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Factors Associated with Target Fertility in Bangladesh

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FACTORS ASSOCIATED WITH TARGET FERTILITY IN BANGLADESH

Ph. D Dissertation

By

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B.Sc Honours, M.Sc and M.Phil in Statistics, Rajshahi University

A Dissertation Submitted to the Department of Statistics
University of Rajshahi, in Partial Fulfillment of the Requirement
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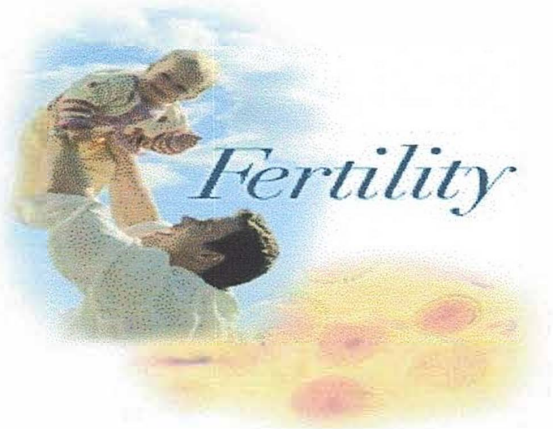
June, 2012

Factors Associated With Target Fertility in Bangladesh



Dedicated
to
My Beloved Mother and Late
Father

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CERTIFICATE

I have the pleasure to certify that the dissertation entitled **"Factors Associated with Target Fertility in Bangladesh"** is the original work of Md. Rezaul Karim. As for as I know, this is the candidate's own achievement and is not a conjoint work. He has completed this dissertation under my direct guidance and supervision. I also certify that I have gone through the draft and final version of the dissertation and found it satisfactory for submission to the Department of Statistics, University of Rajshahi in partial fulfillment of the requirements for the degree of **Doctor of Philosophy** in Statistics.

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DECLARATION

I do hereby declare that the dissertation entitled **"Factors Associated with Target Fertility in Bangladesh"** submitted to the department of statistics, University of Rajshahi for the degree of **Doctor of Philosophy** in Statistics is exclusive my own and original work carried out under the supervision of **Professor Dr. Md. Nurul Islam**, Department of Statistics, University of Rajshahi. No part of it in any form has been submitted to any other university or institute for any degree, diploma or for other similar purposes.

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ABSTRACT

In this study, an attempt has been made to assess the factors associated with target fertility in Bangladesh using nationally representative data from Bangladesh Demographic and Health Survey (BDHS), 2007. Simple linear regression as well as multivariate techniques named logistic regression analysis have been used to find out the direct, indirect and combined (interaction) effects of the selected socio-demographic factors on fertility. To quantify the proximate variables we apply Bongaarts` model as well as proposed Bongaarts` model.

The results of the study show that several socio-economic (socio-economic, demographic) variables affect on fertility behavior. These are age at marriage, place of residence, religion, region, education of women and men (partner's/husband's), working status of women, occupation of women and men (husband's), women's participation at NGO's, age at first birth of women, length of breastfeeding practice, contraceptive use, number of dead children (boys and girls) etc.

Fertility is still high in Bangladesh, though it has been declining over time. A major cause of declining fertility has been the steady increase in contraceptive use over the last 32 years; another major cause of declining fertility has been the steady increase the age at marriage. Current contraceptive prevalence rate (CPR) is 56% in 2007 BDHS (Mitra et, al., May 2009). The effect of marriage pattern and marital fertility, on the overall fertility of Bangladesh examined by Coale's indices show higher influences of marriage pattern than that of marital fertility. The effect of change of marriage pattern in reducing fertility level perhaps has increased over time. Again, the

age pattern of marriage and the contraceptive use have changed in a positive direction, the negative impact of which has fallen on fertility. Examination of the changes of the indicated indices at various time segments that the changed could be a recent phenomenon.

To identify the change of fertility in terms of proximate variables, Bongaart's model has been used. Among the variables in the analysis of proximate determinants of fertility happened to be in response of the effect of increase in proportion married and contraceptive use. These determinant shows that 5.69% decline due to change in the proportion of women married, 12.36% decline due to contraceptive use, 0.596% decline due to increase the index of fetal wastages and approximately 20.38% increase due to decrease of the duration of lactational infecundability. Application of Bongaarts` model indicates that there is a downward trend in all the proximate indices. Between 1997 and 2007 the amount of decrement of total fertility rate is about 17.51% and it is about 10.139% between 2004 and 2007. This is primarily caused by an increase in the use and effectiveness of contraceptives. The divorce and widowhood has also a major contribution on reduction of the fertility in Bangladesh.

Observed TFR found to be 2.7 in 2007 and Bongaarts` model estimate the TFR is 3.21 which is far away from observed TFR but our proposed model estimate the TFR is 2.76 which is more close to the observed TFR. Again for consideration only abortion index in Bongaarts` model the estimated TF is 12.83 which is far away from assumed TF and our proposed model gives the value of TF is 14.99 which is very close to observed TF (15.3). So comparing the estimated values we conclude that proposed model is better than Bongaarts` model.

The study of differential fertility indicates the inverse relationship between age at marriage and fertility; education of women, men (husbands) and fertility; occupation of women, men (husbands) and fertility. We observed that fertility is higher in rural areas. There are several reasons, these include may be the rural women are less educated than urban women; rural women have poor media connection etc. Regional difference reveals that fertility is higher in Chittagong, Sylhet and Barisal than from Khulna, Rajshahi and Dhaka division. Dhaka and Rajshahi division have intermediate levels of fertility. Religion has affect on fertility behavior through Muslims and Non-Muslims. The analysis shows that fertility among Muslims is higher as compared with Non-Muslims in each age group. Several variables, such as, work status of women, women's participation at NGO's suggests that labor force participation may be consequence of lower fertility than non-working counterpart. Women who are involved, with any service are not dependent on men (husbands), both socially and mentally have their own rights and absence of dependence, men cannot forcibly use women to increase their fertility. This has resulted in lower fertility.

Results of logistic regression analysis indicates that place of residence, religion, age at marriage of women, age of first birth of women, women's education, contraceptive use, women's currently working status, pregnancy status, number of living children, access of mass media and involvement in NGO's are the most important significant variables that influence fertility in Bangladesh.

According to the regression, the TFR equals, on average 7.742 births per women in the absences of contraception (CPR=0), and fertility declines at a rate of approximately 1.0 birth per women for each 9% increment in the contraceptive prevalence rate. The regression equation of TFR on CPR

suggests that a TFR of 2.4 births per women can be achieved if the level of CPR will be raised to 61% and if the level of CPR will be raised to 65% it is possible to achieve a target TFR level of 2.1 births per women.

The prevalence rates are computed at the effectiveness levels of 0.85 and 0.90 such effectiveness of contraception has already reached 0.85 in the year 2007. The results indicate that if target fertility 2.6 is to be achieved then the CPR will be raised to 58% and 57% with 0.85 and 0.90 effectiveness respectively. Similarly, if target fertility 2.1 can be achieved the CPR is to be approximately 68% and 66% with 0.85 and 0.90 effectiveness respectively. The result also found that to reach the desired level of target fertility it must increase the use of contraception, duration of breastfeeding, singulate mean age at marriage and amenorrhea period. To achieve replacement level of fertility at 2.1 births per women we should increase the CPR, SMAM, duration of breastfeeding and amenorrhea period by 68%, 20.80 years, 15.5 months and 22.56 months respectively.

CONTENTS

		Page No.
CHAPTER ONE	**Introduction**	1-39
1.1	Bangladesh and its population	1
1.2	Reproductive behavior in Bangladesh	15
1.3	Research Perspectives	17
1.4	Review of Literature	20
1.5	Objectives of the Study	35
1.6	Organization of the Study	38
CHAPTER TWO	**Data Source and Methodology**	40-57
2.1	Introduction	40
2.2	Selection of Sample Size	40
2.3	Sampling Design	41
2.4	Questionnaire	42
2.5	Background Characteristics of Women	43
2.6	Conceptual Framework of the Study	44
2.7	Scope of the Study and Limitation	48
2.8	Training and Field Work for Data Collection	48
2.9	Processing of Data	49
2.10	Methods of the Study	50
CHAPTER THREE	**Fertility Differentials**	58-81
3.1	Introduction	58
3.2	Age at Marriage	59
3.3	Place of Residence	62
3.4	Religion	64
3.5	Region	66
3.6	Education	69
3.7	Working Status of Women	71
3.8	Husband's Education	73
3.9	Women's Participation in NGO`s	76

	3.10	Regional Differentials in Fertility	79
	3.11	Conclusion	81
CHAPTER FOUR		**Fertility Trend: Application of Coale`s Indices**	82-99
	4.1	Introduction	82
	4.2	Trend in Age at Marriage	83
	4.3	Trends in Fertility	85
	4.3.1	Period Fertility	87
	4.3.2	Cohort Fertility	91
	4.4	Analysis of Marital Fertility using Coale`s Indices	93
	4.5	Conclusion	98
CHAPTER FIVE		**Impact of Some Selected Variables on Additional Child in Bangladesh**	100-119
	5.1	Introduction	100
	5.2	Factors Affecting the Demand for Additional Child	101
	5.3	Description of the Model Variables	103
	5.4	Development of the Model	107
	5.5	Empirical Results and Discussion	114
CHAPTER SIX		**Proximate Determinants of Fertility: An Alternative approach of Bongaarts` Model**	120-141
	6.1	Introduction	120
	6.2	The Bongaarts` Model	121
	6.2.1	Index of Proportion Married (C_m)	122
	6.2.2	Index of Non-contraception (C_c)	123
	6.2.3	Index of Induced Abortion (C_a)	124
	6.2.4	Index of Lactational Infecundability (C_i)	125
	6.3	Alternative approach of Bongaarts` model	126
	6.4	The estimated Proximate Variables and	127

6.5	Magnitude of the Total Fertility Inhibiting Effect being accounted for each Proximate Determinant	129
6.6	Decomposition of the Change in Fertility and Contribution of Proximate Variables	131
6.7	The Inhibiting Effect of Marriage on fertility	135
6.9	Conclusion	140
CHAPTER SEVEN	**Estimation of the Factors Associated with Target Fertility**	142-156
7.1	Introduction	142
7.2	Aim of the chapter	142
7.3	Target setting Model of CPR required to achieve TFR	143
7.4	Analysis of Results	145
7.5	Mean Age at Marriage and Total Fertility Rate	148
7.6	**Target** C_m, C_i & C_{fw}	150
7.7	Estimated duration of breastfeeding (B) for target fertility with given value of amenorrhea	155
7.8	Conclusion	156
CHAPTER EIGHT	**Summary, Limitations and Policy Recommendations**	157-167
8.1	Overview of Major Findings	157
8.2	Limitations of the Study	165
8.3	Policy Recommendations	167
	BIBLIOGRAPHY	168-180

List of Tables

Table No.	Title	Page No.
3.1	Average number of children ever born per ever-married women by age and age at Marriage: Bangladesh	60
3.2	Average number of children ever born per ever-married Women by age and urban-rural Residence: Bangladesh	62
3.3	Average number of children ever born per ever-married women by age and women's Religion: Bangladesh	65
3.4	Average number of children ever born per ever-married women by age and Regions: Bangladesh	67
3.5	Average number of children ever born per ever-married women by age and women's Education level: Bangladesh	70
3.6	Average number of children ever born per ever-married women by age and women's current working status: Bangladesh	72
3.7	Average number of children ever born per ever-married women by age and Husband's Education level: Bangladesh	74
3.8	Average number of children ever born per ever-married women by age and women`s participation of NGO`s :Bangladesh	76
3.9	Regional Differentials for some selected characteristics: Bangladesh	80
4.1	Singulate mean age at marriage for the women of Bangladesh, indicated years obtained from different sources	84
4.2	Crude Birth Rates: Bangladesh, 1975-2009	86
4.3.1	Age-specific Fertility Rate, per 1000 women of age 15-49, selected sources, Bangladesh 1975-2007	88
4.3.1(a)	Total fertility rates, Bangladesh 1975-2007	90
4.3.2	Trends in Mean Number of Children ever born per ever-	92

	married women, Bangladesh 1975 to 2007	
4.4	Estimated value of Coale`s Indices (I_f, I_m, I_g) in different time point for Bangladesh and their changes	96
5.1	Logistic regression estimates of the odds ratios $[Exp(\beta)]$ of background characteristics of ever-married women of reproductive age 15-49 in Bangladesh: Data from BDHS 2007	112
6.1	Estimated different reproductive measures and indices of fertility, Bangladesh 1975-2007	128
6.2	Trends in the Magnitude of the Total Fertility Inhibiting Effect being accounted for each proximate variable, Bangladesh 1975-2007	130
6.3	Decomposition of changes in TFR by different measures and indices, Bangladesh 1997 to 2007	133
6.4	Decomposition of changes in CBR by different measures and indices, Bangladesh 1975 - 2004 and 1975 - 2007	135
6.5	Estimation of the Effect of Marriage Pattern on Fertility	136
7.1	Observed TFR and CPR from 1979-2007 and Excess Fertility (TFR) Bangladesh	145
7.2	Estimated Contraceptive Prevalence level require to achieved Target Fertility with given level of Contraceptive Effectiveness relative to base year 2007 (in 2007 TFR = 2.7, CPR = 0.56, e = 0.849)	146
7.3	Estimated CPR and TFR	147
7.4	Female mean age at marriage (MAM) and total fertility rate (TFR) for different time periods, Bangladesh 1975 to 2007	149
7.5	Estimated mean age at marriage with given value of Target fertility	150
7.6	Estimated values the indices of C_m, C_i, C_c and C_{fw} with given value of Proportional Reduction in Fertility for targeted TFR.	152

7.7 Estimated duration of breastfeeding (B) and amenorrhea period with given value of Target fertility 155

List of Figures

Table No	Title	Page No.
3.1	Average number of children ever born per ever-married women by age and age at Marriage: Bangladesh	61
3.2	Average number of children ever born per ever-married women by age and urban-rural Residence: Bangladesh.	63
3.3	Average number of children ever born per ever-married women by age and women's Religion: Bangladesh	65
3.4	Average number of children eve born per ever-married women by age and women's Region: Bangladesh	67
3.5	Average number of children ever born per ever-married women by age and women's Education level: Bangladesh	70
3.6	Average number of children ever born per ever-married women by age and women's Current working status: Bangladesh	72
3.7	Average number of children ever born per Ever-married women by age and Husband's education level: Bangladesh	75
3.8	Average number of children ever born per ever-married women by age and women's Participation of NGO's: Bangladesh	78
4.1	Singulate Mean age at marriage from 1975 to 2008, Bangladesh	85
4.2	Crude birth rates Bangladesh 1975 to 2007	87
4.3.1	Age-specific fertility rates, per 1000 women of age 15-49, Bangladesh 1975 to 2007	89
4.3.1 (a)	Total Fertility Rates, Bangladesh 1975-2011	90
4.3.2	Trends in Mean Number of Children Ever Born (CEB) per ever-married women by age group, Bangladesh 1975 to 2007	93

4.4	Estimated values of Coale's Indices (I_f, I_m, I_g) in different time points for Bangladesh and their changes	97
7.1	Trend the index of Proportion married with given level of Target Fertility	153
7.2	Trend the index of Non-contraception with given level of Target Fertility	153
7.3	Trend the index of Lactational Infecundability with given level of Target Fertility	154
7.4	Trend the index of Fetal wastage with given level of Target Fertility	154

Chapter-One

Introduction

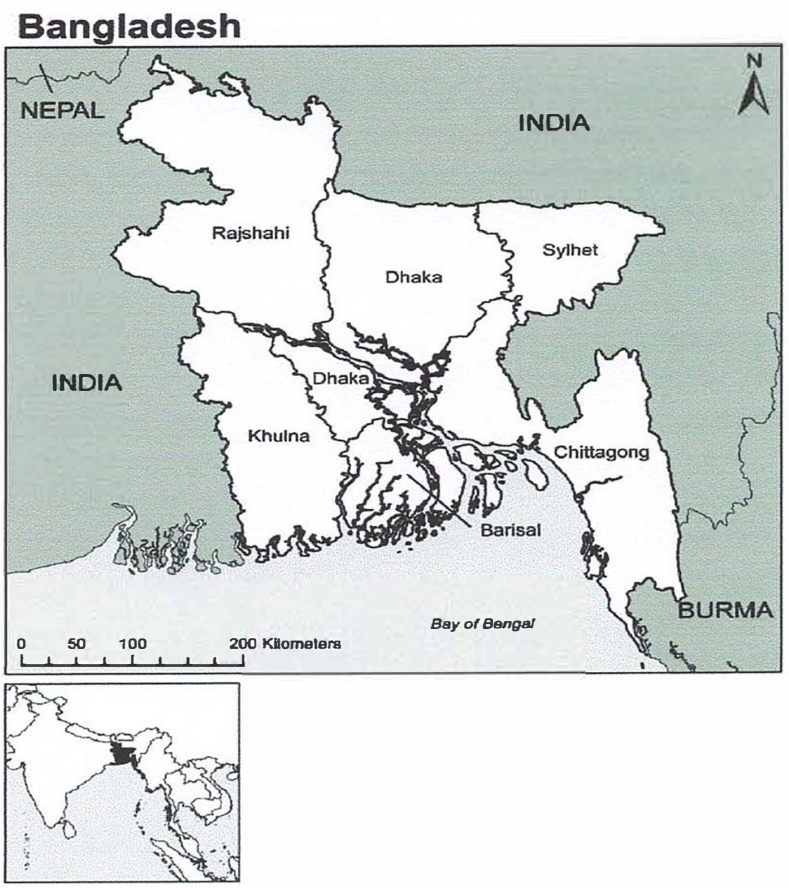


Figure: Map of Bangladesh

Chapter-1

Introduction

1.1 Bangladesh and its population:

Geographical Setting:

Bangladesh is unitary, independent and sovereign Republic as the People's Republic of Bangladesh. She is located in the northeaster part of South Asia. It covers an area of 147570 square kilometer with almost entirely surrounded by India, except for a short southeastern frontier with Myanmar and a southern coastline on the Bay of Bengal. It is situated between latitudes $20^0 34'$ and $26^0 38'$ north and longitudes $88^0 01'$ and $92^0 41'$ east.

During British rule, Bangladesh was a part of India. In 1947 the independent states of Pakistan and India were created with the present of Bangladesh territory as a part of Pakistan, Bangladesh emerged on the world map as a sovereign state on March 26, 1971 after fighting a nine month war of liberation, which was ended on December 16, 1971.

Bangladesh mainly consists of low, flat and alluvial soil. The most significant feature of the extensive network of large and small rivers that are of primary importance to the socioeconomic life of the nation. Chief among these, lying like a fan on the face of the land, are the Ganges-Padma, Brahmaputra, Jumuna, Magna, Teesta, Surma and Karnaphuli (total 230 rivers including tributaries) rivers. The weather of Bangladesh is dominated by seasonal monsoons. The country experiences a hot summer season with high humidity from March to June; a somewhat cooler but still hot and humid monsoon season from July through early October; and a cool, dry winter from November to the end of February. The climate variation: in winter (November-February) temperature average maximum 29^oC and average minimum 11^0C, summer (March-June) temperature average maximum 29^oC and average minimum 34^0C, and

average rainfall 1194 mm to 3454 mm (BBS 2005; statistical pocket book p-5; November 2006). The fertile is frequented by natural calamities such as floods, cyclone, tidal bores, and drought. The physical geography of Bangladesh may be considered in term of two principal divisions: the flat alluvial plain comprising most of the country and the much smaller area of the Chittagong district and Chittagong Hill tracts in the south-East. The alluvial plain of Bangladesh. This constitutes about eight percent of the greater plain of Bengal lies between the Indian foothills of the Himalayan Mountains on the North and the Bay of Bengal on the South. It is often regarded as deltaic in its entirety, making it the largest delta in world. The land characteristics if the Bangladesh plains from North to South have sometimes between summed up by geographer as "old mud, new mud and marsh". Most elevations are less than 30 feet about sea level, although, altitude up to 350 feet occur tin the northern part of the plain (Richard F. Nyrop, et. al, 1975).

During the summer monsoon (mid-May to mid-October) rains dominate the seasons in Bangladesh. The rainfall is high and falls in the range of 140 centimeters to 200 centimeters. The mean maximum temperature is 34^0C (in July) and tem mean minimum temperature is 11°C (in January). These factors make the Climate very unpleasant with high relative (Johnson, 1975). Despite the return of sunny skies the uncomfortable hot humid weather persists up to October. Because of rain and flooding there is a super-abundance of standing water and this excess. Moisture helps to maintain unpleasantly sticky atmosphere. The coastal regions of Bangladesh are subject to damaging cyclones and floods almost every year.

For administrative purposes, the country is divided into 6 divisions, 64 districts, 476 upazila, 556 thana, 298 Municipalities, 4488 union (Source: LGRD Ministry and Police Headquarter, 31th December ' 2005, statistical pocket book, p-3; Published November 2006). Muslims constitute almost 90 percent of the population of Bangladesh, Hindus constitute about 9 percent and others constitute about 1 percent. The national language of Bangladesh is bangle, which is spoken and understood by all.

The national anthem of Bangladesh comprises the first ten lines of " Amar Sonar Bangla' of Rabindra Nath Tagore.

The national flag of the Republic consists of a circle coloured red throughout its area, resting on a green rectangular background. The length to width ratio of the rectangle is 10 : 6 and the circle has a radius of one fifth of the length. It center is placed on the intersecting point of the perpendicular drawn from the nine-twentieth part of the length of the flag and the building are: 305cm×183cm, 152cm×91cm and 76cm×46cm and for cars are: 38cm×23cm and 25cm×15cm.

The national emblem of the republic is the flower "Shapla" (Nymphaea mouchali) resting on the water having on each side an ear of paddy and being surmounted by three connected leaves of jute with two stars on each of the leaves.

The capital of the republic is Dhaka. Currency of the country is known as Taka (Tk). The citizens of Bangladesh are known as Bangladeshis.

Ethnic and Religion:

Ethnically, Bangladesh is homogeneous, having only one major ethnic group (98.5%) known as Bengalese. There are some ethnically different tribal people in the hilly regions of the country constituting 1.2% Islam is the predominant religions of with 90%, Hinduism about 9%, and others constitute about 1% (Bangladesh Population Census Report, 2001). the country is more or less culturally homogeneous. The national language of Bangladesh is Bangle, which is spoken and understood by all.

Agriculture and Economy:

Agriculture is the important sector of the nation's economy. It account for 22% of the gross domestic product (GDP). The sector also account for around 48% of the labor force (BBS, 2008b). The average per capita income is as low as US$599 during the fiscal year July 1, 2007 – June 30, 2008, mainly due to remittances from citizens working abroad. If average per capital income were to reach US$750, Bangladesh would progress from its present least development country (LDC) status to a middle

income economic (LANS, 2008). Rice, wheat, Jute, sugarcane, tobacco, oilseeds, potatoes, and specs are the principal crops. Jute is the main non-food crop and the main cash crop of Bangladesh (are but now it place of Garments industry, 1998). Less than 20% of the cropped land areas used for crops other than Jute and rice (BBS, 1997a: 187, 188). Bangladesh produces about 1,057,000 metric tons of superior quality jute annually and 16% of export earnings come from raw-jute manufactures (BBS Report, 2001). The country produces about 51 million kilogram of tea per year, a sizable quantity of which is exported to foreign markets after meeting the internal demand. Principal industries are Jute and cotton, textiles, garment making, tea processing, paper, newsprint, cement, chemical, fertilizer, light Engineering, sugar. Principal minerals are: Natural gas, lignite coal, limestone, ceramic clay, and glass sand. Principal exports are: Ready made garment, raw jute, jute manufactures, tea, fish, hides and skins and newsprint. Industry, although small, is increasing in importance as a result of foreign investments, employment/underemployment is a serious problem, and pressure on the land in rural areas has led to movement of people from rural to urban areas.

Population size, growth, fertility, mortality:

Bangladesh has a population of about 140 million, with a corresponding population density of more than 900 per square kilometer. It is the most densely populated country in the world. According to the 2001 census, 39 percent of the population is under 15 years of age, 57 percent are between 15 and 64 years, and 4 percent are age 65 or over (BBS, 2003:51). This young age structure constitutes built-in "population momentum," which will continue to generate population increases well into the future, even in the face of rapid fertility decline. The population projections indicate that the population will increase rapidly even after attaining replacement-level fertility because of the echo effect of the high fertility experienced in the past.

The Bangladesh population policy indicates that the population should stabilize at 210 million by 2060, if replacement-level fertility is reached by 2010. This estimate of

population size reasonable consistent with the World Bank projections from 1994 (Bos et at., 1994), and United Nation projections 1996 (United Nation, 1996), both of which estimated a mid-21st century population of 218 million. However, there is wide disparity between the estimates of the Bangladesh Government and others on the time when the population would stabilize. The World Bank boldly forecast a final stationary population of 263 million by mid-22nd century (2150), whereas others have not projected beyond the mid-21st century. Recently however, the United Nation has revised there estimate for 2050 by 25 million (or 11 percent) to 243 million, apparently on the basis of the decade long fertility plateau (United Nation, 2004).

This recent and very substantial upward revision of the mid-century population by the United Nations seems unduly pessimistic because of five-year delay in Attaining replacement-level fertility adds only 3 percent to the population at any Point of time. Nevertheless, Bangladesh still faces many decades of continued population growth, and effects to slow that growth need to continue, through the family planning program and increasingly, through social and health interventions that will facilitate further fertility decline, so that progress towards economic development is not hindered.

Bangladesh has undergone a remarkable demographic transition over the last 35 years. In 1971-1975, women in Bangladesh were having on average 6.3 children. Total fertility rate (TFR) declined to 5.1 fifteen years latter and to 4.2 in 1989-1991.The TFR plateau at around 3.3 for most of the 1990s, when the three earlier BDHS surveys took place. The Bangladesh fertility rate has declined slightly to 2.7 children per women (BDHS, 2007). Comparison of the Bangladesh TFR, with fertility rates in other Asian country that have implement a demographic and health survey (DHS), indicate that, with a TFR of 2.7, Bangladesh is in mid rage among the countries below Nepal (4.1 in 2001), Cambodia (3.8 in 2000), and Philippines (3.5, in 2003), but above India (2.8 in 1998-1999), Indonesia (2.6 in 2002-2003) and Vietnam (1.9 in 2002).

Moreover, fertility rate is higher in rural areas 2.8 children per women and in urban areas 2.4 children per women (BDHS 2007), a pattern that persisted in various

censuses and demographic surveys that have been carried out in the country. The total fertility rate is highest in Sylhet division 3.7 and lowest in Khulna 2.0, the fertility rate for Dhaka and Barisal division are same which is 2.8, Rajshahi 2.4 and for Chittagong 3.2 (BDHS, 2007). The total fertility rate has declined dramatically from high level of 6.3 births per women in 1975 to 2.7 births per women in 2007. The infant and under-five mortality have also decreased over the period and life expectancy has increased substantially. Several Researchers argued that the fertility decline in Bangladesh was achieved primarily due to a successful family planning program (Cleland, 1994; Caldwell et al., 1999; Islam et al, 1998) that succeeded in raising the contraceptive prevalence rate (CPR) from a low level of 8 percent in 1975 to as high as 36 percent in 2007 (Mitra et al., May 2007.

Bangladesh women have a pattern of early childbearing. The age specific fertility rates (ASFR) indicate a pattern of early child bearing, with a peak at age group 20-24. According to current fertility rates on average, women will have 23 percent of their before reaching age 20 and will complete 55 percent of their childbearing before age 30 (BDHS, 2007).

The crude birth rate (CBR) for the whole country is 26.1 (BDHS, 2007) birth per 1000 population. The crude death rate (CDR) has fallen dramatically, from about 19 per 1000 population to 5.9 (Sample Vital Registration System 'SVRS', BBS; p-139; Published November 2006). Although infant and under-five mortality rates are declining, they are still high. The infant mortality rate less than five was 150 death per 1000 live birth in 1975 and fall to 53 (SVRS, BBS; November 2006).

Maternal mortality rate (MMR) has come down from 4.7 death per 1000 birth in 1991 to 3.8 in 2003 (SVRS, BBS; November 2006). This small but important decline is mainly attributed to increased availability of family planning and immunization services, improved antenatal and delivery care and a reduction in the number of births to high-risk mothers. Because of fertility decline, there is evidence of modest improvement in life expectancy during the past period. Life expectancy at birth was

56.5 years for female in 1991 (BBS, 2006). It increased to 64.3 years for male and 65.4 years for female in 2003 (SVRS, BBS; p-141; statistical pocket Book 2005).

Striking change has been observed were asked how many children they would ideally like to have, the response was an average of 4.1 children (Huq and Cleland, 1990:53, 54). The desire for additional children declined noticeably in Bangladesh over the past decade. For example, the percentage of women with two children who want no more children has risen from only 48 percent in 1991 to 60 percent in 2007 (Mitra et al., 2009). Conversely, in 1991, 45 percent of married women with two children wanted to have another child in future (BDHS, 1993-94); in the 2007 BDHS surveys the proportion is only 16 percent.

Over population or high density is one of the most important causes for both low and deteriorating living condition in Bangladesh Population is still growing and the situation is worsening with every passing year. Begging fully aware of the detritus effect of such rapid growths, the government of Bangladesh has declared population a problem of great importance and identified it as the number of one problem in the agenda of governmental duties and functions.

Family Planning Program:

Family planning program in Bangladesh have considerable impact on the practice of contraceptive and consequent in the reduction of fertility. A major cause of declining fertility in Bangladesh has been the steady increase in contraceptive use over the last thirty years. The contraceptive prevalence rate (CPR) has steady grown in Bangladesh since 1975, only eight percent of currently married women reported using a family planning method, as compared with 53.8 percent in 1999-2000 BDHS (Mitra et al., 2001), with 58 percent in 2004 BDHS survey (Mitra et al., 2005) and with 56 percent in 2007 BDHS survey (Mitra et al., 2009). The most commonly used modern is the pill (28.5%), followed by injectables (7%). Female sterilization and male condoms are used by 5% and 4.5% respectively; While Norplant, the IUD, and male

sterilization are each used by only one percent, Perodic abstinence, used by seven percent of married women, is the most commonly used traditional method.

Among ever-married women, the most widely known methods if family planning are the pill 100 by the IUD (85%), Norplant (76%), male sterilization (73%), periodic abstinence (70%), injectables (99%), female sterilization (96%), and condom (92%); these are followed (70%), and withdrawal (58%). Since overall knowledge of contraceptive methods was already high in 1999-2000 BDHS, little change has taken place. However knowledge of Norplant has increased from 56% to 77% among currently married women.

As in the 1999-2000 BDHS, majority of ever-married women and currently married men embrace the two-child family as ideal 2.4 and 2.3 children respectively. Both the ever-marred and currently married women who gave numeric response, the mean ideal family size are 2.4 children. Among all men, ideal family size ranges from 2.1 for those with one or two children to 2.6 for men with at least six living children. Slightly more men prefer a two-child family than women do. For currently and ever-married women, there has been no change at all in the mean ideal family size over the last ten years (2007, BDHS).

Differentials of contraceptive use:

Women in urban areas are slightly more likely to use contraceptive methods (62%) than their rural counterparts (54%); Howe ever, the condom is the only method that shows in use by urban-rural resident: 9.5 percent in urban areas compared with only 3.1 percent differentials in rural areas. Use of any method varies from 31.5 percent in Sylhet and 43.9 percent in Chittagong to 63.1 percent in Khulna and 65.9 percent in Rajshahi. Contraceptive prevalence is 56.3 percent in Barisal and 56.4 percent in Dhaka. The proportion of women using contraceptive increases with increasing number of children. Women with no children are currently using 19.1 percent contraceptive method, compared with 66.1 to 55.9 percent of women with two or more children. However, women in economically better-off households tend to use

family planning 63 percent and those in households in the lowest wealth quintile 54 percent. There is also a little variation in contraceptive use by level of education.

Out of hundred, 57 percent contraceptive users in Bangladesh, stops using their methods within one year of starting. The most common reason for discontinuation is side effects or health problems. Discontinuation rates are highest for condoms 76 percent and lowest for periodic abstinence 67 percent. Eleven percent of married women and withdrawal have an unmet need for family planning unmet need is about equally divided between spacing and limiting births. Unmet need declined from 15% in 1999-2000 to 11% in 2007. It has remained high in Sylhet division 21 percent while dropping substantially in Rajshahi 7 percent, Khulna 8 percent. Overall, 84 percent of the demand for family planning is currently being met

Breastfeeding Practices and Nutritional Status:

The 2007 BDHS, result document an exceptional long duration of breastfeeding, with median duration of any breastfeeding in is 32.8 months, which has not changed since 2004 BDHS. The median duration of any breastfeeding is five month shorter in urban areas than in rural areas. It is longest among children living in Rajshahi and Khulna divisions (37 months and 36 months respectively) and shortest in Sylhet and Chittagong divisions (28 months and 26 months respectively). The duration of breastfeeding trend toward shorter since 1993-94. The median duration of breastfeeding has declined from 36, month in 1993-94 to 33 months in 1996-97 and 31 months in 1999-2000 (Mitra et, al., 132; 132; 1994:120). Exclusive breastfeeding of children under six months based on 24-hour period before the survey has not improved in the past 10 years: it remained unchanged at around 45 present between 1993-94 and 1999-2000 and has declined to 42 percent most recently.

Supplementary feeding of children who are also breastfeed has greatly improved over the decade. In 1993-94, only 29 percent of children age 8-9 months received complimentary foods while being breastfed, compared with 64 percent in the last BDHS report. The most commonly used complementary foods are rice, wheat, and

porridge (over 60%), 20 to 25 percent of the children in this age group received other complimentary foods e.g., fruits, meat/fish/eggs and green leafy vegetables: a smaller proportion received dal. Feeding children with a bottle with a nipple starts very young and 30 percent infant age 2-3 months receive some food this way. Also commercially produced baby formula is more popular than it was at the time of the 1999-2000 BDHS.

According to the 2007 BDHS, which measure all children under five in the household, 43% of children are stunted and 17% severely stunted. Thirteen percent of children under five are wasted and 1 percent severely wasted. Forty eight percent of children under five are underweight, with 13% severally underweight. Comparison of children under five whose mothers were interviewed shows that in spit of the fact that child nutritional level showed a substantial improvement from 1996-1997 to 1999-2000, since then no noticeable improvement has occurred except that the severe stunting has slightly decreased and overall wasting has increased from 10 to 13 percent.

The mean height of Bangladesh women is 150.4 centimeters, which is above the critical height of 145 centimeters. A high proportion of women (15%) are below 145-centimeters. About 59 percent women are considered to have normal BMI (18.5<BMI<25). Thirty percent of women were found to be chronically malnourished, their body mass index (BMI) being less than 18.5. Twelve percent women were found to be overweight or obese (BMI 25 or higher). A women's place of residence, level of education, and household wealth quintile ate strongly associated with her nutritional status. Among divisions, Sylhet has the height proportion of women who are thin (48%) and household wealth quintiles are strongly associated with her nutritional status. Among divisions, Sylhet has the highest proportion of women with children under five years are not getting taller, there is a substantial improvement for mother nutritional status as measured by BMI. Since 1996-97 the proportion of mothers below the cutoff point of 18.5 continued to drop, from 52 percent in 1996-97 to 38 percent in 2007 a decline of 27% in less ten years. The above results show that malnutrition is a serious problem in Bangladesh.

Marriage:

In Bangladesh, marriage means the prescribed legal union between a man and women, establishing them in new social roles as husband and wife. Pre-marital cohabitation does not exist and it is looked upon as a social evil. Marriage is a desirable event and a universal phenomenon in Bangladesh. Early marriage for women in Bangladesh is widespread and most of them become married by the time they are age of 15. Although the legal age for marriage is 18 for women by the law of our country. In rural Bangladesh, there is a common belief that a girl aged 20 years is too old to marry. Constraint on marriage that did not exist before are, however, now making an appreciable change-shortage of land, unemployment, etc. also marriage among the highly educated elite is becoming less desirable as they are capable of making themselves free from the contractually of arranged marriages. As early as possible a girl must to go her husband's households. For parents a past puberty unmarried daughter is considered daughter because of the secret desire to indulge in illicit coitus that might be in their daughter's mind, which may result in social scandal and for which the parents must be socially condemned and have to face rancor and social boycott. If a daughter's marriage is delayed the parents feel guilty and being to think of her as a burden. Parents of girls who can arrange early marriages for their daughters feel very proud.

A mature girl may cherish illusive fatness about events related to sexually pleasure and wishes to find a husband as soon as possible so that she can comfortably establish a happy home with children and can lead a life with proper rights and esteem. Whenever a mature unmarred girl finds that friends in her age group friend ate marred she becomes unhappy and wishes to be marred soon and like her friend she wants to have a husband, children and her own happy home where she can legitimatize her prestige. Men and women who never marry are excluded from many social activities, which make them feel that they have somehow failed to get a partner. Socially they are

stigmatized due to their unusual marital status (Aziz et.al, 1985; Malonuy et. at, 1981; 1990)

For the man, age at marriage is not rigidly determined but is usually decided by his ability to independently support a family. If he is the eldest or the only son, he will be expected to get marrying early. Traditionally, the main occupation is cultivation and the eldest son inherits or shares his father's land. Therefore, employment outside the family is not an important criterion for marriage for the son. Marriage in Bangladesh in mostly arrange by the father and other relatives or guardians. Usually parents or in the absence of parents, close elderly relatives, approach him/her for his/her consent to a proposed marriage. The young man/girl passes on his/her opinion through a friend. While the selection is made by the parents or near relatives, the consent of both partners, that is, the bride and bridegroom, in front of witnesses is witnesses is essential for the marriage to be considered valid.

Islam, which is the predominant religion of Bangladesh, attaches great importance to the family by strengthening the ties binding its members and safeguarding it against undermining influences. Hence marriage is considered an important social institution and is almost universal in Bangladesh. In the Islamic sharia or law, marriage is obligatory for persons who are able to cope with its financial burdens. There are certain restrictions that must be followed in finding a suitable spouse according to Islamic law.

The marriage ceremony usually takes place at the house of the bride or a place mutually decided on by families of the bride and groom. The actual marriage ceremony is usually performed by the Kazi (according to Islamic rites). In this ceremony, assent to marriage is obtained directly from the groom in case of the bride; this is obtained from her representative, known as Ukil. Two male witnesses are required to validate the legal aspect of the marriage. In Islamic, marriage is considered a contract and the terms are required to be fully documented on Nikah Namma (registration from). According to the Muslim Family law ordinance of 1961, the

following information is to be recorded on the marriage registration form: (i) year of marriage (ii) name of the locality (union/town committee) (iii) age of bride and groom (iv) marital status of the bride at the time of the marriage (v) date of marriage according to the Arabic calendar (Afzal et. al, 1971).

According to the Muslim marriage, a husband is required to give a certain amount of Mahor to his wife at the time of marriage (Afzil et, al. 1971). The balance of Mahor is in any case required must be paid with or without divorce for the marriage to be legal. She has the right to forgive all or some of the unpaid if she wishes. The amount is decided taking into consideration, among other things, the social positions of the bride and the groom. The law of dower is drawn directly from the Holy Quran where it is stated: "As the women in marriage surrender her person, so the man must also surrender besides some of his independence at least part of his property according to his means".

Since marriage under Muslim law is a contract, divorce is allowed. Under the traditional Muslim law, divorce can be obtained in one of the following ways:

(i) By mutual consent of the husband and the wife without the intervention of the court.

(ii) By a judicial decree at the suit of the wife and

(iii) By the husband at his will by simply pronouncing the intention to do so in front of witness, without the intervention of the court.

In the case of divorce, the husband has sole claim over the children, if any. Remarriage following divorce is permissible by law but a divorce person finds it difficult to find a suitable spouse. A strong social stigma exists in marrying a divorced person. Usually a divorced women, if she marriages, will marry a divorced or widowhood man or an old man who has never married.

The marriage law and customs of the Muslims who constitute about 90 percent of the total population have been discussed briefly so far. There is a little need then, to draw attention to some aspects of marriage customs and laws of the Hindus, who constitute

about 9 percent of the total population. The Hindus marriage system differs from the Muslim's marriage system in come respects and marriage usually takes place within a caste. It may be mentioned that there are four main castes among the Hindus. Marriage arrangements are, however, in similar in both the Islamic and Hindus religions in Bangladesh, having been influenced by local custom (D' Souza, 1979).

The practice of paying dowry to the bridegroom in cash or kind is prevalent among both Muslims and Hindus. Among the Hindus, the bridegroom is also required to pay a certain amount known as pan or price to the father of the bride. The pan is fixed through the negotiation by the bride and groom and partly depends upon social position. Pan is the social practice. Hindus marriage ceremony is eternal and need not be registered. Divorces are very rare among the Hindus in India and Bangladesh (D` Souza, 19979). Usually separate is the alternative to divorce for the Hindus. If a divorce happens, a man has to bear all necessary expenses of his divorced wife until her death. She still remains a claimed of his property. Marriage of a widow was prohibited for many centuries in the Hindu religion. It is still discourage and thought to be something evil in the society although many social leaders have fought for the cause of remarriage for widows. On the other hand Hindu widowers can marry a single woman. Among the Hindus, polygamy is permissible with the consent of the first wife (Krishnamorthy, 1977).

A match-maker plays a vital role in Bangladesh marriage. He is the media of communication between the two parties involved and any query or demand has to be passed through him. On many occasions he has to face attacks and counter-attacks from both sides. This is a thankless job, but without a match-maker intervening, marriage negotiation is almost unthinkable in both rural and urban Bangladesh.

After the independence from Pakistan, political leader thinker began to be aware of the growing population problems. But they had a long wait unit the people realized that legal action was needed to rise the minimum age at first marriage. The Muslim family law ordinance was passed in 1961 requiring registration of all Muslim marriages. The sarda act was amended rising the minimum age of marriage for females from 14 to 16

years and for males from 18 to 21 years. But in actual practice on action was taken for the violation of the ordinance so far as age at marriage was concerned. In the absence of a vital registration system it is difficult to implement the law, as there is no way to challenge the age as stated by a person. The Bangladesh Population Council has recommended that a proposal should be developed in due course to rise the age at marriage giving due consideration to the existing socio-economic condition of the country (Population Control and Family planning Division, 1976). Its recommended age at marriage for females is 18 to 25 years and for males 20 to 28 years.

The University Marriage and low age at marriage is related to the religious affiliation and lower status of females in the society. Pre-marital sex is strictly prohibited and unacceptable in this society. Bangladesh remains desperately a poor country, despite some signs of improving condition. Even through some improvement have been made over the last two decades, most Bangladesh remain uneducated and malnourished. Most agricultural holding are small and increasing becoming smaller and income inequality is growing.

1.2 Reproductive Behavior in Bangladesh:

Bengali peasantry culture is suffused with a pro-fertility ethos, which evolved over 3,000 years of adaptation and symbolic relationship between man and the land. The culture has become highly successful in its ecological setting. The various great religions are superimposed but rural beliefs about fertility and the human body are more fundamental and cut across them.

Human fertility and fertility are analogous. A woman is the field and her juices nourish the seed before birth and by her milk after birth.

Muslims commonly say that every mouth brings its own food, and can indefinitely support those souls to be born. Such pro-fertility beliefs were at one time functional, but because life expectancy is now over 65 years, they have become dysfunctional. It is thought by Muslims to be a moral duty to have and raise children and to increase one's kinship and lineage groups. The bodily substances shared by the breeding group are said to be transmitted by the male semen and female, which mix at conception.

Muslim consistently has higher fertility than Hindus and give negative advice about population control twice as much as Hindus. But these differences have disappeared through motivation. The most fertile group is the rural middle class and urban labor class, who are mostly Muslim cultivators. There higher fertility is not just because of religious affiliation, but because they are enmeshed in the matrix of peasant life that evolved with a pro-fertility bias.

It is believed that one's fate is written on one's forehead at conception, or that at birth, Allah determines fate before the soul is sent to the fetus. God controls the four main aspects of living: life, death, wealth, and sustenance. There are two kinds of fate-unchangeable and changeable-and Muslims seeks god's favor for the changeable fate on the night of Shab-e-Barat. The concept of karma is actively assented to by Muslims and Hindus: one's deeds, especially bad deeds, will affect the doer.

The number of one's children, thus, is pre-determined by God is allocated accordingly. It is a culture expectation that people should affirm this. Stated dependence on God for number of children is statistically correlated with higher fertility, early marriage, and stricter purdah, more prayers, less abortion, negative advice on population, and negative opinion of religious leaders on family planning and less use of modern contraceptives.

Having children is a compulsory duty in Islamic tradition and children must be raised in the religion: this is also advocated in Hindu tradition. Muslim say if there are several sons one can be given for religious education. Many children will have more voices to praise god and in the day of the judgment, the prophet will be pleaded to see king line of worshipers. Children have a duty to care for the parent's funerals. An infant who dies innocence will plead in heaven for its parents to be let in. The female is blamed for childlessness, like a barren field without nutrients. Children are needed for old age support and this need may be increasing with more landlessness. Children who do not support aged parents are said to be beasts and accursed. Sons are more desirable and more of them bring diversity of income and make the kinship group large and strong, but daughters require dowry to be married.

Among the reasons for people wanting more children, the first is sex preference. Sex preference operates as a relatively stronger reason for waiting more children among female than among male. Most people want several children for undefined personal fulfillment, which is couched in terms of moral duty, family prosperity or future support. When there will be an increase in the level of happiness and convenience. If one does not have children, this possession of property is meaningless.

A male child is favored. If the males in a family are few then the size of the lineage segment (bangsa) becomes small. Makes are future earners, but females are economically unproductive. Parents have to spend a lot on arranging marriage of daughters. So for economic reasons a male child is preferred. Nowadays a girl is viewed as a problem in family. If parents could control the sex of children born, then more couple would decide to have a male child first. A son is essential for continuity of the lineage and old age security.

1.3 Research Perspectives:

Bangladesh is one of the developing countries which have been experiencing accelerated population growth in recent decades. The ever-growing population is putting severe constraints on national effort to improve the overall living conditions of the people. The high rate of growth is presumably due to sustained high level of fertility and declining mortality as in other developing countries. High population growth in the recent decades in the world, in general, in the developing countries in particular, has drawn attention of several researchers because of its indirect relationships with and important bearing on the socio-economic development. There is now a general recognition that rapid population growth in developing countries is jeopardizing all the developmental effort in ameliorating the socio-economic condition in this country. For large increase in population of limited land space as that of other resources would not only lead to an increasing presser on land but also may create ecological imbalance.

Moreover, sustained population growth, ceterisparibus, means more consumption, less saving, high social overhead cost, less investment, reduced output per worker, less job opportunities all leading to vicious circle of poverty and fatalism (coal and Hoover; 1958;kuzntes, 1969; Demney, 1972; 154; Mueller, 1977; Birsall, 1977).

Planner in the developing countries previously maintained that, like the presently developing countries of the world, it would be possible to make socio-economic development without taking into cognizance the population variable. But they proved to be not correct because the initial conditions (law rate of natural increase, high man/land/resource ratio etc). Which helped the developing countries in maintaining balance between population growth and development were quite different from those now prevailing being taken into account in formulating socio-economic planes and developing strategies and policies in order to promote balance and rational development.

Population growth is the resultant of three component- fertility, mortality, and migration as such any change in the growth rate can be brought about by manipulating any all of a combination of these components. The possibility to bring down population growth by migration seems to be bleak, because of imposed restrictions on migration, as also the possibility by raising the mortality (no moral grounds). Thus, it appears that, fertility is the only variable which may have to be manipulated by policy interventions in order to reduce population growth (N, A. S., 1971: 70-92; 1973: 631-660).

Thus "the problematical condition of fertility and the prospects for their change" (U. N. 1979: 57). Thus has made the study of fertility so important in recent years. Human reproductive is influenced by social, economic, psychological, genetic, and cultural factors interacting with each in a complex manner. As Simon and Saunders (1977:85) point out "genetic and physiological factors set condition that make reproduction both certain and limited. Social and psychological forces determine to a large extent when and where it will occur".

Thus with equal level of development other determining factors may cause variation in the fertility level among nations and even among regions within the same nation. Moreover, socio-cultural consideration may be pre-determining the economic considerations in some countries or region in determining the level of fertility in contrast of others. Thus, study of fertility and its determinants is the prime importance not only for its own sake, but also in understanding the mechanism through which it works and its subsequent relationship with other components of the population growth and related matters.

In explaining the decline of fertility in the developed countries Ryder maintains that low fertility has been achieved in Western Europe through four transitional phases: high nuptiality-high marital fertility: low nuptiality high marital fertility; low nuptility-low fertility; high nuptiality-low fertility; where as Eastern Europe has cut the sequence by omitting the two intermediate stages (Ryder 1967; 300).

Coale asserts that the presently low fertility countries achieved this stage by employing both mulhusion and Nio-Mulhusion methods of fertility regulation (Coal, 1967: 205-209). Hence, age at marriage and proportion marrying occupy a very important place in studies related to policy intervention for reducing fertility in countries with sustained high fertility like Bangladesh (Duza and baldin, 1977; Norman and Hofstatter, 1978).

Level and patterns of fertility consideration vary in various sub-groups of the same population. Study of differential fertility is useful in identifying the factors, which determine fertility levels among various subgroups. It is also helpful in projecting more accurately population size of entire country. Not only can this but such a study which family planning programs can be concentrated.

There are several factors, which are responsible for differential fertility. Moreover, assessment of the extent of differences among various groups in a population is often the first step in identifying the important determinants of fertility behavior. Information on fertility also provides a basis for Projecting changes in the overall level

in the fertility necessary for reliable populations, which are essential ingredients of development planning (Rele, 1963; U. N., 1979: 65-66).

Differential fertility includes ecological factors, regional difference, urban-rural setting, educational attainment, economical status, occupation, employment of women, religion, caste, age, race and sex structure, participation of NGO's etc., therefore for differential fertility study several factors combined together are always taken into consideration.

Recent studies have identified many reasons for plateauing and slow decline of fertility in Bangladesh. High demand for children with son preference and unwanted fertility play an important role in determining actual level of fertility (Islam et., 2002). Pritchet (1994), in his classical study, argued that to reduce fertility in a population, desired fertility, which depends on development, culture etc., is important, and a family planning program and even contraception use itself have a very minor role to play in decreasing fertility in a population. So, the policies that improve the socio-economic conditions and reduce the demand for children are the most important and sustainable way to reduce fertility.

In order to improve our understanding of the cause of fertility decline in Bangladesh during early 1990's and then its stabilization, it is necessary to analyze the mechanisms through which socio-economic variables interact with biological and behavioral factor to influence fertility. As biological and behavioral factors affect fertility directly and all other socio-economic factors affect through them, they are termed as 'Proximate determinants' of fertility. In this study, an attempt is made to explore the relative importance of the effect of different proximate determinants on fertility in Bangladesh and their role on fertility decline and then stabilization.

1.4 Review of Literature:

Bangladesh is characterized by high fertility and comparative high mortality. Study conducted in the early sixties reported total fertility rates as seven in Bangladesh (Afzal, 1967; Alauddin and Faruque, 1983). Since the mid sixties, several surveys

reveal the persistence of fertility pattern, a characterized, which has been corroborated by the fertility surveys (Sirageldin et al, 1975; BFS, 1978).

A solid understanding of the influence of the socio-demographic (also socio-economic), characteristics of the population policies. A good deal of research has been devoted to reach an understanding. An extensive literature on "the influence of the socio-Demographic Characteristics of the Population on fertility" exists. These sections have been set out the bodies of the past research about the influences of the socio-demographic characteristics of the population on fertility and highlight the gaps that are revealed.

Bangladesh has undergone a remarkable demographic change over the last three decades. The total fertility rate has decline from about 6.3 in the 1975 to 2.7 in 2007 (BDHS). From various sources suggest that the CBR fluctuated around 45 per thousand populations until the mid-1960s and in recent years there has been a modest decline in CBR in Bangladesh. Policy makers interested in achieving lower fertility in developing countries may see manipulation of marriage pattern as a potentials useful means of reaching that end but the relationship of marriage patterns to fertility reveals that in some countries latter marriage reduces a women's fertility largely by limiting her opportunity for childbearing.

Paul Demeny (1942) described demographic change as the central pre-occupation of modern demography. In the same article he succinctly captures it essence "in traditional societies, fertility and mortality are high. In modern societies fertility and mortality are low. In between there is the demographic change.

Serageldin et al., (1975) seriously questioned the likelihood of success of the service delivery efforts alone to generate demand for the birth control in Bangladesh. They argued that the demand for the birth control could only be induced through transformation in the socio-economic condition that generate demand for large families, or in short, that "development was the best contraceptive".

Cola (1978), had a case study of "The household Life Cycle and Economic Mobility in Rural Bangladesh". Conducted between 1976-1978, in a rural area of Bangladesh. He estimated the mean age at first marriage as 24.0 years for males and 16.0 years for females. He also found that the higher the age at marriage of males the larger is the age difference between husband and wife, which often leads to a wife becoming widowed at a young age.

Ahmad (1979) had a study about women who married after the age of 20 years were more liberal in attitude towards abortion in Bangladesh. Shaidullah (1980), studied the differentials nuptility pattern in Bangladesh using the 1975-76 Bangladesh fertility survey data. He estimated the proportion married, the mean and median age at first marriage, average age difference between husband and wife at first marriage, and the socio-economic differentials of age at marriage for rural and urban areas of divorce and widowhood in rural and urban areas.

Abedin (1982) highlighted that the mean and median age at first marriage in rural community of Bangladesh. He has estimated various nuptiality parameters recursion Coal's nuptiality models and using these values estimated the frequency of first marriage and risk of first marriage.

Choudhury R, H (1983) reported that the relationship between certain aspects of the status of women that is education, work experience and age at marriage, and the use of contraception and fertility, using data collected by Bangladesh Fertility Survey (BFS) of 1975. the analysis is present separated for rural and urban areas "Results of the test in brief are as follows: (a) Education is found to be strongly correlated with use of contraception within each sub-group of the study population. Education is positively related with use of contraception and negatively with fertility. (b) age at marriage is found to be the most important factor explaining fertility for every sub-group of the study population. Couples marrying at higher age are likely to have fewer children and

(c) work experience has very littlie or no effect on current use of contraception and fertility.

Bongaarts (1987) model, they estimated that 8 percent increase in contraception use would be needed to bring down TFR from 5.3 to 4.8 and 17 percent increase in contraception will be needed to bring down TFR from 5.3 to 4.3, these reduction could be produced by raising their minimum age at marriage to 18 and 21 years respectively.

Thein et al., (1988) found despite the legal age at marriage, many girls being married before they reach the age of years. This had suggested that introducing legislation to increase age at marriage has little impact unless social traditions are changed. In this respect access to higher education for female students would have greater impact. Finding from a female scholarship program suggest that more highly educated girls tend to marry later.

Cleland (1989) examined the fertility decline in Bangladesh and show that there is a patriarchal society in which most women are in purdah, there status is low and they are dependent on their father's, brothers and sons. Families and individual face many risks for which relatives, especially adult sons, are only available insurance. This is a complex of conditions generally considered and these condition led many component observes as recently as the decade to believe that in Bangladesh there could not be a significant demand for family planning services and lower fertility before substantial structural changes occurred. Indeed, they remain a basis for the plausible idea that further gains will be difficult and that a plateau will be reached in fertility levels long before the recent decline brings fertility to replacement levels.

Kabir and Rab (1990) had analyzed Coal's index, Im (the index of proportion married) to see the change in marriage patterns. The index of proportion married among women in the childbearing ages is divided by comparing the experiencing Hutterite Schedule of marital fertility schedule. The interpretation of the index is straightforward. The proportion-married index indicates how much marriage

contributes to the overall fertility of the given population. Thus the proportion-married index can be thought of as a weighted index of the proportion of women married index can age group with weight varying at the level of potential fertility can be parity explained by change in proportion married.

Islam et al,. (1991) had estimated the fertility inhibiting effect of the three most important proximate determinants: marriage, contraception and lactational infecundability. The analysis shows that although the fertility level of Bangladesh is declining, it is still very high (around 5 births per women). They suggest that fertility reducing effect of the marriage variable is also increasing but at a very slow rate. In fact, the fertility inhibiting effect of marriage and lactational infecundability are compensating each other.

This study reported that, among females marrying before the age of 18 years, the impact of age at marriage on children born till the age 45-49 years was small. But the reliability of this estimation is questionable for several reasons. Firstly, the data were collected retrospectively and accuracy of both an individual's age and age at marriage data is unknown. Secondly, the findings that complete fertility of women married before their tenth day was higher by one birth than of women married between their tenth and twelfth births days is highly unlikely. Since all those women should be in fecund at the time of marriage and should be fecund at the same age of their married life and the same fertility.

Chowdhury and Bairagi (1992) estimated the effect of age at marriage on fertility using Matlab data. They suggest that most of the girls who married before age 12 or 13 years were not fecund at marriage and their age specific fecund ability, at least for first 10 years of marriage life (this follow-up time was for about 10 years), is not different from that of women married at a higher age. In other word, age specific fecundability up to 25 years of life does not depend on age at marriage. They also suggested that the monthly rich of a birth during 20-24 years of life did not vary with age at marriage

could potential affect fertility, because the age specific monthly risk of a birth, which is equivalent to age specific fecundability in this population, has not affect by age at marriage, which in turn produce a higher total fertility for women married at a young age. They also estimated the average first birth interval, which has been almost two years (1.9 years) for women whose age at first marriage was 18 years, most of the birth, which took place to the mothers before age 20 could be avert. Appling these results to the age specific births rates, and assuming that age at first marriage on crude birth rate (CBR) and total fertility rate (TFR) have been estimated. The results showed that CBR would be raised to (which is the minimum age at marriage set for males in the Bangladesh Population Policy), CBR could be reduced by 32 percent and TFR by 20 percent.

Islam S M, et. al., (1993) had reported that the effects of selected socio-economic and demographic factors on fertility in a rural area of Bangladesh. It has been revealed that age at first marriage and coital frequency has didrect significant effects while ever use of contraception and duration of breast-feeding have direct positive significant effects on total parity. Total effects of wife's education and age at first marriage on fertility are found to be negative while those of religion and household income on fertility are found to be positive.

Islam and Islam (1993) studied the fertility inhibiting effects of the three most important proximate determinant: marriage, contraception, and lactational, infecundability, using data extracted from the 1989 Bangladesh Fertility Survey (**BFS**), lactational infecundability was found as the most prominent fertility factor in the reduction of fertility. Their analysis suggested that the fertility reducing effects of contraception was steadily increasing, whereas the effect of lactation infecundability remained nearly constant. In another study, using data from the 1993-07 BDHS, Islam et al., (1996) observed that contraception appeared as the most prominent determinant of fertility reduction followed by lactation infecundability and marriage.

Khan H, T, et. al., (1993) analyzed data from two sources in rural Bangladesh had been used in this study to examine the differential in fertility by selected socio-economic and demographic factors. They found that age at first marriage; education of spouses and availability of electricity in the household had inverse relationship with fertility. Higher fertility is observed for Muslim's women than for non-Muslim. It had also found that fertility was the lowest to those women whose husbands were service holders and highest for those engaged in agriculture.

Cleland et al., (1994) analyzed the World Bank report gives a major place to government actions in moving the onset of fertility decline and stepping that decline in Bangladesh. The report states that the crucial change that has taken place concerns acceptability of and access to birth control and not structural change that has driven down the demand for children. Economic and socio change, with concomitant shifts in ideas and outlook may have an important facilitating factor, just as contraceptive availability is seen as a facilitating factor.

Deborah Balk (1994) had examined that women's status is well reported neither by one direct measure nor one indirect single proxy. Implementing the data (approximately 5,000 women) from some villages of rural Bangladesh. Different dimensions of women's status influence fertility differently in terms of magnitude, direction, and statistical significance. The effects of status on fertility are widely different in rural Bangladesh and measures the not account for the simultaneous determination on reverse causality of women's status and fertility will probably mistake the direction and under estimate the effects of status on fertility.

Pritchett(1994) argued that to reduce fertility in a population, desired fertility, which depends on development, culture etc is important and a family planning program and even contraceptive use itself have a vary minor role to play in decreasing fertility in a population . Citing the examples of different countries, he demonstrated that keeping

the desired family size constant, contraceptive has major role to play in bringing fertility down.

Amin et al., (1994) have observed that total marital fertility rate fall by around 10 percent from 5.3 percent in 1990. Similarly, the average number of children ever born and percentage pregnant decline from 4.3 and 11.7 percent in 1983 to 3.7 and 10.6 percent in 1991 respectively. They also showed between 1983 and 1991, the decline in total marital fertility was higher among urban residents and educated women that that of rural resident and uneducated women respectively.

Das Guta and Narayana (1996) criticized the World Bank Report (Cleland et al.; 1994) on fertility decline in Bangladesh from other stances. They showed that Bangladesh's socio-economic, family planning and demographic trends were not unique but were similar to some Indian states. They explained the fertility traditions not only by local event but every largely by happening on a much larger scale.

Islam (1996) indicated by application of Bongaart's model that there was a downward trend in all the proximate indices. He estimated that between 1975 and 1989, the amount of decrement of fertility was about 23 percent and it was about 31 percent in between 1975 to 1991. Islam concluded that this was primary caused by an increase in the use and effectiveness of contraception. He also investigated the fertility differentials by various demographic and socio-economic work status of women, education of husband and occupation of husband. He suggested that socio-economic variables have positive effect on proximate variables, which in turn affect reproduction performance. He concluded that age at marriage and education have strong determinant of fertility as well as higher age at marriage and educational level affect on fertility decreasing.

Khan HT, Raeside R. (1997) reported on which have been undertaken using data from the 1989 BFS to determine the significant of influence on the probability of birth in the year preceding the survey. In the survey a total of 11905 ever-married women of

reproductive age were asked of questions related to fertility aspects of women. Variables selected in this study were grouped into demographic, socio-economic, culture, and decision-making variables. Finding from the study indicate that the mother's age, whether contraception has ever been used, the death of a child at any time, whether the women has ever worker, religion, and region of residence, and female independence are the important covariates for explaining recent fertility in Bangladesh.

Models are developed for the probability of a women giving birth in urban and rural areas, dependent on her demographic and socio-economic condition. Also, developed models for contraceptive use, which is applicable in urban- rural Bangladesh. This modeling contributes to a better understanding of fertility changes in Bangladesh and the differentials between urban fertility. It is indicated that a continued fertility decline is likely.

Caldwell et al., (1999) viewed that the national family planning program in Bangladesh had a "marked effect over a short time within the larger framework provided by socio-economic change". Change in the socio-economic environment in the late 1970s and early 1980s clearly indicate that the economics of demand for children had undergone revision causing the motivation to limit family size to become increasingly widespread since the mid -1980s. the demand for children decrease not only among the wealth and better education classes but more importantly among the vast majority of the population belonging to the proper less education classes living in the rural areas.

Rezzaqua A. (1999) examines wife-husband preference for children and subsequent fertility for five years in the treatment and comparison areas of Matlab, Bangladesh. The two data sets used were the In-depth Survey (1984) and the Demographic Surveillance System (1994-89*). In the case of wives' preferences for children, subsequent childbearing was 13.8 percent higher than desired in the treatment area and 44.7 percent higher than desired in the comparison area. After controlling for all

variables in the model, the likelihood of giving birth was 1.78 times higher for wives who wanted no more children, but whose husbands did want more, compared with couples where neither husband nor wife wanted more, but the husband did not wanted more children, the likelihood of giving birth was 0.63 times that of couples where both the husband and wife wanted more children. This finding suggests that to enhance the decline in fertility in these two areas of Matlab, it will be necessary to motivate both wives and husbands to cease childbearing.

Ray (2000) stated that slowing down of fertility levels in Bangladesh confirms that the socio-economic rational for limiting fertility is even more important today, if anything. This is evident from persistent socio-economic differentials in desired family size, observed fertility and in the proximate determinants (Contraceptive use, age at marriage and mean duration of insusceptibility). The lack of further decline in the birth rate despite increasing contraceptive prevalence, although much more slowly, is because current fertility preferences measured by mean ideal family in 1999-2000 of still high relative to replacement level fertility (TFR of 2.1) especially among the poor firmed the "micro inertia" of fertility.

Abdur Razzaque and Peter Kim Streafield (2000) have studied the past, percent and future fertility in Bangladesh. they observed that the population of Bangladesh has been much increases in the second half of the 20th century, 41 million in 1950 to 120 million in 1998. Such huge increase mainly due to mortality decline after the war II with improvement of medical science and public health measures. However, in Bangladesh, fertility decline at a very low level of socio-economic development. The study used two data sources: Matlab Demographic Surveillance, ICDDRB and Demographic and Health Survey of Micro International, 1993-94, 1999-2000. They observed that in the past, fertility was high because familial, social and economic conditions were favorable to many rather than few children but recent data shows widespread motivation for small family size and it is mainly due to increase in the

direct economic cost of living. Such appreciable decline in fertility was possible mainly due to the family planning program have been successful.

It has also documented that a large proportion of birth is stall unwanted in Bangladesh as well as in both the MCH-FP and comparison area of Mtlab. If the unwanted birth could have been eliminated, fertility would have been much lower along with fewer abortions, because contraceptive use can lower down abortion by reducing unwanted birth. They also discussed the future level of fertility in Bangladesh.

Bairage (2001) conducted a study in Matlab (a research unit of ICDDR, B) and found that the fertility in Matlab converges to the desired fertility. The Matlab couples used different proximate determinant of fertility, including contraception and abortion, in this converging process. The study does not support the hypothesis that an MCH-FP project alone can bring fertility down to any low level, and the view that the Government of Bangladesh will able to bring population growth down by 25 percent by increasing only the CPR from its present 51 to percent 71 present. It was concluded in the study that a change in the desired family size and gender preference, along with family planning and reproductive health services, is apparently essential to have a further decline in fertility to complete the fertility change in Bangladesh.

Islam and Abedin (2001) examined the effect of women's education on age at marriage of the females and as well as on fertility. They showed that education is one of the important social variables of fertility differentials. It is an achieved status of individuals, which dies not change over time like some other variables and is expected to give individuals an alternative source of new normative orientations as opposed to traditional ones. Women engaged in such activity contribute in rising age at marriage and thereby affect to reduce.

Vera Zlindar, Rober Gardner (2001) observed, why increasing contraceptive use doesn't always results in an immediate decline in total fertility rate. They showed that other direct factors also affect fertility. The contraceptive prevalence rate (CPR) is not the only predictor of what will happen to fertility levels. The level of contraceptive use

is one of the fertility strongest factors affecting the level of fertility linear regression of 105 countries comparing fertility levels and contraceptive use levels found 77 percent of the variation in fertility is explained by variation in contraceptive use and remaining 25 percent of the variation in total fertility is also important.

Bongaart's (2002) conducted a study on fertility trends for 143 "Less developed 'Country (LDC)". Assuming the past record of fertility transition will be repeated, he expected that the small number of countries that are still pre-transitional would likely enter the transition. When this will happen depends on achievement of some socio-economic progress, but the level of development for entering the transition has been dropping. He also expected that fertility transition would proceed relatively rapidly for countries in the early phases of the transition; the pace of decline would slow down. The conclusion made in this paper is consistent projections, which expect the (un-weighted) average TFR of all developing countries to decline at modest pace to 2.8 in 2020-2025.

Agyel-Mensah, S. (2005) investigate that the causes of constant fertility change in Ghana, during the period 1998-2003. Fertility desires was given as a plausible reason. He mentioned that reducing fertility from levels of 6 to 8 down to 4 to 5 may not be so difficult, because most couples do not want the burden a lots of children surviving (6+). But the further step down below 4 children makes couples anxious and insecure.

Banggaart's (2005) in an examination of causes of the slow change of fertility in seven mid-transition countries: Bangladesh, Colombia, Dominican Republic, Ghana, Kenya, Peru, and Turkey revealed a systematic pattern on living off or near leveling in contraceptive access during the stall, but levels of unmet need and unwanted fertility are relatively high. At the onset of the stall the level of fertility was low relative to the level of development in all but one of the stalling countries.

Goto Aya, et, al., (2006) studied about "Influence of Unintended Pregnancy on Child Rearing". Addressing Japan's fertility decline. Japan has been experiencing a counting

decline in fertility and an increase in pre-marital conceptions and abortion among young people. Child rearing is often viewed as a burden. In response, Japan is now seeking ways to improve the child-rearing environment for parents. In this context, they conducted a prospective study among 206 pregnant women in Sulagawa City. They fond that unintended pregnancy was associated with a higher risk of negative child-rearing outcomes, including lower mother-to-child attachment, increased negative feelings of mothers and a lower level of participation of fathers in child rearing. Unintended pregnancy exacerbates the real and perceived burdens of child rearing. Researchers believe which underpin low fertility, rather than focus on fertility decline. They suggest adopting a comprehensive approach to improve the lives of young couples, with a focus on adolescents, including life skills education to prepare for adulthood, marriage and parenthood.

Sabina F R (2006) studied about "Emerging Changes in Reproductive Baheviour among Married Adolescent Girl in an Urban Slum in Dhaka, Bangladesh". Structural and social inequalities, a harsh political economy and neglect on the part5 of the state have made married adolescent girls on extremely vulnerable group un the urban slum environment in Bangladesh. The importance place on newly married girls' fertility results in high fertility rates and low rates of contraceptive use. Ethnographic fieldwork among married adolescent girl, age 15-19, was carried out in a Dhaka slum from December 2001 to January 2003, including 50 in-depth interviews and eight case studies from among 153 married adolescent girl and observations and discussion with family and community members. Culture and social expectations meant that 128 of the girls had borne children before they were emotionally or physically ready. Twenty-seven had terminated their pregnancies of which 11 reported they were forced to do so by family members. Poverty, economic conditions, marital insecurity, politics in the household, absence of dowry and rivalry among family, co wives and in-laws made these young women acquiesce to decisions made by others in order to survive. Young marred women acquiesce to decision made by others in order to survive. Young

married women's status is changing in urban slum conditions. When their economical productivity takes priority over their reproductive role, the effects on reproductive decision-making within families may be considerable.

Ahmed Kabir et al., (2009) conducted a comparison of regional variations of fertility in Bangladesh. This study, based on the 2004 Bangladesh demographic and health survey (BDHS), examines the extent to which regional variations of reproductive behavior are explained by inherent demographic, socioeconomic, and programmatic differences among regions. This article also attempts to investigate the impact of four intermediate fertility variables; namely marriage, contraception, lactational infecundability, and induced abortion, on fertility among different regions in Bangladesh. The contribution of proximate variables was observed through the decomposition of the total fertility rate (TFR) into proximate components. The results indicate that contraception is the highest fertility reducing factor in all the regions.

Adhikari R. (2010) studied the demographic, socio-economic, and cultural factors affecting fertility differentials in Nepal. The contributing factors age at first marriage, perceived ideal number of children, literacy status, mass media exposure, wealth status, an child-death experience by mothers. He concluded that programs should aim to reduce fertility rates by focusing on these identified factors so that fertility as well as infant and maternal mortality and morbidity will be decreased and the overall well-being of the family maintained and enhanced.

Bussarawan, T.& S. Amin (2010) designed a study on the role of abortion in the last stage of fertility decline in Vietnam. He mentioned that Vietnam has experienced a rapid fertility decline over the last decades, yet fertility rates vary considerably across the country's 54 ethnic groups. He also concluded that because better access to abortion in unlikely by itself to reduce fertility among high-fertility minority groups, program that provide supportive health services and that target young, low-parity and less educated women may help to lower fertility among these groups.

Islam S, et al., (2010) studied on high fertility regions in Bangladesh: a marriage cohort analysis. The results show that the probability that a woman from the recent cohort in Sylhet or Chittagong who had a third birth will have a fourth birth is nearly twice that of her counterpart in other regions. Social characteristics such as education, occupation, religion and residence have no effect on fertility in Sylhet and Chittagong. Additional period-specific analyses using the 2007 BDHS data show that women in Sylhet are considerably more likely to have a third or fourth birth sooner than those in other divisions, especially Khulna. The findings call for specific family planning policy interventions in Sylhet and Chittagong ensuring gender equity, promoting female education and delaying entry into marriage and childbearing.

Sarkar P (2010) investigated determinants of age at first birth in Bangladesh. He shows that that women in Bangladesh engage in sexual activities at an early age before 15 years and most use modern methods (43%) for birth control. Most of women use specific pills method. Islam religion has a more tendency to marry at age before 15 years. The incidence of primary sterility for formerly married women; it is increases as duration of marriage increase and for currently married women; it is decreases with increase in duration of marriage. Findings need to be scientifically used in suitable programs addressing the case of fertility control in the developing countries as well as in Bangladesh.

Baqui A M, et al., (2011) examined the levels, timing, and etiology of stillbirths in Sylhet district of Bangladesh. They were recorded a total of 1748 stillbirths recorded during 2003-2005 from 48,192 births (stillbirth rate: 36.3 per 1000 total births). About 60% and 40% of stillbirths were categorized as antepartum and intrapartum, respectively. Maternal conditions, including infections, hypertensive disorders, and anemia, contributed to about 29% of total antepartum stillbirths. About 50% of intrapartum stillbirths were attributed to obstetric complications. Maternal infections

and hypertensive disorders contributed to another 11% of stillbirths. A cause could not be assigned in nearly half (49%) of stillbirths

Ellis M M et al., (2011) studied about the Intrapartum-related stillbirths and neonatal deaths in rural Bangladesh: a prospective, community-based cohort study. They concluded that the Difficulty initiating respiration among infants born at home in rural Bangladesh is common, and resuscitation is frequently attempted. Newborns who remain in poor condition at 5 minutes have a 20% mortality rate. Evaluation of resuscitation methods, early intervention trials including antibiotic regimes, and follow-up studies of survivors of community-based resuscitation are needed.

Khan M M et al., (2011) estimated the study on trends in sociodemographic and health-related indicators in Bangladesh, 1993-2007: will inequities persist. They found the positive trends in urbanization, availability of electricity, age at first marriage, use of modern contraception, access to skilled antenatal care, child vaccination, knowledge of human immunodeficiency virus (HIV) infection and acquired immunodeficiency syndrome and overweight and obesity. In contrast, negative trends were seen in factors such as literacy, infant and child mortality, fertility rate, home delivery and malnutrition and underweight.

Rahman A, et al., (2011) conducted on the arsenic exposure and risk of spontaneous abortion, stillbirth, and infant mortality. They found evidence of increased risk of infant mortality with increasing arsenic exposure during pregnancy, with less evidence of associations with spontaneous abortion or stillbirth risk.

1.5 Objectives of the Study

In an empirical analysis of data on Asian countries, Smith (1976) demonstrated a change in the fertility pattern. He also observed that urbanization; expansion of education and creation of non-agricultural occupation causes rapid change in the marriage pattern as well as fertility and the timing of family formation. Social

scientists believe that urbanization and industrialization will bring changes in developing countries in the same way that they did in European countries (Goode, 1963). Malaysia, Tunisia and Sri-lanka are cited as examples. The pattern of changes may be the same, at a certain level of abstraction, but their manifestations do vary depending on the cultural setting. In societies where traditional and cultural values are strong the pace of change in family formation appears to be slower (Gupta, 1979).

After independence from the British Government in 1947, the Pakistan Government began. Because of the unstable condition of the government in the first few years, these programs were not implemented properly. After crossing the crisis period the government launched an effective multiphase developmental program in the country. During the period of Pakistan, there was a significant increase in the literacy rate, urbanization, industries, and non-agricultural occupation and per head medical facilities. After 1971, marking independence of Bangladesh, the government made efforts to further enhance the pace of the social development program.

Therefore if the existing theories of social change are true, changes the level of fertility in Bangladesh may be expected. With this conceptual background this study intends to test the following hypothesis:

(i) If modernizing institutions such as urbanization, industrialization, education, communication and mass media have the capacity of enhance individual value systems (Ogburn, 1961; Inkeles et al., 1974), if the country has been undertaking polices for implementation and expansion of such modernizing institutions and if individuals are exposed to such institutions, then an increasing trend in the age at marriage can be anticipated in the country and reduce the level of fertility.

(ii) If cultural differences, ecological differences in pace of development and Socio-Demographic compositional differences have an effect on individuals' value judgments, individuals' decision making processes and individuals' outlook on social life, then differences in age at marriage and level of fertility between regions are expected to be observed. Specially,

differential pattern of urbanization, education, religions distribution and sex differential child or infant mortality create differences in the level of age at marriage as well as the trend of age at marriage and level of fertility.

(iii) If urbanism is a way of life, then the age at marriage in the urban areas will be higher than in rural areas and increasing trend of age at marriage will be faster in the urban areas than rural areas. Specially, the higher opportunities for women's education, jobs and participation in alternative activities have a direct impact on the age at marriage as well as fertility level.

(iv) Efforts are necessary to motivate people to have a smaller family size and extend more family planning facilities in order to reduce the high rate of population growth in the country. Redistribution of Socio-Economic facilities such as medical facilities, educational facilities and employment opportunities; especially for females, will eventually levels-off the regional variations in the level of fertility and hence reduce the overall level of fertility in the country. Integrated socio-economic development and family planning activities are thus necessary to slow down the rate of population growth. While socio-economic development will generate necessary motivation towards desire for smaller family size, family planning facilities will help in translating the desire.

The Government of Bangladesh has taken up the basic need strategies as one of the means of achieving the target set in Population policies from time to time. However, in spite of various socio-cultural and economic impediments notable progresses are expected to achieve during the near past in the areas of Population, in general, and in the areas of marriage and fertility, in particular.

The present study is undertaken with a goal to explore the trends of influence of socio-demographic characteristics of population on fertility that are taken place in the country in response to various development programs and also investigate the factors mostly responsible for giving rise to current levels of marital fertility. The study requires an in-depth analysis to explore the inherent peculiarities of fertility: which

stems from the speculation those in recent times both the aforesaid phenomena have shown some changes in their levels, trends and differentials.

Broadly speaking, the specific objectives of the present study are to analyze the trends and differentials of fertility in Bangladesh and to estimate the direct and indirect effects of socio-demographic and socio-economic factors on fertility. These are as follows:

(i) To examine the fertility differentials by some selected background variables

(ii) To investigate the trends in fertility levels

(iii) Estimate the Impact of some selected variables for additional child in Bangladesh

(iv) To estimate the Proximate determinants of fertility: Using An alternative approach of Bongaarts` model

(v) Estimate the factors associated with target fertility

In order to fulfillment the stated objectives, our purpose are then to examine the trends to evaluate various socio-demographic characteristics that affect fertility patterns and to assess the proximate determinants of fertility. But before proceeding for detailed analysis investigation should be made into the temporal trends in fertility pattern and such analysis is undertaken in chapter to revised a model of proximate determinants of fertility given by Bongaarts`.

1.6 Organization of the study

The study is organized into eight chapters. Following the introduction Chapter (Chapter One), which contains a brief description about Bangladesh and its population, reproductive behaviors of the population, review of literature and objectives of the present study are presented in this Chapter.

Chapter two contains description about data sources used in the study together with data screening and methods. Techniques adopted in course of analysis of data are included in this chapter.

Chapter three contains an analysis of fertility differentials where attempts are made to provide comprehensive information about the components, which significantly affect on fertility.

Chapter four contains analysis of trends in fertility patterns on the basis of various indicators of fertility of Bangladesh by means of cohort and period fertility as well as by Coale`s indices.

Chapter five contains a multivariate analysis of fertility of the present study, which is the logistic regression analysis technique are undertaken to isolate the intensity of the influences of various socio-demographic characteristics as well as socio-economic factors on additional child in Bangladesh.

Chapter six provides a study on the biological aspects of fertility analyzed by means of Bongaarts`and proposed Bongaarts`model of the proximate determinants of fertility.

Chapter seven contains an analysis of the factors which are associated with target fertility. The study is completed by providing summary, policy implications and concluding remarks in chapter 8.

Chapter-Two

Data Source and Analytical Methodology

Chapter-2

Data Source and Analytical Methodology

2.1 Introduction

The present study covers a period of 32 years, from 1975 to 2007. Admittedly, vital rgistration survey (VRS) had been functioning in the country on a national basis on 1981 to 1998 in each year under Bangladesh Bureau of statistics (BBS), and sample vital registration system (SVRS), on 1999 to 2007 in each year under BBS. Bangladesh has a long history of census taking and quite a few nationwide surveys on fertility and contraception have been conducted. Mainly, these are Bangladesh Fertility servey (BFS) of 1975 and 1989 and contraceptive prevalence Survey (CPS's) of 1979, 1981, 1983, 1986, 1989 and 1991. Eventualy, the data of the present study are taken from three sources, viz. (a) Bangladesh Population Census of 1981, 1991 and 2001 (b) BFS's of 1975 and 1989 (c) the Bangladesh Demographic and Health Survey (BDHS's), conducted during 1993-1994, 1996-1997, 1999-2000, 2004 and 2007.

The BDHS's are nationally representative surveys. The BDHS's were conducted under the authority of National Institute for Population Research and Training (NIPORT) of the Minstry of Health and Family Welfare. The surveys were implemented by Mitra and Associates a Bangladeshi research firm located in Dhaka, Technical assistance was provided by ORC Macro through the MEASURE DHS Program. The U.S Agency for international Development (USAID) Bangladesh provided financial support for the survey.

2.2 Selection of Sample Size

The choice of total size for the 2007 BDHS was made after balancing analytical requirement against factor of cost and logistic feasibility. It was expected that the sample would interviews with approximately 10,996 ever-married women age 15-49

years and 3,751 men age 15-54 years. A sample of 10400 households was selected from the sampling frame. All ever-married women age 15-49 in the selected household were eligible respondents for the women's questionnaire. For the men's survey, 50 percent of the selected households were chosen through sampling. Interveiwers interviewed one randomly selected men's regardless of marital status, in the age group 15-54 years, from each of the selected households.

2.3 Sampling Design:

The sample for the 2007 BDHS covered the entire population residing in private dwelling units all over Bangladesh. Administratively, she is divided into six divisions, each division is divided into zilas and in turn each zila into upazilas. Each urban area in the upazila is divided into wards and into mahallas within the ward; each rural area in the upazila is divided into union parishads (UPs) and into mouzas within the (UPs). The urban areas were stratified into three groups:

(i) Standard metropolitan

(ii) Municipality areas and

(iii) Other urban areas.

These divisions allow the country as a whole to be easily seperated into rural and urban areas.

For the 2001 census, subdivisions called enumeration areas (EAs) were created based on a convenient number of dwelling units. Because shetch maps of EAs were accessible, EAs were considered suitable to use as primary sampling units (PSUs) for the 2007 BDHS survey. In each division the list of EAs constituted the sample frame for the 2007 BDHS servey.

The present study sample is a stratified, a multistage cluster sample consisting of 361 PSUs, 122 in the urban area and 239 in the rural area. After the sample was allocated to each group area according to urban and rural areas, the number of PSUs was calculated in term of an average of 28 completed interviews of eligible women per

PSU (or an average of 30 selected households per PSU). Mitra and Associates conducted a household listing operation in all the sample point from 1 March 2007 to 11 Augest 2007

2.4 Questionnaire:

The 2007 BDHS has four types of questionnaire: a Household questionnaire a women's questionnaire, a men's questionnaire and a community questionnaire. The final questionnaires were developed in English and then translated into and printed in Bangla.

The verbal autopsy instrument were developments were developed using the 1996-1997 and 1999-2000 and 2004 BDHS verbal autopsy surveys, the World Health Organization (WHO) verbal autopsy qustionnaire and the instrument used since 2007 in the Matlab Health and Demographic Surveillance System.

The household questionnaire was used to list all the usual members and visitors in the selected households. Some basic information was collected on the characteristics of each person listed, including his/her age, sex, education, and relationship to the head of the household. The main purpose of the Household Questionnaire was to identify women and men who were eligible for individual interview.

The data used for the analyses is mainly collect from women's questionnaire and a small amount of Men's questionnaire. This questionnaire mainly used to collect information from ever-married women age 15-49 years. These women were asked questions on the following topics:

* Background characteristics (age, educatin, religion, place of resident etc.)
* Reproductive history
* Knowledege and use of family planning methods
* Antenatal and delivery care
* Breasdfeeding and weaning practiecs
* Detail information about marriage

* Work status including participation in NGO's
* Fertility preferences
* Husband's background and work status
* Awareness of AIDS and other sexually transmitted diseases.

Small amunt of the Men's Questionnaire was also used to collect information from men age 15-54 years, whatever ever-married or not. The men were asked questions on the following topics.

* Background characteristics including respondent work.
* Marriage and sexual activity
* Participation in reproductive health care
* Fertility preferences
*Awareness of HIV and AIDS including sexually transmitted infections (STIs).

2.5 Background Characteristics of Women

Before executing any statistical analysis, it is important to know the characteristics or nature of the related data. Therefore, it is necessary to pay attention to the background characteristics of the researchable data at the begining of the analysis. It is significant to investigate each variable individually and to decide whether an individual variable is concentrated in a particular group or having considerable large number of missing observations or remain ill defined. In that case those particular variables will be required to be extracted from this study. The variable that is considered for this study can broadly be grouped into:

(i) Demographic, Socio-demographic Characteristic:

Age of respondents (women), current age of respondents, region of respondents, maritial status and marriage, age at birth, sex and number of children ever born. The current rate of population growth, mean and median age of the population, the dependency ratio, crude rates, expectation of life at birth.

(ii) Socio-economic Characteristics:

Education of respondents, place of residence, occupation, etc.

2.6 Conceptual Framework of the Study

Crude Birth Rate:

Crude Birth Rate (CBR) is the ratio of the total number of births during a given year to the average or mid-year population in that year

Symbolically,

$$CBR = \frac{B}{P} \times K$$

where B and P denoted the total number of births occurring in a given year and the total average or mid year population in that year and K is a constant usually 1,000

Genenaral Fertility Rate:

General Fertility Rate (GFR) is the ratio of the total number of births during a given year to the average number of women in for the age group on the age range 15-45 or sometimes 15-44 GFR is expressed as

$$GFR = \frac{B}{W_{15-49}} \times k$$

where B and W_{15-45} respectively denote the total number of birth occurring in a given year and the average number of women in the resproductive ages in the period concerned and K is a constant usually 1,000

Genenaral Fertility Rate; can be expressed by another way that is

$$GFR = \frac{Live\ \ Birth}{Women\ \ in\ age\ \ group\ \ (15-49)} \times k$$

General Marital Fertility Rate:

General Marital Fertility Rate (GMFR) in the ratio of the total number of births during a given year to the average number of married women in fertile age group (in the age range 15-49 or sometimes 15-44 GMFR is expressed as

$$GMFR = \frac{B}{W^{M}_{15-49}} \times K$$

$$GMFR = \frac{Live\ \ Birth}{Marital\ \ Women\ \ in\ age\ \ group\ \ (15-49)} \times 1000$$

Age Specific Fertility Rate:

Age Specific Fertility ASFR can be calculated separately for each age or for any convenient age group ASFR is calculated by the formula

$$ASFR_x = \frac{B_x}{W_x} \times K$$

where B_x and W_x are the births to women aged x and the average number of women aged x respectively

Age Specific Marital Fertility Rate:

Age Specific Marital Fertility Rate (ASMFR) is an improvement over age specific fertility rate in the same sense as general marital fertility rate is over general fertility rate (ASMFR) describes the fertility experience of marred women by age the formula for calculation of ASMFR is

$$ASMFR_x = \frac{B_x}{W_x^M} \times K$$

Where B_x and W_x^M are the births to women aged x and the average nmber of married women aged x respectively.

Total Fertility Rate:

Total Fertility Rate (TFR) is the expected number of children that a cohort of 1,000 women will bear in their , if none of them before crossing the age of reproduction. Total Fertility Rate summarizes the pattern of fertility. It is just a summation of age specific fertility rate over all ages, that is

$$TFR = 5\sum_{x=15}^{49} ASFR_x$$

Gross Reproductive Rate:

The Gross Reproductive Rate is defined as the average number of daughters among a birth cohort of women, which they will bear in their lifetime, passing through the reproductive ages and bearing children according to a fixed schedule of fertility, if they all survive to the end of child bearing period. Thus the GRR indicates how effectively mothers are replacing themselves with daughters who will bear the next generation, GRR can be expressed as

$$GRR = \sum_{x=15}^{49} \frac{B_x}{W_x} \times \frac{B_{fx}}{B_x}$$

where $\frac{B_x}{W_x}$ is the age specific fertility rate of age x and $\frac{B_{fx}}{B_x}$ is the proposion of female births among the total births at age x of mothers.

Net Reproductive Rate:

The Net Reproductive Rate (NRR) icdicates that on an average gow many daughters would be born to a group of women starting life together and experiencecing throughout their life a given schedule of fertility and mortality. It is an edtimate of the extimate of the extent to which a nearly born girl infant will live to replace herself with a daughter, taking care of the likelihood of her death before she accomplishes replacement. Thus it is a measure of replacement that considers both the schedule of fertility and the schedule of fertility and the schedule of mortality. In symbois it is defined as

$$NRR = \sum_{x=15}^{49} \frac{B_x}{W_x} \times \left(\frac{B_{fx}}{B_x} \right) \times \frac{L_x}{l_x}$$ Where $\frac{L_x}{l_x}$ is the life table survival rate, $\frac{B_x}{W_x}$ is the age specific fertility rate of age x and $\frac{B_{fx}}{B_x}$ is the proporsion of female births among the total births at age x of mothers.

Fertility:

Fertility means the natural capability of women, men or caple of giving life birth and fertility rate is the number of child born per woman. Fertility is different from fecundity. Human fertility depends on factors of nutrition, sexual behavior, culture, instinct, timing, economics, way of life and emotions, etc.

Fecundability:

Fecund means the ability to conceive and the term fecundability refer to specific meaning as the probability of non-pregnant married women who will conceive per month.

Probability of fetal loss:

A proportion of conceptions end in death of the fetus. The probability that any conception will end in the death of the fetus may depend on maternal age, rank order of the pregnancy, interval from the end of the last pregnancy to this conception, and the health of the mother.

Abortion:

Natural or medically induced expulsion of a foetus from the womb before it is able to survive independently.

Threatened abortion=Possible abortion in the early stages of pregnancy, indicated by bleeding.

Induced abortion=Abortion which is produced by drugs *or* by surgery.

Spontaneous abortion = MISCARRIAGE.

Miscarriage:

Miscarriage is a pregnancy loss that occurs before 20 week, well before the fetus is able to survive outside the womb Or Miscarriage is the spontaneous loss of a fetus before the 20^{th} week of pregnancy.

Stillbirth :

A stillbirth is defned as the death of a fetus at any time after the twentieth week of pregnancy. Stillbirth is also referred to as intrauterine fetal death.

Amenorrhoea:

Absence of one or more menstrual periods, normal during pregnancy and after the menopause, but otherwise abnormal in adult women

Primary amenorrhoea = Condition where a woman has never had menstrual periods

Secondary amenorrhoea = Situation where a woman's menstrual periods have stopped

Threatened abortion = Possible abortion in the early stages of pregnancy, indicated by bleeding

2.7 Scope of the Study and Limatation

2.7.1 Scope of the study

The proposed study will focus on fertility which, reflect a country`s level of socioeconomic development. It is used for monitoring and evaluation population and health programs and policies. It will find out the level, trend and behavior of target fertility. The study will also investigate how fertility pattern is affected by Socio-Demographic variable in Bangladesh.

2.7.2 Limitation of the Study

Data distribution is a matter of sensitivity in Bangladesh.The proposed study will focus on the target fertility in Bangladeh. Updated and reliable data are not always available on issue like fertility. As a result there is much dependency of government documents and statistics. The proposed study will be conducted on the basis of the available secondary souces of data. There are some constraints for

conducting this study. The major constraint is that proposed secondary data published every three years later. There are also time and resource constraints.

2. 8 Traning and Field Work for Data Collection

Training for the BDHS, 2007 survey was conducted for four weeks (March, 2009). Recruitment criteria for field staff positions included educational attainment, ability to send one month in training and ata least four months in the field, and experience in other surveys. Initiality, training consisted of lectures on how to complete the question, with mock interviews between participants to gain practice in asking questions. Towards the end of the training course, the participants spent several days in practice interviewing in various place close to Dhaka. Superior performer trainees were selected as supervisors and field editors. Male and female interviewers were trained at the office of Mitra and Associates.

Field work for the 2007 BDHS was carried out by twelve interviewing teams. Each consisted of one male supervisor, one female field editor, five female interviewers, two male interviewers and one logistics staff person, for a total of 120 field staff for the survey. Mitra and Associate also fielded four quality control teams of two persons each to check on the field teams. In addition to these field control teams, NIPORT monitored fieldwork by using their quality control teams. Additionally, USAID, ORC Macro and NIPORT monitored the fieldwork by visting teams in the field. Fieldwork commenced on 1 January 2007 and was implemented in five phases.

2.9 Processing of Data:

All questionnaires for the 2007 BDHS were periodically returned to NIPORT (Azimpur Dhaka) for data processing at Mitra et al.,. The processing of the data collected began shortly after finishing the fieldwork. The processing operation consisted of office editing, coding of open-ended questions, data entry, editing

inconsistencies found by the computer programs. The data were processed on 6 microcomputer found by the computer programs.

2.10 Data screening:

As usual with data sets of this type, a few outliers (abnormal data points) were found. These were identified using the informal techniquea suggested by Dunn and Clark (1974). After detecting the presence of outlier, they were removed. The presence of such abnormal point in data sets can affect the interpretation of result (Stevins, 1996).

2.10 Methods of the Study:

To achieve the objectives of the study the research methods will be applied:

A. Percentage Distribution:

Reproductive women`s age beings from 15 to 45 which are divided in different group. Fertility can be estimate from those age groups. From the division of different age groups it is easier to estimate the probability distribution of each age group of reproductive women. We can also find over all picture of target fertility based on the different determinants in each group.

B. Chi-square test:

Chi-square test will be based on bi-variate distribution. As our proposed secondary data is bi-variate in nature. So that chi-square test is a technique where it is a way to find out the relation exists or not between an independent variables. From chi-square test we can take decision about the variables whether it is significant or not only significant variables are using in logistic regression analysis for measuring dependent variables contribution.

C. Bongaarts' Model:

Bongaart's model is an inderect technique for calculating total fertility rate by using proximate determinants. Bongaart's revised the original classification and provided a simple analytical method according framework, which permits a quantitative assessment of the contribution of proximate determinants to give fertility levels or change. The technique applied for identification of changes in terms of proximate variables, which seems to be rewarding on many occasions. The model is necessarily multiplicative in nature and requires data among others on proportion married, extent of use effectiveeness of contraception, prevelence of induced abortion and lactational infecundability.

D. Logistic Regression Analysis:

It is an attempt to find out those variables, which are truly related to fertility defferntials. Some characteristics such variable includes age of ever-married women, level of education, current pregnancy, number of living children, working status, access of mass media, involvement in N.G.O's, religion, Geographic Division. Certain other characteristics are treated as demographic, current age of respondent, month of breast-feeding and involved in NGO. Logistic regression technique will be employed to identify the contribution of the independent variables on demand for additional child of ever-married women in Bangladesh.

Model Specifications:

There are many multivariate statistical techniques exist for analysis of fertility over time. It is difficult to apply the techniques when the dependent variables are categorized (dichotomous and polytomous). In such situation it is better to fit linear logistic regression.

The general linear logistic regression model expresses qualitative dependent variables as a function of a single or several independent variable (Y). consider the relationship between a dichotomous depedent variate (Y) and a single independent variable (X) as

$Y_i = \alpha + \beta_i x + \varepsilon_i, i = 1,2,3,.....,n$ .....(*)

where $\varepsilon_i = N(0, \sigma^2)$. ε_i and ε_i are independent for $i \neq j$. If x is random, then we assume that it is independent of ε.

Since y_i can take on only the values 0 and 1, a reasonable probability model for the response is the Bernouli distribution the random variable Y_i takes on the value 1 with probability $p(y_i=1) = .\pi_i$

we have

$E(y_i / x_i) = \alpha + \beta x_i + E(\varepsilon_i) = \pi_i$

$or, \alpha + \beta x_i = \pi_i$

which account for the linear probability model designation. Again y , take on only two values. However, then is dichotomous as well: if $y_i=1$, then

$\varepsilon_i = 1 - (\alpha + \beta x_i) = 1 - \pi_i$ (which occurs with probability ε_i). Because the error is dichotomous. It cannot be even approximately normally distributed. Moreover the variance of ε_i is not constant as we may demonstrate: Recalling that $E(\varepsilon_i) = 0$ and using the relations just noted.

$V(\varepsilon_i) = E(\varepsilon_i^2) = (1-\pi_i)^2.\pi_i + (-\pi_i)^2.(1-\pi_i) = \pi_i(1-\pi_i)$

the striking of nn normality and heteroskedasticity of errors bode iff for ordinary least square esimation of the linear probability model. Goldberger (19964)has proposed a correction for deteroskedasticity employing weighted least square and pbtains adhoc estimates from a preliminary OLS regression that is he takes

$V(\varepsilon_i) = y_i(1-y_i)$, or equivalingtly, $W_i = \dfrac{1}{\{y_i(1-y_i)\}}$ as weights.

In some problems withan indicator response variable the relationship between y and x is non linear. Very frequently we find that response function is S-shaped. There are

several approaches to fitting such a function. One method involves modeling the response funtion with the normal cumulative distributin function. This approach is called Provit analysis (finney, 1971). A second method of analysis is to model the response using the logistic function

$$E(y/x) = \pi_i = \frac{\exp(\alpha + \beta x)}{1 + \exp(\alpha + \beta x)}$$

The logistic function has asymptotes at and , guarantying that the estimated response function lies between zreo and on . fitting the logistic function is usually called logit aanalysis rearranging equation , we get

$$\log_e\left(\frac{\pi_i}{1-\pi_i}\right) = \alpha + \beta x_i$$

which is known as simple logit regression model. Note that $\log_e\left(\frac{\pi_i}{1-\pi_i}\right)$ is called logit of π_i. Is the log odds that y_i is one rather than zero. If the odds are even, that is if $\pi_i = 0.5$. Then the logit is zero, if $\pi_i < 0.5$, then the logit is negative and if $\pi_i < 0.5$, then the logit is positive.

Fox (1984) the extension of the simple logitic regression model to general linear regression model as

$$\log_e\left(\frac{\pi_i}{1-\pi_i}\right) = X_i' B$$

where X_{nxk} be a matrix of full colum rank with one row X_i' for all observation and B_{max} be a vector of parameters relating π_i to X. as in general linear model. X may not constant regression. But he could not give ay directon of basis for choosing such a model in real pruposes.

6.01 Estimation of Parameters

The general regression model is defined as

$$\log_e\left(\frac{\pi_i}{1-\pi_i}\right) = X_i' B$$

where X_{nxk} be a matrix of full colum and B_{max} be a vector of parameters.

Since y_i takes on the values one or zero with probabilities π_i and $1-\pi_i$ and if the observation are independent the joint probability for the observation is given by

$$P(y_i, y_2, y_3, \ldots\ldots, \ldots\ldots\ldots, y_n) = \prod_{i=1}^{n} \pi_i^{y_i} (1-\pi_i)^{1-y_i}$$

$$= \prod_{i=1}^{n} \left(\frac{\pi_i}{1-\pi_i}\right)^{y_i(1-y_i)}$$

$$= \prod_{i=1}^{n} \left(e^{x_i'\beta}\right)^{y_i} \left(\frac{1}{1+e^{x_i'\beta}}\right)$$

and the log likelihood function is $LogL(\beta) = \sum_{i=1}^{n} Y_i X_i' \beta - \sum_{i=1}^{n} Log_e(1+e^{x_i'\beta})$

The partial derivation of the log likelihood with respect to B as

$$\frac{\delta \log L(\beta)}{\delta \beta} = \sum_{i=1}^{n} Y_i X_i - \sum_{i=1}^{n} \left(\frac{e^{x_i'\beta}}{1+e^{x_i'\beta}}\right) X_i$$

$$= \sum_{i=1}^{n} Y_i X_i - \sum_{i=1}^{n} \left(\frac{1}{1+e^{x_i'\beta}}\right) X_i$$

$P = \frac{1}{(1+\exp(-X_i'\beta))}$ is the fitted of π_i amd thus estimating equation set the fitted sum $\sum Y_i X_i$. In matrix form, we may write the estimatin equations as $X'P = X'Y$ where $P = (P_1, P_2, P_3, \ldots\ldots\ldots\ldots, P_n)$

Note that the similarity of the least square estimating equation of the general linear model which may be written as $X'Y' = X'Y$

Wald Statistic for testing the significance of the coefficients:

For large sample size the test that a co-efficient is zero can be based on the Wald statistic which has a chi-square distribution. When a variable has single degree of freedom, the wald statistic is just the square of the ratio of the co-efficient to its standard error i.e

$W_i = \frac{\beta_i}{S.E(\beta_i)}$, which follows chi-square distribution with 1 degrees of freedom.

Unfortunately, the Wald statistic had a very undesirable property. When the absolute value of the regression co-efficient becomes large, the estimated standard error is too large. This provides a Wald statistic that is too small, leading to fail to reject the null hypothesis that the co-efficient is zero.

Therefore whenever we have a large co-efficient, we should not rely on the Wald statistic for hyphothesis testing. Instead we should build hyphothesis test on the difference between the ratio two likelihood ratio chi-squares (Huck and Donner, 1977)

D. Chi-square (χ^2) Test

Chi-square (χ^2) test are used mainly by testing hyptheses that specify the nature of one or more distribution as a whole[30]. It may also specify that certain attributes or variate are independent.The Chi-square (χ^2) test is also used for testing the equality of a set of variances or correlation coefficients. If O_i (i=1,2,...k), denotes

the observed frequency and E_i denotes the corresponding expected frequency, the test statistic (χ^2) defined as

$$\chi_{(f)}^{2} = \sum_{i=1}^{k} \frac{(O_i - E_i)^2}{E_i}$$

where f denoted the degrees of freedom, the only parameter of the theoretical Chi-square (χ^2) distribution. This parameter is equal to (k-r) where r is the number of independent restrictions imposed on the set of frequencies while calculating the expected series.

E. Bongaarts' Model

Bongaarts' (1978) expressed total fertility rate TFR, is the product of four indices measuring the fertility inhibiting effect of these four indices and the total fecundity rate (TF). The TF is the average number of live births expected among women who during their entire reproductive period, remain married, do not use contraception, do not have any induced abortion and do not breastfeeding their children (Bongaarts', 1982). According to Bongaarts' model, the TFR can be written as:

$$TFR = C_m \times C_c \times C_a \times C_i \times TF$$

Where, C_m is the index of proportion married

C_c is the index of non-contraception

C_a is the index of abortion, and

C_c is the index of lactational infecundability.

TF is the total fecundability

F. Alternative approach of Bongaarts` model

In Bongaarts` model we replace only the index of fetal wastage in stead of the index of induced abortion which as one of the proximate determinants of fertility. The other indices have remained the same as proposed by Bongaarts`.

In our proposed Bongaarts` model we considered all miscarriage or all fetal wastages (miscarriage, abortion and stillbirth) together in stead of only induced abortion in computing the index. The index may be termed as index of fetal wastage and indicated as $C_{fw.}$ Because the index of miscarriage or all fetal wastage have direct impact on fertility. Then our proposed Bongaarts` model becomes

$TFR = C_m \times C_c \times C_{fw} \times C_i \times TF$

Where the index of fetal wastage is defined as the ratio of the observed total fertility rate, to the estimated total fertility rate with all fetal wastage which is (TFR+FW) that is

$$C_{fw} = \frac{TFR}{(TFR + FW)}$$

The Coale`s Indices

The indices devised by Coale and others take the following forms:

I_f (Index of Overall Fertility) = $\frac{\sum W_x f_x}{\sum W_x F_x} = \frac{B}{\sum W_x F_x}$

I_m (Index of marriage pattern) = $\frac{\sum m_x f_x}{\sum W_x F_x}$ and

I_f (Index of Marital fertility) = $\frac{\sum W_x f_x}{\sum m_x F_x} = \frac{B}{\sum m_x F_x}$

Where x range in five-year age groups from 15 to 50 and the sum is taken over all ages.

Here W_x is the number of women at age x

m_x is the number of married women of age x

f_x is the fertility rate of women of age x

F_x is the fertility schedule of the Hutterites: 1921-1930[1]

B is the total births.

Chapter-Three

Fertility Differentials

CHAPTER-3

Fertility Differentials

3.1 Introduction

The study of the determinant of fertility in a population is a complex process. While every animal increase family. Human beings are not exception of it. To give birth is a general characteristic woman. But the capacity of giving birth is not the same for all women. At a time, which is seen in different region and within the same region is called the differential fertility. The focus on fertility differentials is due to its important role in determining population growth and its impact on economic development. Human fertility is to be influence by a multitude of socio-economic, socio-culture, biological, demographic, and socio-economic factor. Socio-economic and socio-culture variables cannot directly influence fertility but must act on fertility through their effect on one or more of the proximate determinants. Socio-economic condition of population and difference in them affect the level of fertility in a population and create differences among the sub-groups or sub-regions.

In this chapter differentials of fertility are investigate by some selected background variables: Age at marriage, Region, Place of residence, Religion, Education, Currently working, Occupation of women, Knowledge of MR, and women's participation of NGO's, Husband's Education, Husband's occupation, Group family members (for living children) and birth status of women in Bangladesh. Here the average number of children ever born per ever-married women is used as a fertility measurement. The analysis is performed on the basis of means, standard deviation and co-efficient of variations where necessary, in order to look at the inherent pattern in the fertility analysis only mean (average) number of children ever born and mean number of living children are taken into account.

3.2 Age at marriage.

Age at marriage is one of the important factors in demography as it is directly related to fertility societies. 'Marriage in most Asian societies defines the onset of the socially acceptable time for childbearing' (Ahmed Al Sabir et. al., May 2005). Women who marry early will have, on average, a longer period of exposure to pregnancy, often leading to a higher number of children ever born.

Age at marriage has an important effect on fertility, especially in a society where contraceptive is not regularly practiced and where births do not occur outside marriage (Coale and Tey, 1961, p: 631). It is a common believe that marriage is inversely related to fertility. While early marriage of women has been conductive to high fertility (Osborn, 1958), late marriage is argued to have a fertility reducing effect (Coale, 1975). Delayed marriage with other thing being equal, shortens the period between generations and hence puts an independent brake on long-range population growth (Davis and Blake, 1982).

In Mysore, it has been shown that a rise in the age at marriage of women from under 15 years to 16-18 years has raised fertility, but postponement of marriage to 19-21 years or beyond has produced an appreciable decline in fertility (UN, 1961). Agarwala (1967) estimated that an increase in average age at marriage from the existing 15.6 years to 19 or 20 would lead to a decline of birth rate 29% in India. The potential impact of age at first marriage is especially high in countries where there is little voluntary control of fertility (Yaukey and Thorsen, 1972). The proportion of women marrying by age 15 has declined by almost half over time, form 71 percent among women in the oldest cohort (that is 45-49) to 37 percent among women age 20-24 (Mira and Associates, May 2005; 93). Still, more than 50 percent of all women age 20-49 enter marriage before their 15th birthday. Compared of data from the four BDHS surveys since 1993 indicates that although the median age at first marriage for women 20-49 has increased over time, there was a decrease from a median of 15.0 years at the time of the 1999-2000 BDHS to 14.10 years in 2007 (NIPORT, Dhaka; March 2009).

In this section the average numbers of children ever born per ever-married women are calculated by age and age at marriage, which are presented in Table 3.1 and figure 3.1 and figure 3.1(a). The Table reveals that when current age is held constant, the average number of children decreases with higher age at marriage. It is experimental that fertility increase in age.

Table 3.1 Average Number of Children ever born per ever-married women by age and Age at Marriage: Bangladesh (2007)

Age Group of Women	Age at Marriage				Mean $\bar{x}=\frac{\sum x}{n}$	S.D(σ)	$C.V=\frac{\sigma}{\bar{x}}\times 100$
	<15	15-19	20-24	25^{+}			
10-17	0.5449	0.1508			0.34780	0.2787	80.132
18-25	1.7981	1.1040	0.525		1.1424	0.6374	55.794
26-33	3.1852	2.5816	1.6298	0.7333	2.0325	1.0771	52.992
34-41	4.2126	3.4810	2.6667	1.6	2.9901	1.1214	37.504
42-49	4.9261	4.3602	3.3012	1.9	3.6219	1.3309	36.746

The table indicated that the women completing her childbearing period who was married at the age of <15 years has on average produced 4.9260, while one who was married at age of 25+ has produced on average 1.9 children which is more than 61.42 less than those marred at <15 years of age. The table also shows age standardized mean live births decline to educated women. It appears that fertility goes down when marriage takes place at a late stage it is well known fact that fertility rate is higher in countries where marriages take place at comparatively early ages, as compared with the people who marry at late stage.

Figure 3.1 Average Number of Children ever born per ever-married women by age and Age at Marriage: Bangladesh

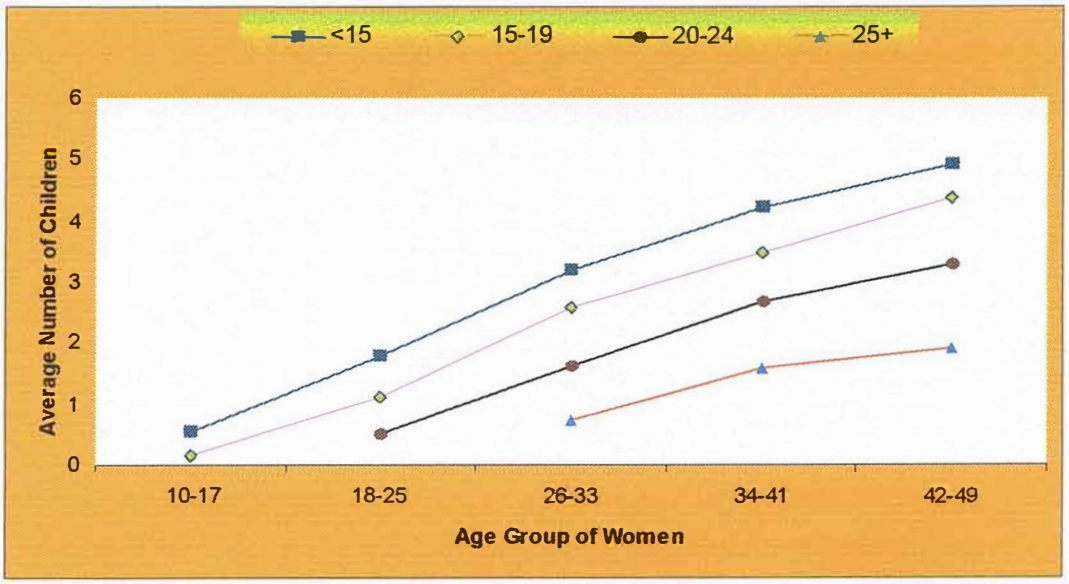
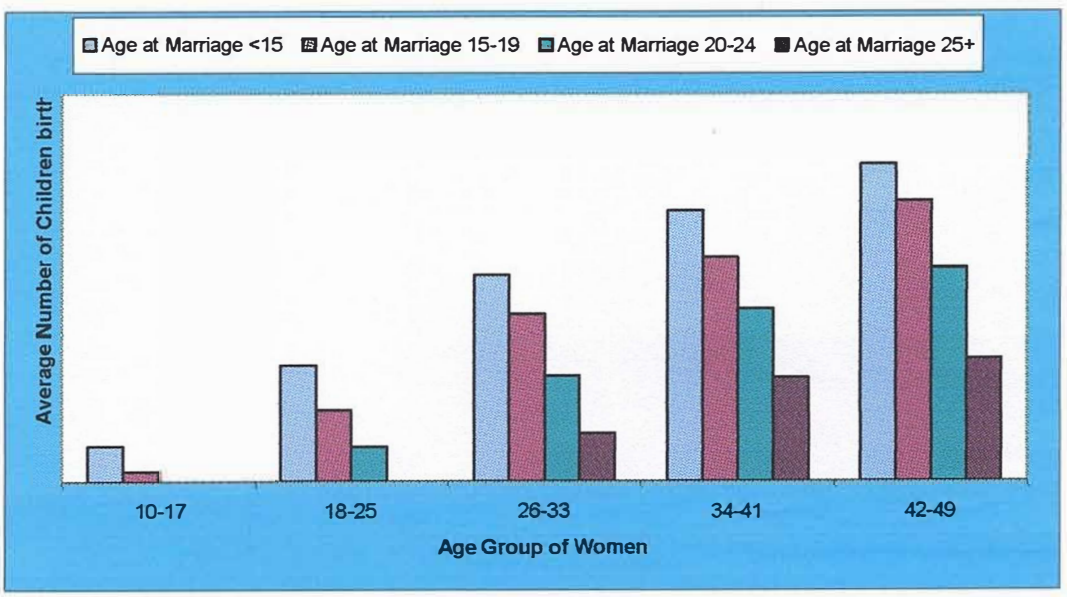


Figure 3.1(a) Average Number of Children ever born per ever-married women by age and Age at Marriage: Bangladesh



3.3 Place of Residence

Urban-rural differential in fertility is one of the most widely studied areas in differential fertility. While higher fertility in rural areas than in the urban areas has almost consistently observed in the present developed countries, results from the developing countries do not show consistent differentials by urban-rural place of residence. Thus urban fertility was found to be lower in Taiwan (Freedman et. al., 1972; 294) and Thailand (Gold, 1973: 225), than the rural one, while higher in urban than rural fertility has observed in Indonesia (University of Indonesia, 1974: 6) and Egypt (Omran, 1973: 100). Data on urban-rural fertility for Bangladesh are presented in Table 3.2 and Figure 3.2. Considering the mean live births to ever-married women in the age group 42-49) as completed fertility, it is observed that urban fertility is lower on the average by about 0.43 children than the rural one. The total average fertility all over Bangladesh is 2.31. The lower fertility for urban areas is also seen for all age groups.

Table 3.2 Average number of children ever born per ever-married women by age and urban-rural Residence: Bangladesh (2007)

Age Group of Women	Residence		
	Urban	Rural	Total
10-17	0.473054	0.454327	0.92738
18-25	1.299505	1.478058	2.77756
26-33	2.424351	3.003962	5.42831
34-41	3.405063	4.084034	7.489097
42-49	4.224894	4.995421	9.220315
Average Number of live birth	2.365373	2.803160	2.305079

When average number of live births for age differences, higher fertility in rural areas are still apart, the overall average number of live births being 2.3653 in the rural areas and 2.803160 in the urban areas (Table 3.2). This observed differential might be attributed to higher age at marriage, higher level of real income per person, better health services, educational facilities, employment of women in the modern sector and other social amenities in the urban areas, which have the effect of reducing fertility.

Furthermore, children might be considered as economic assists rather than burden in the rural areas, which cause higher fertility in the rural areas (Caldwell, 1978). Rural community people, considered children are both as earners during childhood and as social security in old age.

The relative cost of bearing children and the lower economic value of children in the urban area, opportunity cost for mother's time might have played an important role in lowering the fertility of urban women through practice of the effective methods of birth control. Thus it is seen that the level of fertility is somewhat higher in the rural than urban areas.

Figure 3.2 Average number of children ever born per ever-married women by age and urban-rural Residence: Bangladesh.

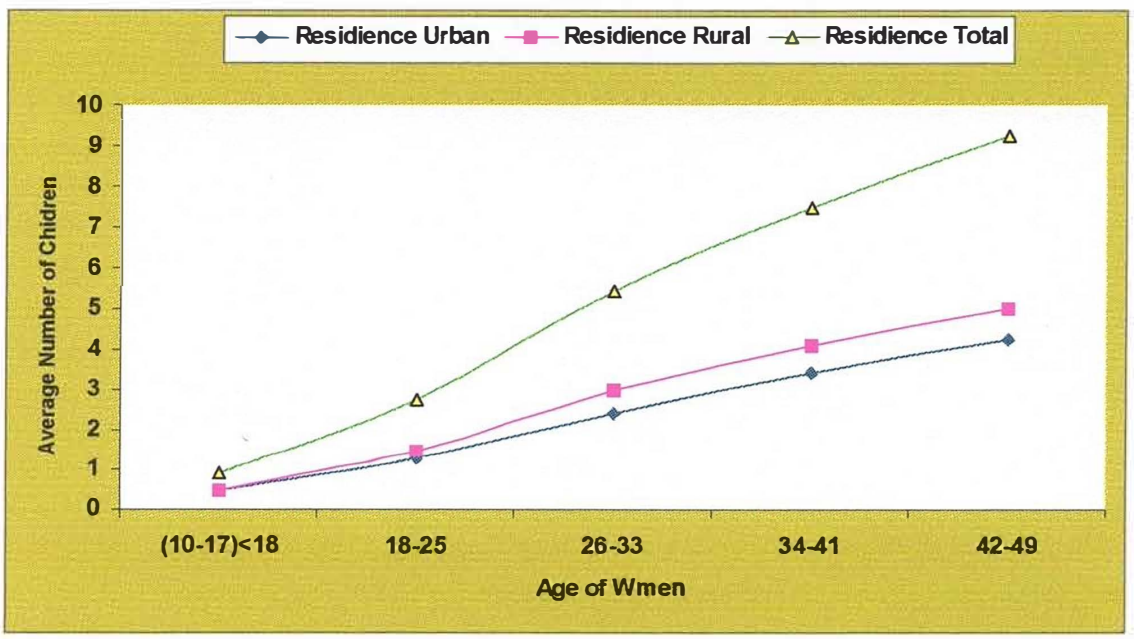
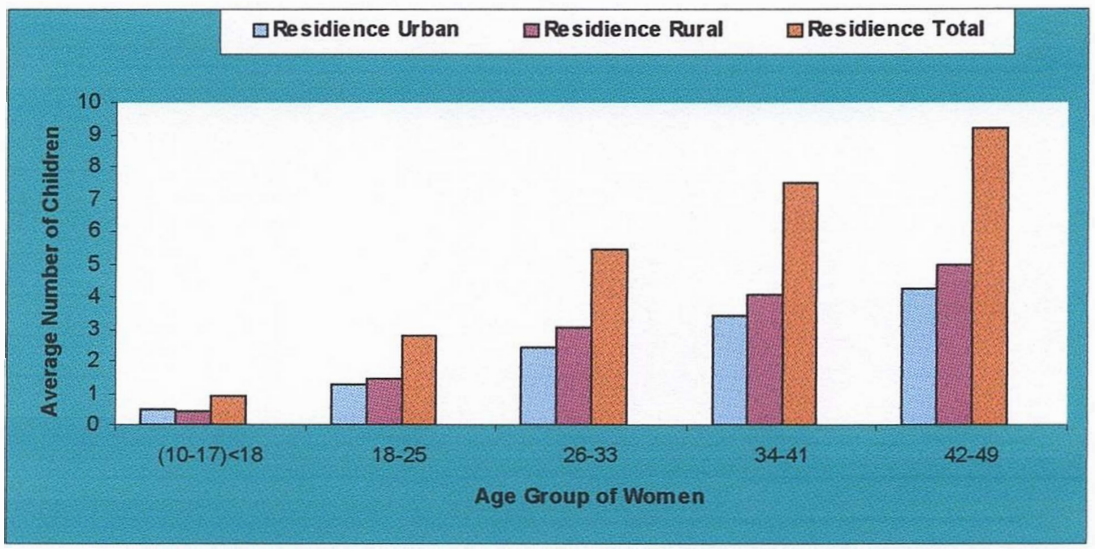


Figure 3.2(a) Average Number of Children ever born per ever-married women by age and urban-rural Residence: Bangladesh.



3.4 Religion

Fertility is affected and influence by the preaching of religions. Those religions, which do not put any bar on the number of marriage and children, are likely to have more fertility than the others. Because more the number of wives for a male person have normally there are more children. Islam is the pre-dominant religion in Bangladesh with 90.1% Muslim, 9.0% Hinduism, 0.1% Buddhism, 0.7% Christianity, and others 0.1% (BDHS 2007). Religion values system, which influence individual values are different between the Muslim and Non-Muslims.

The average numbers of children ever born by religion are presented in Table 3.3 and Figure 3.3(a). The Table indicate that the Muslim have higher fertility than Non-Muslim in each age group. The table also shows that average number of live birth for age differences, Muslim has the highest average live births 2.67 than Non-Muslim women 2.27; which mean that Muslim women have the 15% higher average live births than Non-Muslim women.

Table 3.3 Average number of children ever born per ever-married women by age and women's Religion: Bangladesh (2007)

Age Group of Women	Religion	
	Non-muslim	Muslim
10-17	0.35556	0.468401
18-25	1.230284	1.432664
26-33	2.479592	2.813514
34-41	3.159292	3.881860
42-49	4.105263	4.761964
Average Number of lives birth	2.265997	2.671681

Figure 3.3 Average number of children ever born per ever-married women by age and women's Religion: Bangladesh

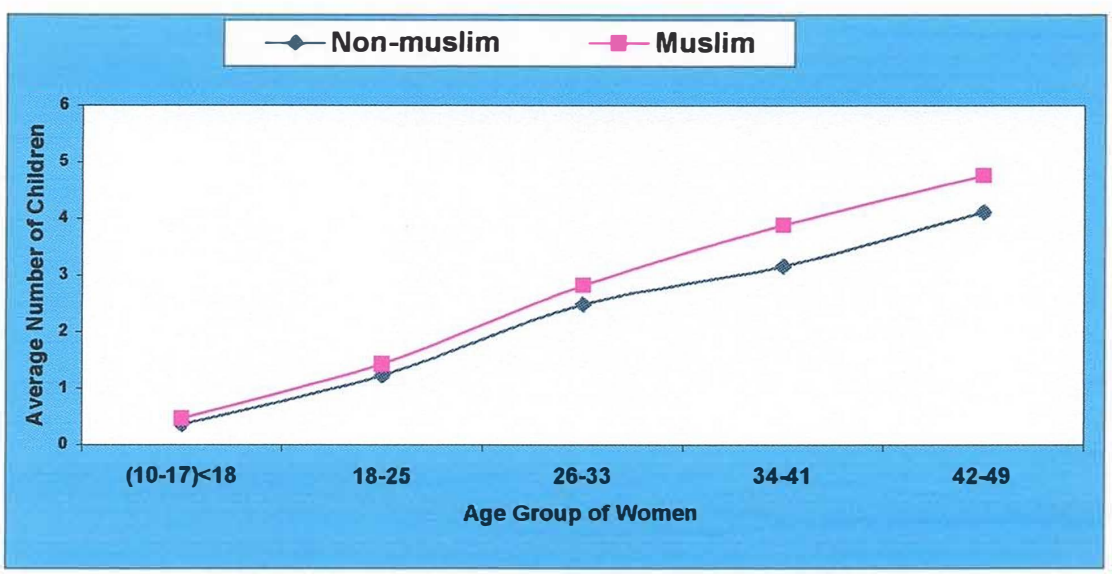
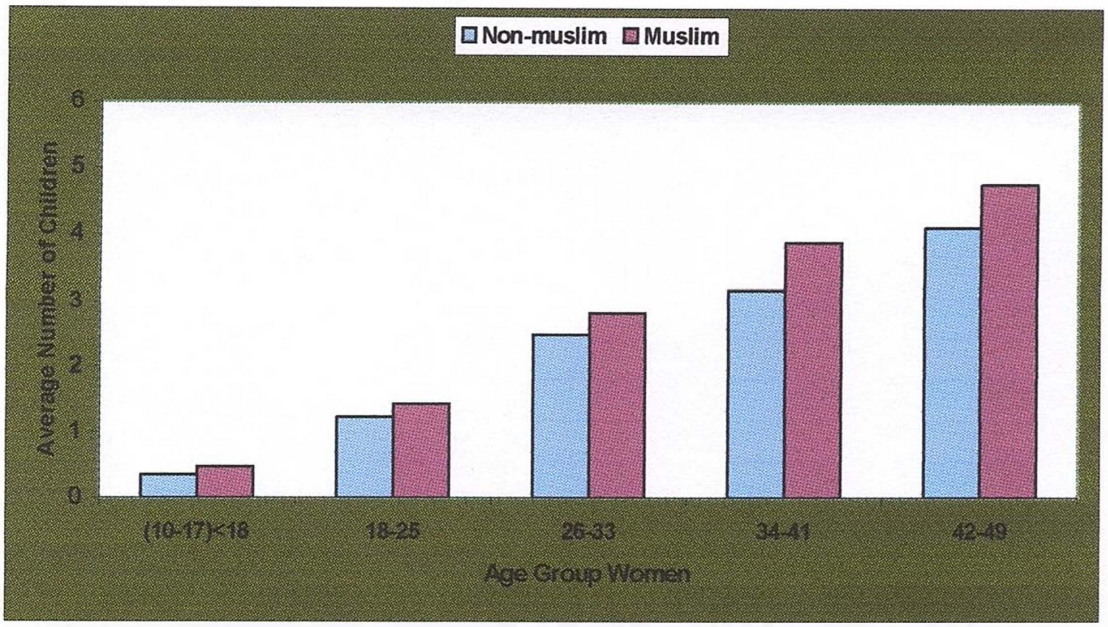


Figure 3.3(a) Average number of children ever born per ever-married women by age and women's Religion: Bangladesh



3.5 Region

The study of regional differentials in fertility is of great importance because it will throw light on the regional variation, if any, in the childbearing patterns. The identification of the factors underlying the differentials will help in formulating strategies and programs for reducing fertility. It has been shown that the regional variation in the rate of growth of population in Bangladesh is mainly due to the variations in fertility (Sivamurthy and Ahemed, 1979)

Table 3.4 and Figure 3.4(a) show the number of children ever born per ever-married women by age group among the regions. It can be seen form the Table that the variation is prominent in the age group 18-25 and diminishes with increasing age. The higher variation in the age groups may be attributed to variation in the level of urbanization; the level of education and female participation in the labor force might have had varying influence in bringing about the observed variation in fertility. On the other hand, the variation in the higher age groups may be due to the extent of variation in widowhood, divorce and childlessness in addition to differential behavior towards

Table 3.4 Average number of Children ever born per ever married women by age and Regions Bangladesh (2007)

Age Group of Women	Barisal	Chittagong	Dhaka	Khulna	Rajshahi	Syhlet	Mean($\bar{x}$)	S.D(σ)	C.V = $\frac{\sigma}{\bar{x}} \times 100$
10-17	0.3529	0.51923	0.46902	0.34375	0.5153	0.56363	0.4606	0.09206	19.9852
18-25	1.4577	1.3975	1.4205	1.2812	1.3733	1.5900	1.4200	0.1022	7.2004
26-33	2.7802	3.1403	2.7669	2.3205	2.5155	3.2479	2.7952	0.3546	12.6851
34-41	3.8063	4.3846	3.7976	3.1792	3.3155	4.5542	3.8395	0.5516	14.3664
42-49	5.0531	5.3243	4.5270	4.0132	3.9481	5.5389	4.7341	0.6750	14.3664
Average Number of live birth	2.6900	2.9531	2.5962	2.22757	2.3335	3.0989	2.6498	0.3395	12.8143

fertility regulations or family planning practices among the regions, which are dependent on socio-cultural differences.

Figure 3.4 Average number of children eve born per ever-married women by age and women's Region: Bangladesh

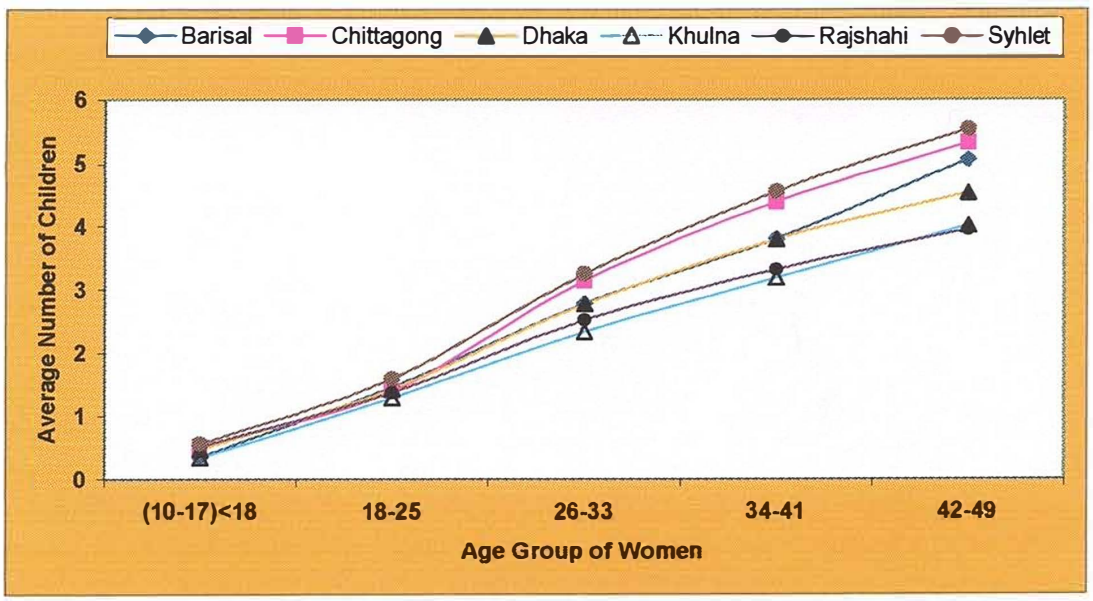
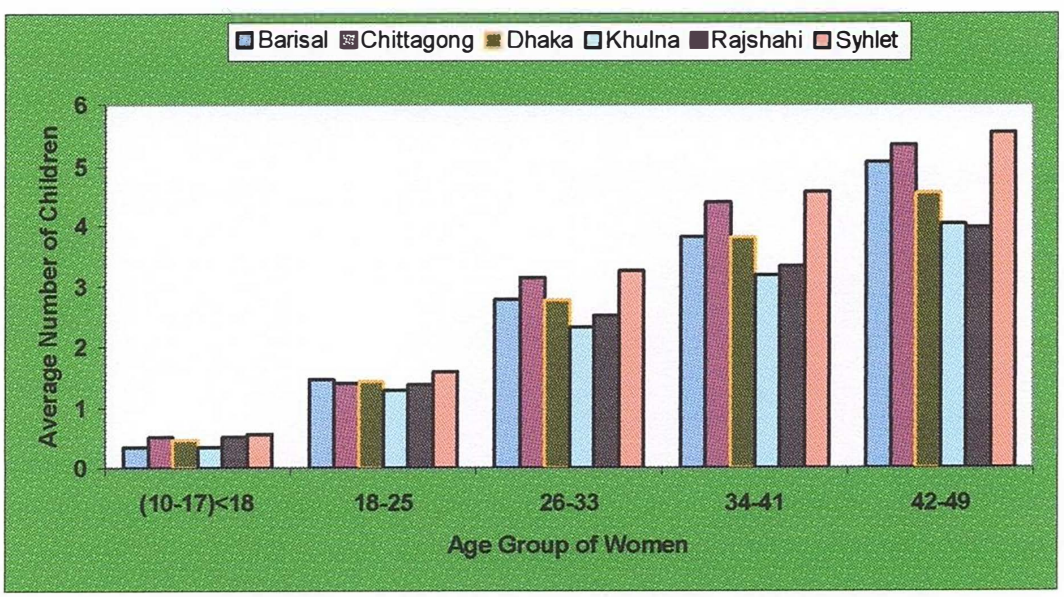


Figure 3.4 (a) Average number of children eve born per ever-married women by age and women's Region: Bangladesh



When average no of births for age groups (Table 3.4 and Figure 3.4), it appears that fertility is higher in Chittagong, Sylhet and Barisal with average number of children ever born per women are 3.9531, 3.0989, 2.690 respectively. Fertility is lower on average in Khulna 2.227; and Rajshahi 2.3335 respectively. Dhaka and Rajshahi have intermediate levels of fertility. The following information of BDHS data may be the effect of the regional variation of fertility.

3.6 Education

Education is one of the most important factors of fertility. One of the consistent is finding in the inverse relationship between education and fertility. Education may affect fertility through raising age at marriage, giving alternative source of new normative orientation and expansion of vision, increasing a woman's knowledge and use of birth control as well as providing better opportunity for labor force participation (Ryder, 1967; Janowitz, 1976).

Examination of the Table 3.5 and Figure 3.5 (a) presenting average number of live births per ever-married women by women's education reveals that women who had no education (that is illiterate) show the highest completed fertility 2.557. The completed fertility for women with education levels secondary and higher is respectively 2.036 and 1.387

The completed fertility for women who had completed primary education is 4.064, which are less than those with no formal education, although the difference is very little. It can be also seen from Table 3.5 that women with no education tended to have more children in all the groups than those with primary, secondary, and higher education level.

Table 3.5 Average number of children eve born ever per-married women by age and women's Education level: Bangladesh. (2007)

Age Group of Women	Education			
	Illiterate	Primary	Secondary	Higher
10-17	0.58064	0.43373	0.39541	0.16667
18-25	1.75146	1.49374	1.13203	0.6716
26-33	2.9168	2.70934	2.2643	1.5287
34-41	3.5890	3.49140	2.9340	2.1381
42-49	3.9476	4.0642	3.4585	2.4348
Average Number of lives birth	2.557	2.4384	2.0368	1.3879

The higher level of fertility for women with no education (illiterate) than educated (literate) women may be due to the following reasons.

(i) Women with no education are not conscious of having a limited family size.

(ii) At an age when there are more chances of having fertility, the girls are in the college and university and thus do not get children, which during this period uneducated girl get.

Figure 3.5 Average number of children ever born per ever-married women by age and women's Education level: Bangladesh

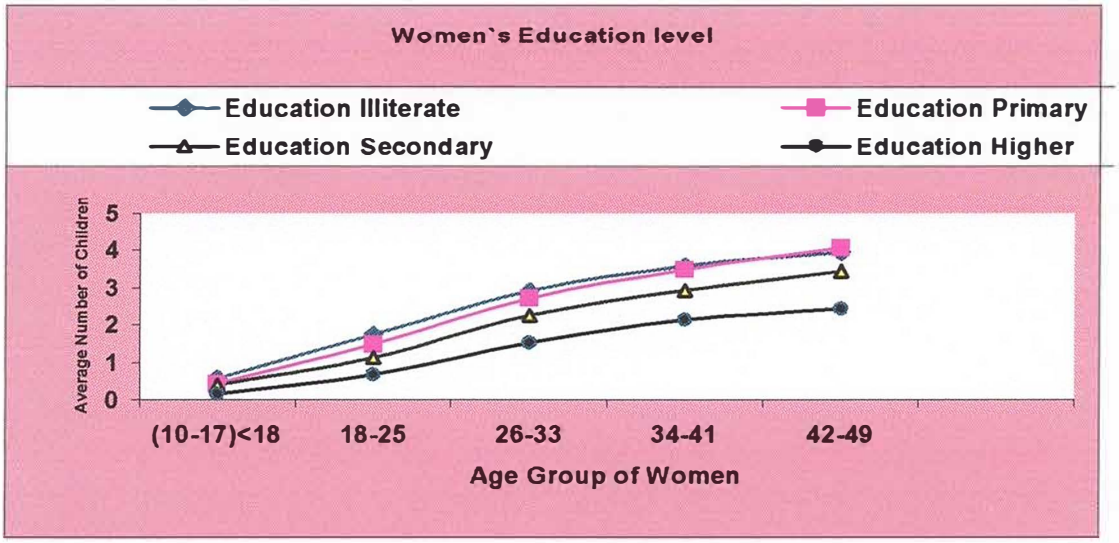
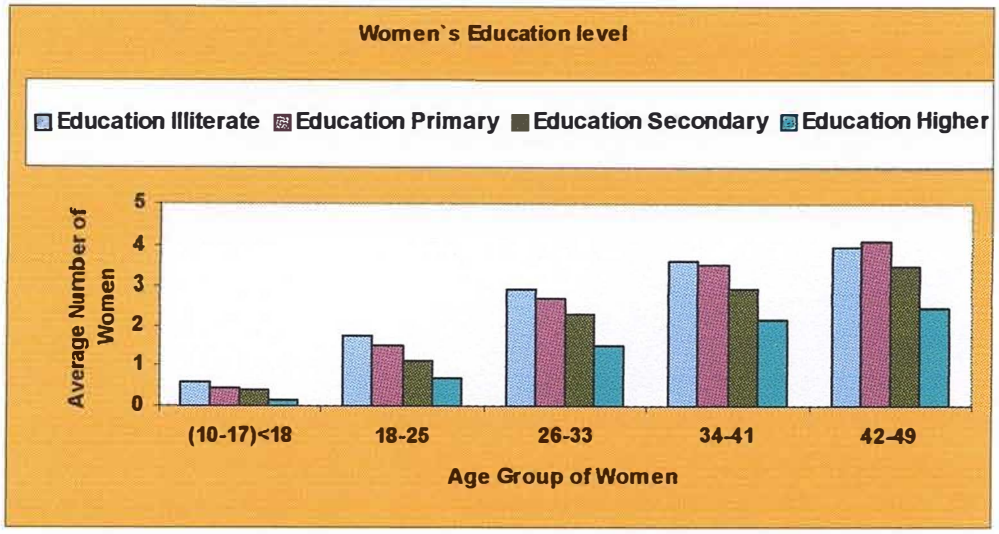


Figure 3.5(a) Average number of children eve born per ever-married women by age and women's Education level: Bangladesh



3.7 Working status of women

Studies of concerning the impact of labor force participation on fertility suggest that working women have lower fertility than their non-working counterparts (Devanzo, 1972; UN, 1973). It also argued that labor-force participation would have a decreasing effect on fertility only if it is incompatible with childbearing (UN, 1973). The direction is of causality between labor force participation and fertility is not certain, because labor force participation may be a consequence as well as a cause of lower fertility. The average numbers of children ever born by work status and current age of lower fertility. The average numbers of children ever born by work status and current age of women are presented in Table 3.6 and Figure 3.6

Table 3.6 Average number of children ever born per ever-married women by age and Women's Current working status: Bangladesh (2007)

Age Group of Women	Women's Currently Working Status	
	Not- working (No)	Working (Yes)
10-17	0.451220	0.505495
18-25	1.393582	1.468610
26-33	2.82592	2.699906
34-41	3.936582	3.602506
42-49	4.893098	4.302782
Average Number of live birth	2.70008	2.51586

It appears that the children ever born on the average is higher for non-working women than working women for each age group except 10-17 and 18-25. In the case of average of live birth same picture is apparent. Women who are involved with a job are not dependent on men now and often. Both socially and mentally these have their own rights and absence of dependence, men cannot use women to forcibly increase their fertility. This has also resulted in low fertility. Fertility depends on social status of the women. In societies where women are confined only to housed jobs, these are considered suitable only for producing children and such those women who are held in high esteem.

Figure 3.6 Average number of children ever born per ever-married women by age and Women's Current works status: Bangladesh.

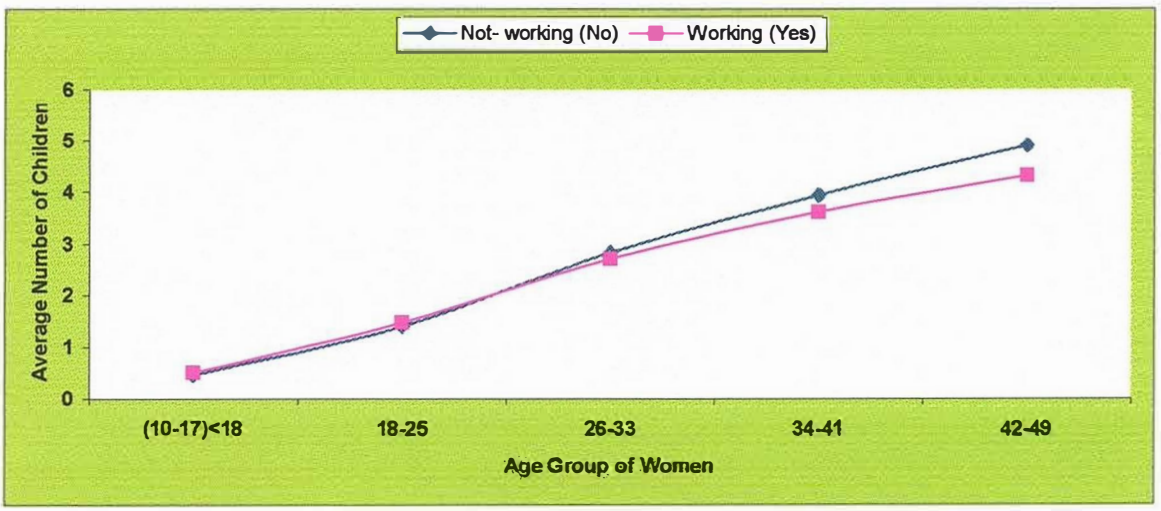
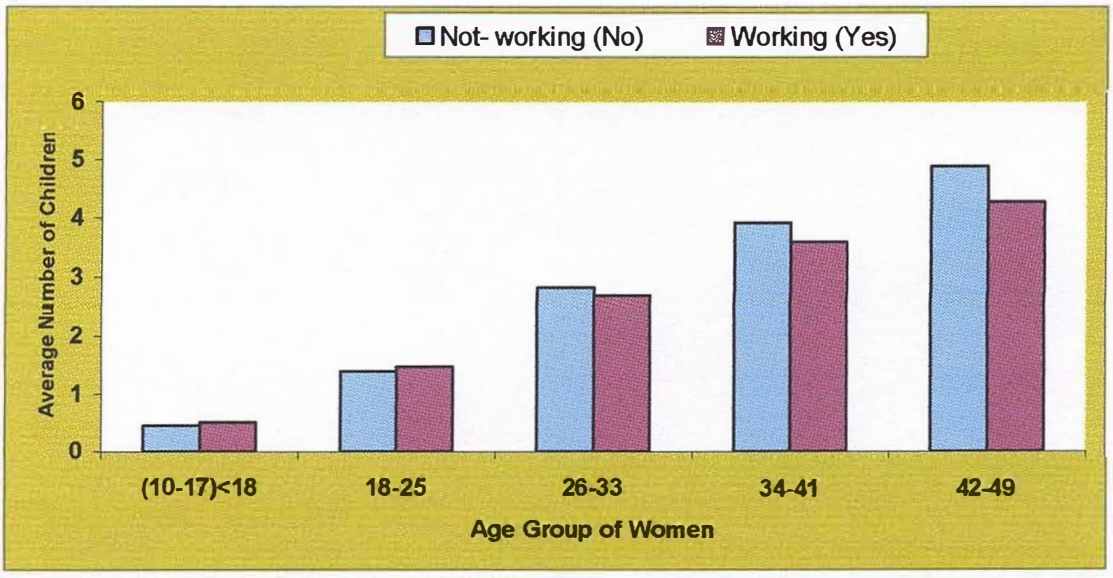


Figure 3.6(a) Average number of children ever born per ever-married women by age and Women's Current works status: Bangladesh.



3.8 Husband's Education

Husband's education has a significant effect on the children ever born to ever-married women, because in our society almost everything depends on the opinion of a husband. Now a day's higher educated persons are giving important to the educated female for marriage; as a result a balance is prevailing upon the families, which play a negative role in fertility.

To observed the Table 3.7 and Figure 3.7; 3.7(a) presenting average number of children ever born per ever-married women by husband's education. This table also shows that husband with no education observed higher fertility than all other educational categories.

Table 3.7 Average number of children ever born per ever-married women by Age and Husband's Education Level: Bangladesh (2007)

Age Group of Women	Husband`s Education level			
	Illiterate	Primary	Secondary	Higher
10-17	0.5857	0.46261	0.3846	0.3617
18-25	1.7725	1.54062	1.2106	0.9214
26-33	3.2154	2.9817	2.6126	1.8078
34-41	4.3199	4.0659	3.5726	2.6033
42-49	4.9781	5.0656	4.5700	3.5289
Average Number of live birth	2.9743	2.8232	2.47008	1.8446

Table 3.7 indicated that women with husband's educational levels tended to have more children in all age groups than those with higher education. The completed fertility for women whose husband's with primary education is 5.0656, which is greater than higher level that is 3.5289. When average number of live births is calculated the same picture is visible. That is, higher the education level, lower the number of children ever born.

The lower level of fertility for women whose that's education level is higher than those with secondary education may be due to the following reasons:

(i) Usually educated men marry at late stage and so fewer children are produced but uneducated men marry at early age, as a result they produce more children.

(ii) Educated men always want to educate his children. As too much money is expending to educate the children, so they want to keep their family limited. But illiterate men never think so.

(iii) An educated men is more conscious about hygiene than an illiterate men and he dies not taking so many children considering the physical condition of his wife.

(iv) Uneducated men are usually orthodox about religion and they consider family planning as anti-religious and don't use any method. But the educated man always think practically and they maintain different customs in s systematic way.

(v) Educated men are generally involved in different occupation and so they have to go different places and they want to maintain the high standard with other families. But too many children create hindrance to maintain it.

Figure 3.7 Average number of children ever born per ever-married women by age and Husband's education level: Bangladesh.

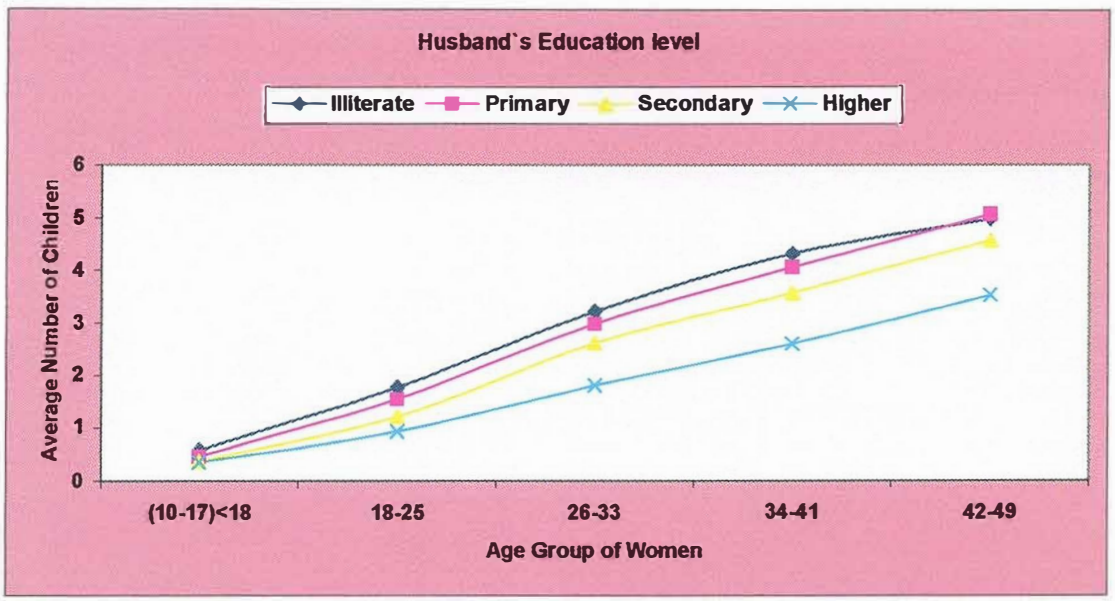
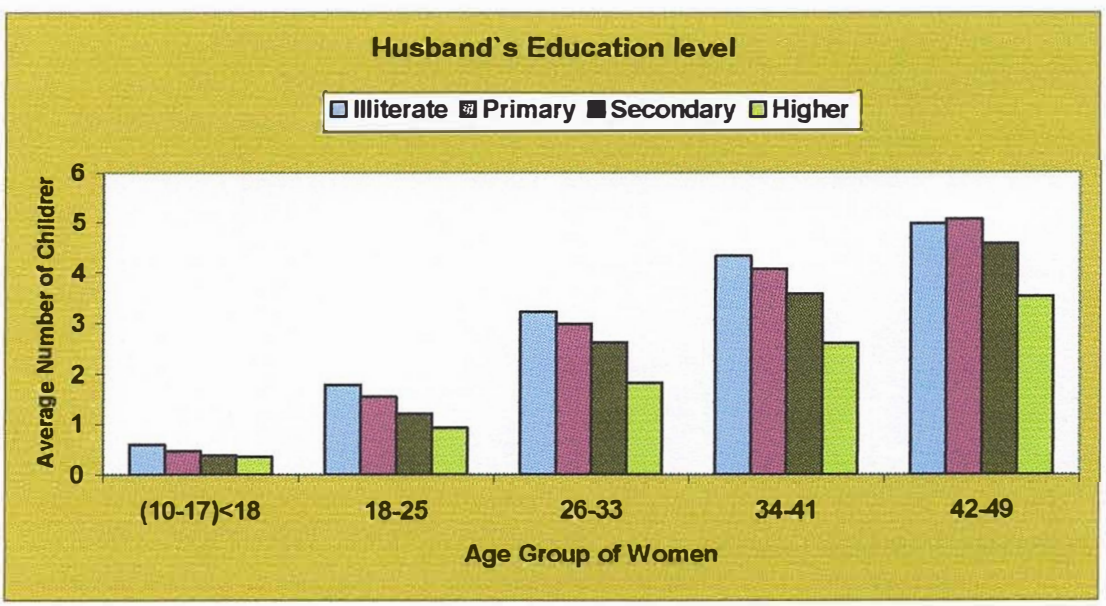


Figure 3.7(a) Average number of children ever born per ever-married women by age and Husband's education level: Bangladesh.



3.9 Women's Participation of NGO's

New a day NGO's play a very important role in reducing effect such a third world country like Bangladesh. In Bangladesh NGO's are said to be the alternative institution to promote the national progress of the country. There are data on many NGO's in 2007 BDHS surveys such as Grameen Bank, BRAC, BRBD and Mothers club etc.

In Bangladesh NGO's are so diverse in nature and terms of activities that it is hard for anybody to find a single sphere where NGO's are not involved directly or indirectly or individually. Have the NGO's three district categories are observable; these are local, regional and national. At present is a large number of local, religion and national NGO's are working all over the Bangladesh to change the socio-economic through demographic, socio-demographic structure of the country. NGO's play a vital role for human resources development. Human resource development in the pre-condition for economic development and economic conditions are directly linked with fertility. The average number of children ever born by current age and women participation of NGO's is presented in Table 2.8

Table 3.8 Average number of children ever born per ever-married women by age and Women's Participation of NGO's: Bangladesh (2007).

Age Group of Women	Women's participated in NGO's and Organization					
	Grameen Bank		BARC		BRDS	
	No	Yes	No	Yes	No	Yes
10-17	0.4563	0.51515	0.45632	0.5454	0.4569	1.0000
18-25	1.37776	1.705722	1.3915	1.6983	1.4088	1.7907
26-33	2.75081	2.95285	2.7332	3.2539	2.7695	3.3830
34-41	3.79049	3. 93548	3.7884	4.0792	3.8140	3.7576
42-49	4.61317	5.22127	4.69320	4.6849	4.6901	4.9047
Average Number of lives birth	2.5977	2.07899	2.61252	2.8523	2.6278	2.9672

The table indicates that the average number of children ever born is higher for women up to age group 18-25, who have concerned with Grameen Bank and BRDB; up to age group 26-33, who have concerned with BRAC; than others who are not concerned with NGO's. But in the next age groups the average number of children ever is lower

for women who have concerned with NGO's except for age group 42-49 of Grameen Bank and age group 34-41 of BRDB than others.

The probable causes of these situations are as follows:

(i) Considering to updating the standard of the lives of the people the NGO's has taken lots of programs. They go to the rural and remotest area of the country and by their physical visit and they make the people understand the benefit of building sound health and provide them a little bit idea of medical science. Which affect fertility reducing effect?

(ii) Most of the villagers of our county are poor and illiterate; as a result, they cannot understand properly which thing is bad and which thing is good for them. In this situation NGO's help the villagers by taking proper decision for their improvement and that increased their consciousness as result, there creates a tendency on them that family size should be small and population explosion should be checked, otherwise many economic and social problem are bound to arise.

(iii) Educational activities taken by the NGO's open a new chapter all over the country. NGO's has taken various educational activities such as formal education, informal education, adult education, mass education, practical education and many other kinds of training etc. in this way a large number of villagers being conscious about themselves, about surrounding environment, about their practical life and about family planning system. Many NGO's supplies various materials of family planning methods, which directly affect fertility.

(iv) Although, NGO's take the above programs we see from the Table 5.9 that average number of children ever born per ever married women is increasing up to age groups 18-25 and the next two age groups decreasing, 42-49 age group again increasing who have concern with Grameen Bank than others who have not concern with Grameen Bank this may be due to that who are the member of Grameen Bank, most of them are poor, uneducated, early married and live in the rural areas; same behavior would have

found for all other NGO's members also. Overall, when they become a member of NGO's, then they already got married and have some of them are more children.

Figure 3.8(a) Average number of children ever born per ever-married women by age and women's Participation of NGO's: Bangladesh

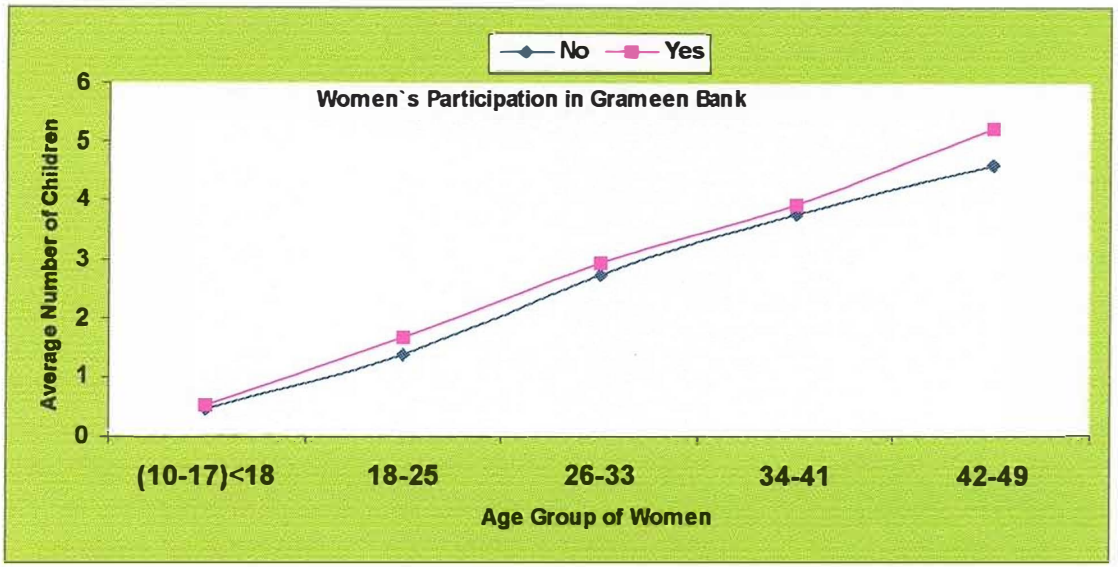


Figure 3.8(b) Average number of children ever born per ever-married women by age and women's Participation of NGO's: Bangladesh

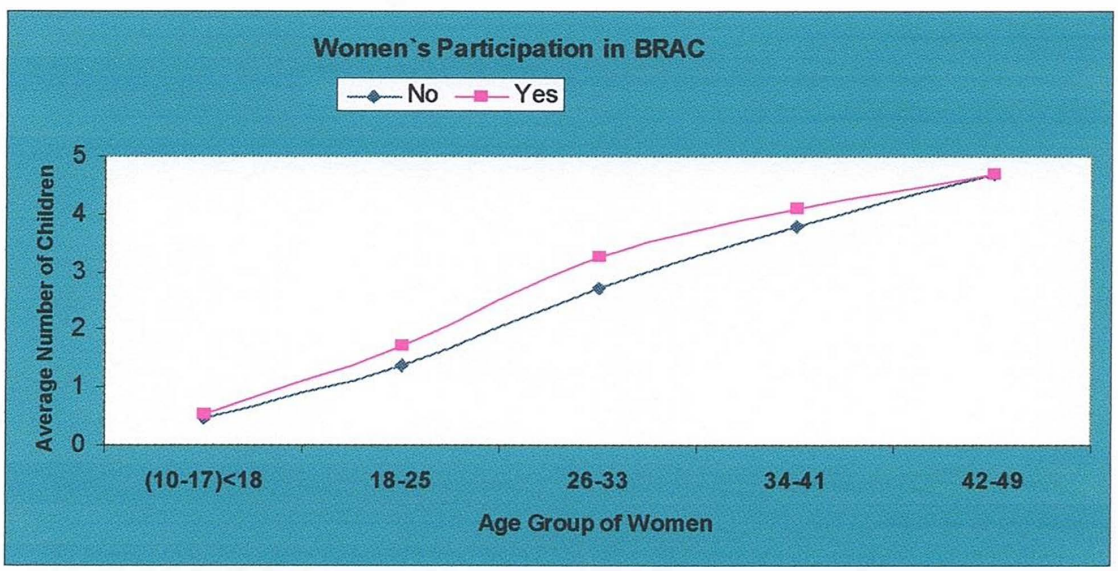
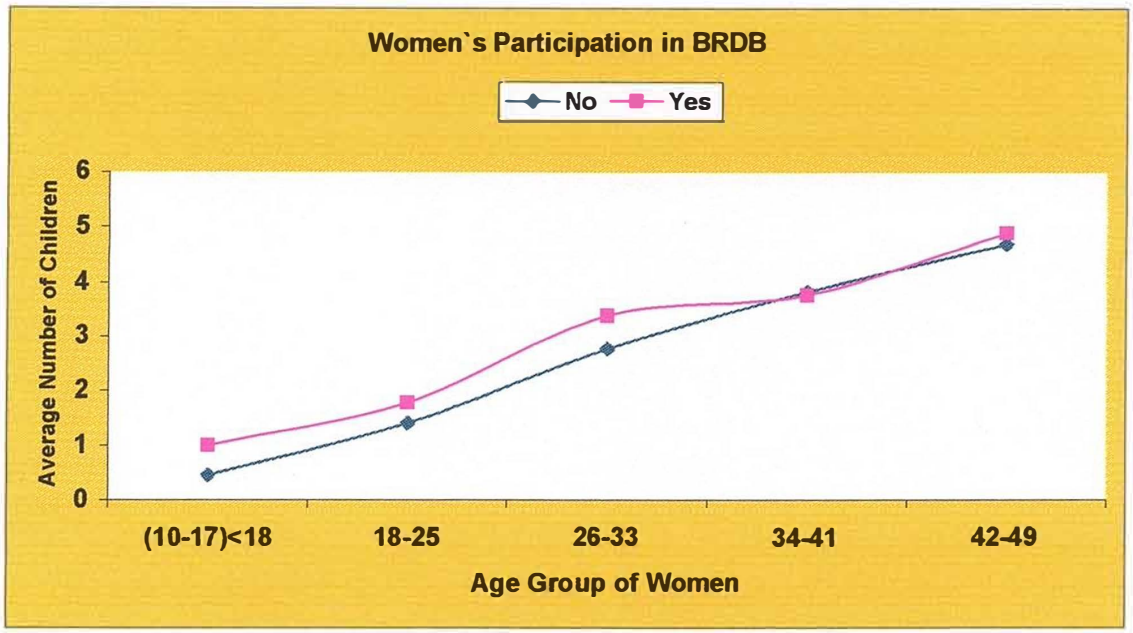


Figure 3.8(c) Average Number of Children ever born per ever-married Women by age and Women's Participation of NGO's: Bangladesh



3.10 Regional Differentials in fertility Changes: 19996/97-2007

The fertility decline in Bangladesh has not been uniform in different region. It is evident that the fertility level have decline rapidly in Dhaka and Rajshahi divisions. On the other hand, Chittagong and Sylhet division are lagging behind. Here we compare the regional differentials in order to reveal the factors associated with fertility change in different regions of Bangladesh.

Table 3.9 shows that the TFR decreased in Sylhet division from 4.20 to 3.70 during 2004 to 2007 in BDHS surveys. It is surprising that the fertility decreased in division from 2.80 to 2.00 while the level of fertility is approaching towards the replacement level in this region. The TFR is lowest in Khulna division, which is now leader in the success of family planning and fertility in Bangladesh.

The mean number of children declined in all the divisions during 2004 to 2007. It is evident that the birth interval has increased in all the divisions. It is surprising that for

the birth interval increased from 45.5 in 2004 to 49.4 in 2007 according to BDHS survey, and the TFR decrease from 3.0 to 2.7 during 1999/2000 to 2007. Also mean children ever born decreased in 2004 and in 2007 according to BDHS surveys.

Table 3.9 Regional Differentials for some selected characteristics (2007)

Characteristics	Barisal	Chittagong	Dhaka	Khulna	Rajshahi	Sylhet
TFR						
1996/1997 BDHS	3.31	4.06	3.18	2.52	2.78	4.20
1999/2000 BDHS	3.26	3.96	3.21	2.70	3.02	4.08
2004 BDHS	2.90	3.70	2.90	2.80	2.60	4.20
2007 BDHS	2.80	3.20	2.80	2.00	2.40	3.70
Mean CEB						
1996/1997 BDHS	2.80	3.10	2.80	2.60	2.70	3.10
1999/2000 BDHS	2.80	2.90	2.50	2.20	2.40	3.00
2004 BDHS	2.70	2.70	2.40	2.10	2.30	2.80
2007 BDHS	2.40	2.50	2.20	2.10	2.10	2.70
Mean Ideal Children						
1996/1997 BDHS	2.50	2.80	2.40	2.30	2.30	2.90
1999/2000 BDHS	2.50	2.80	2.40	2.30	2.50	3.00
2004 BDHS	2.40	2.70	2.40	2.20	2.30	2.70
2007 BDHS	2.30	2.50	2.20	2.10	2.10	2.70

The age at marriage decreased slightly in all the division except Barisal during 1999/2000-1007. Also the mean number of ideal children has remained nearly same during the recent past. Also the level of wanted fertility around the value of replacement level has increased recently. This is inductive of the fact that a slight reversal or offsetting effect has been taking place as the fertility is approaching replacement level. This can be viewed as a cause of stalling fertility change.

Although researchers and policymakers tipped the family planning programs as the most important contribution to the decline in fertility in the past, the BDHS data shows that about half of the users of contraception in all the regions discontinue within twelve months. In recent years, the discontinuation rates have increased slightly in most of the region indicating a further decline in the efficiency of methods of contraception. In other wards, the effective contraceptive prevalence rate has declined to small extent during the most past in all regions. This decline in the effective

contraceptive offsets the forthcoming impact of rising CPR, which contributed in stalling of fertility change

Fertility reached the lowest level 2.52 in Khulna division in 1996/1997, and since that although there was a slight increase in the level of CPR, the fertility level increased from 3.00 in 2004 to 2.7 in 2007 according to BDHS survey data. Highest increase in TFR was evident in Sylhet division from 4.08 to 4.2 during the same period. Interestingly, during the same period, all the low and medium performing regions registered steady decline in the level of TFR. Thus declining trends in TFR seemed to be at par, with corresponding increase in the level of CPR, unlike the high performing region of Khulna. According to Islam et, al. (2000), this increase was attributable to the relationship between ideal number of children and TFR.

3.11 Conclusion

Although all studies have shown that there are socio-economic variable like age at marriage, education, place of residence, religion, member of NGO's, work status of women, husband's education and occupation have positive or negative effect on fertility. So also in the case of Bangladesh as found in the preceding analysis, education and age at marriage has been found to be a strong discriminate of fertility, increase of the age at marriage and level of education may effectively reduce reproductive performance of the women in Bangladesh. Again, the urban-rural differential of fertility shows that the rural fertility is higher than urban. Besides these socio-economic variables that is women and men labor force participation influence fertility negatively. Again, it is usually seen that that those who are engaged in mental work have less number of children, as compared with those who are in physical labor. Socio-cultural variables religion and others status of women prove that in our rural and superstitious society such variables help to increase fertility and those may be the result of education, occupation, religion, urbanization and economic condition of that area.

Chapter-Four

Fertility Trends: Application of Coale's Indices

Chapter-4

Fertility Trends: Application of Coale's Indices

4.1 Introduction

One of the major objectives of the present study is to look at the fertility level and the changes thereof in context of the people of Bangladesh. It is well recognized that marriage in Bangladesh is universal. It takes place at an early age and almost all marriages of the females as well as of males in particular, are completed within a short span because within the marriageable span marriage progresses very fast (Shahidullah, 1980; Abedin, 1982; Kabir, 1990). Such peculiarities of the marriage pattern might be changed with time due to the development in the socio-economic conditions of the people both at the individual and collective levels.

There is evident that the fertility of women in Bangladesh was having on average 6.3 children in 1971-1975. It is declined to 2.7 children per women in 2007 BDHS (NIPORT, May 2009). Again, fertility behavior within marriage has changed in a countervailing manner. The marital fertility perhaps also has changed due to probable change in the marriage pattern.

The present chapter investigates the trends in the marriage pattern as well as in fertility for a period of 32 years from, 1975 to 2007. The objectives are to:

(i) Investigate the fertility levels, and

(ii) Assess the impact of marriage pattern on marital fertility.

The trends in marriage pattern are investigated by means of singulate mean age at marriage (SMAM) and trends in fertility by means of crude birth rate (CBR), total fertility rate (TFR) and trends in pregnancy rate; obtained at different point of time.

The cohort and the period fertility and their changes over time would investigate by means of children ever born (CEB) and age specific fertility rates (ASFR) respectively. Such changes in marriage and fertility cover a period of 32 years from 1975 to 2007. Finally the effect of marriage pattern and marital fertility and its trends are evaluated by means of the indices of I_f, I_m and I_g devised by Coale.

4.2 Trends in Age at Marriage

The mean age at first marriage is a useful tool for summary measure to study the pattern of distributions of first marriages. Mean age at marriage is a straightforward matter to compute directly the mean age or median age at first marriage, if data on age at first marriage are available. In absence of detail and adequate data on first marriage, it is possible to adopt indirect method. Hajnal (1953) suggested such a method for computing mean age at marriage from proportion or percentage single. He calls this mean singulate mean age at marriage (SMAM). Since the most frequently considered age group are five year in span, the process of computing the SMAM is described for data classified by such age groups. It is assumed that no first marriage occurs after age 50 or before age 15. The summary of the results on SMAM at different time points is presented in table 4.1

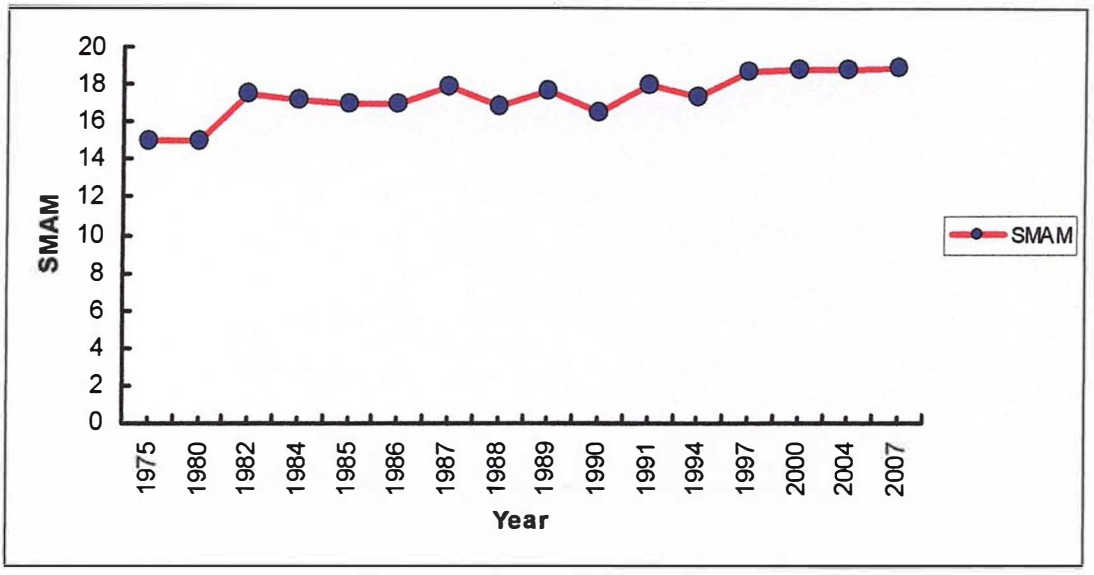
Table 4.1 Singulate mean age at marriage for the women of Bangladesh, indicated years obtained from different sources

Year	*TFR*	*SMAM*
1975	6.34	15.00
1980	4.99	15.00
1982	5.21	17.50
1984	4.83	17.20
1985	4.71	16.95
1986	4.70	17.00
1987	4.42	17.90
1988	4.39	16.90
1989	4.35	17.70
1990	4.33	16.50
1991	4.30	18.00
1993-'94	3.40	17.40
1996-'97	3.30	18.70
1999-2000	3.30	18.80
2004	3.0	18.90
2007	2.7	18.95

Source: BBS 1991; BBS; SVR; Statistical pocket book Bangladesh 2007 and BDHS

The data in table 4.1 include an increase in the singulate mean age at marriage from 1975 to 2007. The SMAM for females increased from 15.0 years 1975 to 18.95 years in 2007.

Figure 4.1 Singulate Mean age at marriage from 1975 to 2007, Bangladesh



4.3 Trends in Fertility

Trends may be ascertained that fertility levels in Bangladesh have been relatively high and fluctuating within a relatively narrow range except in catastrophic situation such as war and famines. The prospects for a dramatic decline in the birth rate do not appear to be bright given the age structure of the people, early age at marriage, universality of marriage and the high traditional value given to childbearing and large families in the Islamic as well as Hindu cultures. The slow pace of mortality decline, particularly the persistence of infant and child mortality, does not provide a strong incentive for limitation either.

Tables 4.2 represent the trend in the crude birth rates (CBR) from 1975 to 2007. The rates have been taken from various sources and thus may be varying reliability. On the whole after 1975, fertility has been declining moderately. The fluctuations in the birth rates at the high levels indicate forces operating that serve to compensate for the high mortality resulting from the recurrent epidemics, famines and the consequent worsening nutritional situation.

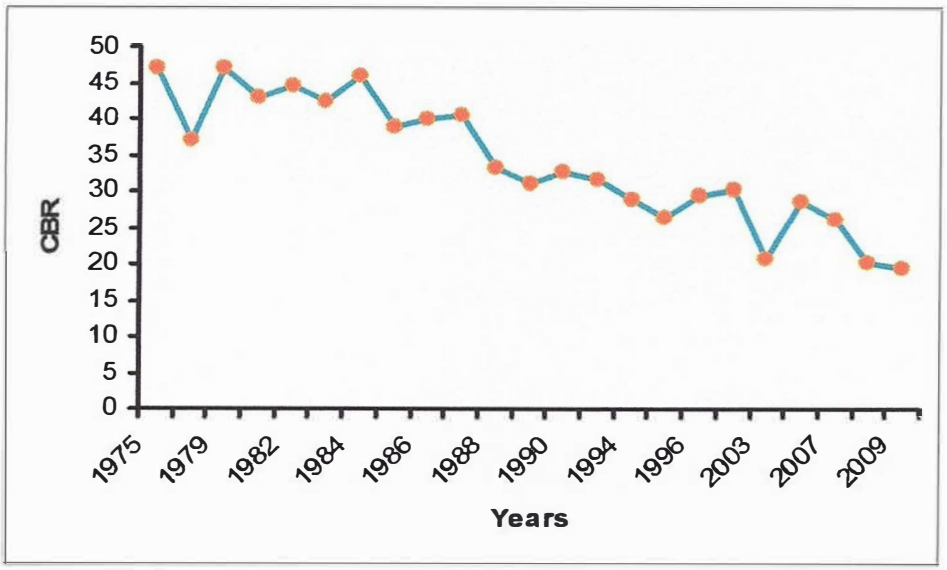
Table 4.2 Crude Birth Rates: Bangladesh, 1975-2009

Source	*Year*	*CBR (Per 1000)*
Bangladesh Fertility Survey (BFS)	1975	47.0
Pilot Survey(BFS)	1978	37.0
ICDR'B(Matlab)	1979	47.0
Planning Commission (GOB)	1981	43.0
ICDR'B(Matlab)	1982	44.6
ICDR'B(Matlab)	1983	42.4
ICDR'B(Matlab)	1984	46.6
Planning Commission (GOB)	1985	39.0
ICDR'B(Matlab)	1986	40.0
ICDR'B(Matlab)	1987	40.6
Vital Registration Survey (VRS), BBS	1988	33.3
Bangladesh Fertility Survey (BFS)	1989	31.0
Vital Registration Survey (VRS), BBS	1990	32.8
Vital Registration Survey (VRS), BBS	1991	31.6
Sample Vital Reg. System (SVRS), BBS	1994	27.8
Sample Vital Reg. System (SVRS), BBS	1995	26.5
BDHS	1996-97	29.4
BDHS	1999-2000	30.2
Sample Vital Reg. System (SVRS), BBS	2003	20.9
BDHS	2004	28.7
BDHS	2007	26.1
Sample Vital Reg. System (SVRS), BBS	2008	20.4
Sample Vital Reg. System (SVRS), BBS	2009	19.4

Source: Bangladesh Demographic and Health Survey (BDHS); Government of Bangladesh (GOB); Bangladesh Bureau of Statistics (BBS); International Center for Diarrhoeal Disease Research, Bangladesh (ICDDR'B).

The crude birth rate as a measure of fertility is limited by its inability to reflect the reproductive pattern of the population age and marital status. Shifts in the age structure, particularly in the proportion of women of childbearing ages, and change in the marriage pattern affecting proportion of married women at each age group may lead to change in the number of births and the crude birth rate even if underlying reproductive behavior of the population remains unchanged.

Figure 4.2 Crude birth rates Bangladesh 1975 to 2007



4.3.1 Period Fertility

The essential quality of period fertility analysis is that it looks at fertility crossectionally that is at birth occurring during a specified period of time, normally one year. Period analysis is generally simpler than cohort analysis and is more frequently used.

Period fertility is measured by total fertility rate (TFR) based on the age specific fertility rate (ASFR's) of women for different age groups of the reproductive period (15-49 year of age) during a year. Period fertility is the current picture of the actual fertility performance in a recent time, generally the year preceding the census or survey, by women of different age groups in the reproductive period within a population.

Trend in Age-Specific Fertility Rate (ASFR)

Table 4.3.1 and Figure 4.3.1 summarizes the characteristics of fertility patterns over the period of 1975 to 2007. The table reveals some interesting features of change in the age-specific fertility behavior of the women during the recent past. Most of the

childbirths in recent years took place within a shorter span than in the past and the central tendency of fertility is shifting towards younger ages.

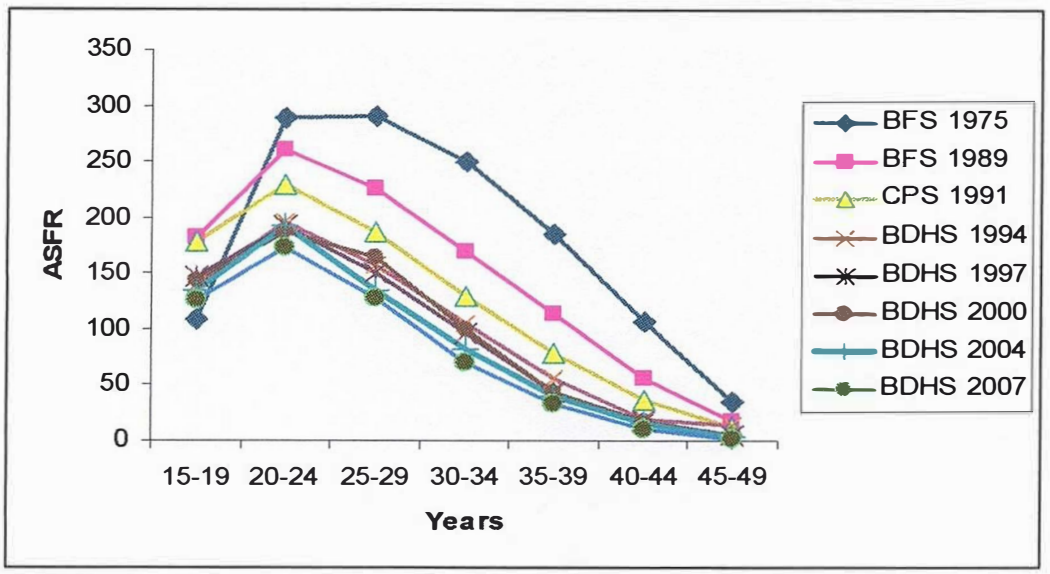
Table 4.3.1 Age-specific Fertility Rate, per 1000 women of age 15-49, selected sources, Bangladesh 1975-2007

Age Group	Year							
	BFS	BFS	CPS	BDHS				
	1975	1989	1991	1994	1997	2000	2004	2007
15-19	109	182	179	140	147	144	135	126
20-24	289	260	230	196	192	188	192	173
25-29	291	225	188	158	150	165	135	127
30-34	250	169	129	105	96	99	83	70
35-39	185	114	78	56	44	44	41	34
40-44	107	56	36	19	18	18	16	10
45-49	35	18	13	14	6	3	3	1

Source: Mitra and Associates: BDHS 1993-1994,.1996-1997, 1999-2000, 2004 and 2007, BFS 1975, 1989; CPS 1991;

This table also reveals that the level of fertility is still very high in Bangladesh although ASFR has been decreasing over time in each age group. The peak age has shifted from 25-29 in 1975 to 20-24 in 1999-2000, in 2004 and in 2007.

Figure 4.3.1 Age-specific fertility rates, per 1000 women of age 15-49, Bangladesh 1975 to 2007



Looking at figure 4.3.1, it observed that the age pattern of fertility remains almost similar at different time points. The fertility curve is less skewed in the recent years than in the past.

Thus it may be concluded that the level of fertility is still high and seems to change little over time. It is observed that fertility increasing up to age 25 years then declines sharply. This implies that women who postpone their marriages to later ages try to recover the reproductive period already lost by producing on the average more children. But beyond age 25, the fertility performance slows down, which might be due the fact that women who postpone their marriage up to that age might be motivated reduce their fertility by using some method of modern contraception and or might have become less fecund as the level of fecundity decreases with increasing age or might have been become sterile.

Trends in total fertility rate (TFR)

Trends in fertility in Bangladesh since the early 1970s can be examined by observing a time series estimates of TFR, produced from demographic surveys field

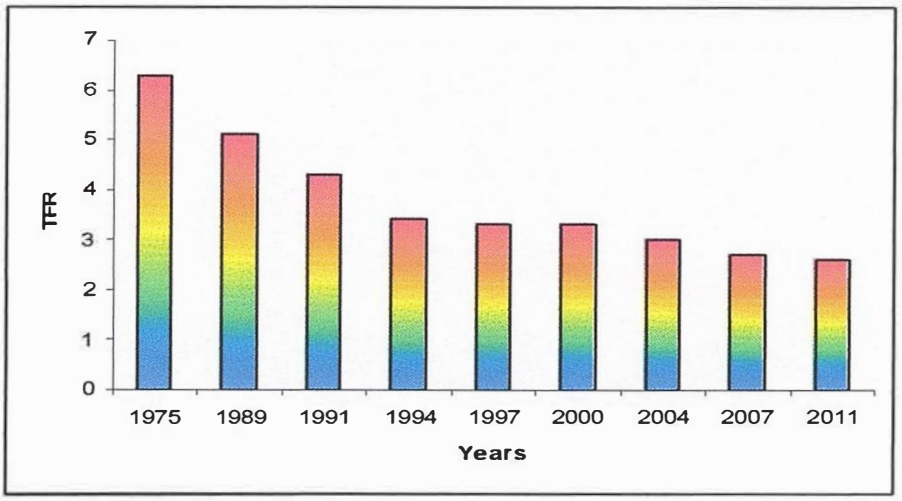
over the last three decades, beginning with the 1975 Bangladesh fertility survey. The estimates shows in table 4.3.1(a) describe the ongoing Bangladeshi fertility change. Fertility has declined sharply from 6.3 in 1975 to 2.7 in 2007, which shown figure 4.3.1(a). During this period, fertility decline rapidly in the late 1980s and early 1990s and stalled at around 3.3 for most of the 1990s. The 2007 BDHS data indicate that after almost a decade-long stagnation the TFR declined slightly from 3.3 to 2.7 between 2004 and 2007. Investigation of the age pattern of fertility shows no anomalous, the decline since the mid-1980s has fairly uniform over all age groups of women.

Table 4.3.1(a) Total fertility rates, Bangladesh 1975-2007

Source	*Year*	*TFR*
BFS	1975	6.3
BFS	1989	5.1
CPS	1991	4.3
BDHS	1993-94	3.4
BDHS	1996-1997	3.3
BDHS	1999-2000	3.3
BDHS	2004	3.0
BDHS	2007	2.7
World Bank	2011	2.6

Sources: Mitra and Associatess March 2009, World Bank (2011)

Figure 4.3.1 (a) Total Fertility Rates, Bangladesh 1975-2011



4.3.2 Cohort Fertility

Cohort analysis looks at fertility longitudinally that is at all births occurring to a specific group of women, normally all those born or married during a particular year. Cohort analysis is complex than period analysis. A cohort approach to fertility is a comparatively new idea, having become widely used only in the last twenty years or so. It is used mainly for explaining fertility levels and trends, rather than forecasting, and it is consequently normally of more interest to academic researchers than to administrations and planners. The essential feature of cohort fertility analysis is that it is considers the experience of one group of people over time.

Cohort fertility computed for each age group reflects the actual cumulative fertility rate of the age cohort, for women age 45-49, may be assumed to be the completed family size. The completed family size in the case of cohort fertility will give the level of fertility of particular cohort. Usually, cumulative fertility is expected to increase with age. However, accurate reporting of the number of children ever born is questionable, especially among older women. As such the completed family size may give an underestimate of the level of the fertility of the cohort, which will mainly depend on the extent of under-reporting. If fertility did not change much over time and the reporting of the number of children never born is reasonably good, the completed fertility may be expected to give a closer approximation to the current level of fertility.

The information on reported mean number of children ever born is presented in table 3.3.2 and figure 3.3.2 by age of ever-married women of age 15 years and over in different time periods.

The mean number of live births per ever-married women's are calculated for each age group of women by dividing the total number of live births in each age group by the total number of ever-married women in the corresponding age group. The table indicates that the average number of children ever born per ever-married women tends to decline over time. This is slightly lower in recent years in each age group.

Table 4.3.2 Trends in Mean Number of Children ever born per ever-married women, Bangladesh 1975 to 2007

Age Group	Year							
	BFS	BFS	CPS	BDHS				
	1975	1989	1991	1994	1997	2000	2004	2007
15-19	0.6		0.4	0.3	0.4	0.4	0.4	0.3
20-24	2.3	1.7	1.7	1.6	1.5	1.4	1.4	1.3
25-29	4.2	3.1	3.2	2.9	2.8	2.6	2.6	2.3
30-34	5.7	4.7	4.5	4.1	3.9	3.6	3.4	3.2
35-39	6.7	5.9	5.7	5.2	4.8	4.3	4.1	3.8
40-44	7.1	6.6	6.7	6.4	5.6	5.1	4.7	4.3
45-49	6.7	7.3	7.4	6.9	6.4	6.1	5.6	4.9
Total	u	u	3.5	3.0	2.8	2.6	2.5	2.3

Note u = Unknown (not applicable): Source: BFS 1975, 1989; CPS 1991 BDHS 1993-94, 1996-2000, 2007; Mitra and Associates, March 2009.

Figure 4.3.2 Trends in Mean Number of Children Ever Born (CEB) per ever-married women by age group, Bangladesh 1975 to 2007

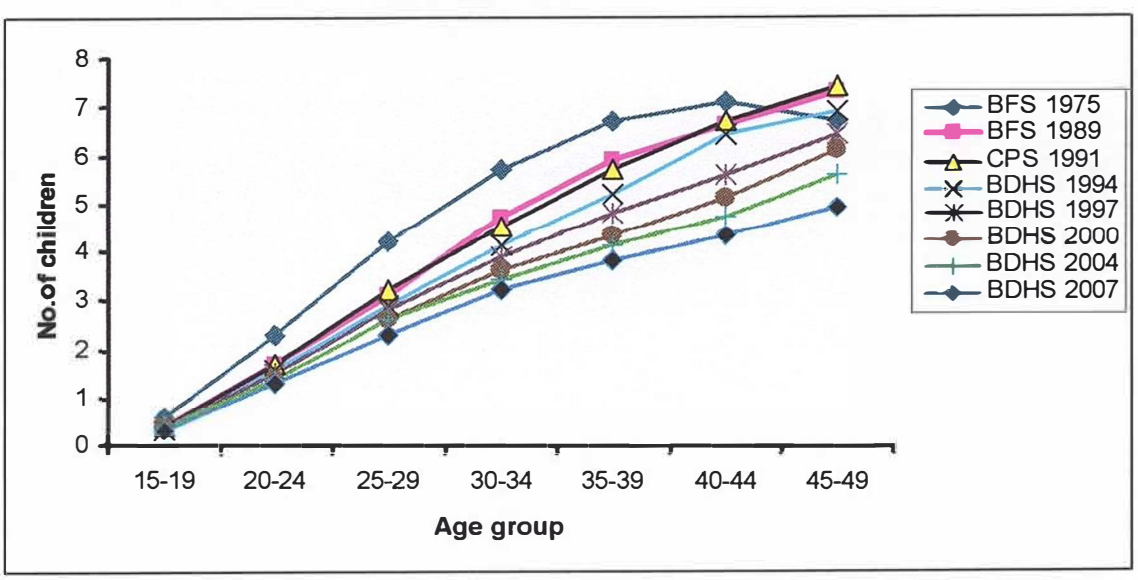
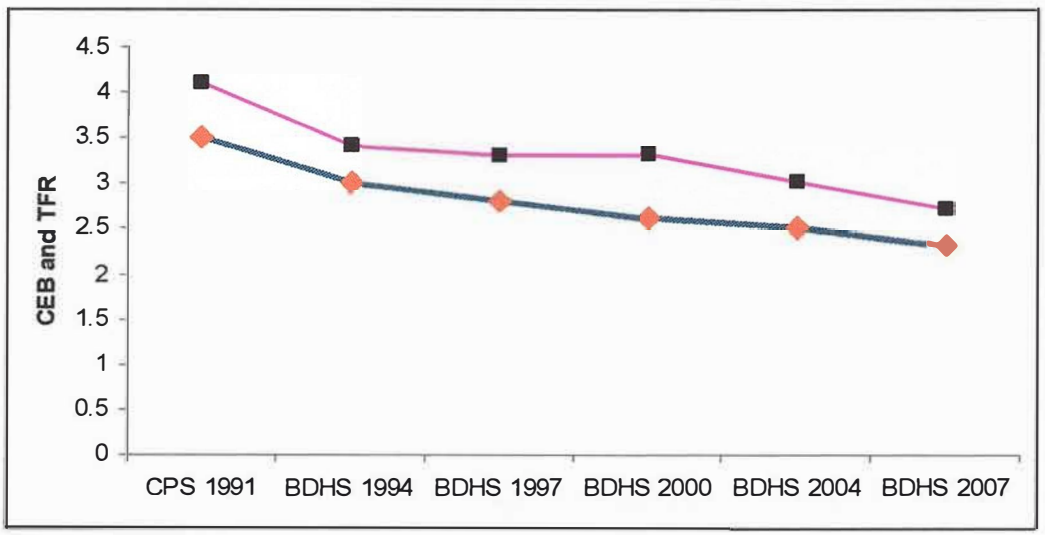


Figure 4.3.2(a) Trends in Mean Number of Total Children Ever Born (CEB) and total fertility Rate, Bangladesh 1991 to 2007



Despite the fluctuation between surveys, the data generally show only modest decline until the data 1980s. Although this was followed by little change between 1989 and 1993-'94. The mean number of children again declined considerably between 1991 and 1993-'94. The most recent data showed a declined in the mean number of children between 1999-2000 and 2007 among women age 30 and above. In figure 3.3.2(a), above, it is seen that trend in CEB stalled since 1993/94, also TFR stalled in the same period.

4.4 Analysis of Marital Fertility Using Coale's Indices

Age at marriage is one of the most important factors in demographic analysis as it is directly related to fertility. Such age has been established as one of the strongest determinant of fertility (Ahamed, 1982; Sirageldin, Norris and Ahmed, 1975), and it make an important contribution on the rate of population growth through fertility especially in a society where contraception is not generally practical and where birth do not occur outside marriage (Coale and tye, 1961)

Clearly, a shift in proportions single of the magnitude should have a measurable impact on the overall level of fertility, unless, as proves to be the case, fertility

behavior within marriage has changed in a countervailing manner. We can assess this impacts mostly simply by mean of Coal's indices, summary indices of overall fertility, marital fertility and marriage pattern devised by Ansley Coale and others (Coale, 1969).

The Indices

The indices devised by Coale and others take the following forms:

I_f (overall fertility index) = $\frac{\sum W_x f_x}{\sum W_x F_x} = \frac{B}{\sum W_x F_x}$

I_m (marriage pattern index) = $\frac{\sum m_x f_x}{\sum W_x F_x}$ and

I_g (Marital fertility index) = $\frac{\sum W_x f_x}{\sum m_x F_x} = \frac{B}{\sum m_x F_x}$

Where x range in five-year age groups from 15 to 50 and the sum is taken over all ages.

Here W_x is the number of women at age x

m_x is the number of married women of age x

f_x is the fertility rate of women of age x

F_x is the fertility schedule of the Hutterites: 1921-1930[1]

B is the total births.

That is, over fertility is decomposed into its two important components: marital fertility and marriage pattern. The interpretation of the indices is straight forward. Each rang from zero to unity and each describe an estimated level in term of the maximum presumed to be possible, a physiological upper limit approximated by the marital fertility schedule generally used while arbitrary, is nevertheless one of the highest levels on record, that of marriage Hutterites over the 1921-1930 period (Henry, 1961).

The indices form the single relation

$$I_f = I_g \times I_m$$

That is, overall fertility is decomposed into its two important components: marital fertility and marriage pattern. The interpretation of the indices is straightforward. Each range from zero to unity and each describes an estimated level in term of the maximum presumed to be possible, a physiological upper limit approximated by the marital fertility schedule F_x. the maximum schedule generally used, while arbitrary, is nevertheless one of the highest levels in record, that of married hutterites over the 1921-1930 period (Hennry, 1961)

The indices I_m summarizes the proportion married among women in childbearing ages by comparing the number of children that married women would bear if experiencing the Hutterites schedule of marital fertility rates to the number of children all women would bear if subject to same fertility schedule. The weights by Hutterites fertility give a convenient way for taking into account the differential importance of marriage in the age groups for fertility. The index I_m indicates how much marriage is contributing to the achievement of the highest potential fertility of the given population. It depends on the average age of marriage, the proportion of women who remain single and frequency of widowhood, divorce and marriage and remarriage. The index can be throughout of as a weighted index of the proportion of women married in each age group with weight varying as the level of potential fertility.

Although the index I_m incorporate statistical weights based on the Hutterites schedule marital fertility, it is essentially a measure of the marital fertility state of the population under study. The estimated values of the indices are presented in table 4.4

To compute I_m, I_g, I_f the fertility schedules of the Hutterites is used which is given by Henry (1961). The schedule is given by:

Age Group	15-19	20-24	25-29	30-34	35-39	40-44	45-49
MASFR	0.300	0.550	0.502	0.447	0.406	0.222	0.061

The fertility schedules of the Hutterites used in the present analysis since no other alternative schedules specific to Bangladesh is not known although it is believed that natural fertility of Bangladesh women seems to be low in comparison to western experience because of the traditional practices and religion taboos prevalent in these population kabir (1978), Kabir and Rab (1990, Islam (1996), and many others have used the Hutterites schedules for their analysis.)

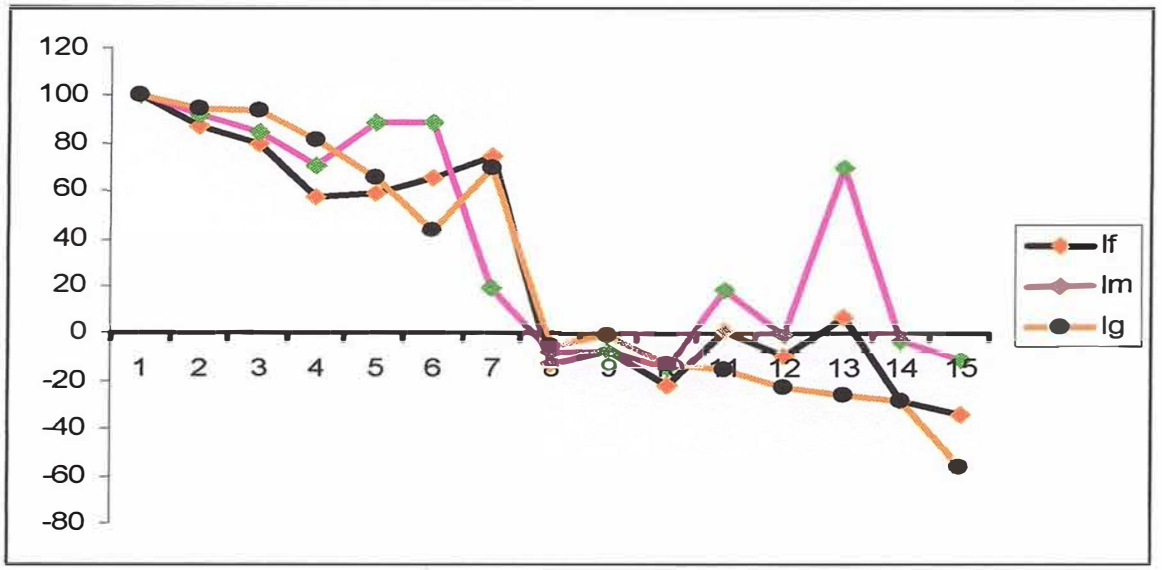
Table 4.4 Estimated values of Coale's Indices (I_f, I_g, I_m) in different time points for Bangladesh and their changes:

Indices	Year							Percentage Change						
	1975	1989	1991	1996-1997	1999-2000	2004	2007	1975-1989	1989-1991	1991-1996	1996-1999	1999-2004	1989-1999	1975-2007
I_f	0.517	0.451	0.413	0.299	0.305	0.339	0.246							
%	100	87.23	79.88	57.83	58.99	65.57	47.58	-12.77	-7.33	-22.05	1.16	6.58	-28.24	-52.42
I_m	0.869	0.802	0.740	0.618	0.775	0.770	0.854							
%	100	92.29	85.16	71.12	89.18	88.60	98.27	-7.71	-7.13	-14.04	18.06	-0.58	-3.11	-1.73
I_g	0.595	0.502	0.558	0.484	0.394	0.261	0.288							
%	100	94.45	93.78	81.34	66.18	43.86	48.40	-5.55	-0.67	-12.44	-15.18	-22.32	-28.27	-51.6

Sources: BFS 1975, 1989; CPS 1991; BDHS 1996-1997, 1999-2000, 2004, 2007; Mitra and Associates, March 2009;

Percentage are taking 1975 base(1975 = 100%)

Figure 4.4 Estimated values of Coale's Indices (I_f, I_m, I_g) in different time points for Bangladesh and their changes:



From table represent above indicates among overall fertility, marriage pattern and marital fertility have declined respectively by 52.42%, 1.73% and 51.6% over the period 1975 to 2007. The quantity of the index of marital fertility has decreased from 0.595 to 0.288 during 1975 to 2007, a decrement of about 51%, which is higher by 45% than I_m values during the 32 years period. Thus, it is observed that in the amount of decrement of fertility index I_f values 52.42% from 0.517 in 1975 to 0.246 in 2007. The contribution of change in the marriage pattern index is less than the change in the I_g values. However, such contribution could be an artifact. A number of factors may be listed which may/might be responsible for changes in the marital fertility of which use of contraception and marriage pattern are important.

The data on the table suggests that marriage pattern has changed over time. It can be observed that the proportion of single women particularly in the age group 15-19 and 20-24 years have increased quite greatly, with time the age at marriage begins has tended to increase and also the tempo of marriage and hence the span of marriage and the maximum age beyond which first marriage is likely to take place have

probably increased. Therefore, the indication is that the marriage pattern what has been expected to change over time is firstly established and thereby, causing changes in the marital fertility and hence overall fertility.

It is indicated from the table that marital fertility has changed over time. The major increase occurs during the period 2004 to 2007. The impression is that in recent times the effect of marital reproductive behavior on reducing overall fertility is remarkable and the effect of change of marriage pattern is less than that of marital fertility.

4.5 Conclusion

To observe the trends in fertility of Bangladesh, it is evident that fertility is declining over the past 32 years. The trends in the crude birth rates from 1975 to 2007 indicates that the crude birth rates fluctuated around 34 per 1000 population throughout the period until 1989 from then fertility has been declining moderately. Total fertility rate has declined about 52% from 6.3 births per women in the period 1975 to 2.7 birth for the period 2007. It is truly an exceptionally steep decline. Period fertility approach reveals that the level of fertility is still very high in Bangladesh although the age specific fertility rate has been decreasing over time in age group. The age has shifted from 25-29 is still very high in 1975 to 20-24 in 2004 and 2007. Moreover, the completed family size in the case of cohort fertility will give the level of fertility of a particular cohort and it indicates that the mean number of children ever born per ever married women has been declining over time and it is slightly lower on recent years in each age group.

In Bangladesh, the norm of early and universal marriage still prevails. Most of the first marriage occurs within a short span of life. The age patterns of marriage occur within short span of life. The age patterns of marriage and the contraceptive use have changed in a positive direction, the negative impact of which bas fallen on fertility.

Examination of the percent changes of the indicate indices at a various time segments that the change could be a recent phenomenon. Again, the effect of marriage pattern on the overall fertility and marital fertility on the overall fertility of the Bangladesh is examined by Coale's indices show higher influences of marriage pattern than marital fertility. The change in marital fertility that has taken place in the country overtime is contributed less by the change in marital fertility in comparison to the change in marriage pattern. Also the effect of change of marriage pattern in reducing fertility level perhaps has increased over time.

Chapter-Five

Impact of Some Selected Variables on Additional Child in Bangladesh

Chapter-5

Impact of Some Selected Variables on Additional Child in Bangladesh

5.1 Introduction:

The 1974 world population conference in Bucharest, the 1984 international conference on population in Mexico and the 1994 international conference on population and development in Cario have stressed the integration of population policies with development policy. Population control, as a means of sustainable development in Bangladesh, has become a major issue.

Bangladesh is the ninth most populous country in the world. According to the 1991 population census, it had a population of over 111 million people, increasing at an annual growth rate of around 2% Govt. of Bangladesh 1991). Today the country has an estimated population of 150 million people. Expect for some Island States, Bangladesh has the highest population density in the world. Resource scarcity and subsistent-level economic conditions characterize the Bangladesh economy (Khuda 1991). Bangladesh is predominantly dependently dependent on land, with agriculture as its primary industry. Increasing population pressure on the land is continually decreasing the land-man ratio: from 49 decimals in 1951 to 20 decimals in 1991. Although high-yielding variety technology has expanded since the early 1960s, covering over on-squarter of cultivable land area, the per hectare yield is among the lowest in the world (Khuda, Barkat and Helali, 1991). Socio-economically, Bangladesh is comparatively disadvantaged in terms of such key indicators as per capita income (US $ 220 in 1991, world Bank 1993) and proportion living below the poverty line (78% of total population and 86% of rural population, UNDP 1994).

Consequently, extremely low savings and investments characterize the Bangladesh economy. Both the per capita food production index and daily calorie

supply as percentages of requirements (83%) are quite low in Bangladesh. The overall literacy rate is only 37%: males and 49% and female 23%. Female school attendance is low, and there is an uneven ratio of male to female school enrolment, especially beyond the primary level (Khuda and Barkat 1992).

Life expectancy in Bangladesh continues to be quite low. Bangladesh is one of the few countries in Asia where female life expectancy remains lowers than that of males. This is due in part to multiple high-risk pregnancies. Continued high infant and childhood result from relatively weak prenatal and postnatal services, less than optimal birth spacing and wide spread malnutrition among children.

Despite pervasive poverty and underdevelopment, however, Bangladesh has achieved a considerable decline in fertility. Indeed it represents an apparent anomaly for its decline in fertility, despite the absence of conditions believed to be necessary for such reproductive changes. Bangladesh is the only country among the world's twenty poorest countries where such a chance has occurred. The recent decline in fertility in Bangladesh from a total fertility rate of 6.3 children per women in 1975 to 2.7 in 2007 (MHPC, 1978; BBS, 1996, BDHS 2007) has created interest among researchers, policy makers and academicians.

5.2 Factors affecting the demand for additional child:

(i) The most important among various developments in economic analysis is the investment in human capital. Investment in human capital, as we know, rests on the proposition that there are certain expenditures (sacrifices) that are made deliberately to create productive stocks, embodied in human beings, which provide services over future periods. These services consist of producer services revealed in future earnings and of consume services that accrue to the individual as satisfactions over his lifetime.

(ii) Children are here viewed as forms of human capital. From the point of view of the sacrifices that are made in bearing and rearing them, parents in rich countries acquire mainly future personal satisfactions from them, while in poor countries children also contribute substantially to the future real income of their parents by the

work that children do in the household and on the farm and by the food and shelter they provide for their parents when they no longer are able to provide these for themselves. Children are in a very important sense are the "poor man's capital". It is becoming clear that the investment in children is in many ways akin to the investment in home grown trees for their beauty and utility.

A very young child is highly labor intensive in terms of cost and the rewards are wholly psychic in terms of utility. As a child becomes a teen-ager the additional cost borne by the parents involves less labor intensiveness and the rewards, especially in poor countries, consists in increasing part of useful work that the teen-ager performs.

(iii) Children are considered as an important part of the standard of living of most families in our elite society. Also most of the couples in our society expect children to preserve the successor as well as new generation. Most married couples want their own children, and they proceed to bear and rear them. It is clear that parents derive satisfactions and productive services from their children and that the sacrifices made by parents in bearing children and in the investment they make in the care, health and education of their children are in substantial part deliberate family decisions (Schultz, 1972).

(iv) It may proceed on the postulate that parents respond to economic considerations in the children they bear and rear those parents equate the marginal sacrifices and satisfactions including the productive services they expect from children, in arriving at the value of children to them. Thus, in thinking about the economics of fertility, social cost and benefits aside, the analytical key in determining the value of children to their parents is in the interactions between the supply and demand factors that influence these family decisions.

(v) Demand for a child can also be influenced by the value of time of women as well as sufficient manpower associated with them to bear and rear the expected children. Because sound economic status, enough time and manpower is essential to

grow up and establish a baby, by the availability of the above mentioned constraints, the couple may be influenced to demand for a child.

5.3 Description of the model variables:

Age of ever-married women:

From the data we observed that the demand for a child is affected by the age variation of ever-married women, which inspired me to include this variable in the model analysis. To compare the differential of various ages of ever-married women we have divided it into five sub-divisions as age group

i) 15-19

ii) 20-24

iii) 25-29

iv) 30-39

v) 40-49

Each of this sub-division is incorporated in the model through indicator variable one and zero indicating the presence and absence of particular women in a particular sub-division. The median age group 25-29 is considered as reference category. Because the trend of demand for a child can be identified about median age group and it may be attributed to population momentum.

Geographic Division:

In my analysis I suspect that demands for a child can vary over different geographic region. Thus administrative divisions are considered in the model. There are six administrative divisions in Bangladesh.

i) Dhaka

ii) Chittagong

iii) Rajshahi

iv) Khulna

v) Barisal

vi) Sylhet

Each of this division is considered as an indicator variable assuming two values one and zero indicating the presence and absence of a particular woman in a particular division. Dhaka division is considered as reference category under the assuming that Dhaka is the capital of Bangladesh and 22% respondent of the sample are from this division and the population of this division is the combination and interaction of all other divisions.

Level of Education:

Education is necessary for accumulate knowledge. Education level seems to be an important factor, which influence women to demand for a child. Thus level of education is sub-divided into four groups.

i) No education

ii) Primary

iii) Secondary level

iv) Higher

Each level of educations considered as a variable assuming two values one and zero indicating the presence and absence of a particular woman in the particular level. Secondary level of education is considered as reference category because in this stage a girl becomes mature gradually and she may achieve sufficient knowledge about the positive impact of family planning program.

Religion:

I think in our society ritual sentiment of women can affect the demand for a child in Bangladesh. Hence in our country the four important religions are considered in the model.

i) Islam

ii) Christianity

iii) Hinduism

iv) Buddhist

Each category of religion is considered as an indicator variable, which assumes two values one and zero corresponding to the presence and absence of a particular woman in a particular category of religion. Islam is considered as reference category under the assumption that most of the people in Bangladesh are Muslim and about 90% of the selected sample covered by the Muslim respondents.

Pregnancy status:

Current pregnancy status can also influence women to demand for a next issue. Therefore current pregnancy is considered as an indicator variable having two values one and zero indicating the presence and absence of current pregnancy respectively. Absence of current pregnancy is considered as reference category.

Number of living children:

Total number of living children can influence the demand for a child. Total number of children is classified into three groups.

i) Below 2

ii) Exactly 2

iii) Above 2

Each of this group is incorporated in the model via indicator variable having values one and zero indicating the presence and of absence of particular number of children in particular group. Number of children is exactly 2 is considered as reference category because in order to achieve the replacement level fertility the total number of children should not exceed two.

Working status:

Apparently if seems demand for a child is affected by the working status of ever-married women which inspired me to include this variable in this model analysis. To compare the impact of work on demand for a child with reference to without work or housewife of a woman, we divided the ever-married women onto two categories.

i) Currently working

ii) Not working or simply housewife

The variable working status is considered as an indicator variable having two values one zero corresponding to the currently working and not working respectively. Since 82% respondents are mainly housewives not working or simply housewife is considered as reference category.

Access of mass media:

It seems to me access of mass media can affect the demand for a child of ever-married women in Bangladesh. Therefore the variable 'Access of mass media' is inspired me it to include in the model analysis. To compare the differential of mass media we have divided it into two categories.

a) Radio

b) Television

Each of the mention media is considered as an indicator variable having two values one and zero indicating listen or watches regularly and irregularly respectively. For each category listens or watches irregularly is considered as reference group.

Involvement in N.G.O's:

In our country various type of N.G.O are working since three decades for the development of our society particularly in the rural women. There for the ever-married women who are involved in the N.G.O's may conscious about the demand for a child. To compare the differential of various N.G.O we have divided it into five categories.

i) Grameen Bank

ii) BRAC

iii) BRDP

iv) Mother's club

v) Others Organization

Each of these categories is incorporated in the model through indicator variable, one and zero indicating the involvement and not involvement of particular women in a particular N.G.O. here BRDP is considered as reference category. BRDP is the

development program governed by the Government of Bangladesh and it is the logic behind the reference category.

5.4 Development of the model:

In my problem the dependent variable is demand for additional child (Y) which is taken to be dichotomous one. It indicates the demand for a child of ever-married women in Bangladesh. It takes on the value one (Y=1) with probability π (say) if the respondent demands one or more children and zero (Y=0) with probability 1-π if she does not demand any more. Most of the explanatory variables in our analysis are qualitative.

In order to interpret the qualitative independent variable, age of ever-married women has been taken into an interval scale, such as age group 15-19, 20-24, 25-29, 30-39 and 40-49 and the corresponding variable are denoted by X_{11} = age group 15-19, X_{12}= age group 20-24, X_{13}= age group 25-29, X_{14}=age group 30-39, X_{15}=age group 40-439 and respectively. Each of the age group is considered as an indicator variable i.e. the respondent belongs to a particular age group has the value 1 and 0 otherwise.

The geographic region is also a qualitative variable and we denote these regions by X_{21} = Dhaka, X_{22}=Chittagong, X_{23}=Rajshahi, X_{24}=Khulna, X_{25}=Barisal and X_{26}=Sylhet. Each of the sub variables is an indicator variable.

The level of education is taken as qualitative and has been expressed into interval scale and denoted by X_{31}=No education, X_{32}=Primary level, X_{33}=Secondary level and X_{34}= Higher. Each of the sub variable is an indicator variable.

Next, religion is a qualitative variable and various religious groups are denoted by X_{41} = Islam, X_{42}=Christianity, X_{43}=Hinduism, X_{44}=Buddhist respectively. Each of the religious groups is considered as an indicator variable.

The variable current pregnancy is qualitative as well as dichotomous one and it is denoted by X_5. The variable total number of living children is quantitative but for the comparison we convert it into qualitative variable of interval scale. We denoted them

by X_{61} = Number of children is below 2, X_{62} = Number of children is exactly 2, X_{63}= Number of children is above 2. Each of the sub variables is an indicator variable.

The variable working status is qualitative and dichotomous one and it is denoted by X_7

The variable access of mass media is also a qualitative variable. The media radio and television are denoted by the variables X_{81} and X_{82} respectively. Each of the variables is an indicator variable.

Similarly, the variable involvement in N.G.O's is also a qualitative one. The mentioned categories of N.G.O's are denoted by X_{91}=Grameen Banik, X_{92}=BRAC, X_{93}=BRDP, X_{94} = Mothers' Clube and other organizations. Each of the variable is an indicator variable.

Now the expression π_i is given by

π_i = E [$Y_i = 1$ $X_{11} = x_{11}$, $X_{12} = x_{12}$, $X_{13} = 0$, $X_{14} = x_{14}$, $X_{15} = x_{15}$, $X_{21} = 0$, $X_{22} = x_{22}$, $X_{23} = x_{23}$, $X_{24} = x_{24}$, $X_{25} = x_{25}$, $X_{26} = x_{26}$, $X_{31} = x_{31}$, $X_{32} = x_{32}$, $X_{33} = 0$, $X_{34} = x_{34}$, $X_{41} = 0$, $X_{42} = x_{42}$, $X_{43} = x_{43}$, $X_{44} = x_{44}$, $X_5 = 0$, $X_{61} = x_{61}$, $X_{62} = 0$, $X_{63} = x_{63}$, $X_7 = 0$, $X_{81} = 0$, $X_{82} = x_{82}$, $X_{91} = x_{92}$, $X_{93} = x_{93}$, $X_{94} = 0$, $X_{95} = x_{95}$,].

(Here the values of the variables corresponding it the reference category are considered as "0")

That is $\pi_i = \frac{1}{1+e^{-(\beta_0+\sum\beta_i x_i)}}$

And $1-\pi_i = \frac{e^{-(\beta_0+\sum\beta_i x_i)}}{1+e^{-(\beta_0+\sum\beta_i x_i)}}$

There fore, $\frac{\pi_i}{1-\pi_i} = e^{\beta_0+\sum\beta_i x_i}$

Hence multiple binary logistic regression models is given by

$$Log\ \frac{\pi_i}{1-\pi_i} = \beta_0 + \beta_1 x_{11} + \beta_2 x_{12} + \beta_3 x_{14} + \beta_4 x_{15} + \beta_6 x_{22} + \beta_6 x_{23} + \beta_7 x_{24} + \beta_8 x_{25} + \beta_9 x_{26}$$
$$+ \beta_{10} x_{31} + \beta_{11} x_{33} + \beta_{12} x_{34} + \beta_{13} x_{42} + \beta_{14} x_{43} + \beta_{15} x_{44} + \beta_{16} x_5 + \beta_{17} x_{61} + \beta_{18} x_{63} + \beta_{19} x_7$$
$$+ \beta_{20} x_{82} + \beta_{21} x_{91} + \beta_{22} x_{92} + \beta_{23} x_{101} + \beta_{24} x_{102} + \beta_{25} x_{104} + \beta_{26} x_{105} \text{.....} \quad (3.1)$$

For age of the eligible women, let

X_{11} = 1, if age of the respondent belongs to the age group 15-19

= 0, elsewhere

X_{12} = 1, if age of the respondent belongs to the age group 20-24

= 0, elsewhere

X_{13} = 1, if age of the respondent belongs to the age group 30-39

= 0, elsewhere

X_{15} = 1, if age of the respondent belongs to the age group 40-49

= 0, elsewhere

For geographic region of respondent, let

X_{22} = 1, if the respondent is in Chittagong division.

= 0, elsewhere

X_{23} = 1, if the respondent is in Rajshahi division.

= 0, elsewhere

X_{24} = 1, if the respondent is in Khulna division.

= 0, elsewhere

X_{25} = 1, if the respondent is in Barisal division.

= 0, elsewhere

X_{26} = 1, if the respondent is in Sylhet division.

= 0, elsewhere

For the level of education of respondent, let

X_{31} = 1, if the respondent has no education.

= 0, elsewhere

X_{32} = 1, if the respondent education is in primary level.

= 0, elsewhere

X_{34} = 1, if the respondent education is in higher level.

= 0, elsewhere

For the variable religion, let

X_{42} = 1, if the respondent is Christianity.

= 0, elsewhere

X_{43} = 1, if the respondent is Hinduism.

= 0, elsewhere

X_{44} = 1, if the respondent is Buddhism.

= 0, elsewhere.

For the variable current pregnancy, let

X_5 =1, if the respondent is currently pregnant.

= 0, elsewhere

For the variable total number of children, let

X_{61} = 1, if the respondent has less than two children.

= 0, elsewhere

X_{63} = 1, if the respondent has more than two children.

= 0, elsewhere

For the variable working status, let

X_7 = 1, if the respondent is in work other than housewife.

= 0, elsewhere

For the variable access of mass media, let

X_{81} = 1, if the respondent listens to radio regularly.

= 0, if the respondent listens to radio irregularly

X_{82} = 1, if the respondent listens to watches TV regularly.

= 0, if the respondent listens to watches TV irregularly

For the variable involvement in N.G.O, let

X_{91} = 1, if the respondent involves in Grameen Bank

= 0, otherwise

X_{92} = 1, if the respondent involves in BRAC

= 0, otherwise

X_{93} =1, if the respondent involves in Mothers Club

= 0, otherwise

X_{94} = 1, if the respondent involves in other organization

= 0, otherwise

Here an attempt has been made to examine the relationship between a dichotomous dependent variable (demand for a child) and a set of explanatory variables as selected and discussed earlier. The main feature of the analysis is to identify the factors that affect demand for a child of a respondent that is ever-married women of age 15-49. In order to get the solution of the above problem, a well - known and now a day widely used statistical technique (multiple binary regression models) is used.

But we utilize the computer package SPSS (Statistical Package for Social Sciences) for windows base 15.0 version and the binary logistic regression parameters $\beta_j's$ were iteratively solved with the help of this package program.

Since the dependent variable Y_i is coded as '1' it the respondent wants one or more children and '0' if the respondent does not want any more, positive coefficient indicates that the respondent is likely to demand one or more children; one the other hand negative coefficient indicates that the respondent does not expect any more. In order to obtain the increment of the regression we have calculated odds ratio of the j^{th} regressor which is the anti-log of the j^{th} slop coefficient.

Table: 5.1 Logistic regression estimates of the odds ratios $[Exp(\beta)]$ of background characteristics of ever-married women of reproductive age 15-49 in Bangladesh: Data from BDHS 2007

Background characteristics (variable)		Estimated regression coefficient	Odds ratio [Exp(β)]
Age			
	15-19	2.805	16.532
	20-24	1.442	4.229
	25-29[r]	-	1.000
	30-39	-1.603	0.201
	40-49	-3.225*	0.040
Geographic region (Division)			
	Dhaka[r]	-	1.000
	Chittagong	0.099 ****	1.104
	Rajshahi	-0.170 ***	0.843
	Khulna	-0.089	0.915
	Barisal	0.026	1.027
	Sylhet	0.103 ****	1.108
level of education			
	No education-.	-1.343 *	0.261
	Primary	-0.128 *	0.88
	Secondary level	-	1.000
	Higher	0.697 *	2.008
Religion			
	Islam[r]	-	1.000
	Christianity	-.209	0.811
	Hinduisn	-.024	0.977
	Buddhist	0.704****	2.023

Background characteristics (variable)	Estimated regression coefficient	Odds ratio [Exp(β)]
Current Pregnancy		
Not pregnancy[r]	-	1.000
Pregnant	-1.099 *	0.3330
Number of living children		
Below 2	4.011*	2.200
Exactly 2[r]	-	1.000
Above 2	-1.664 *	0.189
Working Status		
Not working	-	1.000
Working	-0.566*	0.568
Access of mass media		
(a) listen to radio irregularly	-	1.000
listen to radio regularly	0.479 *	1.615
(b) Watch TV irregular[r]	-	1.000
Watch TV regular	0.321 *	1.379
Involvement in NGO's		
Grameen Bank	-0.497 *	0.608
BRAC	-0.321****	0.649
BRDP[r]	-	1.000
Mothers Club	3.347 **	28.428
Others organization	-0.439 *	0.645

Background characteristics (variable)	Estimated regression coefficient	Odds ratio [Exp(β)]
Intercept	-0.287*	
2log likehood	620.009	
Cox & Snell R^2	0.393	
Negelkerike R^2	0.528	
Model χ^2	357.997*	
df	25	

r = Reference categoery, '*' Significant at P<0.001, '' Significant at P<0.01, '***' Significant at P<0.05, '****' Significant at P<0.10**

5.5 Empirical results and Discussion:

The estimated multiple binary logistic regression model is given by

$$\log_e \frac{\pi_i}{1-\pi_i} = -0.287 + 2.261X_{11} + 1.442X_{12} - 1.63X_{13} - 3.225X_{15} + 0.099X_{22} - 0.170_{23}$$
$$- 0.089X_{24} + 0.026X_{25} + 0.103X_{26} - 1.34X_{31} - 0.128X_{32} + 0.697X_{34} - 0.349X_{42} - 1.122X_{43}$$
$$+ 0.842X_{44} - 1.099X_5 + 4.011X_{61} - 1.664X_{63} - 0.566X_7 + 0.479X_{81} + 0.321X_{82} - 0.497\ X_{91}$$
$$- 0.321X_{92} + 3.347X_{94} - 0.439X_{95}$$

The logistic regression coefficients of ever-married women for the age group 15-19, 20-24, 30-39 and 40-49 are calculated. Considering median age group 25-29 as reference category the regression coefficients of eligible women corresponding to age group 15-19 and 20-24 are 2.805 and 1.442 respectively and these are positive in sign, but for the age group 30-39 and 40-49 the coefficient are -1.603 and -3.225 respectively and negative in sign. The results illustrate that the ever-married women under age 30 are likely to demand more children and above age 30 are less likely to demand any more children and the results are statistically significant as compared to the reference age group 25-29. The odd ratio corresponding to the age group 15-19, 20-24 are 16.532, 4.229 respectively. It indicates that the ever-married women of age

group 15-19, 20-24 have 16.532, 4.229 times higher risk to demand for additional children than that of age group 25-29 (reference category). On the contrary, the odds ratio corresponding to the age group 30-39 and 40-49 are 0.201, 0.040 respectively. It indicate that the women of age group 30-39 and 40-49 have (1-0.201) × 100 = 79.9%, (1-0.040) × 100 = 60% lower risk to demand for additional children as compared to the age group 25-29. So for achieving the replacement level fertility the family planning program should be strengthened among the ever-married women under age 30.

The regression coefficients of ever-married women under different geographic region are calculated. Considering Dhaka division as reference category the coefficients corresponding to Chittagong, Sylhet and division are calculated 0.099, 0.103 and 0.026 respectively and positive in sign, but for the divisions Rajshahi and Khulna the coefficients are -0.170 and -0.089 respectively and negative in sign. Except for Barisal and Khulna all the results are statistical significant. The odd ratio corresponding to Chittagong, Sylhet and Barisal are 1.104, 1.027 and 1.108 respectively. The results indicate that the demand for additional children among ever-married women under Chittagong, Sylhet and Barisal 1.104, 1.027 and 1.108 times higher than that of Dhaka division. On contrary, the odds ratio corresponding to Rajshahi and Khulna divisions are 0.843 and 0.915 respectively. It indicates that the demand for additional children among women under Rajshahi and Barisal division are (1-0.843) ×100 = 15.7%, (1-0.915) × 100 = 85% less than of Dhaka division. It is evident from data of BDHS 2007 that there are original variation in contraceptive use, with Rajshahi and Khulna divisions having the highest prevalence and Chittagong and Sylhet division the lowest prevalence. That is from the data of BDHS 2007 the percentage of women currently using any contraceptive methods by the regions of Dhaka, Chittagong, Rajshahi, Khulna, Barisal and Sylhet are 56.3, 43.9, 56.4, 63.1, 65.9 and 31.5 respectively. The result is consistent with that of mine. It may be the impact of ritual sentiment. Therefore, in order to achieve our target the family planning program as well as adult education should be strengthened in Chittagong and Sylhet division.

The regression coefficient of women corresponding to different levels of education is obtained but the coefficients are statistically significant they do not show the expected sign. Considering secondary level of education as reference category, the coefficients corresponding to no education, primary level and higher are -1.343, -0.128 and 0.697 respectively. It is general convention that demand for a child reduces as level of education raises up to secondary level. It is also observed from the data that the overall literacy rate is significantly lower in Chittagong and Sylhet divisions as compared to other divisions. Data from the world fertility surveys and the demographic and surveys in Bangladesh and worldwide confirm the positive effect of education on reproductive behavior (Schultz, 1994; World Bank, 1994). Since the results are not consistent as our desire, the economic condition of the respondent should be investigated and a further analysis is required.

The regression coefficients of eve-married women under different religion are computed. In my analysis 87% of the respondent is the religion Islam and it is evident from data of BDHS 2007 that the proportion of women currently using any contraceptive method between Muslim and non-Muslim are 48.6% and 58.5% respectively. That is probability of contraceptive use is higher among non-Muslims than Muslims. Therefore, considering Islam as a reference category the coefficients corresponding to Christianity, Hinduism and Buddhist are -0.209, -0.024 and 0.704 respectively and first two are negative in sing. Except for Buddhist the remaining results are statistically significant. The odd ratio corresponding to the religion Christianity and Hinduism are 0.811 and 0.977 respectively. The results indicate that the demand for additional children among women under religion Christianity and Hinduism are $(1-0.811) \times 100 = 18.9\%$ and $(1-0.977) \times 100 = 2.3\%$ less than of Islam. The odds ratio corresponding to the religion Buddhist is 2.023 time higher than that of Islam. It may due to the fact that many of the male population among Buddhist are "Bhikku". They are life long bachelor. Also it is observed that the growth rate in many Buddhist countries like China, Japan etc. are negative. So the women among Buddhist

are likely to demand more children for their social security. Though the result is not significant the activities of family planning program should be enhanced among the Buddhist women.

The logistic regression coefficient of currently pregnant women is -1.099 and statistical significant. Non-pregnant women are considered as reference category. The odds ratio corresponding to the coefficient is 0.3330. The result indicates that the demand for an additional child is too much lower i.e. $(1\text{-}0.330)\times 100 = 66.7\%$ lower among the currently pregnant women than that of non-pregnant women. It may due to complicacy of pregnancy. Therefore the field worker of family planning program should explain the complicacy of pregnancy among the eligible women and discourage them for further issue. The interpretation of the result become more meaningful if is possible to identify the parity at which the pregnancy is occurred. But initially the birth order of living children was not considered in the data. Therefore, further analysis is required.

The logistic regression coefficient corresponding to the total number of children below 2 and above 2 are 4.011 and -1.664 respectively each has expected sign. Also the results are statistically significant. Therefore total number of children exactly 2 is considered as reference category the odd ratios are 2.200, 0.189 respectively. The results indicate that the eligible women having less than two children are likely to 2.200 times higher as well as the women having more than 2 children are likely to the $(1\text{-}0.189)\times 100 = 81.1\%$ lower the demand for additional child than that are prevailing among the women having two children. Therefore, the family planning program should be strengthened and widely acceptable especially among the women having less than two children. The field worker may explain the positive impact of single child and discourage them for further one.

Government has already declared many opportunities for the family of single child.

The logistic regression coefficient of working women other than housewives is -0.335 with excepted sign and statistical significant. Here 82% of the respondent is non-

working i.e. housewives and non-working women are considered as reference category because it is evident from data of BDSH 2007 that the proportion of women currently using any contraceptive method among working and housewives are 56.0% and 46.3% respectively. That is contraceptive use is higher among working women than among housewives. The odd ratio corresponding to the working women is 0.568. The result indicates that the demand for a child among working women is $(1-0.568)\times 100 =$ 42.3% less than that among housewives. Also it is evident from the data that the percentage of working women is significantly lower in Chittagong and Sylhet divisions as compared to other divisions though the scope of work is much in those divisions as compared to Rajshahi and Khulna divisions. Therefore, in order to get more effective and fruitful responses from family planning program that is achieving replacement-level fertility female empowerment through education, as well as service is necessary.

Logistic regression coefficient of mass media listens to radio regularly and watches TV regularly are 0.479 and 0.321 respectively. But the impact of radio on demand for a child does not show the expected result and also the impact of television on demand for additional children does not show the expected sign and statistically significant. In order to identify the positive impact of access to mass media, irregular access to mass media is considered as a reference category. The odd ratio corresponding to the media listen to radio regularly is 1.615 times higher to demand for additional child among the women who do not listen to radio regularly.

The odd ratio corresponding to the media watches TV regularly is 1.379 times higher to demand for additional child among the women who do not listen to radio regularly.

The logistic regression coefficient of eligible women under the activities of NGO's Grameen Bank, BRAC, Mothers Club and Others Organization are -0.497, -0.321, 3.347 and -0.439 The coefficients corresponding to Mothers Club do not show the expect sign and the result is statistically significant but for Grameen Bank, BRAC, Others Organization coefficient show the expect sign and the result are significant.

Considered the BRDP as reference category. The odd ratio corresponding to Grameen Bank, BRAC and Other organization are 0.608, 0.649 and 0.645 respectively. The result indicate that the women under the activities of Grameen Bank, BRAC and Other organization are $(1-0.608)\times 100 = 39.2\%$, $(1-0.649)\times 100 = 35.1\%$ and $(1-0.645)\times 100 = 35.5\%$ lower demand for additional children than that obtained from the women under the activities of BRDP. Now there are hundred than that obtained of NGO's are working in Bangladesh. If it is possible to attach the activities of family planning program with their traditional activities, the replacement level fertility may be achieved soon.

Chapter-Six

Proximate Determinants of Fertility: An Alternative Approach of Bongaarts' Model

Fig. 4

Chapter-6

Proximate Determinants of Fertility: An Alternative Approach of Bongaarts` Model

6.1 Introduction

The study of determinants of human fertility is a very complex process. While human fertility influence population growth, which has consequences towards pressure on resource, employment situations, health and other social facilities and savings and investment: such consequences, in turn, great bearing on the socio-demographic and socio-economic variables that affect fertility behavior. The level of fertility in a society is directly influenced by a set of variables is called intermediate variable or proximate determinants (Davis and Blake, 1956). In general, the biological and behavioral factors through which socio-demographic, socio-economic, culture and environmental variables affect fertility called an intermediate fertility variable. The primary characteristics of an intermediate fertility variable are its direct influence on fertility. Davis and Blake (1956) produce the first systematic, social and other factors must operate to influence fertility.

Bongaart's (1978) revised the original classification and provide a simple analytical method accounting framework, which permits a quantitative assessment of the contribution of different proximate determinants to give fertility levels or change. Bongaart's (1978) demonstrated that most of the variation in fertility is due to four intermediate variables or proximate determinants. These are marriage, contraception, and abortion and lactation infecundability. If a proximate determinant such as contraceptive use changes, then fertility necessarily changes also (assuming the other proximate determinants remain constant), though this is not necessarily the case of socio-economic determinants. As a result, fertility differences among population and

changes in fertility of a population over time can always be traced to variations in one or more of the proximate determinants.

Historical studies about fertility change have shown that as societies being to undergo the transformation from natural to deliberately controlled fertility, significant changes in the overall levels of total natural fertility, total marital fertility and total fertility being occur (Bongaarts' and Potter, 1983). Such changes can be traced to one or more proximate determinants, such as, an increase in contraceptive use for stopping and spacing purposes a rise in age at first marriage, a decline in the proportion married, prolonged breast feeding and induced abortion.

To improve our evident understanding of the fertility change, we critically examine the effect of major proximate determinants: proportion married, contraception, lactational infecundability on fertility and their changing effects. Again, since fertility is the resultant of multiplicity of factors, studies have attempted to identify these factors, which have important bearing for policy intervention in altering the level of fertility (Heer, 1966; Cain and Weininger, 1973; Bahr, 1975; Defranzo, 1976; Kohli, 1977). Keeping this in mind, in this chapter attempts to identify the four intermediate variables namely proportion married among females, contraceptive use effectiveness, induced abortion and duration of lactational infecundability and investigates their impacts on change in the level of fertility for the period 1975 to 2007 in Bangladesh. During this period decomposing Bongaarts' model to assess the individual contribution made by each of the four intermediate variables and alternative approach of Bongaarts` model also assess the individual contribution made by each of the intermediate variables to change the fertility level, especially index of fetal wastages.

6.2 The Bongaarts' Model

To quantify the fertility inhibiting effects of four major proximate determinants, Bongaarts' developed a model, which is now widely used in fertility analysis. Bongaart's model of estimating the effect of different proximate determinants assumes

that the natural reproductive capacity (that is total fecundity rates, TF) of women is nearly the same for all women, but their actual reproductive performance is modified by four major proximate determinants.

In this model Bongaarts' (1978) expressed total fertility rate TFR, is the product of four indices measuring the fertility inhibiting effect of these four indices and the total fecundity rate (TF). The TF is the average number of live births expected among women who during their entire reproductive period remain married, do not use contraception, do not have any induced abortion and do not breastfeeding their children (Bongaarts', 1982). According to Bongaarts' model, the TFR can be written as:

$$TFR = C_m \times C_c \times C_a \times C_i \times TF \quad \text{---------- (1)}$$

Where, C_m is the index of proportion married

C_c is the index of non-contraceptive

C_a is the index of induced abortion, and

C_i is the index of lactational infecundability.

$C_m = 1$; if all women of reproductive age are married

$= 0$; in the absence of marriage.

$C_c = 1$; in the absence of contraception

$= 0$; if all fecund women use cent percent effective contraceptive

$C_a = 1$; in the absence of induced abortion

$= 0$; if all pregnancies aborted.

$C_i = 1$; in the absence of lactation and postpartum abstinence

$= 0$; if the duration of infecundability is infinite

The estimation procedure of the indices of intermediate fertility variables are as follows:

6.2.1 Index of Proportion Married (C_m)

The index of proportion married is estimated by the equation

$$C_m = \frac{\sum m(a)g(a)}{\sum g(a)} \text{ ---------- (2)}$$

Where m(a) is the age-specific proportion of females currently married and g(a) is the age-specific marital fertility rate.

Equation (2) can also be written as:

$$C_m = \frac{TFR}{TM}, \quad \text{so that } TFR = C_m \times TM \text{ ---------- (3)}$$

The index C_m = gives the proportion by which TFR is smaller than TM, as the result of non-marriage, $C_m = 0$, if nobody is married, and $C_m = 1$, if all women are married during the entire reproductive period.

Here, TM = Σg(a) = Total marital fertility rate, equal to the number of births a women would have at the end of the reproductive years if she were to be bear children at prevailing age-specific marital fertility rates and remain married during the entire reproductive period (based on the fertility of married women aged 15-49). If $C_m = 1$, then TFR = TM and hence, the difference between TM and TFR are account for by the effects of the non marriage.

6.2.2 Index of Non-Contraception (C_c)

To estimate the effect of contraception on marital fertility, the following equation expresses marital fertility as the interaction of contraception practice and natural fertility.

$$TM = C_c \times TNM \text{ ---------- (4)}$$

Where, TNM is the total natural marital fertility rates, which are equal to TM in the absence of contraception and induced abortion. Equation (3) simply states that TM is smaller than TNM by a proportion C_c with the value of C_c depending on the prevalence of contraception that is the extent of use effectiveness of contraception (induced abortion is assumed absent for the moment).

When no contraception is practiced, $C_c = 1$, and when all non-sterile women in the reproductive years are protected by 100 percent effective contraception; $C_c = 0$, and

then TM = 0. if all couples, who practice contraception is assumed non-sterile, the index C_c can be written as :

$$C_c = 1 - s \times u \times e \quad \text{---------- (5)}$$

Where, u is the proportion currently using contraception among married women of reproductive age (average of age specific use rate). e is the average contraceptive effectiveness and a value for s = 1.08 (Sterility correction factor obtain by Henry (1961). To relate the index of contraception to the total fertility rate, equation (2) becomes-

$$TFR = C_m \times C_c \times TNM \quad \text{---------- (6)}$$

This equation gives the total fertility rate from the natural fertility rate by taking into account the fertility reducing impact of contraception and marriage measured by the index of C_m and C_c respectively.

6.2.3 Index of Induced Abortion (C_a)

Although reliable measurements of the prevalence of induced abortion is practiced in many societies, even in cases where good estimates are available, it has proven difficult to determine the abortion. Estimates of number of birth averted by induced abortion are largely based on numerical exercise using mathematical reproductive models. The most detailed studies of this topic have been made by Potter (1976), whose work has demonstrated as the following:

In the absence of contraception, an induced abortion averts about 0.4 birth, while about 0.8 births are averted when moderately effective contraceptive is practiced. To generalize from these findings the births averted per induced abortion B, may be estimated with the following the equation.

$$B = 0.4\ (1+u) \quad \text{---------- (7)}$$

A convenient overall measure of the incidence of induced abortion is provided by the total abortion rate (TA) equal to the average number of induced abortions per women at the end of the reproductive period, if induced abortion rates remain at prevailing

levels through the reproductive period (excluding induced abortion to women who are not married).

The reduction in fertility associated with a given level of total abortion rate is calculated as:

$$A = B \times TA$$
$$= 0.4\,(1+u) \times TA$$

Where, A equals the average number of birth averted per women by the end of the reproductive years. The index of induced abortion is defined as the ratio of the observed total fertility rate (TFR), to the estimated total fertility rate with induced abortion, TFR+A; that is

$$C_a = \frac{TFR}{TFR + A} \text{ ---------- (8)}$$

The index C_a equals the proportion by which fertility is reduced as the consequence of the practice of induced abortion (Note that C_a decline with increasing incidence of induced abortion). Modifying equation (5) accordingly, the relationship between TFR and TNM becomes:

$$TFR = C_m \times C_c \times C_a \times TNM \text{ ---------- (9)}$$

6.2.4 Index of lactational Infecundability (C_i)

In modern western population lactation is generally short and many women do not lactate at all. In traditional societies in Africa, Latin America and Asia, lactation is usually long and lasts until the next pregnancy occurs.

Lactation has an inhibition effect on fertility and thus increases the birth interval and reduces natural fertility (potter, 1965). A typical average birth interval without lactation can be estimated to be 18.5 months[2]. The ratio of the average birth intervals without and with lactation is given by

$$C_i = \frac{20}{18.5 + i} \text{ ---------- (*)}$$

Where, i is the average duration (in months) of infecundability from birth to the first post-partum ovulation (menses). An indirect estimates of i as developed by Bongaarts' is given by-

$$i = 0.1753 \times \exp\left[0.1396 \times B - 0.001872 \times B^2\right]$$

Where, B is the average duration of breastfeeding in months. The relationship between lactation and the total natural marital fertility rate becomes:

$TNM = C_i \times TF$

Where, TF is the total fecundity rate equal to the natural marital fertility rate in the absence of lactation. Then the model is represented including lactational infecundability as:

$$TFR = C_m \times C_c \times C_a \times C_i \times TF$$

6.3 Alternative approach of Bongaarts` model

In Bongaarts` model we replace only the index of fetal wastages in stead of the index of induced abortion which as one of the proximate determinants of fertility. The other indices have remained the same as proposed by Bongaarts`.

In our proposed Bongaarts` model we considered all miscarriage or all fetal wastages (miscarriage, abortion and stillbirth) together in stead of only induced abortion in computing the index. The index may be termed as index of fetal wastage and indicated as $C_{fw.}$ Because the index of miscarriage or all fetal wastage have direct impact on fertility. Then our proposed Bongaarts` model becomes

$TFR = C_m \times C_c \times C_{fw} \times C_i \times TF$---------- (10)

Where the index of fetal wastage is defined as the ratio of the observed total fertility rate, to the estimated total fertility rate with all fetal wastage which is (TFR+FW) that is

$$C_{fw} = \frac{TFR}{(TFR + FW)}$$

Where FW equals the average number of birth averted per women by the end of the reproductive years. We considering all fetal wastage for computing the index because

it is true that induced abortion not only have direct impact on fertility but the other fetal wastage have also direct impact on fertility which are miscarriage and stillbirth. So we considered all fetal wastage for computing the index in stead of only induced abortion.

Again Bongaarts` model gives over estimate the TFR, because he considered only induced abortion as one of the proximate determinants of fertility. But our proposed model gives approximately true estimate of the TFR, because we consider all fetal wastage as one of the proximate determinants of fertility.

6.4 The Estimated Proximate Variables and Implications

On the basis of the Bongaarts' model given in equation (1) & (10), the estimated value of the measures and indices for different time points are presented in table 6.1. The complement of indices represents the proportionate reduction in fertility attribute to the fertility determinant. The lower the estimated value of the indices, the greater the fertility reducing effect. Thus, we have the value of C_m in 1975 is 0.859, indicating that the proportion of married women reduces fertility by 14.1% while the value of C_m in 1989 is 0.785, in 1996-97 is 0.781, in 1999-2000 is 0.785, in 2004 is 0.725 and in 2007 is 0.737 indicating that the proportion of married women reduces fertility by 21.50%, 21.90%, 21.50%, 27.50% and 26.90% respectively. The value of C_c in 1975 is 0.932 indicating that the use of contraceptive reduces fertility by 6.80%, while the value of C_c in 1989 is 0.718, in 1996 - 1997 is 0.548, in 1999-2000 is 0.529, in 2004 is 0.520 and in 2007 is 0.468 indicating that the use of contraceptive reduces fertility by 28.20%, 45.20%, 47.06%, 48% and 45.40% respectively.

The value of C_a in 2004 is 0.970 and in 2007 is 0.975 indicating that the induced abortion reduces fertility by 3% and 2.5% respectively and also the index of C_{fw} in 2004 is 0..834 and in 2007 is 0.835 indicating that the all fetal wastage reduces fertility by 16.6% and 16.5% respectively.

[2]Chan, Ahmed, Gesche and Mosely(1974) found for Matlab Population and average duration of lactional infecundable period as 18.7 months. Abedin(1983) as 18.0 months for a rural Population in Bangladesh and BFS (1989) as 18.5 months

Again the index of C_i in 2007 is 0.626 indicates that the average estimated effect is very strong for the reduction in fertility by 37%, compared with the value of the index C_i in 1999-2000 which is 0.670 indicates that the average estimated effect is 33%. The reducing fertility impact of contraceptive on fertility varies from one time point to another because of varying use effectiveness of methods. In recent years, the use of contraceptive increased and as a result the average fertility reducing impact of contraceptive also increased. It is clear from table 6.1 that there is a downward trend in C_c and C_m which shows an increasing effect in reducing fertility.

Table: 6.1 Estimated different reproductive measures and indices of fertility, Bangladesh 1975-2007

Measures and indices	Year								
	1975	1981	1985	1989	1991	1996 -97	1999 - 2000	2004	2007
TFR(Ob)	6.329	5.042	4.502	4.895	4.350	3.27	3.310	3.000	2.700
TM	7.368	6.017	5.558	6.236	6.400	4.181	4.262	4.160	3.710
TNM	7.906	7.284	7.284	8.685	10.090	7.631	8.051	8.010	7.839
C_m	0.859	0.838	0.810	0.785	0.700	0.781	0.785	0.725	0.7365
C_c	0.932	0.835	0.763	0.718	0.634	0.534	0.529	0.520	0.468
C_a	1.000	1.000	1.000	0.990	0.980	0.980	0.990	0.970	0.975
C_{fw}	1.000	1.000	1.000	0.850	0.840	0.840	0.857	0.834	0.835
C_i	0.524	0.523	0.534	0.678	0.672	0.65	0.67	0.66	0.626
TFR(Bongaarts Model), R^2=84%	6.42	5.63	5.05	5.78	4.47	4.06	4.21	3.69	3.22
TFR(Proposed Model) R^2=98%	NA	NA	NA	4.97	3.83	3.48	3.65	3.17	2.76
TF(Bongaarts`)	NC	NC	NC	NC	NC	NC	NC	NC	12.83
TF(Proposed Model)	NC	NC	NC	NC	NC	NC	NC	NC	14.99

(NA: Not Available), (NC: Not Computed)

Source: BFS 1975, 1989; 1981, 1991; BDHS 1996-97, 1999-97, 1999-2000, 2004, 2007

When we put the value of C_a in equation (1) we get the value of TFR is 3.22 and also put the value of C_{fw} in equation (10) we get the value of TFR is 2.76 but our observed TFR 2.7. From two estimated values it is found that both estimated TFR are higher than that of observed TFR.

Bongaarts` model estimates the TFR is 3.22 which is far away from observed TFR but our proposed model estimates TFR is 2.76 is more close to the observed TFR. Again for considering only abortion in Bongaarts` model our calculated TF is 12.83 which is far away from assumed TF and our proposed model gives the value of TF is 14.99 which is very close to observed TF (15.3). From R^2 value we also conclude that our proposed model explained are than 98% of total variation of TFR by the indices where as Bongaarts` model explained 84% only. So comparing the values we conclude that proposed model is better than Bongaarts` model.

6.5 Magnitude of the Total Fertility Inhibiting Effect being accounted for each Proximate Determinant:

The difference between the total fecundity rate (TF, taken as 15.30 in 2007) and the estimated TFR is attributed the result of the inhibitory effect of each variable. The total inhabiting effect is prorated by the proportion of the logarithm of each index to the sum of logarithm of all indices (Wang et al., 1987).

$$\text{Effect of marriage} = \frac{[TF - TFR(estimated)] \times \log_e C_m}{\log_e C_m + \log_e C_c + \log_e C_i + \log_e C_{fw}}$$

$$\text{Effect of contraception} = \frac{[TF - TFR(estimated)] \times \log_e C_c}{\log_e C_m + \log_e C_c + \log_e C_i + \log_e C_{fw}}$$

$$\text{Effect of Postpartum Infecundability} = \frac{[TF - TFR(estimated)] \times \log_e C_i}{\log_e C_m + \log_e C_c + \log_e C_i + \log_e C_{fw}}$$

$$\text{Effect of all fetal wastage} = \frac{[TF - TFR(estimated)] \times \log_e C_{fw}}{\log_e C_m + \log_e C_c + \log_e C_i + \log_e C_{fw}}$$

Here, TFR (estimated) = $C_m \times C_c \times C_{fw} \times C_i \times 15.30$

Table 6.2: Trends in the Magnitude of the Total Fertility Inhibiting Effect being accounted for each proximate variable, Bangladesh 1975-2007

Proximate Variable	Fertility Inhibiting Effect											
	Birth per women						Percentage					
	1975	1991	1996-97	1999-00	2004	2007	1975	1991	1996-97	1999-00	2004	2007
Marriage	1.53	2.96	1.97	1.96	2.47	2.24	17.5	25.85	16.71	16.77	20.45	17.85
Contraception	0.71	3.78	5.00	5.16	5.04	5.56	8.2	33.03	42.39	44.16	41.58	44.30
Postpartum infecundability	6.51	3.26	3.44	3.24	3.20	3.43	74.3	28.48	29.11	27.28	26.42	27.33
Fetal wastage	-	1.44	1.39	1.32	1.40	1.32		12.64	11.78	11.27	11.54	10.52
TF-TFR(Esti.)	8.76	11.45	11.82	11.68	12.13	12.54		100	100	100	100	100

Table 6.2 exhibits the trend in the magnitude of the inhibiting effect being accounted for by each proximate variable at different time points. The results indicate that a total of 8.76 births in 1975 being inhibited, 1.53 births are due to effect of marriage variable; 0.71 are due to contraception and 6.51 are due to postpartum infecundability. A total of 12.13 births in 2004 being inhibited; 2.47 births are due to effect of marriage variable; 5.04 birth are due to contraception, 3.20 births are due to postpartum infecundability and 1.40 birth are due to fetal wastage. A total of 12.54 births in 2007 being inhibited 2.24 births are due to effect of marriage, 5.56 births are due to contraception and 3.43 births are due to postpartum infecundability, and 1.32 births are due to fetal wastage. Table 6.2 depicts that the continuously increased to 1.97 births per-women in 1996-1997 to 2.47 in births per-women in 2004, from a level of 1.53 births per-women in 1975 and from a level of 2.24 in 2007. Also, the effect of contraceptive use increased to 5.00 births per-women in 1996-1997 to 5.56 births per-women in 2007, from a level of 0.71 births per-women in 1975. Oppositely, the effect of postpartum infecundability decreased during the period 1996-97 to 2007.

6.6 Decomposition of the Change in Fertility and Contribution of Proximate Variables

Bongaarts' proposed model given by the equation (10) can easily be turned to a decomposition equation that allows the quantification of the contribution made by each of the four intermediate fertility variables to an observed change in fertility between two time points 0 and t, the basic equation is as follows:

$$\frac{TFR(t)}{TFR(0)} = \frac{C_m(t)}{C_m(0)} \times \frac{C_c(t)}{C_c(0)} \times \frac{C_{fw}(t)}{C_{fw}(0)} \times \frac{C_i(t)}{C_i(0)} \times \frac{TF(t)}{TF(0)} \quad \text{---------- (11)}$$

If the two points of times are 2004 and 2007, using equation (11) for two times 2004 and 2007, we can show that:

$$\frac{TFR(2007)}{TFR(2004)} = \frac{C_m(2007)}{C_m(2004)} \times \frac{C_c(2007)}{C_c(2004)} \times \frac{C_{fw}(2007)}{C_{fw}(2004)} \times \frac{C_i(2007)}{C_i(2004)} \times \frac{TF(2007)}{TF(2004)} \quad \text{---------- (12)}$$

Define again,

$$P_f = \frac{TFR(2007)}{TFR(2004)} - 1$$

= Proportional change in TFR between in 2004and 2007.

$$P_m = \frac{C_m(2007)}{C_m(2004)} - 1$$

= Proportional change in TFR due to change in the index of proportion marriage.

$$P_c = \frac{C_c(2007)}{C_c(2004)} - 1$$

= Proportional change in TFR due to change in the index of contraception.

$$P_i = \frac{C_i(2007)}{C_i(2004)} - 1$$

= Proportion change in TFR due to change in the index of lactational infecundability.

$$P_{fw} = \frac{C_{fw}(2007)}{C_{fw}(2004)} - 1$$

=Proportional change in TFR due to change in the index of fetal wastage.

$$P_r = \frac{TF(2007)}{TF(2004)} - 1$$

= Proportion change in TFR due to change in the remaining proximate determinants - natural fecundability, spontaneous intrauterine mortality and permanent sterility. The relationship becomes

$$P_f = P_m + P_c + P_{fw} + P_i + P_r + I \text{---------- (13)}$$

Here I represent an interaction factor. This equation simply states a given proportional change in the TFR between 2004 and 2007 equal to the sum of the proportional fertility changes due to the different intermediate fertility variables plus an interaction term. It is simply estimated by subtractive the sum of P_m, P_c, P_{fw}, P_i, and P_r, from P_f. Equation (13) can now easily be turned into a decomposition equation for the absolute decline in TFR (2007) viz. TFR (2007)- TFR (2004) dividing TFR (2004). The decomposition procedure for the TFR can easily be extended also to allow the decompositions of a change in the crude birth rate (CBR). The CBR is linked to its proximate determinants by the following equation:-

$$CBR = S \times C_m \times C_c \times C_{fw} \times C_i \times TF \text{----------(14)}$$

Where S is an age-sex composition term calculated by-

$$S = \frac{CBR}{TFR} - 1$$

Define again,

$$P_b = \frac{CBR(2007)}{CBR(2004)} - 1$$

= Proportion change in the CBR between 1975 and 2007.

$$P_s = \frac{S(2007)}{S(2004)} - 1$$

= Proportional change in the CBR due to a change in the age-sex composition.

Then it becomes

$$P_b = P_s + P_m + P_c + P_{fw} + P_i + P_r + I \text{---------- (15)}$$

Where P_m, P_c, P_{fw}, P_i, and P_r are the values obtained earlier.

Table 6.3: Decomposition of changes in TFR by different measures and indices, Bangladesh 1997 to 2007

Changing Indices	*Percentage of Change*		*Distribution of Percentage Change*		*Absolute Change of TFR*	
	1997-2007	2004-2007	1997-2007	2004-2007	1997-2007	2004-2007
C_m	-5.698	1.65	-32.55	16.27	-0.185	0.049
C_c	-12.36	-10.00	-70.59	-98.63	-0.402	-0.296
C_{fw}	-0.596	0.119	-3.40	1.17	-0.019	0.0035
C_i	-3.692	-5.152	-21.09	-50.81	-0.120	-0.1524
TF	-17.632	-19.756	-100.71	-194.85	-0.574	-0.585
I	22.47	23.00	128.34	226.85	0.731	0.681
TFR	-17.508	-10.139	100	100	-0.57	-0.30

Source: BFS 1975; BDHS 2004, 2007

Table 6.3 represents the decomposition of change of all indices in TFR between 1997-2007 and 2004-2007. It indicates that TFR has declined about 17.51% from 3.27 in 1997 to 2.7 in 2007 and 10.139% from 3.00 in 2004 to 2.7 in 2007. It also indicates that the decomposition of this decline in TFR between 1997 to 2007 has nearly 5.69% due to change in proportion of married, about 12.36% decline due to increase in proportion to contraceptive use and effectiveness, about 0.596% decline due to increase the index of fetal wastage and approximately 3.69% increase due to decrease of the duration of lactational infecundability. The remaining proximate determinants together contribute about 17.63% decreases and increase 22.47% in TFR by interaction factor.

Again, the decomposition of this decline in TFR between 2004-2007 has been nearly 1.67% increase due to change in the proportion of women married, about 10% decline due to an increase in contraceptive use and effectiveness, 0.12% decline due to increase the index of induced fetal wastage, a dramatically change about 5.15% decline due to increase the duration of lactational infecundability. The remaining proximate determinants together contribute about 19.76% increase by the interaction factors increase 23%

The decomposition results are standardized to add to 100%. Further table 6.3 indicate that during 1997 to 2007, it has declined by 0.57 births per-women of which 0.185 births declined by proportion married, 0.402 births declined due to contraceptive use, 0.019 birth declined due to the index of fetal wastage, and 0.120 births increased due to lactational infecundabilty, 0.574 births declined by other proximate determinants and the interaction factor has increased 0.731 births per-women.

Again during 2004 to 2007, it has declined by 0.30% births per-women of which 0.049 births has increased by proportion married, 0.296 births decline due to contraceptive use, 0.0035 birth increase due to the index fetal wastage, and 0.152 births decline due to lactational infecundability; 0.585 births declined by other proximate determinants, and 0.681 births increase by the interaction factor.

It is clear from table 6.3 that fertility is declining by proportion married made significant contribution to the overall fertility reduction, and that the contraceptive has the highest impact on reducing fertility which may be attributed to the increase use of contraception from 49% in 1975 to 58.1% in 2004 and 55.8% in 2007 (Mitra and Associates, March 2009).

Table 6.4: Decomposition of changes in CBR by different measures and indices, Bangladesh 1975 - 2004 and 1975 - 2007

Changing Indices	*Percentage of Change*		*Distribution of Percentage Change*		*Absolute Change CBR*	
	1997-2007	2004-2007	1997-2007	2004-2007	1997-2004	2004-2007
P_s	9.578	1.167	85..33	12.88	2.81	0.3349
C_m	-5.698	1.65	-50.97	18.21	-1.68	0.4736
C_c	-12.36	-10.00	-110.116	-110.39	-3.63	-2.87
C_{fw}	-0.595	-0.12	-5.309	-1.32	-0.175	-0.034
C_i	-3.692	-5.15	-32.892	-56.85	-1.08	-1.48
TF	-17.628	-19.76	-157.049	-218.12	-5.18	-5.67
I	19.171	23.154	170.8	255.59	5.64	6.64
P_b	-11.2245	-9.059	100	100	-3.3	-2.6

Source: BFS 1975; BDHS 2004, 2007

It is clear from table 6.4 that different intermediate fertility variables and age-sex composition has contributed in decreasing of CBR, by the proportion of women married about 50.97% of total decrease during 1997 to 2007 and about 18.21.% of total increase during 2004 to 2007.

It also indicate that about 1.68 births decrease by the proportion of women married during 1997-2007 and about 0.474 births increase by the proportion of married during 2004-2007. About 3.63 birth decrease by use of contraception during the period 1997-2007 and about 2.87 births decrease by use of contraception during the period 2004-2007.

6.7 The Inhibiting Effect of marriage on Fertility

The approximate effect of marriage pattern on fertility can be measured by adopting Bongaarts` model (Bongaarts`, 1982). The model assures that women who are not currently married would experience the same fertility as their married counterparts. If they themselves were married as shown in Table 6.8 which includes the relevant data for 1975, 1978, 1981, 1991, 1996-2000, 2004 and 2007. Column (1) of the table 6.8

indicated the age specific fertility rates (ASFR), averaged for the five-year period prior to the survey from 1975-1991 and for the three-year period preceding the survey from 1996-2007. By multiplying these rates by the reciprocal of the proportions ever married at the time of the survey, an estimate is formed of hypothetical fertility in the absence of any postponement of marriage beyond age 15, which is shown in column (3). Column (4) shows the proportion that are currently married among those who ever-married. The reciprocal of these proportions multiplied by the rates in column (3) gives an estimate of hypothetical fertility in the absence of any postponement of marriage beyond age 15 and the absence of divorced and widowed shown in column (5). In column (6) reduction in fertility by marriage has shown.

Table 6.5: Estimation of the Effect of Marriage Pattern on Fertility

Age	ASFR (1)	Proportion. Ever married (2)	ASEMFR (3)=(1)/(2)	Proportion Currently married among Ever married (4)	ASMFR (5)=(3)/(4)	$(6)=1-\frac{(1)}{(5)}$
			1975			
15-19	0.1090	0.7020	0.1553	0.9231	0.1682	0.3520
20-24	0.2886	0.9540	0.3025	0.9466	0.3198	0.0970
25-29	0.2911	0.9900	0.2940	0.9303	0.3160	0.0788
30-34	0.2502	0.9980	0.2507	0.9097	0.2756	0.0922
35-39	0.1848	0.9960	0.1855	0.8468	0.2191	0.1565
40-44	0.1074	0.9980	0.1076	0.7888	0.1364	0.2125
45-49	0.0347	1.000	0.0347	0.7105	0.0488	0.2889
Total	1.2658		1.3304		1.4817	0.1469
5×Total	6.3290		6.6515		7.4185	
Effect			0.3223		0.7670	

Age	ASFR (1)	Proportion Ever married (2)	ASEMFR (3)=(1)/(2)	Proportion Currently married among Ever married (4)	ASMFR (5)=(3)/(4)	$(6) = 1 - \frac{(1)}{(5)}$
1981						
15-19	0.1330	0.6870	0.1936	0.9518	0.2034	0.3461
20-24	0.2755	0.9490	0.2903	0.9577	0.3031	0.0911
25-29	0.2384	0.9870	0.2415	0.9560	0.2526	0.0562
30-34	0.1667	0.9900	0.1684	0.9379	0.1796	0.0718
35-39	0.1296	0.9960	0.1301	0.9015	0.1443	0.1019
40-44	0.0465	0.9930	0.0468	0.8245	0.0568	0.1813
45-49	0.0185	0.9970	0.0186	0.7471	0.0249	0.2570
Total	1.0082		1.0893		1.1647	0.1314
5×Total	5.0041		5.4465		5.8235	
Effect			0.4055		0.3770	
1989						
15-19	0.1422	0.5095	0.2791	0.9439	0.2957	0.5191
20-24	0.2596	0.8797	0.2954	0.9415	0.3138	0.1718
25-29	0.2254	0.9771	0.2307	0.9362	0.2464	0.0852
30-34	0.1642	0.9968	0.1647	0.9319	0.1767	0.0707
35-39	0.1141	0.9985	0.1143	0.9002	0.1270	0.1016
40-44	0.0555	0.9882	0.0555	0.8428	0.0660	0.1591
45-49	0.0176	0.9989	0.0175	0.8070	0.0218	0.1927
Total	0.9789		1.1574		1.247	0.2151
5×Total	4.8945		5.7870		6.2370	
Effect			0.8925		0.4500	
1991						
15-19	0.1910	0.5330	0.3583	0.9588	0.3738	0.4890
20-24	0.2350	0.8770	0.2680	0.9422	0.2844	0.1737
25-29	0.2030	0.9720	0.2088	0.9489	0.2200	0.0773
30-34	0.1500	0.9950	0.1506	0.9343	0.1614	0.0706
35-39	0.0890	0.9990	0.0891	0.0948	0.0985	0.0965
40-44	0.0500	0.9970	0.0502	0.8581	0.0585	0.1453
45-49	0.0100	1.000	0.0100	0.7746	0.0129	0.2248
Total	0.9280		1.1352		1.2093	0.2327
5×Total	4.6400		5.6760		6.0475	
Effect			1.0360		0.3715	

Age	ASFR (1)	Proportion Ever married (2)	ASEMFR (3)=(1)/(2)	Pro.Currently married among Ever married (4)	ASMFR (5)=(3)/(4)	$(6) = 1 - \frac{(1)}{(5)}$
1996-97						
15-19	0.1470	0.5020	0.2930	0.9620	0.3050	0.5180
20-24	0.1920	0.8280	0.2320	0.8580	0.2420	0.2070
25-29	0.1500	0.9650	0.1550	0.9620	0.1630	0.0790
30-34	0.0960	0.9950	0.0960	0.9250	0.1040	0.0760
35-39	0.0440	0.9990	0.0443	0.9140	0.0480	0.0830
40-44	0.0180	1.0000	0.0180	0.8600	0.0210	0.1430
45-49	0.0060	1.0000	0.0080	0.7900	0.0080	0.2500
Total	0.6530		0.8440		0.8910	0.2670
5×Total	3.2650		4.2200		4.4550	
Effect			0.9550		0.2350	
1999-2000						
15-19	0.1440	0.4810	0.2994	0.9688	0.3080	0.5320
20-24	0.1880	0.8150	0.2307	0.9546	0.2417	0.2222
25-29	0.1650	0.9580	0.1722	0.9509	0.1811	0.0889
30-34	0.0990	0.9990	0.0991	0.9399	0.1054	0.0208
35-39	0.0440	0.9980	0.0441	0.8788	0.0502	0.1235
40-44	0.0180	0.9990	0.0182	0.8428	0.0216	0.1667
45-49	0.0030	1.0000	0.0030	0.8230	0.0036	0.1667
Total	0.6610		0.8667		0.9128	0.2758
5×Total	3.3050		4.3335		4.5638	
Effect			1.0285		0.2303	
2004						
15-19	0.1350	0.4790	0.2810	0.4600	0.6100	0.7787
20-24	0.1920	0.8480	0.2270	0.8170	0.2787	0.3111
25-29	0.1350	0.9580	0.1410	0.9210	0.1530	0.1176
30-34	0.0830	0.9880	0.0840	0.9270	0.0900	0.0778
35-39	0.0410	0.9960	0.0410	0.8940	0.0450	0.0889
40-44	0.0160	0.9970	0.0160	0.8440	0.0180	0.1111
45-49	0.0030	1.0000	0.0030	0.8160	0.0043	0.2500
Total	0.6050		0.7930		1.1990	0.4954
5×Total	3.0250		3.9650		5.9950	
Effect			0.9400		2.0300	

Age	ASFR (1)	Proportion. Ever married (2)	ASEMFR (3)=(1)/(2)	Proportion Currently married among Ever married (4)	ASMFR (5)=(3)/(4)	$(6) = 1 - \frac{(1)}{(5)}$
2007						
15-19	0.1017	0.4465	0.2154	0.9123	0.2362	0.56943
20-24	0.1715	0.8569	0.2000	0.9577	0.2089	0.17903
25-29	0.1353	0.9569	0.1414	0.9643	0.1466	0.07730
30-34	0.0910	0.9940	0.0916	0.9325	0.0982	0.07304
35-39	0.0343	0.9943	0.0345	0.9271	0.0327	0.0782
40-44	0.0115	0.9984	0.0115	0.8575	0.0134	0.1439
45-49	0.0019	0.9923	0.0019	0.8379	0.0023	0.1686
Total	0.5472		0.6962		0.7383	0.8517
5×Total	2.736		3.4815		3.6915	
Effect			0.7455		0.2100	

In absolute terms, it is estimated that postponement of marriage in 1975, 1981, 1989, 1991, 1996-97, 2004 and 2007 reduce fertility by 0.323, 0.406, 0.893, 1.036, 0.960, 0.940 and 0.746 births respectively. Again, widowhood and divorced further reduce fertility by 0.767, 0.377, 0.450, 0.372, 0.235, 0.225, 2.030 and 0.210 respectively in indicated years. The table also shows the effect of postponement of marriage on fertility by age. At the ages 15-19 the reduction of fertility by postponement of marriage is being 0.352 births in 1975, 0.346 births in 1981, 0.519 births in 1989, 0.489 births in 1991, 0.518 births in 1996-97, 0.532 births in 1999-2000, 0.779 births in 2004 and 0.596 births in 2007. After the age 15-19 the rate has been decreasing up to ages 25-29 in 1975 up to the ages 25-29 in 1981 up to the ages 30-34 in 1989, up to the ages 30-34 in ages in 1991, in 1996-97, 1999-2000, 2004 and 2007. After that the rates are found to be gradually increased up to the marriageable ages.

The effect of postponement of marriage on fertility in 2007is 0.8517 which is higher than any other point of time. It implies that the age at marriage is higher and also the fertility is lower in 2007 than in the other study periods. It also indicates that the effect of marriage on fertility is higher in recent times.

Again divorces and widowhood have a major contribution on fertility reduction. The table further shows the effect of marriage pattern respectively in the years of 1975, 1981, 1989, 1991, 1996-97, 1999-2000, 2004 and 2007 by 14.7%, 13.4%, 21.5%, 23.3%, 26.7%, 27.3%, 49.50% and 85.17% reduction in fertility. Thus the fertility reducing effect of marriage pattern has increased over time for the years 1975, 1989, 1991, 1999-97, 1999-2000, 2004, and 2007 except 1981. The impact of changing marriage pattern between 1975 to 2007 may have caused lowering fertility. For example the singulate mean age at marriage (SMAM) for females in 1975 was 15 years, while in 2007; the (SMAM) is 18.95 years (BDHS 2004 and BDHS 2007). During this period widowhood and divorce increased clearly before the past two and a half decades.

When we put the value of C_a in equation (1) we get the value of TFR is 3.22 and also put the value of $C_{(fw)}$ in equation (10) we get the value of TFR is 2.76 but our observed TFR 2.7. From two estimated values it is found that both estimated TFR are higher than that of observed TFR.

Bongaarts` model estimates the TFR is 3.22 which is far away from observed TFR but our revised model estimates TFR is 2.76 is more close to the observed TFR. Again for considering only abortion in Bongaarts` model our calculated TF is 12.83 which is far away from assumed TF and our proposed model gives the value of TF is 14.99 which is very close to observed TF (15.3). Again from R^2 value we also conclude that our proposed model explained are than 98% of total variation of TFR by the indices where as Bongaarts` model explained 84% only. So comparing the values we conclude that proposed model is better than Bongaarts` model.

6.8 Conclusion

Application of Bongaarts` model clearly indicates that there is a downward trend in all the proximate indices. Between 1997 and 2007, the amount of decrement of total fertility rate is about 17% and it is about 10% from 2004 to 2007. This is primarily

caused by an increase in the use and effectiveness of contraception. Again, in the analysis of inhibiting effect of marriage pattern, it is observed that the effect of marriage pattern on fertility is higher in recent times. The divorce and widowhood has also significant contribution on fertility reduction. It is clear that whatever the cause of changing marriage pattern, their net effect has not been large. A downward effect on fertility at young ages caused by rising age at marriage has been balanced by an upward effect at older ages caused by decreasing widowhood and divorced. Again comparing among these observed and estimated values we conclude that the proposed model is better than Bongaarts` model. Hope, from now, this proposed model may be used for further higher research in fertility analysis.

Chapter-Seven

Estimation of the Factors Associated With Target Fertility

Chapter-7

Estimation of the Factors Associated With Target Fertility

7.1 Introduction:

Like so many developing countries Bangladesh emphasizes the importance of reducing fertility as part of her overall strategy to bring down the growth rate of population. Family planning programs at work in the country in order to achieve demographic goals through the reduction of fertility. The demographic goals of accepters of different family planning methods to be recruited in each case.

Unfortunately, there has always been a gap between the target fertility and its achievement at the terminal year of the target period in the country all its plan periods. The country has never gained either the desired level of fertility or the contraceptive prevalence rate (CPR) annual at achieving the target fertility. For example, during the plan period 1980-85 the target fertility has been 4.1 children per women (total fertility rate: TFR) and the desired level of CPR has been 38 percent: the achievement have been a TFR of 5.55 and CPR of 25 percent. Similarly is the case with TFR and CPR during the plan period of 1985-90. Such gaps have raised questions about the estimation equation used to project CPR in order to achieve TFR at a desired level at the end of a plan period.

7.2 Aim of the present chapter:

The aim of this chapter are as follows:

(i) Estimate the TFR for a given level of CPR

(ii) Estimate the CPR for achieving the target fertility level (TFR) taking account the trends in a few proximate determinants of fertility.

(iii) Estimate the indices of Proportion married (C_m), Non-Contraception (C_c), lactational infecundability (C_i), and Fetal wastage (C_{fw}), for achieving the target fertility and

(iv) Estimate the mean age at marriage, amenorrhea period, and duration of breastfeeding for desired level of fertility.

7.3: Target setting Model of CPR required to achieve TFR

Estimate of TFR for given level of CPR is made by fitting a simple regression equation of the form $TFR = \alpha + \beta\, CPR + \varepsilon$

Where TFR= Total Fertility Rate, CPR = Contraceptive Prevalence Rate and ε = the error term. Here α and β are two parameters. Estimates of α and β are made by the method of least squares using longitudinal data of TFR and CPR from 1979 to 2007. The practice of fitting regression equation to the data of TFR and CPR of which TFR is a dependent variable is not a new one. Bongaart's (1984) examining the strength of relationship between TFR and CPR by fitting a regression line of TFR on CPR. In this chapter fitting an accomplished using longitudinal data instead of cross section data as used by Bongaarts'

Again, projection of CPR for the attainment of a specified level of fertility is made by means of Bangaarts target setting model (Bangaarts`, 1984). The model is derived as Bangaarts` original multiplication model relating TFR with a few proximate determinants of fertility (Bangaarts` 1978)

$$TFR = C_m \times C_c \times C_{fw} \times C_i \times TF$$

Where C_m, C_c, C_{fw} and C_i are the indices of proportion married, Non-contraception, fetal wastage and lactational infecundability respectively and TF, the total fecundity rate. Each of the four indices various from 0 to 1, the model can be applied for target setting for the target year t with respect to the base year 0. That is

$$\frac{TFR(t)}{TFR(0)} = \frac{C_m(t) \times C_c(t) \times C_{fw}(t) \times C_i(t) \times TF(t)}{C_m(0) \times C_c(0) \times C_{fw}(0) \times C_i(0) \times TF(0)}$$

The above equation indicates that the reduction in fertility from TFR (0) to the target level depend a trend in all of the indices of proximate variable. The base year may be the present or some recent year. Under the assumptions of no change in total fecundity, absence or negligible effect of fetal wastage and trends in the indices of C_m and C_i compensate each other the equation reduces to the form

$$\frac{TFR\ (t)}{TFR\ (0)} = \frac{C_c(t)}{C_c(0)}$$

$$1-\frac{TFR(t)}{TFR(0)} = 1-\frac{C_c(t)}{C_c(0)} = -\frac{C_c(t)-C_c(0)}{C_c(0)}$$

The above expression indicates that the proportional reduction in fertility (PRF) between 0 and t depends on the proportionate increase in the CPR from 0 to t (on the assumption that with pace of development CPR increases). Now, since

$C_c = 1-1.08\times u\times e$, Where u = contraceptive prevalence rate, e = effectiveness of contraception,

Then $1-\frac{TFR(t)}{TFR(0)} = 1-\frac{C_c(t)}{C_c(0)} = 1-\frac{1-1.08\times u(t)\times e(t)}{1-1.08\times u(0)\times e(0)}$ =PRF

$$1-PRF = \frac{1-1.08\times u(t)\times e(t)}{1-1.08\times u(0)\times e(0)}$$

Or, $(1-PRF)(1-1.08\times u(0)\times e(0)) = 1-1.08\times u(t)\times e(t)$

Since $u(t)$ is the CPR among married women at the beginning of target year t, in which we are interested, we have

$$u(t) = \frac{1-(1-PRF)\times(1-1.08\times u(0)\times e(0))}{1.08\times e(t)}$$

On the assumption of equal effectiveness of contraception between the base and target years, we have

$$u(t) = \frac{1-(1-PRF)\times(1-1.08\times u(0))}{1.08}$$

Thus the data required for the estimation of u(t), the CPR at the target year t are

$$\text{PRF} = \frac{TFR(o)-TFR(t)}{TFR(o)}$$

and $u(0)$, the CPR at the base year. Fitting the regression line and incorporating the target-setting model for the population of Bangladesh are estimate the contraceptive prevalence rate required to achieve target fertility.

The study use data available from surveys as Bangladesh Contraceptive Prevalence Surveys of 1979, 1981, 1983 and 1985 and Bangladesh Fertility surveys of 1975, 1989 and BDHS 2000, 2004 and 2007. These surveys cover the nationwide representative sample and the data provided by these surveys are taken to be of nationality good quality.

7.4 Analysis of Results:

Table 7.1: Observed TFR and CPR from 1979-2007 and Excess Fertility (TFR) Bangladesh

Year	TFR	CPR	Effectiveness	Excess TFR
1979	6.56	12.7	0.812	-0.0611
1981	6.35	18.6	0.786	0.2422
1983	6.08	19.1	0.839	0.0157
1985	5.55	25.3	0.845	0.0251
1987	5.30	29.6	0.845	0.1492
1989	4.90	30.8	0.849	-0.1464
1991	4.3	40.0	0.85	0.054
1993-94	3.4	45.0	0.85	-0.411
1996-97	3.3	49.0	0.85	-0.163
1999-2000	3.3	54.0	0.85	0.272
2004	3.0	58.0	0.85	0.32
2007	2.7	56.0	0.85	-0.154

$$\hat{TFR} = 7.742 - 0.087\,CPR$$

$$\hat{CPR} = (7.742 - TFR) / 0.087$$

$$Excess\ \ TFR = TFR - \hat{TFR}$$

(i) The actual contraceptive prevalence rate (CPR) and the total fertility rates (TFR) for the population of Bangladesh from 1979 to 2007 are given shown in Table 7.1. The regression of the TFR on CPR in this longitudinal data yielded a regression line of

$\hat{TFR} = 7.742 - 0.087CPR$

The degrees of correlation seem to be high (r = -0.98) and significant (at 10% level of significance). Thus the temporal variation in fertility explain by CPR may be attributed to the 98% remaining 2% of the total variation unexplained by CPR may attributed to the effect of other socio-economic and demographic variables. Deviations from the regression line (execs fertility) are due party to measurement errors and partly to variations in the other proximate determinants of which marriage is an important one. According to the regression, the TFR equals, on average 7.742 births per women in the absences of contraception (CPR=0), and fertility declines at a rate of approximately 1.0 birth per women for each 9% increment in the contraceptive prevalence rate. Under such relationship between TFR and CPR, we can assessed the required contraceptive prevalence level to achieve replacement fertility level. The regression equation of TFR on CPR suggests that a TFR of 2.4 birth per women can be achieved if the level of CPR is raised to 61% and if the level of CPR is raised to 65% it is possible to achieve a target level of 2.1 births per women.

Table 7.2: Estimated Contraceptive Prevalence level require to achieve Target Fertility with given level of Contraceptive Effectiveness relative to base year 2007 (in 2007 TFR = 2.7, CPR = 0.56, e = 0.849)

Target TFR	PRF	Required CPR u(t) to achieve TFR with Contraceptive Effectiveness e(t)		Reduction in TFR from 2007	increase in CPR (in %) from 2007	
		e(t) = 0.85	e(t) = 0.90		e(t) = 0.85	e(t) = 0.90
2.6	0.03704	0.579605	0.577363	0.1	1.960462	1.736321
2.5	0.07407	0.599209	0.594726	0.2	3.920923	3.472641
2.4	0.11111	0.618814	0.61209	0.3	5.881385	5.208962
2.3	0.14815	0.638418	0.629453	0.4	7.841846	6.945283
2.2	0.18519	0.658023	0.646816	0.5	9.802308	8.681603
2.1	0.2222	0.677628	0.664179	0.6	11.76277	10.41792

(ii) Estimation of contraceptive prevalence rate required to each different level of target fertility shown in table 7.2. These rate are recurring Bongaarts` target setting model taking 2007 as the base year when TFR is observed to be 2.7 and the contraceptive prevalence and effectiveness are 0.56 and 0.85 respectively (BDHS, 2007). The prevalence rates are computed at the effectiveness levels of 0.85 and 0.90 such effectiveness of contraception has already reached 0.85 in the year 2007. The results in the table indicates that if a TFR of 2.6 is to be achieved with 0.85 contraceptive effectiveness has to be raised to around 58% and with effectiveness of 0.90, 57% and that a TFR of 2.3 can be achieved CPR level of approximately 64% and 63% with 0.85 and 0.90 effectiveness of contraceptive respectively. The model demonstrate that the contraceptive prevalence rate of nearly 68% with an effectiveness of 0.85 and 66% percents with 0.90 effectiveness to achieve a target fertility around 2.1

Table 7.3: Estimated CPR and TFR

Year	TFR=Y	CPR=X	TFR(Estimated)	CPR (Estimated)	$e_i=Y-\hat{Y}$
1979	6.56	12.7	6.64	13.59	-0.08
1981	6.35	18.6	6.12	16.00	0.23
1983	6.08	19.1	6.08	19.10	0
1985	5.55	25.3	5.54	25.20	0.01
*1987	5.3	29.6	5.17	28.06	0.13
1989	4.9	30.8	5.06	32.57	-0.16
1991	4.3	40.0	4.26	39.56	0.04
1994	3.4	45.0	3.83	49.91	-0.43
1997	3.3	49.0	3.48	51.06	-0.18
2000	3.3	54.0	3.04	51.06	0.26
*2004	3.0	58.0	2.7	54.51	0.3
2007	2.7	56.0	2.87	57.95	-0.17

Considering the previous year of the current year to be the base year the target setting model (based on regression) estimates CPR very close to observed levels for the years 1987 and 1991 but a little variation between the two at 2007. According to model estimate the CPR should be around 57.8 percent in 2007 instead of 56 percent as observed for a TFR of 2.7. Contrarily, if the observed CPR is true then the model

estimate of TFR should be 3 births per women instead of 2.7 births, a reduction of 0.17 births per women. For the observed CPR of 12.7, 18.6, 19.1, 25.3, 29.6, 30.8, 40.0, 45.0, 49.0, 54.0, 58.0 and 56.0 percents corresponding to the years 1979, 1981, 1983, 1985, 1987, 1989, 1991, 1994, 1997, 2000, 2004, and 2007 the estimated CPR are 13.59, 16.00, 19.10, 25.20, 28.06, 32.57, 39.56, 49.91, 51.06, 51.06, 54.51 and 57.95 percents respectively for the TFR of 6.56, 6.35, 6.08, 5.55, 5.30, 4.90, 4.3, 3.4, 3.3, 3.3, 3.0 and 2.7. Conversely, taking the observed CPR to the model to estimates TFR of 6.64, 6.12, 6.08, 5.54, 5.17, 5.06, 4.26, 3.83, 3.48, 3.04, 2.70 and 2.87 births per women respectively corresponding to the years of 1979, 1981, 1983, 1985, 1987, 1989, 1991, 1994, 1997, 2000, 2004, and 2007.

7.5 Singulate Mean Age at Marriage and Total Fertility Rate

It is a common belief that age at marriage is inversely related to fertility, particularly in countries with no popular effective use of contraceptives. This means that delayed marriage increases the interval between generations and hence puts an independent barrier to longer-range population growth by reducing the proportion of married female in the reproductive ages relative to the total population. As a society develops, desired family size decline, because of the influences of different socio-demographic and socio-economic determinants. The evidence for this view of the reproductive behavior includes the high degree of negative association ($r = -0.826$) between the total fertility rate and the singulate mean age at marriage.

Table 7.4 Female singulate mean age at marriage (SMAM) and total fertility rate (TFR) for different time periods, Bangladesh 1975 to 2007

Year	*TFR*	*SMAM*
1975	6.34	15.00
1980	4.99	15.00
1982	5.21	17.50
1984	4.83	17.20
1985	4.71	16.95
1986	4.70	17.00
1987	4.42	17.90
1988	4.39	16.90
1989	4.35	17.70
1990	4.33	16.50
1991	4.30	18.00
1993-'94	3.40	17.40
1996-'97	3.30	18.70
1999-2000	3.30	18.80
2004	3.0	18.90
2007	2.7	18.95

Source: BBS 1991; BBS; SVR; BDHS Statistical pocket book Bangladesh 2007.

$$\text{TFR} = 15.37 - 0.638\ \text{SMAM}$$

$$TFR = 15.37 - 0.638\,SMAM$$

$$Or,\ \ SMAM = (15.37 - TFR)/0.638$$

According to this regression, the total fertility rate equal on average 15.37 births per women in the non-increasing of age at marriage and fertility declines at a rate of 6.3 birth per women for each 10 percent increment in singulate mean age at marriage. It also indicates that singulate mean age at marriage explains about 68.20 percent (R^2 = 68.20%) of the variation in the total fertility rate. Deviations from the regression line are partly due to measurement errors and partly to variations in other determinants. This is a statistical relationship, but in most developing countries like Bangladesh, the increase in contraceptive use also might be a factor for declining fertility. From the relation we can determine the SMAM of females for desired level of fertility.

Table 7.5: Estimated singulate mean age at marriage with given value of Target fertility

Target TFR	SMAM
2.6	20.01
2.5	20.17
2.4	20.33
2.3	20.48
2.2	20.64
2.1	20.80

Table 7.5 indicates that singulate mean age at marriage increasing for the decreasing of target fertility. For the achievement of the replacement level fertility 2.1 we should be increased 20.80 years.

Target of C_m, C_i & C_{fw}

Bongaarts' model can also be used to estimate the projection of indices of proportion married (C_m), lactational infecundability (C_i), and C_{fw} fetal wastage by using proportional reduction in fertility (PRF), which are illustrated below:

$C_m = \frac{\sum m(x)g(x)}{\sum g(x)}$, Where m(x) is the age-specific proportion of females currently married and g(x) is the age-specific marital fertility rate.

$C_i = \frac{20}{18.5+i}$, i is the average duration of infecundability from birth to the first post-partum ovulation (menses) $i = 1.752 \times \exp[0.1396 \times B - 0.001872 \times B^2]$ B is the average duration of breastfeeding in months.

The index of fetal wastage is given by

$C_{fw} = \frac{TFR}{TFR + A}$, Where TFR = Total Fertility Rate, 'A' equals the average number of births averted per women by the end of the reproductive years. $A = B \times TFW$, B = births per woman and TFW=Total Fetal Wastages

The index of Non-contraception C_c can be written as:

$C_c = 1 - S \times u \times e$

Where, u is the average proportion of married women currently using contraception (average of age specific use rate), e is the average contraceptive effectiveness and a value for S = 1.08 obtain by Henry (1961) is likely to provide a good approximation for many countries (Bongaarts', 1978).

From the proposed Bongaarts' model can be write as:

$$C_m(t) \times C_c(t) \times C_i(t) \times C_{fw}(t) = (1 - PRF) \times C_m(0) \times C_c(0) \times C_i(0) \times C_{fw}(0) \text{ ----------(1)}$$

Where $C_m(t)$ is the index of proportion married at time t

$C_c(t)$ is the index of non-contraception at time t

$C_i(t)$ is the index of lactational infecundability at time t

$C_{fw}(t)$ is the index of wastage at time t

$C_m(0)$ is the index of proportion married to base year at 2007

$C_c(0)$ is the index of non-contraception to base year at 2007

$C_i(0)$ is the index of lactational infecundability to base year at 2007

$C_{fw}(0)$ is the index of fetal wastage to base year at 2007

Now, if we eliminate the effect of fetal wastages, during time period $C_{fw}(t) = C_{fw}(0)$ then the equation becomes

$$C_m(t) \times C_c(t) \times C_i(t) = (1\text{-PRF}) \times C_m(0) \times C_c(0) \times C_i(0) \text{ ----------(2)}$$

If the lactational infecundability is constant over time. The equation (2) becomes

$$C_m(t) \times C_c(t) = (1\text{-PRF}) \times C_m(0) \times C_c(0) \text{-------(3)}$$

Again if the index non-contraception is constant over time that is use of contraception may not be changed then we have the equation (3) is as:

$$C_m(t) = (1\text{-PRF}) \times C_m(0) \text{----------(4)}$$

If all the indices exact the index of C_c are constant over time than the index of non-contraception becomes

$$C_c(t) = (1\text{-PRF}) \times C_c(0) \text{ -------(5)}$$

Similarly, the index of lactational infecundability becomes

$C_i(t) = (1\text{-PRF}) \times C_i(0)$ -------(6) and the index of fetal wastage becomes

$C_{fw}(t)=(1\text{-PRF}) \times C_{fw}(0)$----------(7)

Using the equation (6) and (7) we can estimate the values of $C_m(t)$ $C_c(t)$, $C_i(t)$ and $C_{fw}(t)$ for the required level of fertility.

Table 7.6: Estimated values the indices of C_m, C_i, C_c and C_{fw} with given value of Proportional Reduction in Fertility for targeted TFR.

TFR	PRF	$C_m(t)$	$C_c(t)$	$C_i(t)$	$C_{fw}(t)$
2.6	0.037037	0.709704	0.450667	0.602815	0.803111
2.5	0.074074	0.682407	0.433333	0.57963	0.772222
2.4	0.111111	0.655111	0.416000	0.556444	0.741333
2.3	0.148148	0.627815	0.398667	0.533259	0.710444
2.2	0.185185	0.600519	0.381333	0.510074	0.679556
2.1	0.22222	0.573222	0.364000	0.486889	0.648667

Suppose we want to achieve replacement level fertility. We should be increase CPR, age at marriage and lactational infecundability. Different sets of target fertility are selected for calculating PRF. Using this PRF we estimate the indices of $C_m(t)$, $C_c(t)$, $C_i(t)$ and $C_{fw}(t)$. These results are presented in table 7.6. The values of C_m in table 7.6 and figure 7.1 indicate that the target fertility would be declined when the index of proportion married be declined. The value of C_c in table 7.6 and figure 7.2 summarizes that the trend of the index of non-contraception is decreasing when the target fertility is declining.

The value of C_i in table 7.6 and figure 7.3 indicates that if the mothers increase their breastfeeding duration then the target fertility would be decline.

The value of C_{fw} in table 7.6 and figure 7.4 summarizes that the trend of the index of fetal wastage is decreasing when the target fertility is declining

Hence if we achieve our replacement level fertility, the age at marriage, lactational infecundability and the level of CPR should be increase. But unfortunately in Bangladesh the use rate of CPR may not be exceed 60 percent for instead in 2004 and 2007 respectively. It is fact that the use rate of CPR was 58 and 56 percent. So it is

important to take the necessary step on other two important proximate factors proportion married and lactational infecundability. That is increase in age at marriage and duration of breastfeeding. So that we can achieve the replacement level of fertility.

Figure 7.1: Trend the index of Proportion married with given level of Target Fertility

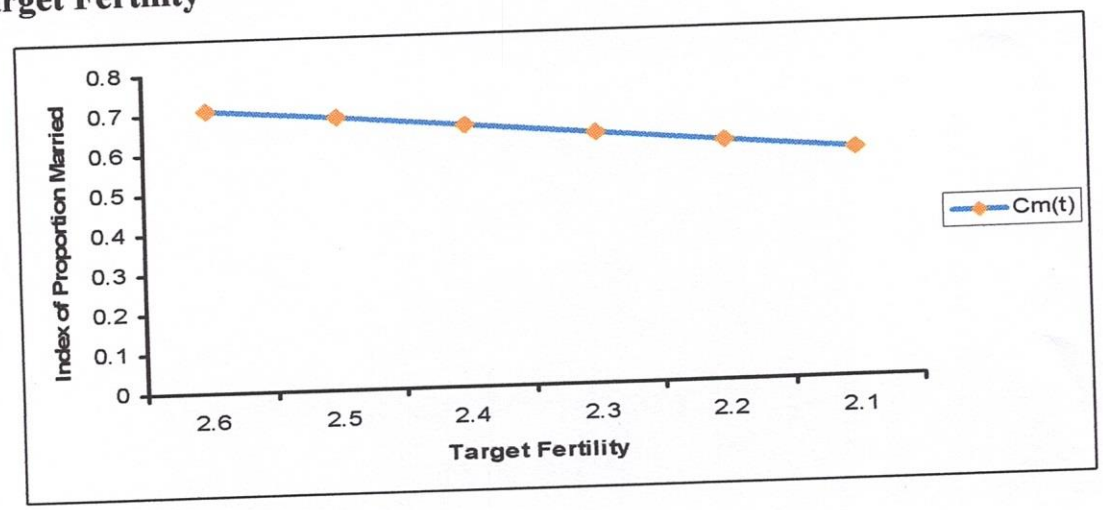


Figure 7.2 Trend the index of Non-contraception with given level of Target Fertility

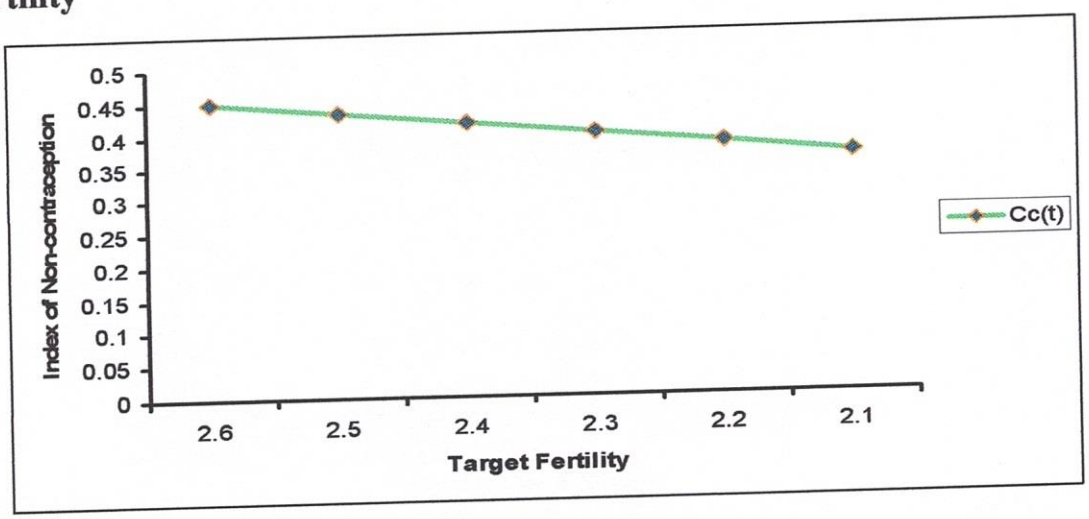


Figure 7.3: Trend the index of lactational infecundability with given level of Target Fertility

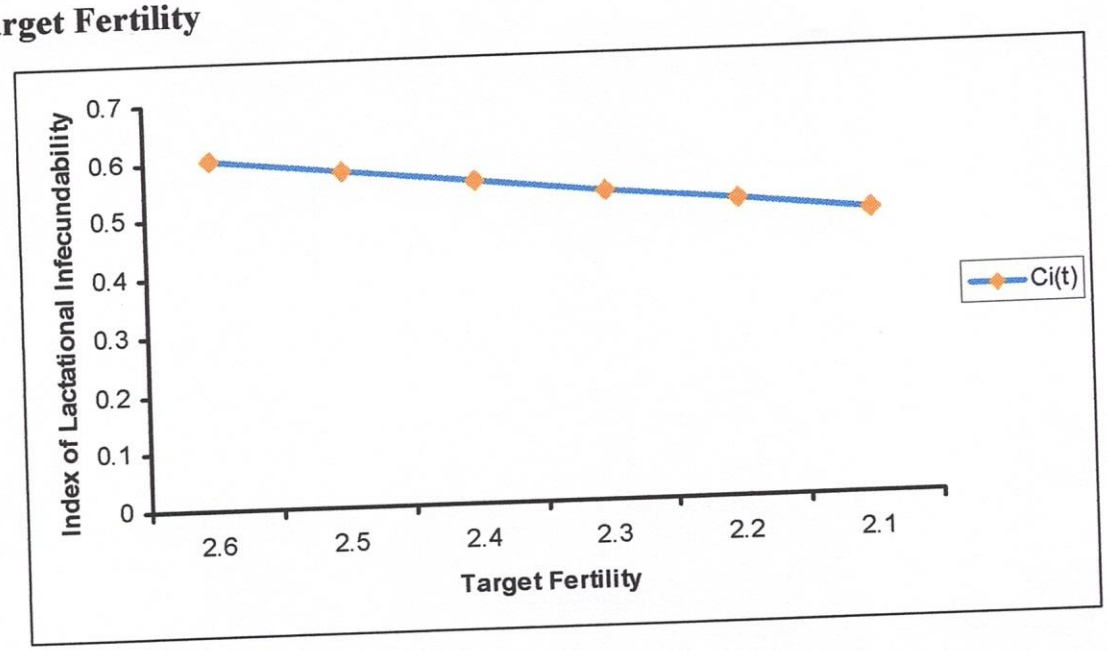
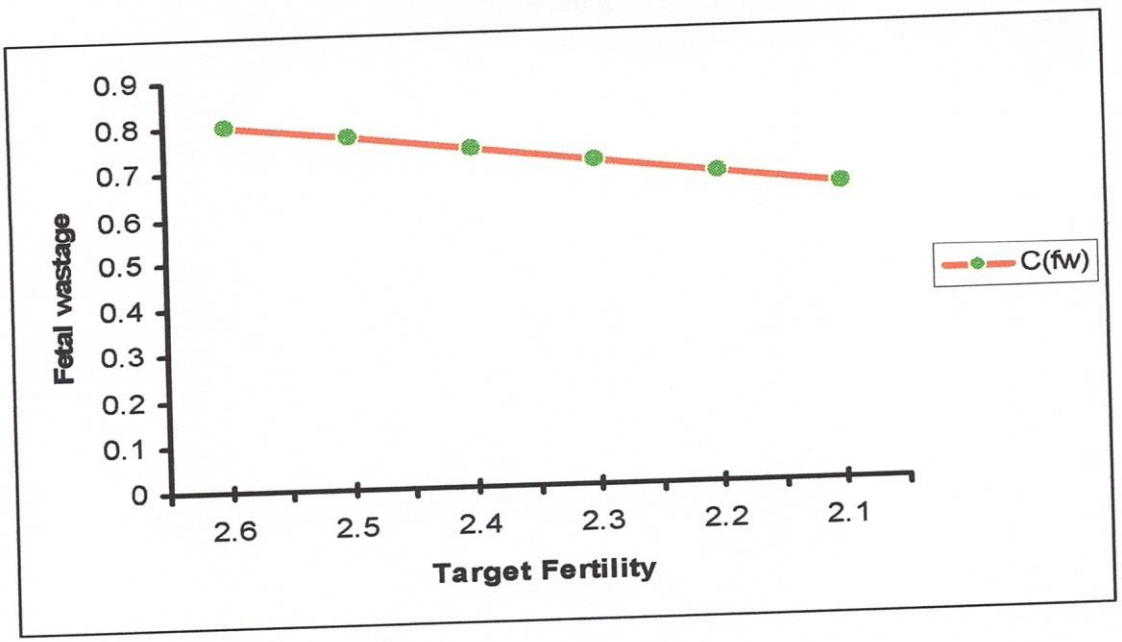


Figure 7.4: Trend the index of fetal wastage with given level of Target Fertility



7.7 Estimated duration of breastfeeding (B) for target fertility with given value of amenorrhea

From the equation of relationships between the duration of breastfeeding and amenorrhea period. We can estimate the breastfeeding duration. The average duration of amenorrhea period is given by

$i = 0.1753 \exp\left(0.1396\,B - 0.0001872\,B^2\right)$ *taking log on both sides*

$\log\left(\frac{i}{0.1753}\right) = 0.1396\,B - 0.000187\,B^2$, *let* $\log(\frac{i}{0.1753}) = c$

$c = 0.1396\,B - 0.000187\,B^2$

$0.000187\,B^2 - 0.1396\,B + c = 0$, *let* $0.000187 = a, -0.1396 = b$ *and* $x = B$ *is the duration of breastfeed ing then we have the equation as*

$ax^2 + bx + c = 0$

The roots of the equation are

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Using this solution we estimate the duration of breastfeeding and amenorrhea period

Table 7.7: Estimated, duration of breastfeeding (B) and amenorrhea period with given level of Target fertility

Target fertility(TFR)	B	C_i	i
2.6	13.93	0.602	14.72
2.5	13.84	0.609	14.34
2.4	14.57	0.548	17.99
2.3	14.72	0.536	18.81
2.2	15.02	0.511	20.64
2.1	15.32	0.487	22.56

Table 7.7 indicates that duration of Breastfeeding and duration of Amenorrhea period are increasing for the decreasing of target fertility. For the achievement of the replacement level fertility 2.1 we should be increased duration of Breastfeeding and Amenorrhea period to about 15.5 months and 22.56 months respectively.

7.8 Conclusion:

The estimates of CPR to achieve certain level of fertility at a stipulated time using two models viz. linear regression and Bongaarts' target setting models are found to be inconsistent for obvious reasons. A part from methodological differences the estimate of CPR using linear regression model is based completely on the face values of TFR and CPR and takes account of the trends of both the factors while the estimate made by Bongaarts' target setting model heavily depends only on the level of contraceptive use of the most recent year and ignores the effect of the two important proximate variables of marriage pattern and lactational infecundability. There seems to be a change in marriage pattern in the country and also exists a norm of long durations of breastfeeding practice - the effects of which can not be ignored to achieve target fertility. A high degree of correlation between TFR and CPR bears the implication that it is possible to achieve a replacement level fertility if the present pace of progress in contraceptive practice is maintained. However the estimation requires more sophisticated techniques.

The estimated of CPR to achieve certain level of fertility at a stipulated time using two models viz. if we take 2007 to be the base year and if we achieve the replacement level of fertility according to the model estimate we have to attain a contraceptive level of around 68 percent with effectiveness if 0.85 and 66 percent with effectiveness of 0.90 an increase of nearly 12 and 10 percents respectively relative to the base year which is perhaps a far reaching target. To reach the desire level of target fertility we must be increase the use of contraception, duration of breastfeeding, singulate mean age at marriage and period of amenorrhea. To achieve replacement level of fertility at 2.1 births per women we should increase the CPR, SMAM, duration of breastfeeding and amenorrhea period by 68%, 20.80 years, 15.5 months and 22.56 months respectively.

Chapter-Eight

Summary, Limitations and Policy Recommendation

Chapter-8

Summary, Limitations and Policy Recommendation

8.1 Overviews of Major Findings

The table 3.1 indicate that the women completing her childbearing period who was married at the age of <15 years has on average production 4.9260 children, while one who was carried at age of 25+ has produced on average 1.9 children which is more than 61.42% less than those marred at <15 years of age. The table also shows age standardized mean live births decline to educated women. It appears that fertility goes down when marriage takes place at a late stage it is well known fact that fertility rate is higher in countries where marriages take place at comparatively early ages, as compared with the people who marry at late stage.

Data on urban-rural fertility of Bangladesh are presented in Table 3.2 and Figure 3.2. Considering the mean live births to ever-married women in the age group 42-49) as completed fertility, it is observed that urban fertility is lower on the average by about 0.43 children than the rural one. The total average fertility of all over Bangladesh is 2.31. The lower fertility for urban areas is also seen for all age groups. When average number of live births for age differences, higher fertility in rural areas are still apart, the overall average number of live births being 2.36 in the rural areas and 2.80 in the urban areas (Table 3.2). This observed difference might attribute to higher age at marriage, higher level of real income per person, better health services, educational facilities, employment of women in the modern sector and other social amenities in the urban areas, which have the effect of lower fertility. Furthermore, children might be considered as economic assets rather than burden in the rural areas, which cause higher fertility in the rural areas (Caldwell, 1978). Rural community people, considered children are both as earners during childhood and as social security in old age.

The average number of children ever born by religion is presented in Table 3.3 and Figure 3.3(a). The Table indicates that the Muslims have higher fertility than Non-Muslims in each age group. The table also shows that average number of live birth for age differences, Muslims have the highest average live births 2.67 than Non-Muslims women 2.27; which mean that Muslim women have the 15% higher average live births than Non-Muslims women.

Table 3.4 and Figure 3.4(a) show the number of children ever born per ever-married women by age group among the regions. It can be seen from the Table that the variation is prominent in the age group 18-25 and diminishes with increasing age. The higher variation in the age groups may be attributed to variation in the level of urbanization; the level of education and female participation in the labor force might have had varying influence in bringing about the observed variation in fertility. On the other hand, the variation in the higher age groups may be due to the extent of variation in widowhood, divorce and childlessness in addition to differential behavior towards fertility regulations or family planning practices among the regions, which are dependent on socio-cultural differences.

When average number of births for age groups (Table 3.4 and Figure 3.4), it appears that fertility is higher in Chittagong, Sylhet and Barisal with average number of children ever born per women are 3.95, 3.10, 2.69 respectively. Fertility is lower on average in Khulna 2.23; and Rajshahi 2.33 respectively. Dhaka and Rajshahi have intermediate levels of fertility. The following information of BDHS data may be the effect of the regional variation of fertility.

Examination of the Table 3.5 and Figure 3.5 (a) presenting average number of live births per ever-married women by women's education reveals that women who had no education (that is illiterate) show the highest completed fertility 2.56. The completed fertility for women with education level secondary and higher are respectively 2.04 and 1.39.

The completed fertility for women who had completed primary education is 4.06, which are less than those with no formal education, although the difference is very little. It can be also seen from Table 3.5 that women with no education tended to have more children in all the groups than those with primary, secondary, and higher education level.

It appears that the children ever born on the average is higher for non-working women than working women for each age group except 10-17 and 18-25. Same picture is apparent in the case of average live birth. Women who are involved with a job are not dependent on men now and often. Both socially and mentally these have their own rights and absence of dependence, men cannot use forcibly women to increase their fertility. This has also resulted in lower fertility. Fertility depends on social status of the women. In societies where women are confined only within the households services, these are considered suitable only for producing children and such those women who are held in high esteem.

Table 3.7 indicated that women with lower husband's educational levels tended to have more children in all age groups than those with higher education. The completed fertility for women whose husband's with primary education is 5.06, which is greater than higher level that is 3.53. When average number of live births is calculated the same picture is visible. That is, higher the education level, lower the number of children ever born.

Table 4.5 indicated that among overall fertility, marriage pattern and marital fertility have declined respectively by 52.42%, 1.73% and 51.6% over the period 1975 to 2007. The quantity of the index of marital fertility (I_g) has decreased from 0.595 to 0.288 during 1975 to 2007, a decrement of about 51%, which is higher by 45% than I_m values during the 32 years period. Thus, it is observed that in the amount of decrement of fertility index I_f values 52.42% from 0.517 in 1975 to 0.246 in 2007. The contribution of change in the marriage pattern index is less than the change in the I_m

(marriage pattern) values. However, such contribution could be an artifact. A number of factors may be listed which may/might be responsible for changes in the marital fertility of which use of contraception and marriage pattern are important.

The table 4.4 suggests that marriage pattern has changed over time. It can be observed that the proportion of single women particularly in the age group 15-19 and 20-24 years have increased quite greatly, with time the age at marriage begins has tended to increase and also the tempo of marriage and hence the span of marriage and the maximum age beyond which first marriage is likely to take place have probably increased. Therefore, the indication is that the marriage pattern what has been expected to change over time is firstly established and thereby, causing changes in the marital fertility and hence overall fertility.

It is indicated from the table 4.5 that marital fertility has changed over time. The major increase occurs during the period 2004 to 2007. The impression is that in recent times the effect of marital reproductive behavior on reducing overall fertility is remarkable and the effect of change of marriage pattern is less than that of marital fertility.

To observe the trends in fertility of Bangladesh, it is evident that fertility is declining over the past 32 years. The trends in the crude birth rates from 1975 to 2007 indicates that the crude birth rates fluctuated around 34 per 1000 population throughout the period until 1989 from then fertility has been declining moderately. Total fertility rate has declined about 52% from 6.3 births per women in 1975 to 2.7 births per women in 2007. It is truly an exceptionally steep decline. Period fertility approach reveals that the level of fertility is still very high in Bangladesh although the age specific fertility rate has been decreasing over time in each age group. The age has shifted from 25-29 in 1975 to in 2004 and 2007. Moreover, the completed family size in the case of cohort fertility will give the level of fertility of a particular cohort and it indicates that the mean number of children ever born per ever-married women has been declining over time and it is slightly lower on recent years in each age group.

In Bangladesh, the norm of early and universal marriage still prevails. Most of the first marriages occur within a short span of life. The effect of marriage pattern and marital fertility on the overall fertility of the Bangladeshi population, examined by Coale's indices, show higher influences of marriage pattern than of marital fertility. The change in marital fertility that has been taken place in the country overtime is contributed less by the change in marital fertility in comparison to the change in marriage pattern. Also the effect of change of marriage pattern in reducing fertility level perhaps has increased over time.

From the findings of chapter-five, it is evident that the demand for children decreases as increase of age of the women and it is remarkable among the women under age 30. In order to minimize such demand for additional children the family planning program efforts should be strengthened among the ever-married women under age 30. An important challenge is to reduce the differentials of demand for children among administrative divisions. As for example, Chittagong and Sylhet division have higher demand for children as any other division in Bangladesh. It is observed (Khuda, et, al. 2000) that the impact of such higher demand is the lowest contraceptive prevalence among the women in Chittagong and Sylhet division. In order to overcome such differentials about demand for children improved family planning services as well as adult education should be strengthened in Chittagong and Sylhet division.

Results obtained from chapter-five suggested that differentials of demand for children among religious groups are remarkable. The demand for children is significantly lower among Christianity and Hinduism than Muslim and Buddhism. Therefore, the positive impact of family planning program and importance of small family norm should be included in the curriculum of religious education especially in the secondary level and motivational activities can be targeted to reduce these differentials. It is observed from chapter-five that education especially secondary or higher level is important for reducing fertility, infant and child mortality, improving the human capital to the population. Also education along with improved family planning services can help

women avoid unintended pregnancies and the abortions that sometimes follow them. Therefore, social, economic, or other changes drastically affect the value or cost of children and reduce fertility rates within education groups. Improvement in family planning programs may hasten the transition of replacement level as will. So, policy makers should be stressed on such sectoral improvements.

It is evident from the analysis introduced in the same chapter that the demand for additional children is higher among currently non-pregnant women as compared to currently pregnant women. It is observed that demand for children is higher among non-working or housewives as compared to working women.

From the study given in chapter-five, the mass media especially television plays a vital role in reducing demand for additional children. Therefore, in order to limit the demand for children it should be ensured that the women have easy access to mass media especially television in rural as well as urban areas. The positive impact of small family norm should be broadcast in television. It is also observed in the chapter that NGO sector is currently playing an important role on family planning programs, especially, in rural areas. It is found that the demand for children is lower among women associated with the activities of NGOs. Therefore, in order to reduce the demand for children the integrated family planning programs should be introduced among public sector as well as private sectors like promising NGOs.

In absolute terms, postponement of marriage in 1975, 1978, 1981, 1991, 1996-2000, 2004 and 2007 is estimated to reduce fertility by 0.323, 0.406, 0.893, 1.036, 0.9550, 1.0285, 0.9400 and 0.746 births respectively. Again, widowhood and divorced further reduce fertility by 0.767, 0.377, 0.450, 0.372, 0.235, 0.2303, 2.03 and 0.2100 respectively in these years. The table also shows the effect of postponement of marriage on fertility by age. At the ages 15-19 the reduction of fertility by postponement of marriage is being 0.352 births in 1975, 0.346 births in 1981, 0.519 births in 1989, 0.489 births in 1991, 0.5180 births in 1996-97, 0.5320 births in 1999-2000, 0.7787 births in 2004 and 0.5694 births in 2007. After the age 15-19 the rate has been decreasing up to

ages 25-29 in 1975 up to the ages 25-29 in 1981 up to the ages 30-34 in 1989, up to the ages 30-34 in ages in 1991, in 1996-97, 1999-2000, 2004 and 2007. After that the rates are found to be gradually increased up to the marriageable ages.

The effect of postponement of marriage on fertility in 2007 is 0.8517, which is higher than any other point of time. It implies that the age at marriage is higher and also the fertility is lower in 2007 than in the other study periods. It also indicates that the effect of marriage pattern on fertility is higher in recent times,

Again divorces and widowhood have a major contribution on fertility reduction. That means the contribution has been decreased in recent times from 1989 to 1999-2000 but increased clearly in recent period. This implies that the amount of divorced and widowhood has increased in recent times which may create social problems.

The table 6.5 further shows the effect of marriage pattern reduces fertility respectively in the years of 1975, 1981, 1989, 1991, 1996-97, 1999-2000, 2004 and 2007 by 14.7%, 13.4%, 21.5%, 23.3%, 26.7%, 27.3%, 49.50% and 85.17%. Thus the fertility reducing effect of marriage pattern has increased over time for the years 1975, 1989, 1991, 1999-97, 1999-2000, 2004, and 2007. The impact of changing marriage pattern between 1975 to 2007 may have caused fertility decrease. For example the singulate mean age at marriage (SMAM) for females in 1975 was 15 years, while in 2007, the SMAM is 18.95. During the period 1975 to 2007 the SMAM have increased about four years for females.

Application of Bongaarts` model clearly indicates that there is a downward trend in all the proximate indices. Between 1997 and 2007, the amount of decrement of total fertility rate is about 18% and it is about 10% between 2004 and 2007. This is primarily caused by an increase in the use and effectiveness of the contraceptive methods.

Again in the analysis if inhibiting effect of marriage pattern on fertility; it is observed that the effect of marriage pattern on fertility is higher in recent times. The divorced and widowhood have also significant contribution on fertility reduction. It is clear that whatever the causes of changing marriage pattern, their net effect have not been large.

A downward effect on fertility at younger ages caused by rising age at first marriage has been balanced by an upward effect at older ages caused by decreasing widowhood and divorce.

The finding is suggests that Bongaarts` model estimate the TFR is 3.22 in 2007 which is far away from observed TFR but our proposed model estimate the TFR is 2.76 which is more close to the observed TFR. Again consideration only abortion in Bongaarts` model the estimated TF is 12.83 which is far away from assumed TF and our proposed model gives the value of TF is 14.99 which is very close to observed TF (15.3). From R^2 value we also can conclude that our proposed model explained about 98% of total variation of TFR by the indices whereas Bongaarts` model explained 84% only. So comparing the values we can conclude that our proposed model is better than Bongaarts` model.

According to the regression of the TFR on CPR indicate that a women have on average 7.742 births in the absences of contraception (CPR=0), and fertility declines at a rate of approximately 1.0 birth per women for each 9% increment in the contraceptive prevalence rate. Under such relationship between TFR and CPR, we can assess the required contraceptive prevalence level to achieve replacement fertility level The regression equation of TFR on CPR suggests that a TFR of 2.4 birth per women can be achieved if the level of CPR is raised to 61% and if the level of CPR is raised to 65% it is possible to achieve a target level of 2.1 births per women.

The prevalent rates are computed at the effectiveness levels of 0.85 and 0.90 such effectiveness of contraception has already reached 0.85 in the year 2007. The results in the table indicates that if a TFR of 2.6 is to be achieved with 0.85 contraceptive effectiveness has to be raised to around 58% and with effectiveness of 0.90, 57% and that a TFR of 2.3 can be achieved CPR level of approximately 64% and 63% with 0.85 and 0.90 effectiveness of contraceptive respectively. The model demonstrate that the contraceptive prevalence rate of nearly 68% with an effectiveness of 0.85 and 66% percents with 0.90 effectiveness to achieve a target fertility around 2.1

To reach the desired level of target fertility we must increase the use of contraception, duration of breastfeeding, singulate mean age at marriage and amenorrhea period. To achieve replacement level of fertility at 2.1 births per women we should increase the CPR, SMAM, duration of breastfeeding and amenorrhea period by 68%, 20.80 years, 15.5 months and 22.56 months respectively.

Limitations of the study:

Studies, specially based on survey data usually suffer from a number of limitations. The present study may not be regarded as exceptional one. The main limitations of the study of which a few are mentioned, are highlighted in this section.

To meet the objectives of this study, information on some variables are not available in the data used for the study, which were paramount important.

Marriages of girls whose father, mother or both, mainly father are no longer alive are delayed. However no information is available in this regard in the data. Respondents father's and mother's education play very significant role in determining age at first marriage, but we are not informed about these. Growing up in a family with step mother/father can affect age at first marriage, which we can't know from the 2007 BDHS data. Girls from joint or extended families also married at younger ages than those from nuclear families (Audinarayans and Rejsree, 1995), which information are not provided in the data. Number of sisters in the family can be assumed to affect female's age at marriage negatively, which was not possible to consider in this study.

Many researchers/authors found age at menarche as a very significant predictor for age at first birth but we are not able to know about this information.

The information regarding whether the husbands were known to the respondents before marriage is tacking, whereas, premarital relationship can be assumed to have affect on marriage age. Ahmed et al.,(1995), found that who married relatives had lower age at first marriage than those who marry non-relatives. In the context of Bangladesh, with types of information's were also required to study the determinants age at first marriage.

Working status has significant affect on age at first birth (as well as at marriage). In 2007 BDHS data, it is not clear when the women started working or earning money and consequently we were unable to include it into the analysis. The colour of Bangladeshi women or appearance plays a very important role in age of first marriage but this type of information was not possible for us to measure. Serious disease before marriage can delay age at first marriage as well as for first birth also. Such types of information were required for us to strengthen our study. Most of the marriages in Bangladesh are held by taking dowry (Joutuk), which type of data, was essential to carry out a study of the type in the context of Bangladesh.

From the 2007 BDHS data, we can only know whether the respondents ever used or currently using a contraceptive method (Condom, Pill, Injection, IUD, etc), but whether they used contraceptives to delay their first birth or succeeding births was not clear at all. Therefore, we had no way to study the effect of contraception on age at first birth as well as for succeeding births. Besides that inadequacy of data, many limitations go to our part. Perhaps, the results could be presented and interpreted in better way than we have done or the number of variables could be enlarged even with these data.

8.3 Policy Recommendations

The finding of this study may have some policy implications that would help the planners and policy-makers of the Government to take necessary steps in achieving fertility as low as possible. Thus, policy implications that can be drawn from this study as they are related to the achievement of further fertility decline are as follows.

(i) Delay marriage and increase birth intervals, particularly the first birth interval. Campaign should be necessary for a further increase in the age at marriage of women, especially in rural areas.

(ii) Encourage efforts to increase the quantity and the quality of contraceptive use to achieve higher use-effectiveness that will lead to a greater contribution to fertility decline:

(iii) Provide a method-mix that meets the varied needs of couples. The method-mix of contraception can be made more effective through encouraging longer acting methods. The birth space can be effectively widened through improving quality of care in the family planning programs.

(iv) Religious fundamentalism (bigotry/fanatic) results in higher fertility, which are needed to be weed out by taking justly efficient steps.

(v) Increase program efforts to maintain current performance levels;

(vi) Taking initiation to identify the reasons, why geographical region appears significant for fertility variation

(vii) The husband's educational and occupational facilities and attainments should be improved which will help females to be married at matured ages that will results fertility decline in Bangladesh.

(viii) Improve the child survival in Bangladesh; immunization programs need to be extended effectively in order to increase the extent of full coverage of essential vaccines to an optimum level. Also to reduce the impact of malnutrition, the programs on alleviation of poverty need to be strengthened that will results fertility decline;

(ix) Ensure the commitment of additional resources to maintain current program momentum;

(x) More notably, attention should be focused on the need for providing educational facilities and occupational facilities, particularly among women in rural areas in order to decrease the level of fertility in Bangladesh.

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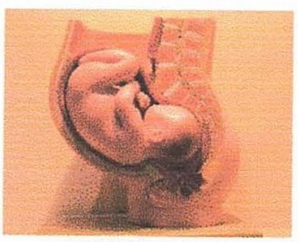

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