The Populatiou Perspective of Bangladesh: Stabilizatiou and Alternative Scenarios

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Abstract

Population and socio-economic development are interrelated. Changes in population size and structure affect various economic and social factors relating to income, education, health and employment. Conversely, demographic factors such as fertility, mortality and migration are affected by changes in socio-economic conditions. The balance with economic growth is crucial and of concern to policy makers since population growth can pose significant and interacting risks to human well-being. Lower rates of population growth that presumably would contribute significantly to improving people's lives, do not by any means provide the only reason to support the population programme. Family planning, preventive and curative health services, expected education for girls and increased economic opportunities for women also directly improve the lives of women and families. The major objective of this paper examines the prospect for stabilization of the Bangladesh population under alternative demographic scenarios. Due to a large base of yoang age population future growth potential in Bangladesh is indeed very high. Because of high fertility in the past, Bangladesh will continue to experience substantial population growth as these yoang people entered their child bearing years. This built in population momentum means that, even if fertility fell immediately to the replacement level about half of the population growth could still take place in the future. In order to stabilize Bangladesh's population while maintaining low death rates, births will need to average about two children per woman. Population momentum can be eased significantly by policy interventions that encourage women to delay child bearing, as this stretehes out the time between generations.

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Introduction

Bangladesh provides a unique opportunity to study the impact of various policy options on future population growth. Four population censuses have been carried out in the country since independence in 1971. Several demographic surveys such as the Demographic and Health Survey in 1996/97, have been under taken to assess various demographic parameters. The data collected in various censuses have documented a rapid increase in population from 76.2 million in 1974 to 111.14 million in 1991. The major contributing factors to these trends have been a significant increase in fertility in the 1960s and 1970s and large declines in mortality. Total fertility rate has been declining very slowly since 1975. But the decline is faster since 1985 when contraceptive use rate also increased substantially. The 1996/97 Demographic and Health Survey indicates that the total fertility rate has declined from 6.3 children per woman in 1975 to 3.3 children per woman in 1996 (Mitra and Associates 1997). If this fertility trend was to continue and be prompted to achieve NRR = 1 by 2002, it is expected to have significant implication for the timing of population stabilization. This paper traces these implications for alternative policy and implementation options. It used the model[1] developed in connection with the Sustainable Human Development Project (Kabir, Sarkar and Sharma 1997).

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[1] The population model used here has been developed in connection with the sustainable Human Development Project (SHD), which is a collaborating work with Institute of Social Studies Advisory Service (ISSAS), the Hague. A population model is an integral component in every consideration of sustainable human development. For an effective SHD programme knowing population size and distribution, spatially and over time, is crucial. For Instance, planners may wish to know what is likely to be the size of the urban population during the plan period and among them how many would be poor and deprived: they may wish to know for how many school age children should they provide education services; or they may wish to know what they should do about the immunization of under ones; or they may wish to know number of widows and female headed households. These questions naturally occur in the design of targeted interventions programs and strategies for optimal realistic resource allocations.

Population Model

To asses sustainable human development issues in a life cycle perspective the model accounts for aging over 81 annual cohorts, disaggregated by sex and location – urban and rural. With this level of disaggregation it is possible to extend the model to scenario policies and corresponding programs in health, education, urban basic services and spatial development. The salient features of the model is presented below:

Feature	Description	Purpose
Population Head Count	Dynamic cohort-component model Rural-Urban migration	Estimate population scenarios and expected impact of FFYP policies regarding • Urbanization and basic services • Population group specific development programs • Implication for population stabilization • Mapping to households
Human Capital Formation		
Education Health Poverty	Population entering into and leaving the educational pipeline at four levels; primary, secondary, tertiary and informal Infant mortality reduction Under five mortality reduction Maternal mortality reduction Linkages with household, demographic and the social services	• Evaluate expected impact and cost of FFYP strategy package • Development of skills • Impact of targeted intervention • Access to health care • Assess potential for poverty alleviation and consider strategies for policy intervention.

For brevity the mathematical specification of the model is omitted here.

Literature Survey

Following the independence of Bangladesh, in 1975, Bangladesh Fertility Survey (BFS) was conducted to understand human fertility as a part of the World Fertility Survey Programme. The World Fertility Survey (WFS) was an international research programme whose purpose was to assess the current state of human fertility throughout the world.

This was being done principally through promoting and supporting nationally representative, internationally comparable and scientifically designed and conducted sample surveys of fertility behavior in as many countries as possible. One of the major objectives of the World Fertility Survey Programme was to assist the participating countries in reaching a better understanding of their levels of fertility. The survey was a comprehensive one and dealt with various demographic issues including reproductive health, fertility, nuptiality, infant and child mortality. In fact, the 1975 BPS outlined as a baseline survey to compare changes in fertility and use of family planning with the subsequent National Surveys conducted in Bangladesh. Since then there was another Bangladesh Fertility Survey held in 1989, which was conduced by the National Institute of Population Research and Training (NIPORT) with the financial support from the World Bank. In 1980s several Contraceptive Prevalence Surveys (CPSs) were also conducted to see changes in the contraceptive prevalence level since introduction of comprehensive Family Planning Programme in 1976. Since 1989 a number of demographic and health surveys (DHS) were conducted to measure the programmatic effects. These are all nationally representative sample surveys.

The population figure found in the 1991 census was adjusted for undercount. According to the post enumeration check there was 3.2 per cent under enumeration of population and the total census figure was adjusted accordingly. The adjusted total population in the 1991 census was 111.14 million.

Bangladesh is an emerging success story in family Planning. In 1975 according to the World Fertility Survey about 8 per cent of currently married women of reproductive age were practicing contraception. By 1983, the proportion has risen to 19 per cent and in the subsequent 15 years, it has become more than double reaching 49.2 per cent in 1996-97 (Mitra and associates, 1997). Despite the family planning programs' great success, there are concerns that its expansion to meet the needs of a growing population and to raise contraceptive prevalence may entail unacceptably high costs.

The 1996/97 Demographic and Health Survey (DHS) was conducted by Mitra and Associates in collaboration with the National Institute of Population Research and Training (NIPORT) with the technical support

from Macro International Inc., U.S.A. According to the DHS report fertility in Bangladesh has decline extremely rapidly over the past 20 years, from 6.3 births per woman in the mid-1970s to 3.3 births per woman for the period 1994-96. According to them this is truly an exceptionally steep decline. However, although few would deny that fertility has fallen rapidly, the various data sources show rather different pictures of fertility trends, especially when examined by calendar year. The rates from 1989 BFS and the 1991-CPS are generally consistent, while the data from the Bangladesh Bureau of Statistics Sample Registration system are initially implausibly low and therefore show a moderate decline over time. The rate of 3.4 from the 1993/94 DHS (which is placed in 1992, the mid point of the 3-year reference period) appears to be implausibly low when compared with other data sets; while the rate from the 1996/97 DHS is more plausible. Further doubt about the 1993/94 estimate of the total fertility comes from the fact that the rate for the same period (approximately 1991-93) constructed from the retrospective birth histories in the 1996/97 DHS data is far higher (roughly 3.8 vs. 3.4). This is a curious turn of events, given the fact that a 1994 study appeared to validate the 1993/94 estimate of fertility. Investigation of the age pattern of fertility shows no anomalies; the decline since the mid-1980s has been generally uniform over all age groups of women except those 45-49, for whom there has been no change. However, data from the 1996 Health and Demographic Survey (HDS) conducted by the Bangladesh Bureau of Statistics show a very different age pattern of fertility, having much low rates for young women and much higher rates for older women (BBS, 1997).

The Fifth Five-Year Plan targets to achieve replacement level of fertility by 2005. The plan envisages reducing the rapid growth of population through strong MCH-based family planning within the framework of reproductive health care and reorganized health and family planning service delivery systems, provision of quality service, decentralized administration and inter-sectoral programs, co-operation of all public bodies and resource mobilization. The operational implications of the above demographic goal in terms or changes in demographic and programme parameters during the Fifth Plan period are discussed.

Simulation Design

The simulation examines the prospect for stabilization of Bangladesh population by estimating the population in the trend path and policy influenced scenarios. The base information (fertility, mortality and migration) used are obtained from the 1992 sample vital registration system. The population model is used to estimate population size.

The Fifth Five-Year Plan (FFYP) has set a target of achieving replacement level fertility by 2005. In order to examine the implication of this target on population growth as well as the timing of stabilization four scenarios are generated. The design of experiment is given below.

Simulated Scenario	Objective	Design	Label
1.	Establish upper bound	The parameters for fertility, mortality and migration remain fixed at their 1992 values	*Upper bound*
2.	Estimate what would happen if the current rate of fertility decline is maintained till 2002 levels off thereafter.	The implementation function is set such that 40 per cent* of target fertility is achieved.	*Trend*
3.	Estimate what would happen if the FFYP target is achieved in time by 2005	The implementation function is set at full achievement of target by 2005.	*NRR = 1 by 2005*
4.	Estimate what would happen if the FFYP target is achieved five years later	The implementation function is set at full achievement of target by 2010.	*NRR = 1 by 2010*
5.	Estimate what would happen if the FFYP target is achieved ten years later	The implementation function is set at full achievement of target by 2015.	*NRR = 1 by 2015*

*Graphic extrapolation of the current trend was used to estimate the implied percent of target fertility reduction.

On the basis of the above simulations, the timing of stabilization is investigated and interpretations and implications about population size are highlighted. The base information used for the population model is

obtained from the 1992 sample vital registration system because of problems in 1991 census age distribution[2].

Fiudings

Population Size:

There are substantial disparities in the size of the population among the five simulations between 1992 and 2050 (c.f. Table I). In the *upper bound* Bangladesh may have a population of about 280 million by 2050. If the current *trend* continues population size is estimated at 242 million (about 38 million less). Achievement of the FFYP target, *NNR =1 by 2005,* significantly lowers the population estimate to about 155 million (almost half of the population in upper bound simulation). A five-year delay *(NNR =1 by 2010)* in achieving the target adds 4 million by 2012. A further delay of five years *(NNR =1 by 2015)* adds another five million by 2012.

[2] Population pyramids showing age-sex distribution for the 1991 census imply that the 1991 enumeration may have some excess population in the 0-4, 5-9 age groups. Assessment of census data by Andrew Kantner (Kantner 1994) observed that the 1991 census enumeration was not very accurate. Single year age distribution shows pronounced, digit preference. Given the poor quality of the 1991 census age sex distribution BBS has employed smoothing procedures to derive final 1991 age-sex distributions. Kantner's evaluation also indicated that the 1991 census enumerated many more children aged 0-9 and far fewer men and women aged 15-24 that had been anticipated. According to the Kantner's estimate the 1991 census counted 4.2 million more children aged 0-9 and 4.4 million fewer men and 2.8 million fewer women aged 15-24. Due to these problems in the age compositions of the 1991 census, we used 1992 sample vital registration data. A comparison of sample vital registration data with those of other demographic survey data revealed that the 1992 sample vital registration data are consistent and reliable.

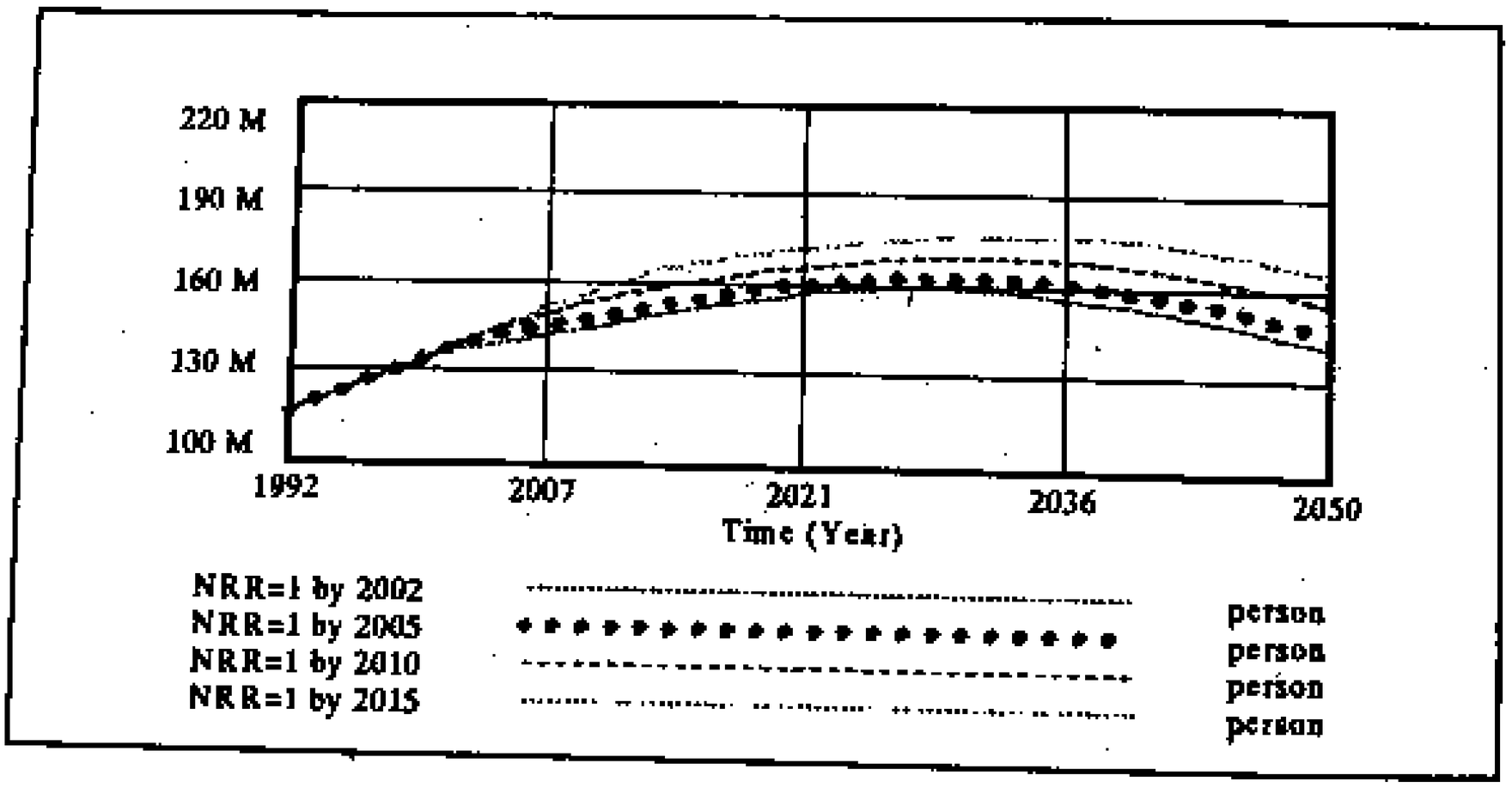
Table 1: Popuiation Size of Bangladesh under Five Demographic Scenarios

[Million Persons]

Year	Upper Bound	Treud	NRR=1 by 2005 FFYP Target	NRR=1 by 2010 Five Year Delay in Achievemeut	NRR=1 by 2010 Ten Year Delay in Achievement
1992	113.30	113.30	113.30	113.30	113.30
1997	123.33	123.08	123.08	123.08	123.08
2002	135.00	133.58	132.66	133.23	133.46
2007	148.72	145.31	139.35	142.63	143.99
2012	164.11	158.48	145.70	149.73	153.49
2017	179.19	171.25	151.67	155.65	159.96
2022	193.45	182.89	156.50	160.56	164.85
2027	207.61	193.73	159.73	164.24	168.74
2032	222.46	204.44	161.20	166.52	171.59
2037	238.22	215.26	161.01	167.04	172.95
2042	254.55	226.04	159.57	166.09	172.69
2047	270.98	236.36	156.94	163.74	170.81
2050	280.91	242.32	154.84	161.78	169.03

The differences in the population size under different demographic assumptions are shown in Figure 1.

Figure 1: Population Size uuder Varying Achicvcment of Replacement Fertility



The longer is the time required to achieve NRR =1 the larger is growth of population. For example, the difference in the population size will be about 87 million between contmuation of the *trend* and achievement of *NRR =1 by 2002*. The sooner we achieve the fertility target the smaller will be the difference in population size. While it does not appear to matter much if the target is achieved by 2002 or 2005 but not achieving the target will have serious consequences.

Momentum and Stabilization:

A major planning consideration is to recognize the implications of population momentum, a consequence of the current young age structure, in turn a result of high fertility in the past. What population momentum really means is that the mothers of today were not born when the TFR was 3.3 but when it was double (6.34). Their sheer numbers are large and no matter what the project does, there is going to be enormous population growth in the future. The effect of momentum of the growth of population is presented in Table II.

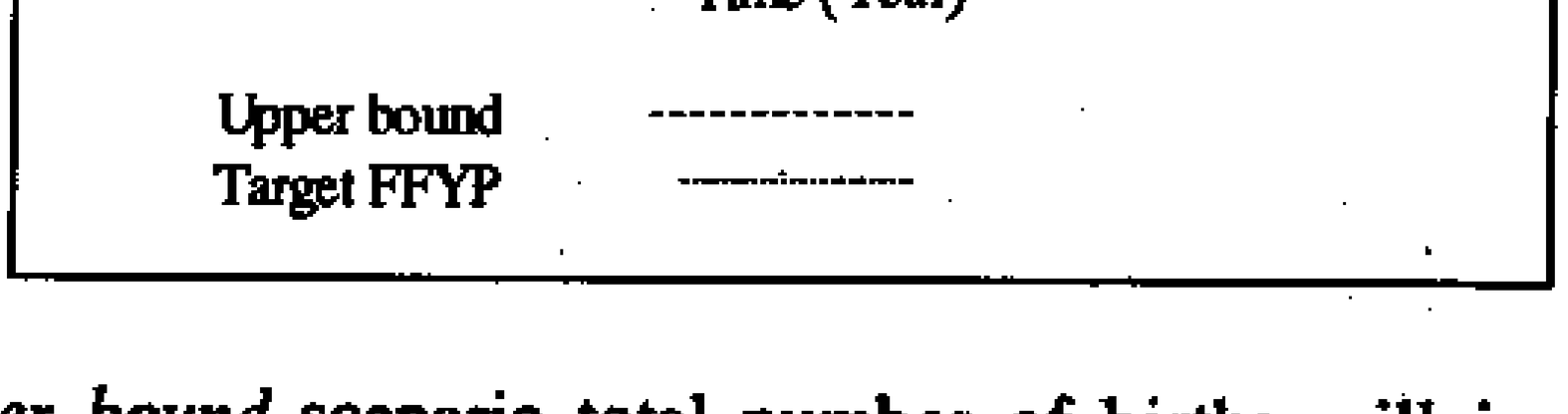
Table 2: The Effect of Momentum on the Population Growth
[Million Persons]

Year	NRR = 1 by 2002	NRR = 1 by 2010
1995	119.05	119.05
2000	128.82	129.22
2005	134.78	139.02
2010	141.02	147.23
2015	147.40	153.38
2020	152.76	158.74
2025	156.44	162.93
2030	158.22	165.81

The population of Bangladesh will continue to grow regardless of whether replacement level fertility (NRR=1) is reached in 2002 or reached in 2010. Table II shows Bangladesh population would grow if fertility fell immediately to replacement level. Due to previous high fertility, a large proportion of the population is at young ages; as young age structure growing numbers of people enter their reproductive years, total births will increase even if couples have two children causing population to continue to grow for several years. What happens if we do not achieve demographic goal? If the demographic objective of the FFYP is not achieved by the year 2005 then there will be a significant impact on potential future population growth and size. For example, in scenario *NRR = 1 by 2005* the population will be 147 in 2015 as opposed to 153 in 2015 if *NRR =1 by 2010, a* difference of 6 million population between the two assumptions. *Figure 1* also shows the effect of momentum on the population growth. Whether the NRR target is achieved by 2002 or 2005 the population will continue to grow because

of population momentum before stabilizing from about 2040. This is brought into sharper focus in Figure 2.

Figure 2: Totai Births in Simulations for *Upper Bound* and *FFYP Target*

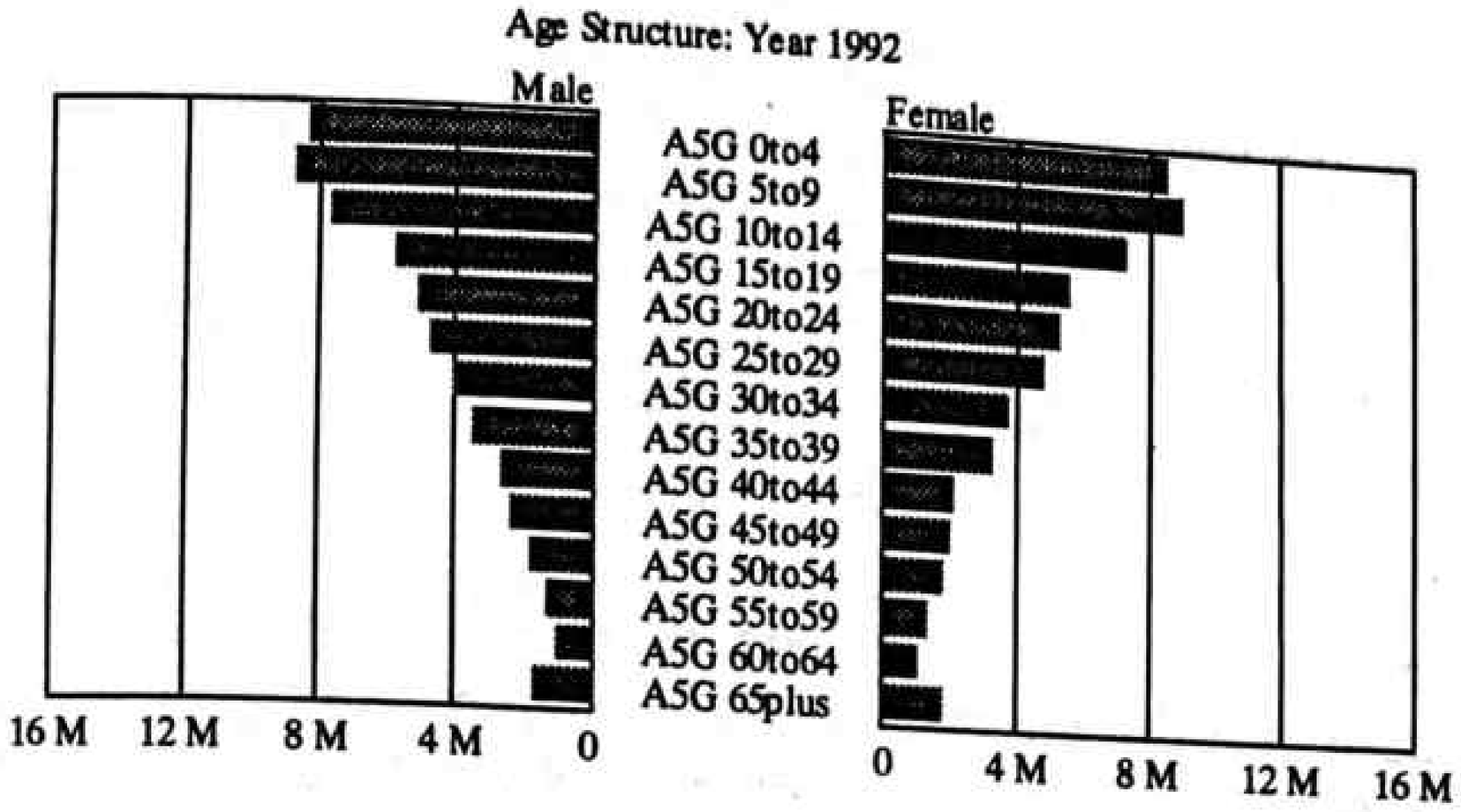


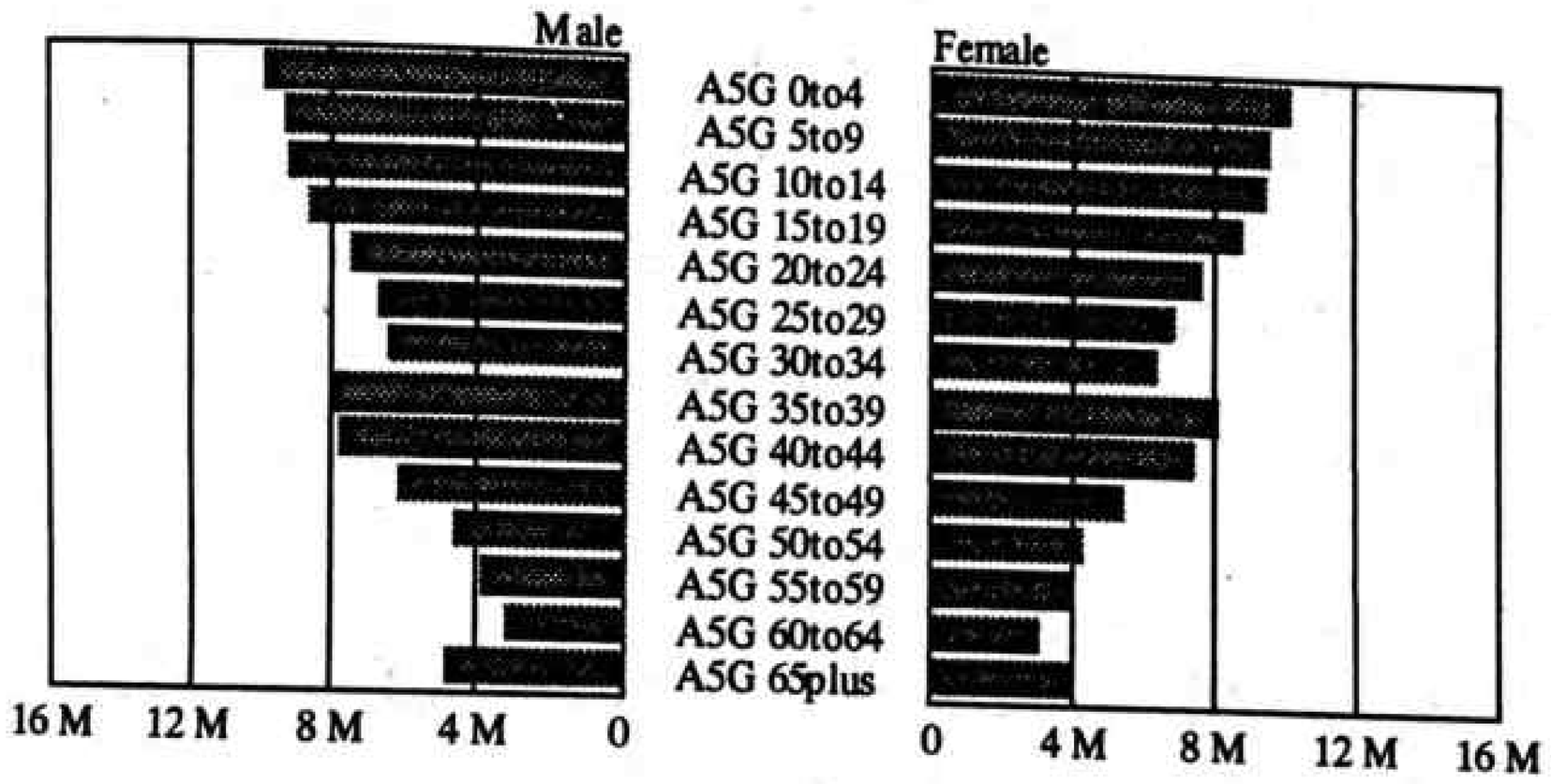
In the *upper bound* scenario total number of births will increase with some fluctuations while under the assumption that NRR =1 will be achieved by 2005, the total number of births will decline before stabilization of number of births froin around 2036 onwards.

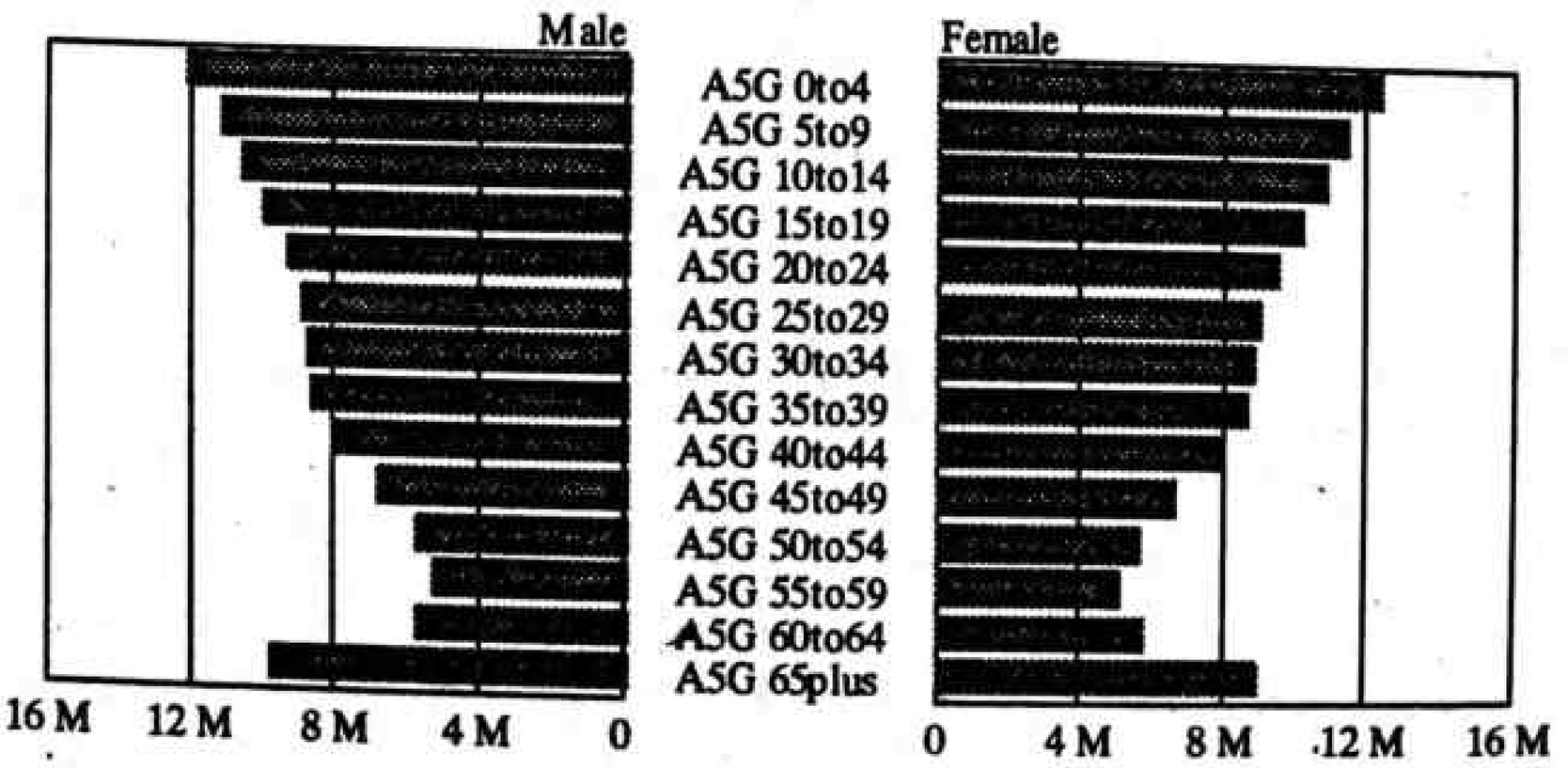
Age Structure Variation

The changing age structure of the population is examined by constructing population pyramids at some selected time points for these simulations. Figure 3 shows the population pyramids in the *upper bound* scenario at three selected time points 1992, 2025 and 2050. At all three time points because of constant assumption of fertility the proportions at the young ages will increase.

Figure 3: Age Structure at 1992, 2025 and 2050 in *Upper Bound* Scenario







On the other hand because of improvement in health status and increase in life expectancy the proportion aged 65 years and above will also increase,

Situation at 2025

If the total fertility rate remains at its present level of 4.2 *(upper bound scenario),* the total population will reach about 202 million by 2025. If the replacement level of fertility is achieved in 2015 the population will be lower at about 167 million in 2025. The difference in population size in these two simulations at year 2025 will be about 35 million, which is almost one-third of the base population, which was 113.30 million in 1992.

What impact will this 35 million difference in population have on Bangladesh? First of all, a lower population growth rate will mean that the problem of overcrowding will not be as severe. It is commonly hypothesized that as rural population density increases, productivity decreases since landlessness increases and more people will live under poverty (World Bank 1992). Due to increase in rural poverty rural to urban migration will increase, where overcrowding is always a very serious problem, and urban poverty may increase. The expected large increases in population size over the next decades in Bangladesh will make the difficult task of reducing poverty and bringing about sustainable development even harder.

A comparison of these simulations of FFYP target achievement with World Bank (1997) estimates show (Table III) that the latter are consistently higher.

Table 3: Comparison of Current Projection Estimates with the World Bank Estimate

[Million Persons]

	Present Estimate		World Bank Estimate
Year	NRR = 1 by 2005	NRR = 1 by 2010	NRR = 1 by 2010
1995	119.05	119.05	119.77
2000	129.07	129.22	129.07
2005	137.06	139.02	139.29
2010	143.12	147.23	149.80
2015	149.39	153.38	160.53
2020	154.74	158.74	170.38
2025	158.66	162.93	179.65
2030	160.82	165.81	188.12

The difference may be attributed to the base parameters considered in the two projections. For instance, the total fertility considered in the World Bank projections was 4.3 children per women in 1990 as opposed to 3.5 children per woman in 1992 in these projections. What is puzzling is that the World Bank (1997) estimates shows a continuous increase with no sign of decline which may be associated with stabilization patterns. However, our projections and the Fifth Five-Year Plan (FFYP) projections are close. In the 1997 FFYP has an estimated population of 123.9 million as against 123.1 million in the scenario NRR =1 by 2005 (see Table I). At the end of FFYP (2002) the population projection is 132.7 million which coincides with the scenario estimate.

Tackling Momentum

The demand for large families may be reduced through positive social and economic polices. Their effect is postulated to work through change in the costs and benefits of child bearing so that more parents will recognize the value of smaller families, while simultaneously increasing the investment in children. This is recognition of a matrix of correlated causes at work. The scope of interventions potentially under government control include expansion of education opportunities (especially girls), empowering women in their personal and economic lives and reducing infant and child mortality (World Bank, 1992).

Designing policies and programs to reduce the momentum clearly poses the greatest challenge in the coming years. Even if fertility could immediately be brought down to the replacement level of fertility, population growth could continue for many years due to population momentum. Despite increased use of contraception and changes in marriage pattern the demographic momentum is such that in the next 30 years the population of Bangladesh will, even in the *best case scenario* grow to about 160 million by 2020.

What can be done? Because small changes in family size have a large impact on the future size of population growth and since the poor have large family size, we should focus on them by investing more in the areas of income generating, health and education (Egero, 1996). Reductions in population growth may also be achieved if the average age at which women begin child bearing rises, (by delaying the age at first birth) and through wider spacing between births (Bongaarts and Amin 1996). Delay

in the onset of child bearing and wider spacing of births leads to a decline by period fertility and hence in the population growth rate (Cleland *et al.* 1994). Another option is to urge the norms of responsible sexual behavior and small family size norm when educating adolescents, on whom future fertility trends will depend. Adolescents should be given information on reproductive health and family planning services to assist them in avoiding early pregnancies. Indirect approaches are also likely to more effective, such as greater investment in the education of girls, particularly at the secondary level. The longer girls stay in school the later they marry and greater the delay in child bearing.

Policy Implication

In order to stabilize Bangladesh's population while maintaining low death rates, births will need to average about two children per woman. Population momentum can be eased significantly by policy interventions that encourage women to delay child bearing, as this stretches out the time between generations. To investigate the timing of the stabilization of Bangladesh population, different demographic assumptions were considered. The results show that if the FFYP target of NRR = 1 by 2005 is achieved the population of Bangladesh will continue to grow another 30-35 years before stabilizing population around 160-165 million and then declining again. If the target of reaching NRR = 1 is delayed to 2010 years the growth of population will be higher. However, in the long run (in 2050) there will not be much difference in the size of the population under two assumptions (155 million as opposed to 162 million). Even if replacement level of fertility is reached say either by 2005 or by 2010 or by 2015, the population will continue to grow due to momentum because of high fertility in the past. Depending upon when replacement level of fertility is reached the population estimates at 2015 ranged between 155 to 163 million. Thus if we fail to act immediately and on a large scale, we will pile up problems for our children, by which time many of the problems will be genuinely and perpetually beyond our solution. Slower population growth will also help the Government reduce the financial burden of providing other services. There will be savings in health, education, social services and housing if replacement level fertility can be reached at the target time. To achieve prevalence rates required for replacement level fertility, new approaches that go beyond the supply side initiatives and increase the level of demand for family planning services would be needed. These probably will require basic

structural change involving such matters as the educational status and empowerment of women, infant and child mortality reduction and improved economic conditions (World Bank 1992). Therefore, in order to achieve a more sustainable rate of population growth and a higher standard of living, it is imperative to reach the replacement level of fertility as soon as possible. To reduce the population momentum both age at marriage and age at birth should be increased. Besides, promoting female education beyond the primary level should be encouraged because of its obvious relationship with fertility and acceptance of contraception. Prolonging girls' stay in school can have a positive impact on age at marriage and female social status. In addition, adolescents should be given information on reproductive health and family planning issues and access to reproductive health and family planning services to assist them in avoiding early pregnancies. The future rates of population growth and consequently, the future size of Bangladesh population are largely dependent on whether such trends continue. Will desired family size continue to fall? The question of whether good quality family planning and related health services will be accessible to all who want them extends far beyond numerical projections of population growth. Infant mortality and child health and women's status in societies and within families, and the financial and political resources available to the government will all influence the future size of Bangladesh's population.

Findings and Conclusions

Due to a large base of young age population future growth potential in Bangladesh is indeed very high. Because of high fertility in the past, Bangladesh will continue to experience substantial population growth as these young people entered their child bearing years. This built in population momentum means that, even if fertility fell immediately to the replacement level about half of the population growth could still take place in the future. In the short run even under the optimistic assumption NRR = 1 by the year 2005, there will be a net increase of 8.8 million population from 123.9 million people in 1997 to 132.7 million in 2002 by the end of Fifth Plan Period. In the long run i.e. by the year 2020, there will a net increase of 33 million people if replacement fertility is achieved by 2005 which is due momentum effects; there will be four million more population if replacement fertility is achieved five years later.

However, ultimate population size depends not only on the size of completed families but also on decisions about when to start them. It is estimated that raising mothers' age at first birth from say 18 to 23 would reduce population momentum by over 40 per cent (Bongaarts and Amin, 1996). In the case of Bangladesh, for instance, such an increase in the length of a generation (the time from birth to average age of childbearing) could lead to reduction in population size considerably (Bongaarts and Amin, 1996). Reducing population momentum through individual choices for later and lower fertility will accelerate population stabilization and ease the course to sustainable development.

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