

FACTORS RELATED TO CHILDBEARING IN BANGLADESH: A GENERALIZED LINEAR MODELING APPROACH

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ABSTRACT

Childbearing is generally considered as an important and major determinant of large family size and rapid population growth, particularly in the countries where family planning is not widely practiced. Bearing more children produces substantial risks to the health of the mothers and the children. This paper aims to determine the different factors of childbearing among the ever-married women in Bangladesh. Bangladesh Demographic Health Survey data 1999-2000 and 2004 have been used for this study. A generalized linear model with Poisson link function is used to determine the key socio-economic and demographic factors of childbearing in Bangladesh. Mother's age group, educational level, types of place of residence, age at first marriage, division, having radio etc. are found to be significantly associated with bearing more children in Bangladesh.

Key words: Factors of childbearing, Socio-economic factor, Demographic factor, GLM, BDHS data.

I. INTRODUCTION

Bearing more children is a common phenomenon among the women in the least developed countries like Bangladesh. The women in Bangladesh become mother at their very early ages with the large majority of women started bearing children before they reach at the age of twenty [12]. For the lack of education and awareness, poverty, marriage at early ages they used to bear children year after year. Consequently their family size increases and population grows rapidly. Childbearing at the young ages consequences a greater risk to maternal mortality and child mortality to the mother and the child respectively [5]. It also inclines to restrict the educational and economic opportunities for all. The childbearing tendency reflects the extent of contraceptive practice in a country. In Bangladesh, the pill, IUD, female sterilization, injectables and condom are widely known methods of contraception. The use of these methods is increased over the last twenty-five years [10][11].

Perhaps this is the main reason of declining fertility in Bangladesh. Another impact of more childbearing is the malnutrition to the mother and to the children. Bangladesh is a tiny land and one of the most densely populated countries in the world. The government has taken all necessary steps to decrease the fertility level. Women in both rural and urban areas are becoming conscious and accepting small family norm. Although fertility has declined over past twenty years, still we need to understand the nature and trend of the determinants of fertility to keep the rate low. In terms of determining the factors of fertility in Bangladesh a number of studies has been performed [6][7][8]. Most studies have been used bi-variate analysis to identify the related factors of fertility. Very little sophisticated and statistically sound methods have been performed to find out the nature of the determinants of fertility. In this paper, a generalized linear modeling approach has been used to understand the nature of socio-economic and demographic factors related to more childbearing

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in Bangladesh. Bangladesh demographic and health survey data have been used for this study. A number of candidate factors have been considered initially. Among the infant factors mother's age group, educational level, types of place of residence, age at first marriage, division, having radio have been identified the most significant factors of childbearing in Bangladesh. Using two consecutive survey data, we also compare the estimated the coefficients of different factors and their trends.

II. MATERIAL

Bangladesh Demographic and Health Survey (BDHS) 1999-2000 and 2004 data have been used for this study. In rural areas, thanas are divided into unions and then mauzas, a land administrative unit. Urban areas are divided into wards and then mahallas for both surveys. A nationally representative, two-stage sample was selected from the master sample maintained by Bangladesh Bureau of Statistics. In the rural areas, the primary sampling unit was the mauza, while in urban areas it was the mahalla. A total of 341 primary sampling units were selected for the BDHS 1999-2000 survey where 99 in urban areas and 242 in rural areas. In BDHS 2004 survey, a total of 361 PSUs, 122 in the urban area and 239 in the rural area has been selected. 10,544 of ever-married women are successfully interviewed in 1999-2000 survey and 11,440 were in 2004. The BDHS 1999-2000 shows that the women in Bangladesh had, on an average, 2.59 living children. The mean number of living children in 2004 was 2.54 which show the decreasing trend of bearing children. The number of living children is considered as dependent variable for this study. The selected demographic and socio-economic differentials like mother's age group, educational level, types of place of residence, age at first marriage, current working status, husband's occupation, division, having radio etc. are taken as explanatory variables for this study.

III. METHODS

The generalized linear model with Poisson link function is particularly useful for response variable that are counts or frequencies and for which it is reasonable to assume an underlying Poisson distribution, that is, the distribution

$$\Pr(y) = \frac{\exp(-\mu)\mu^y}{y!}$$

For exploring the relationship between the mean of a Poisson variate and some explanatory variables of interest, the link function in a generalized linear model (GLM) is generally taken to be the logarithm, generating positive fitted values. Since the response variables here is a count, Poisson regression is used to investigate the relationship of number of children with the explanatory variables; explicitly, the model to be fitted to the mean number of children, μ is

$$\log(\mu) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_p X_p$$

Significance test for the estimated parameters is also done in this analysis by using well-known Wald test statistics. The test statistic for the j th coefficient is

$$W_j = \frac{\beta_j}{S.E.(\beta_j)}$$

Under the null hypothesis that, β_j follows standard normal distribution. The associated p -value is $p = Pr[|Z| > W_j]$

IV. RESULTS AND DISCUSSION

The frequency and percentage distribution of the number of living children to the ever-married women is presented in table: 1 and table: 2. Among the women surveyed in 1999-2000, 12.6 percent have no child, 20.4 percent have one child and 22.4 percent have two children. In 2004, 12.2 percent have no child, 19.3 percent have one child and 23.5 percent have two children.

Table 1: Frequency distribution of the number of living children among the ever-married women in 1999-2000.

Number of Children	Frequency	Percentage
0	1313	12.5
1	2131	20.2
2	2324	22.0
3	1877	17.8
4	1232	11.7
5	787	12.5
6	458	4.3
7	245	2.3
8	108	1.0
9	44	.4
10	17	.2
11	7	.1
12	1	.0
Total	10,544	100.0

Table 3 shows that the mean number of children by selected background characteristics. The mean number of children to women in each five-year age group, which is considered as an indicator of the momentum of childbearing, shows that women in their late twenties have given birth to almost three children. And in their late thirties, they have had about four children. Mean number of living children is highest in Chittagong division 2.83 and 2.84 in both surveys, while it is smallest in Khulna division 2.32 and 2.28.

Table 2: Frequency distribution of the number of living children among the ever-married women in 2004.

Number of Children	Frequency	Percentage
0	1396	12.2
1	2210	19.3
2	2687	23.5
3	2145	18.7
4	1390	12.1
5	812	7.1
6	410	3.6
7	229	2.0
8	98	.9
9	45	.4
10	15	.1
11	3	.0
Total	11440	100.0

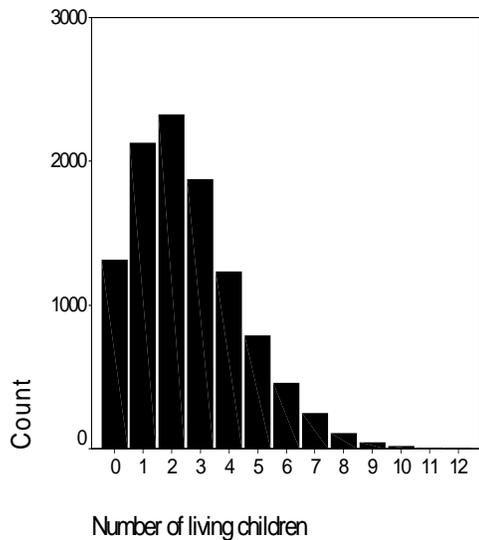


Figure 1: Distribution of number of living children in 1999-2000.

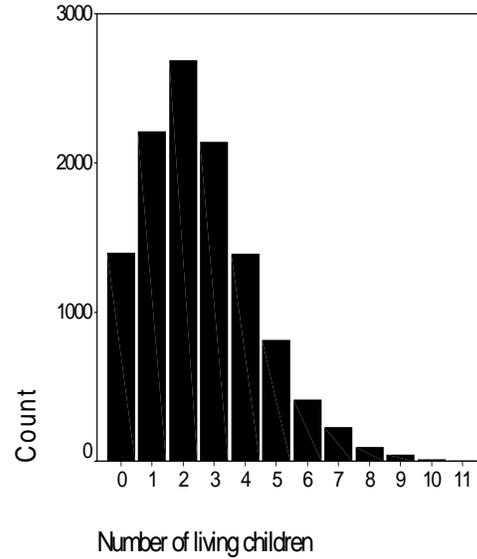


Figure 2: Distribution of number of living in 2004.

Table 3: Mean number of children by selected background characteristics in survey period 1999-2000 and 2004.

Characteristics	Mean Number of Children in 1999-2000	Mean Number of Children in 2004
Age 5-year groups		
10-14	0.10	0.04
15-19	0.69	0.67
20-24	1.54	1.54
25-29	2.36	2.38
30-34	3.11	3.06
35-39	3.54	3.50
40-44	4.12	3.85
45-49	4.87	4.48
Division		
Barisal	2.71	2.73
Chittagong	2.83	2.84
Dhaka	2.53	2.50
Khulna	2.32	2.28
Rajshahi	2.52	2.40
Sylhet	2.82	2.81
Types of place of residence		
Urban	2.33	2.32
Rural	2.65	2.61

Characteristics	Mean Number of Children in 1999-2000	Mean Number of Children in 2004
Highest educational level		
No education	3.04	3.17
Primary	2.55	2.60
Secondary	1.88	1.67
Higher	1.39	1.27
Age at First Marriage		
<20	2.66	2.61
>20	1.61	1.45
Having Radio		
No	2.66	2.64
Yes	2.45	2.36
Religion		
Buddhism	2.61	2.56
Christianity	2.41	2.35
Hinduism	2.33	1.92
Islam	2.82	2.71

The childbearing pattern also varied by types of place of residence. In rural areas, childbearing tendency is higher than urban areas. Childbearing is remarkably varied by the educational level of the women. The women, who have no education, bear on an average more than three children, whereas it is 1.88 for the women who have secondary education and 2.55 who have primary education according to 1999-2000 survey. The same trend retained in 2004. The higher educated women have only 1.39 children on average and the figure decreased in 2004. Age at first marriage is highly evident between the categories <20 and >20. The mean number of children is almost twice among the women who are first married at age <20 than among >20. The tendency of childbearing also varies by the religion. The hinduism women tend to have the smallest families than the women of other religion. The buddhist women have on average the highest number of children, closely followed by the muslim women. Although childbearing differentials by husband's education and occupation, respondent's occupation and current working status, having radio etc. are not notable; but their categories vary in some extent. Since the response variable in this study is a count data, a GLM with Poisson link is used to model for

identifying the significant factors. The graph in Figure 1: also suggests a typical Poisson curve with mean $\mu > 1$. Since the mean no of living children is 2.56 and the bar diagram in Figure 1: shows a Poisson curve with mean $\mu = 2.56$. Hence, the GLM with Poisson link function is justified to use and the results of the fitted model are presented in Table: 3.

The *p*-values in the above table show that all the explanatory variables are highly significant. The coefficients of 5-year age groups show a declining trend, indicates that childbearing decreases as age increases to the women in Bangladesh. The earlier age at first marriage consequences bearing more children to the women. This study also demonstrates that division is significant in childbearing. The coefficient of Khulna division has the lowest value, followed by Dhaka. Chittagong and Sylhet division have the higher value in comparison to Barisal division. Both surveys show that Khulna has the lowest level of fertility and highest level of contraceptive use rate, whereas the lowest level of contraceptive use in found in Sylhet division. These results might be the cause of childbearing differential by division. The place of residence is also found to be significant in childbearing. The coefficient of the category urban has a negative value. This implies that place of residence in urban areas has a negative impact on childbearing rather than that of rural areas. Childbearing differentials by educational level of the mothers and age at first marriage are obtained to be notable as key indicators.

In the preceding analysis, it is found that the childbearing drastically varies by the educational levels of the mothers. The estimated coefficients show declining trend with the level of education to the women, which reveals those who become more educated, bearing less children. Another significant factor, which is considered as an important determinant of childbearing, is the age at first marriage. The coefficient estimated to be negative implies that rate of childbearing decreased with the age at first marriage. The results shown in the above table also indicate that religion, husband's occupation, having radio are also important determinants of childbearing among the ever-married women in Bangladesh.

Table 4: Results of the fitted regression model.

Characteristics	BDHS 1999-2000		BDHS 2004	
	Coefficients	p-values	Coefficients	p-values
Age 5-year groups				
10-14	2.02	0.000	2.49	0.000
15-19	2.84	0.000	3.39	0.000
20-24	3.28	0.000	3.81	0.000
25-29	3.55	0.000	4.06	0.000
30-34	3.65	0.000	4.17	0.000
35-39	3.78	0.000	4.25	0.000
40-44	3.93	0.000	4.36	0.000
45-49	*	*	*	*
Division				
Barisal	0.12	0.000	0.10	0.000
Chittagong	-0.01	0.604	-0.06	0.001
Dhaka	-0.07	0.004	-0.15	0.000
Khulna	-0.02	0.357	-0.12	0.000
Rajshahi	0.07	0.006	0.09	0.000
Sylhet	*			
Types of place of residence				
Urban	0.06	0.000	5.653	0.000
Rural	*	*	*	*
Highest educational level				
No education	0.02	0.067	1.391	0.164
Primary	-0.08	0.000	-5.184	0.000
Secondary	-0.32	0.000	-7.483	0.000
Higher	*	*	*	*
Age at First Marriage	-0.04	0.000	-22.11	0.000
Having Radio				
No	-0.01	0.25	-2.90	0.003
Yes	*	*	*	*
Religion				
Islam	-0.13	0.000	-5.49	0.000
Hinduism	-0.18	0.011	-1.82	0.067
Buddhism	-0.15	0.184	-0.17	0.861
Christianity	*	*	*	*

* Reference category

V. CONCLUSION AND POLICY IMPLICATION

This study has tried to demonstrate the different key issues relevant to childbearing in Bangladesh. The fitted model suggests that mother age group is a determinant of more childbearing. Childbearing at early ages is a common phenomenon in Bangladesh. It was found that adolescent childbearing is highest in Bangladesh among Asian countries, which also happens in sub-Saharan African countries [12]. Among the divisions, women in Sylhet and Chittagong have the greater mean number of living children. In these divisions contraceptive use rate is comparatively low. The educational levels of the mothers are found to be the key factor of bearing more children in Bangladesh. The women who have no education are more likely to bear more children than higher educated or secondary completed mothers. Residence in rural areas is also causes for more childbearing. Early age at first marriage has an obliging effect on childbearing. The overall mean and median age at first marriage are 15 and 14 respectively. In rural areas, a significant number of females are married when they are only 10-12. This is one of the main reasons of more childbearing to the Bangladeshi women. The mean number of children among the women whose age at first marriage was <20 is 2.62 whereas the mean is 1.41 for the women who were first married at >20. So childbearing could be reduced by increasing the female age at first marriage to 20 years. The two fertility transitions in Japan after war are experienced by different demographic determinants. The earlier fertility decline was due primarily to increasing spread of deliberate control of fertility within marriage. And the post-1974 fertility decline was due solely to the increasing delay of first marriage. Japanese women today still bear on the average a little over 2 children by the end of their reproductive career. However, in recent years, the mean age at first marriage in Bangladesh though a very slow rate but increasing in somewhat extent. Husband's occupation, religion and having radio are also appeared to be important as determinants of childbearing. This study confirms that there is not much change observed over past five years from 2000 to 2004 in term of reducing child bearing. The trend of the effects of typical demographic and socio-economic factors on childbearing pattern among the women in Bangladesh does not show a substantial change. Therefore, appropriate policy and programs should

be driven immediately to reduce the level of childbearing in consideration to the existing higher rate of childbearing among the women in Bangladesh. The women and their husbands should be made more aware of the adverse effect on health, social and economic consequences of early marriage and early childbearing. The educated women have taken the small family norm in recent years. So government should give emphasis on female education. Since there exists a moderate gender gap in enrolment, female education has to be encouraged particularly in the rural areas. Also urbanization should be progressed and the facilities of communication, electricity and the scope of employment are to be increased. More childbearing could be brought to a decline by delaying early marriage. To discourage early marriage and to explain the perilous consequences of bearing more children among the mothers, variety of programs in this regard should be broadcasted through the electronic and print media. Therefore, government should take all necessary steps to reduce the level of more childbearing. However, this study considers only 1999-2000 and 2004 BDHS data. It will be more interesting to incorporate the same analysis for 2006 data and derive the trends and substantial changes of the relevant factors if any exists when the data will be available.

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