown in Table 4.1. It is noteworthy that the population size will be doubled during the 60 year period from 1991-2051, if Scenario I is considered. However, if there is further increase in the level of CPR during the period 1991-2006, then the population size in 2051 will be reduced by more than 40 millions. The likely scenario that might emerge (Scenario III) in the future that is reduction in both fertility and mortality will attribute to a few million more population in 2051. Both the Scenarios II and III take into consideration reduction in the proportion never married for the age groups 15-19 and 20-24, in particular. Hence, this reduction could be attributed to: (i) increase in the level of CPR and (ii) increase in the proportion of never married women.

Table 4.1: Projected Total Population of Bangladesh (in Millions) , 1991-2051

Year	Scenario I	Scenario II	Scenario III
1991	111.5	111.5	111.5
1996	122.6	121.7	121.7
2001	133.2	130.3	130.4
2006	145.6	138.6	138.9
2011	159.4	148.1	148.6
2016	173.1	158.5	159.3
2021	185.2	167.9	169.1
2026	195.7	175.3	176.9
2031	205.9	180.4	182.3
2036	216.6	183.2	185.5
2041	227.2	185.5	188.4
2046	236.3	187.4	191.0
2051	243.9	188.1	192.3

The population size of Bangladesh of 1991 will be doubled in forty eight years in the year 2039 if the level of CPR increases to 55 percent by 2006 and the level remains constant thereafter. However, if the level of CPR is increased to 63 percent by 2006 and the proportion of never married is assumed to have decreased during the period, as evident from surveys, then the population will not be doubled even in 2051. The total population will remain in the range of 188.1-192.3 millions in 2051 according to Scenarios II and III. The size of population will be around 243.9 millions in 1951 as per Scenario I. Hence an increased level of CPR will reduce the size of population by 51.6-55.8 millions. According to Bongaarts (1996) the population size of Bangladesh will be 239 millions in 2050 as compared to that of 242 millions obtained by Scenario I assumptions.

4.2 Time to Achieve Replacement Level Fertility

The time to reach replacement level fertility plays a very crucial role in determining the size of the population at the beginning of the process of population momentum and at the end of the process. It is noteworthy that if the population size at the beginning of the population momentum (when the population achieves replacement level fertility) is large then it produces a much larger population size in the process of momentum. This indicates that sooner we achieve replacement level fertility better it is to reduce the growth of the size of population during the population momentum. Hence time to reach level replacement level fertility can make a population size small or larger even after attaining replacement level.

To examine the time to reach replacement level fertility, the best indicator is to look at the total fertility rate (TFR). If the level of TFR converges towards 2.3 then we can assume that the replacement level fertility is achieved. The projected TFR's for three different scenarios are displayed in Table 4.2 below.

Table 4.2: Projected TFR of Bangladesh, 1991-2051

Year	Scenario I	Scenario II	Scenario III
1991	3.86	3.86	3.86
1996	3.23	2.88	2.88
2001	2.72	2.41	2.41
2006	2.80	2.05	2.05
2011	2.86	2.32	2.32
2016	2.70	2.23	2.23
2021	2.37	1.93	1.93
2026	2.26	1.77	1.77
2031	2.48	1.66	1.66
2036	2.68	1.70	1.73
2041	2.70	1.97	2.00
2046	2.54	1.91	1.94
2051	2.44	1.81	1.83

From the above table, we observe that replacement level fertility will be attained in the year 2022 if Scenario I is realized. However, the TFR remains above 2.3 due to the impact of young age composition until 2051 and it shows that the population will still grow substantially even after 2022. The impact of population momentum will be very severe under this scenario. For both Scenarios II and III, replacement level is expected to be attained in 2002. As we mentioned that these scenarios can be attained only if the CPR is increased to 63 percent by 2006. Again, it is observed for both Scenarios II and III that after 2002, the TFR fluctuates at a level well below replacement level fertility. However, from Table 4.1, we observe that the population still continues to grow due to population momentum.

4.3 Projected Age-sex Compositions of Population

One of the major reasons for growth of the population even after attaining replacement level fertility is young age structure of population. In other words, due to echo effect of high fertility, the number of women in the childbearing ages will be replaced by a much larger number of daughters until the age composition of population is stabilized. The number and percent of population by age and sex are shown in Tables 4.3 and 4.4 for the period 1991-2051 at five year intervals.

Table 4.3: Projected Total Population of Bangladesh (in Millions), 1991-2051

Year	Age	Scenario I		Scenario II		Scenario III	
		Female	Male	Female	Male	Female	Male
1991	0-4	9.21	9.49	9.21	9.49	9.21	9.49
	5-9	8.89	9.51	8.89	9.51	8.89	9.51
	10-14	6.27	7.18	6.27	7.18	6.27	7.18
	15-19	4.68	4.82	4.68	4.82	4.68	4.82
	20-24	5.01	4.36	5.01	4.36	5.01	4.36
	25-29	4.93	4.54	4.93	4.54	4.93	4.54
	30-34	3.30	3.50	3.30	3.50	3.30	3.50
	35-39	2.78	3.37	2.78	3.37	2.78	3.37
	40-44	2.22	2.52	2.22	2.52	2.22	2.52
	45-49	1.67	1.96	1.67	1.96	1.67	1.96
	50-54	1.54	1.69	1.54	1.69	1.54	1.69
	55-59	0.90	1.12	0.90	1.12	0.90	1.12
	60-64	1.13	1.25	1.13	1.25	1.13	1.25
	65-69	0.51	0.65	0.51	0.65	0.51	0.65
70-74	0.55	0.69	0.55	0.69	0.55	0.69	
75+	0.56	0.70	0.56	0.70	0.56	0.70	
2001	0-4	6.61	7.04	5.61	5.97	5.66	6.02
	5-9	6.62	7.14	6.19	6.68	6.21	6.70
	10-14	8.76	9.17	8.76	9.17	8.76	9.17
	15-19	8.88	9.57	8.88	9.57	8.88	9.57
	20-24	6.26	7.23	6.26	7.23	6.26	7.23
	25-29	4.67	4.88	4.67	4.87	4.67	4.88
	30-34	4.96	4.38	4.96	4.38	4.96	4.38
	35-39	4.85	4.51	4.85	4.51	4.85	4.51
	40-44	3.24	3.45	3.24	3.45	3.24	3.45
	45-49	2.70	3.26	2.70	3.26	2.70	3.26
	50-54	2.11	2.38	2.11	2.38	2.11	2.38
	55-59	1.54	1.77	1.54	1.77	1.54	1.77
	60-64	1.33	1.42	1.33	1.42	1.33	1.42
	65-69	0.71	0.85	0.71	0.85	0.71	0.85
70-74	0.76	0.81	0.76	0.81	0.76	0.81	
75+	0.59	0.75	0.59	0.75	0.59	0.75	
2011	0-4	8.51	9.05	6.36	6.76	6.47	6.88
	5-9	7.32	7.88	5.41	5.84	5.48	5.91
	10-14	6.38	6.91	5.43	5.89	5.47	5.94
	15-19	6.67	7.25	6.24	6.79	6.26	6.81
	20-24	8.74	9.22	8.74	9.23	8.73	9.23
	25-29	8.82	9.58	8.82	9.58	8.82	9.58
	30-34	6.21	7.22	6.21	7.22	6.21	7.22
	35-39	4.62	4.86	4.62	4.86	4.62	4.86
	40-44	4.87	4.32	4.87	4.32	4.87	4.32
	45-49	4.71	4.38	4.71	4.38	4.71	4.38
	50-54	3.10	3.27	3.09	3.27	3.10	3.27
	55-59	2.50	2.95	2.50	2.95	2.50	2.95
	60-64	1.84	2.02	1.84	2.03	1.84	2.02
	65-69	1.22	1.36	1.22	1.36	1.22	1.36
70-74	0.92	0.95	0.92	0.95	0.92	0.95	

		75+	0.79	0.93	0.79	0.93	0.79	0.93
Year	Age	Scenario I		Scenario II		Scenario III		
		Female	Male	Female	Male	Female	Male	
2021	0-4	8.24	8.75	6.82	7.24	7.00	7.44	
	5-9	8.46	9.08	6.81	7.32	6.96	7.48	
	10-14	8.26	8.90	6.20	6.70	6.31	6.81	
	15-19	7.37	7.99	5.48	5.96	5.55	6.04	
	20-24	6.41	6.70	5.47	5.99	5.51	6.04	
	25-29	6.67	7.30	6.24	6.85	6.26	6.87	
	30-34	8.67	9.21	8.67	9.21	8.67	9.21	
	35-39	8.71	9.49	8.71	9.49	8.71	9.49	
	40-44	6.11	7.12	6.11	7.12	6.11	7.12	
	45-49	4.51	4.74	4.51	4.74	4.51	4.74	
	50-54	4.66	4.11	4.66	4.11	4.66	4.11	
	55-59	4.37	3.99	4.37	3.99	4.37	3.99	
	60-64	2.73	2.81	2.73	2.81	2.73	2.81	
	65-69	2.02	2.31	2.02	2.31	2.02	2.31	
	70-74	1.32	1.38	1.32	1.38	1.32	1.38	
75+	1.20	1.32	1.20	1.32	1.20	1.32		
2031	0-4	8.03	8.52	5.47	5.82	5.64	6.00	
	5-9	7.57	8.11	6.07	6.51	6.24	6.70	
	10-14	8.09	8.70	6.71	7.23	6.89	7.43	
	15-19	8.52	9.19	6.88	7.44	7.03	7.61	
	20-24	8.29	8.99	6.24	6.80	6.35	6.92	
	25-29	7.38	8.05	5.51	6.05	5.58	6.12	
	30-34	6.40	7.03	5.47	6.03	5.52	6.08	
	35-39	6.62	7.28	6.21	6.83	6.23	6.85	
	40-44	8.54	9.08	8.54	9.08	8.54	9.08	
	45-49	8.51	9.24	8.51	9.24	8.51	9.24	
	50-54	5.88	6.79	5.88	6.79	5.88	6.79	
	55-59	4.23	4.37	4.23	4.37	4.23	4.37	
	60-64	4.15	3.57	4.15	3.57	4.15	3.57	
	65-69	3.60	3.16	3.60	3.16	3.60	3.16	
	70-74	2.00	1.95	2.00	1.95	2.00	1.95	
75+	1.95	2.14	1.95	2.14	1.95	2.14		
2041	0-4	9.30	9.86	5.16	5.48	5.45	5.80	
	5-9	8.61	9.22	4.74	5.09	4.93	5.30	
	10-14	7.91	8.50	5.44	5.87	5.60	6.04	
	15-19	7.64	8.24	6.14	6.64	6.32	6.84	
	20-24	8.13	8.79	6.76	7.33	6.94	7.53	
	25-29	8.53	9.25	6.91	7.52	7.05	7.68	
	30-34	8.27	9.00	6.25	6.84	6.35	6.96	
	35-39	7.34	8.03	5.49	6.05	5.56	6.13	
	40-44	6.34	6.96	5.42	5.98	5.47	6.03	
	45-49	6.49	7.12	6.09	6.69	6.10	6.71	
	50-54	8.23	8.67	8.22	8.67	8.23	8.67	
	55-59	7.98	8.52	7.98	8.52	7.98	8.52	
	60-64	5.28	5.93	5.28	5.93	5.28	5.93	
	65-69	3.51	3.51	3.51	3.51	3.51	3.51	
	70-74	3.05	2.51	3.05	2.51	3.05	2.51	

75+ 3.34 3.12 3.34 3.12 3.34 3.12

Year	Age	Scenario I		Scenario II		Scenario III	
		Female	Male	Female	Male	Female	Male
2051	0-4	8.88	9.42	5.31	5.64	5.64	5.99
	5-9	9.03	9.66	5.39	5.78	5.72	6.14
	10-14	9.18	9.84	5.15	5.55	5.43	5.86
	15-19	8.68	9.35	4.83	5.24	5.02	5.45
	20-24	7.96	8.60	5.50	5.99	5.67	6.17
	25-29	7.67	8.32	6.18	6.73	6.35	6.92
	30-34	8.12	8.82	6.77	7.38	6.94	7.57
	35-39	8.48	9.23	6.87	7.51	7.02	7.67
	40-44	8.18	8.92	6.19	6.79	6.30	6.91
	45-49	7.20	7.87	5.41	5.95	5.47	6.02
	50-54	6.14	6.69	5.26	5.76	5.30	5.80
	55-59	6.12	6.60	5.74	6.21	5.75	6.22
	60-64	7.41	7.61	7.41	7.61	7.41	7.61
	65-69	6.69	6.88	6.69	6.88	6.69	6.88
	70-74	3.96	4.25	3.96	4.25	3.96	4.25
75+	4.23	3.92	4.23	3.92	4.23	3.92	

The percent distribution of population by age and sex for the period 1991-2051 are shown in Table 4.4. The highlights of the projected distribution of population for different sets of assumptions are discussed in subsequent sections.

Table 4.4: Percent Distribution of Projected Population of Bangladesh by Age and Sex, 1991-2051

Year	Age	Scenario I		Scenario II		Scenario III	
		Female	Male	Female	Male	Female	Male
1991	0-4	17.01	16.55	17.01	16.55	17.01	16.55
	5-9	16.42	16.58	16.42	16.58	16.42	16.58
	10-14	11.58	12.52	11.58	12.52	11.58	12.52
	15-19	8.64	8.40	8.64	8.40	8.64	8.40
	20-24	9.25	7.60	9.25	7.60	9.25	7.60
	25-29	9.10	7.92	9.10	7.92	9.10	7.92
	30-34	6.09	6.10	6.09	6.10	6.09	6.10
	35-39	5.13	5.88	5.13	5.88	5.13	5.88
	40-44	4.10	4.39	4.10	4.39	4.10	4.39
	45-49	3.08	3.42	3.08	3.42	3.08	3.42
	50-54	2.84	2.95	1.54	1.69	1.54	1.69
	55-59	1.66	1.95	1.66	1.95	1.66	1.95
	60-64	2.09	2.18	2.09	2.18	2.09	2.18
	65-69	0.94	1.13	0.94	1.13	0.94	1.13
	70-74	1.02	1.20	1.02	1.20	1.02	1.20
75+	1.03	1.22	1.03	1.22	1.03	1.22	

Year	Age	Scenario I		Scenario II		Scenario III	
		Female	Male	Female	Male	Female	Male
2001	0-4	10.23	10.26	14.06	8.90	8.95	8.97
	5-9	10.25	10.41	15.52	9.96	9.82	9.98
	10-14	13.56	13.37	13.87	13.67	13.85	13.66
	15-19	13.75	13.95	14.06	14.27	14.04	14.25
	20-24	9.69	10.54	9.91	10.78	9.90	10.77
	25-29	7.23	7.11	7.39	7.26	7.39	7.27
	30-34	7.68	6.38	7.85	6.53	7.84	6.52
	35-39	7.51	6.57	7.68	6.72	7.67	6.72
	40-44	5.02	5.03	5.13	5.14	5.12	5.14
	45-49	4.18	4.75	4.27	4.86	4.27	4.86
	50-54	3.27	3.47	3.34	3.55	3.33	3.54
	55-59	2.38	2.58	2.44	2.64	2.44	2.64
	60-64	2.06	2.07	2.11	2.12	2.10	2.11
	65-69	1.10	1.24	1.12	1.27	1.12	1.27
70-74	1.18	1.18	1.20	1.21	1.20	1.21	
75+	0.91	1.09	0.93	1.12	0.93	1.12	
2011	0-4	11.02	11.01	8.86	8.85	8.98	8.98
	5-9	9.47	9.59	7.54	7.65	7.61	7.71
	10-14	8.26	8.41	7.57	7.71	7.60	7.75
	15-19	8.64	8.83	8.69	8.89	8.69	8.89
	20-24	11.32	11.22	12.18	12.09	12.12	12.05
	25-29	11.42	11.66	12.29	12.55	12.25	12.50
	30-34	8.04	8.79	8.65	9.46	8.62	9.42
	35-39	5.98	5.92	6.44	6.36	6.42	6.34
	40-44	6.31	5.26	6.79	5.66	6.76	5.64
	45-49	6.10	5.33	6.56	5.74	6.54	5.72
	50-54	4.01	3.98	4.31	4.28	4.30	4.27
	55-59	3.23	3.59	3.48	3.86	3.47	3.85
	60-64	2.38	2.46	2.56	2.66	2.56	2.64
	65-69	1.58	1.66	1.70	1.78	1.69	1.78
70-74	1.19	1.16	1.28	1.24	1.28	1.24	
75+	1.02	1.13	1.10	1.22	1.10	1.21	
2021	0-4	9.15	9.19	8.39	8.37	8.55	8.54
	5-9	9.43	9.54	8.37	8.46	8.50	8.58
	10-14	9.21	9.35	7.62	7.74	7.71	7.81
	15-19	8.22	8.39	6.74	6.89	6.78	6.93
	20-24	7.15	7.04	6.73	6.92	6.73	6.93
	25-29	7.44	7.67	7.67	7.92	7.64	7.88
	30-34	9.66	9.67	10.66	10.64	10.59	10.57
	35-39	9.71	9.97	10.71	10.97	10.63	10.89
	40-44	6.81	7.48	7.51	8.23	7.46	8.17
	45-49	5.03	4.98	5.55	5.48	5.51	5.44
	50-54	5.19	4.32	5.73	4.75	5.69	4.72
	55-59	4.87	4.19	5.37	4.61	5.34	4.58
	60-64	3.04	2.95	3.36	3.25	3.33	3.22
	65-69	2.25	2.43	2.48	2.67	2.47	2.65

70-74	1.47	1.45	1.62	1.59	1.61	1.58
75+	1.34	1.39	1.48	1.53	1.47	1.51

Year	Age	Scenario I		Scenario II		Scenario III	
		Female	Male	Female	Male	Female	Male
2031	0-4	8.05	8.02	6.26	6.26	6.38	6.38
	5-9	7.59	7.64	6.94	7.00	7.06	7.13
	10-14	8.11	8.19	7.68	7.78	7.80	7.90
	15-19	8.54	8.66	7.87	8.00	7.96	8.09
	20-24	8.31	8.47	7.71	7.31	7.19	7.36
	25-29	7.40	7.58	6.30	6.50	6.32	6.51
	30-34	6.42	6.62	6.26	6.48	6.25	6.47
	35-39	6.64	6.86	7.10	7.34	7.05	7.29
	40-44	8.56	8.55	9.77	9.76	9.67	9.66
	45-49	8.53	8.70	9.73	9.93	9.63	9.83
	50-54	5.89	6.40	6.73	7.30	6.66	7.22
	55-59	4.24	4.12	4.84	4.70	4.79	4.65
	60-64	4.16	3.36	4.75	3.84	4.70	3.80
	65-69	3.61	2.98	4.12	3.40	4.08	3.36
70-74	2.00	1.84	2.29	2.10	2.26	2.07	
75+	1.95	2.02	2.23	2.30	2.21	2.28	
2041	0-4	8.46	8.41	5.74	5.72	5.98	5.96
	5-9	7.83	7.86	5.28	5.32	5.41	5.45
	10-14	7.19	7.25	6.06	6.13	6.14	6.21
	15-19	6.95	7.03	6.84	6.93	6.93	7.03
	20-24	7.39	7.50	7.53	7.66	7.61	7.74
	25-29	7.76	7.89	7.70	7.85	7.73	7.89
	30-34	7.52	7.68	6.96	7.14	6.97	7.15
	35-39	6.68	6.85	6.11	6.32	6.10	6.30
	40-44	5.77	5.94	6.04	6.25	6.00	6.20
	45-49	5.90	6.07	6.78	6.99	6.69	6.90
	50-54	7.48	7.40	9.16	9.05	9.03	8.91
	55-59	7.26	7.27	8.89	8.90	8.75	8.76
	60-64	4.80	5.06	5.88	6.19	5.79	6.10
	65-69	3.19	2.99	3.91	3.67	3.85	3.61
70-74	2.77	2.14	3.40	2.62	3.35	2.58	
75+	3.04	2.66	3.72	3.26	3.66	3.21	
2051	0-4	7.53	7.48	5.84	6.25	6.07	6.03
	5-9	7.66	7.67	5.93	6.41	6.16	6.18
	10-14	7.78	7.81	5.67	6.15	5.84	5.90
	15-19	7.36	7.42	5.31	5.81	5.40	5.48
	20-24	6.75	6.83	6.05	6.64	6.10	6.21
	25-29	6.50	6.60	6.80	7.46	6.83	6.96
	30-34	6.89	7.00	7.45	8.18	7.47	7.62
	35-39	7.19	7.33	7.56	8.33	7.56	7.72
	40-44	6.94	7.08	6.81	7.53	6.78	6.95
	45-49	6.11	6.25	5.95	6.60	5.89	6.06
	50-54	5.21	5.31	5.79	6.39	5.71	5.84
	55-59	5.19	5.24	6.32	6.89	6.11	6.26
60-64	6.28	6.04	8.15	8.44	7.98	7.66	

65-69	5.67	5.46	7.36	7.63	7.20	6.92
70-74	3.36	3.37	4.36	4.71	4.26	4.28
75+	3.59	3.11	4.65	4.35	4.55	3.94

Let us examine the impact of population momentum on the following characteristics of population: (i) female children under age 5; (ii) females under age 15; (iii) females in the childbearing ages; (iv) males and females aged 65 years or above. In addition, proportion of females under age 30 are compared for different projections to display the potential consequences. The first three characteristics are associated with current or future level of fertility and the fourth one shows the problem of Aging in the coming years. In addition, first two characteristics are associated with the problem of schooling of the daughters as well.

4.4 Female Children Under Age 5

The female children under age 5 years indicate the trend in the fertility behavior of the population and more importantly these female children will eventually replace their mothers after reaching age 15 years provided they survive till that age. We observe from Table 4.4 that the female population under 5 years under Scenario I decrease from 9.21 millions to 6.61 millions in 2001, but thereafter it remains in the range of 8 millions to 8.5 millions during 2011-2031. However, the number of females increases again during 2041-51 period and remains close to 9 millions or higher. If we compare Scenario III projection with that of the Scenario I projections, then it appears that the female children under age 5 decreases sharply from 9.21 millions in 1991 to 5.66 millions in 2001. Although we observe a rise in the number to 7 millions in 2021 but the decline in the number of females under age 5 is evident since 1931 and remains almost constant around 5.5 to 5.6 millions. This implies that the number of births are stabilized during those years. We do not observe any such stabilization for Scenario I.

4.5 Females Under Age 15

The impact of population momentum on the female population under age 15 is examined for different scenarios in Table 4.3. It is noteworthy that all these scenarios show the same number of females under 15 in 1991 but the numbers start to diverge soon after due to the various underlying assumptions. Replacement level fertility is attained in 2022 if the Scenario I assumptions are followed. The time to reach replacement level fertility is year 2002 if assumptions for Scenarios II and III are employed. As there is no much variations between Scenarios II and III, we shall compare Scenario III with Scenario I. The justification for using Scenario III is that the past trend favors Scenario III of declining infant mortality in addition to other Scenario II assumptions.

Table 4.5: Females Under Age 15 (in Millions) for Scenarios I, II and III

Year	Scenario I	Scenario II	Scenario III
1991	24.37	24.37	24.37
2001	21.99	20.56	20.63
2011	22.21	17.20	17.42
2021	24.96	19.83	20.27
2031	23.69	18.25	18.77
2041	25.82	15.34	15.98
2051	27.09	15.85	16.79

Table 4.5 demonstrates that the number of females under age 15 declines during 1991-2001 for Scenario I and during 1991-2011 for Scenario III. For Scenario I the number of females under 15 then increases to 27.1 millions in 2051 whereas the comparable number for Scenario III remains close to 16-17 millions during 1941-51 period. In other words, if we assume that the replacement level fertility can be attained sooner then it can make a difference of 10 millions less females under age 15 during a period of fifty to sixty years.

4.6 Population Momentum and Women in Reproductive Ages

The most visible impact of the population momentum will be observed on the number of women in reproductive ages. The number of women in the reproductive ages will continue

to increase and as a result the number of births will be higher than expected after attaining the replacement level fertility.

Table 4.6: Females in Reproductive Ages(in Millions) for Scenarios I, II and III

Year	Scenario I		Scenario II		Scenario III	
1991	24.59		24.59		24.59	
2001	35.56		35.56		35.56	
2011	44.64		44.21		44.24	
2021	48.45		45.19		45.32	
2031	54.26		47.36		47.76	
2041	52.74		43.06		43.79	
2051	56.29		41.75		42.77	

Table 4.6 shows the remarkable increase of the women in reproductive ages during 1991-2051. The number of women will increase by 129 percent during the reference period if Scenario I is considered. The increase for Scenarios II and III will be in the range of 70 percent to 74 percent. In terms of absolute number of women in reproductive span, the difference between Scenario I and Scenario III is 13.52 millions.

4.7 Population Momentum and Aging

The population momentum initiates the process of aging with the decrease in the level of fertility. After the replacement fertility level is achieved, the population continues to get older with the younger population over time. In other words, the declining fertility attributes less share for the younger age groups due to smaller number of births and the share of older age groups increase until the age composition stabilizes. This process continues for decades after achieving the replacement level fertility.

Table 4.7 Number of Males and Females (in Millions) 65 Years and Older

Year	Scenario I		Scenario II		Scenario III	
	Female	Male	Female	Male	Female	Male
1991	1.62	2.04	1.62	2.04	1.62	2.04

2001	2.06	2.41	2.06	2.41	2.06	2.41
2011	2.93	3.24	2.93	3.24	2.93	3.24
2021	4.54	5.01	4.54	5.01	4.54	5.01
2031	7.55	7.25	7.55	7.25	7.55	7.25
2041	9.90	9.14	9.90	9.14	9.90	9.14
2051	14.88	15.05	14.88	15.05	14.88	15.05

Table 4.7 shows that the process of aging will pose a formidable difficulty in the near future in Bangladesh, irrespective of any scenario. The females of age 65 years and over will increase from a modest size of 1.62 millions in 1991 to 14.88 millions in 2051 and similarly males of age 65 years and over will increase from a size of 2.04 millions in 1991 to 15.05 millions in 2051. The influence of different assumptions would be observed after 2051. However, it is important that such a sharp increase in the population of old age groups will cause additional pressure not only on economy of the country but also on the social and health aspects of the country as a whole.

4.8 Momentum and Females Under Age 30

The demographic determinant of population momentum can be obtained by a simple equation (Preston, 1996, Kim and Schoen, 1997, Bongaarts and Bulatao, 1999). If A is the proportion of female population under age 30 at the beginning of the projection period and A_m is the same proportion at the end of a momentum projection then the momentum multiplier of the female population at the end of the demographic transition is simply A/A_m . Similarly, if A_r is defined as the proportion of females under 30 at the end of the replacement projection, then A_m/A_r is known as the mortality multiplier. According to Bongaarts and Bulatao, the replacement growth multiplier is then simply multiplication of the momentum and mortality multipliers. For South Asia, on the basis of 62.3 percent of females less than age 30 in 2000, replacement growth multiplier to the end of the transition is estimated within the range of 1.87-2.10. The percentage of female populations under 30 for Scenarios I, II and III are shown in Table 4.8. As the purpose of this paper is to project the population of Bangladesh for the period 1991-2051, no effort is made to obtain the multipliers based on the components of population growth. However, the proportion of females under 30 can provide an idea about the potentials of growth of population in this country.

Table 4.8: Percent Females Under 30, 1991-2051

Year	Percent Females Under 30		
	Scenario I	Scenario II	Scenario III
1991	72.0	72.0	72.0
2001	64.7	74.8	64.0
2011	60.1	57.1	57.3
2021	50.6	45.5	45.9
2031	48.0	42.8	42.7
2041	45.6	39.2	39.8
2051	43.6	35.6	36.4

In the beginning of the projection, all the variants of projection demonstrate quite a large proportion of females under 30 (72 percent). This is indicative of the young age structure of the population of Bangladesh. This implies that even with a rapid achievement of replacement level fertility, the momentum will increase the size of the population much faster. With Scenario II and III variants of population projections, the percentage of females under 30 will be reduced to 36 percent in 60 years. During this period, the growth of population will be mostly attributable to the momentum. However, if the population continues to with the current level of contraceptive prevalence then the proportion of females will be reduced to 44 percent.

5. Conclusion

In this paper an attempt is made to examine the potential impact of the population momentum in Bangladesh. In order to investigate the impact of population momentum, we have chosen three different scenarios on the basis of likely policy options that may emerge in the socio-economic setting of Bangladesh. The population projections based on three scenarios indicate that the population will increase rapidly even after attaining the

replacement level fertility due to an echo effect of the high fertility experienced in the past. The Scenario I options show that the population size will be more than doubled in 2051 although the replacement level will be achieved in the year 2022. Similarly, Scenarios II and III show more optimistic projections with the assumptions that the population will increase to 188 and 192 millions respectively in 2051 after reaching the replacement level fertility in the year 2002. Both these scenarios imply that although the level of fertility will start to decline below the replacement level, but the population may still increase to some extent after 2051.

The impact of population momentum on the female populations aged below 5 years and 15 years have been discussed in this paper. It is shown that the females in the younger age groups could be much less in absolute numbers if the Scenario options II or III are adopted. Similarly, the rapid increase in the female population of reproductive ages will continue to increase the absolute size of the population to a great extent. Similarly, within next forty or fifty years, 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.

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Inputs**Index of marriage****Table 3.2 Proportion of Currently Married Women in Childbearing Age Groups, 1991**

Age Group	Proportion of currently married women
15-19	0.496
20-24	0.866
25-29	0.940
30-34	0.938
35-39	0.921
40-44	0.869
45-49	0.817
Total	0.855

Base year fertility rates**Table 3.3 Age Specific Fertility Rates 1991**

Age Group	Age Specific Fertility Rates
15-19	160
20-24	213
25-29	173
30-34	117
35-39	67
40-44	28
45-49	14
TFR	3.86

Acceptor and User Method Mix**Table 3.4 Acceptor Contraceptive Method Mix, 1996**

Method	Percent Acceptors
Condom	14.6
Pill	46.3
Injectable	18.5
Norplant	0.5
IUD	3.1
Male Sterilization	0.3
Female Sterilization	0.5
Traditional	14.9
Other	1.3
Total	100.0

Table 3.5 User Contraceptive Method Mix, 1996

Method	Percent Users	
Condom	7.9	
Pill	2.2	
Injectable	12.6	
Norplant		0.2
IUD	3.7	
Male Sterilization	2.2	
Female Sterilization	15.4	
Traditional	15.7	
Total	100.0	

Twelve-month Continuation Rates**Table 3.6 Twelve-month Continuation Rates of Methods of Contraception**

Method	Continuation Rate	
Condom	0.363	
Pill	0.555	
Injectable	0.495	
Norplant		0.800
IUD	0.587	
Male Sterilization		1.000
Female Sterilization	1.000	
Traditional Methods	0.300	

Contraceptive Effectiveness**Table 3.7 Contraceptive Effectiveness**

	Effectiveness	
Condom	0.80	
Pill	0.90	
Injectable	0.98	
Norplant		1.0
IUD	0.95	
Male Ster.	1.0	
Female Ster.	1.0	
Traditional	0.5	

Mean Duration of Breastfeeding**Table 3.8 Mean Duration of Breastfeeding in Months from BDHS, 1996-97**

Age Group	Mean Duration of Breastfeeding (in Months)
15-19	28.7
20-24	27.3
25-29	27.6
30-34	28.8
35-39	28.6
40-44	31.2
45-49	29.1

Sterility Coefficient**Table 3.9 Sterility Coefficient by Age from BDHS, 1996-97**

Age Group	Sterility Coefficient
15-19	1.03
20-24	1.06
25-29	1.09
30-34	1.10
35-39	1.20
40-44	1.50
45-49	2.03

Abortion**Table 3.10 Age Specific Abortion Rates, 1996**

Age group	Age Specific Abortion Rates (per 100 women)
15-19	3.08
20-24	3.25
25-29	4.43
30-34	2.95
35-39	3.54
40-44	3.79
45-49	4.79