Effects of Demographic Characteristics on Infant and Child Mortality: A Case Study of Rajshahi District, Bangladesh

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Abstract. *The study attempted to identify important effects of demographic characteristics on infant and child mortality. The data for the study was collected in 2004 under the project of the UNFPA entitled "Strengthening the Department of Population Science and Human Resource Development" of Rajshahi University, Bangladesh. Application of logistic regression model suggests that demographic factors are associated with the chance of child survival. Breastfeeding and immunization practice of children has highly significant effects on infant and child mortality among all the included demographic variables. The results show that the risk of infant and child mortality was higher for children whose mother never breastfed than for children who were breastfed. The analysis results also show that the children who got full immunizations had lower risks of infant and child mortality than those who were not immunized at all. Similarly, risk of infant and child mortality gradually declined as both mother's age at marriage and mother's age at birth increased.*

1. INTRODUCTION

Bangladesh, situated in South Asia, is a unitary and independent country. It is a country of 1,47,570 square kilometers and around 140 million people with the highest population density (839 per km²) in the

world (U.S. Department of State, 2004). The people of Bangladesh are mostly poor and majority of them (76.9%) lives in rural areas and the rest (23.1%) lives in urban areas (BBS, 2004). The sanitation conditions in the country are poor; only 7% of rural households and 33% of urban households use sanitary latrine (BBS, 2001). Life expectancy at birth is 60.7 years for male and 60.9 years for female (U.S. Department of State, 2004).

Infant and child mortality is an important indicator for describing the overall social, economical and cultural well being of a country. The national infant mortality rate declined from 150 per 1000 live births in 1975 to 51 per 1000 live births in 2004 (UNESCAP, 2004). Infant mortality in Bangladesh is very high among Asian countries. Low socioeconomic conditions and hygienic status are the prime determinants of postnatal mortality.

Infant and children are the future assets of a country. Women are the heart of development because they rear and bear the children. The studies has found that the main determinants of infant and child mortality, namely, demographic or biological factors such as the age of mother, mother's age at birth, breastfeeding practice, birth interval, sex of the child, and immunization practice of children (Ghosh, 2003). In most developing countries, the availability of adequate breastfeeding alternatives is often limited. Babies born to young mothers are more likely to be premature, have low birth weight, and suffer from complication at the time of delivery (Hobcraft et.al, 1984, Pandey et.al, 1998).

Thus children who are either never breastfed or weaned early in infancy are at a much higher risk of becoming ill and of being malnourished. Because of the synergism between illness/disease and malnutrition as underlying cause of infant mortality, children experiencing both are at a much higher risk of dying. Feeding practices are important determinants of children's nutritional status and many studies have shown the beneficial effects of breastfeeding on the nutritional status, morbidity and mortality of infants (Hobcraft et al, 1984; Benefo and Parnell, 1991).

Breastfeeding could potentially be a confounding factor, since it affects both child survival and the length of the birth interval. Children with short preceding birth intervals are less likely than others to have ever been breastfeed (Retherford, 1989). The effects of breastfeeding on infant survival seem to be greater during the early months of life (Shah and Khanna, 1990). Mosley and Chen (1984) combines social, economic, medical and biological explanations of child mortality and they divide the proximate determinants into five categories, namely, maternal factors (mother's age and parity);

environmental contamination (routes of infection), nutrient deficiency, injury, and personal illness control (preventive and curative care) (Figure 1).

Figure 1
MOSLEY AND CHEN'S (1984) CONCEPTUAL FRAMEWORK
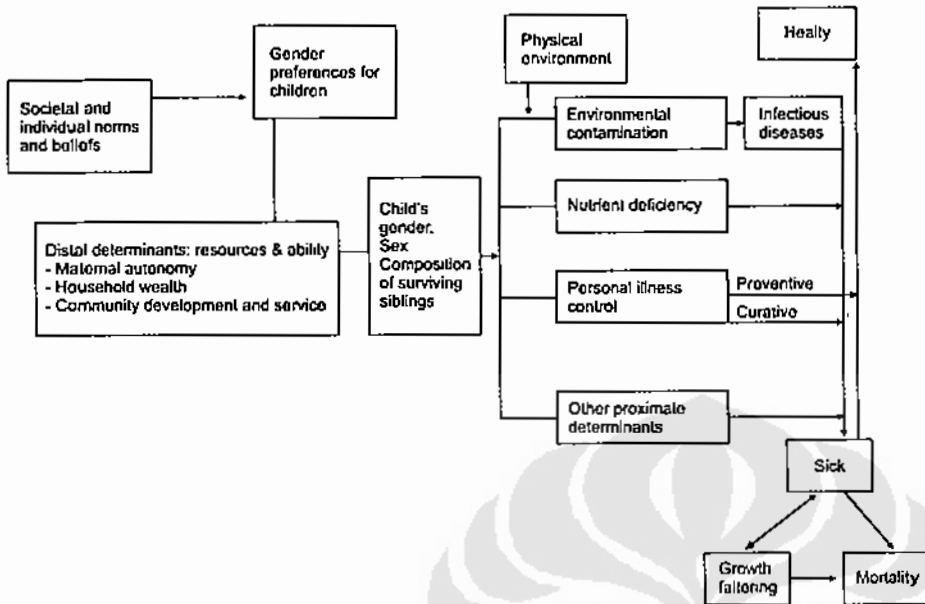
This research is important because it will investigate other researches and creates a vast research field and to improve program on mother-child health and reduction to infant and child mortality in Bangladesh. Therefore the main aim and objective of this study is to identify the demographic factors, which are associates with the infant and child mortality.

2. DATA AND METHODS

Figure 2 provides conceptual framework showing the influence of socioeconomic and demographic factors on infant and child mortality. It shows the influences operating from at least three different levels: the mother (female labor force participation, mother education, age of the mother at time of birth, mother's age at marriage, birth interval, etc), the

domestic environment (the unemployment rate, percentage of employed in manufacture, etc) and the environment outside the home (the population density, number of physicians per 100,000 population, income inequality measure, etc). The overlapping circles appear as layers of protection surrounding an infant; however their relative positions should not necessarily be interpreted as being of the greatest or least importance.

The data of this study was collected in 2004 under the project of the UNFPA entitled "Strengthening the Department of Population Science and Human Resource Development" of Rajshahi University, Bangladesh. These data were collected from rural, urban and suburban areas of Rajshahi district. In the above-mentioned project 6000 respondents were interviewed. The present study needs those respondents who had at least one child died. Again this study was concentrated only on the urban and rural respondents. Thus we got 611 respondents who were related to infant and child mortality. Among these total 611 respondents 292 were from urban areas and 319 were from rural areas of Rajshahi district.

Various alternative statistical tools exist for analyzing the mortality risk over time. This paper reports the results from multivariate logistic regression estimation. Main effects logistic regression models were used to determine the relative effects of demographic characteristics on infant and child mortality.

In this study different models had been considered for demographic characteristics separately. The considering models and the dependent variables used in the model are given below:

Model 1: Y=1, if mortality occurs between in infantile period of life and
           0, if mortality does not occur in infantile period of life.

Model 2: Y=1, if mortality occurs between 1 to 4 years of life and
           0, if mortality does not occur between 1 to 4 years of life

Independent variables used in the model were presented in the Table 1.

Figure 2
CONCEPTUAL FRAMEWORK OF THE INFLUENCE OF SOCIO-ECONOMIC AND
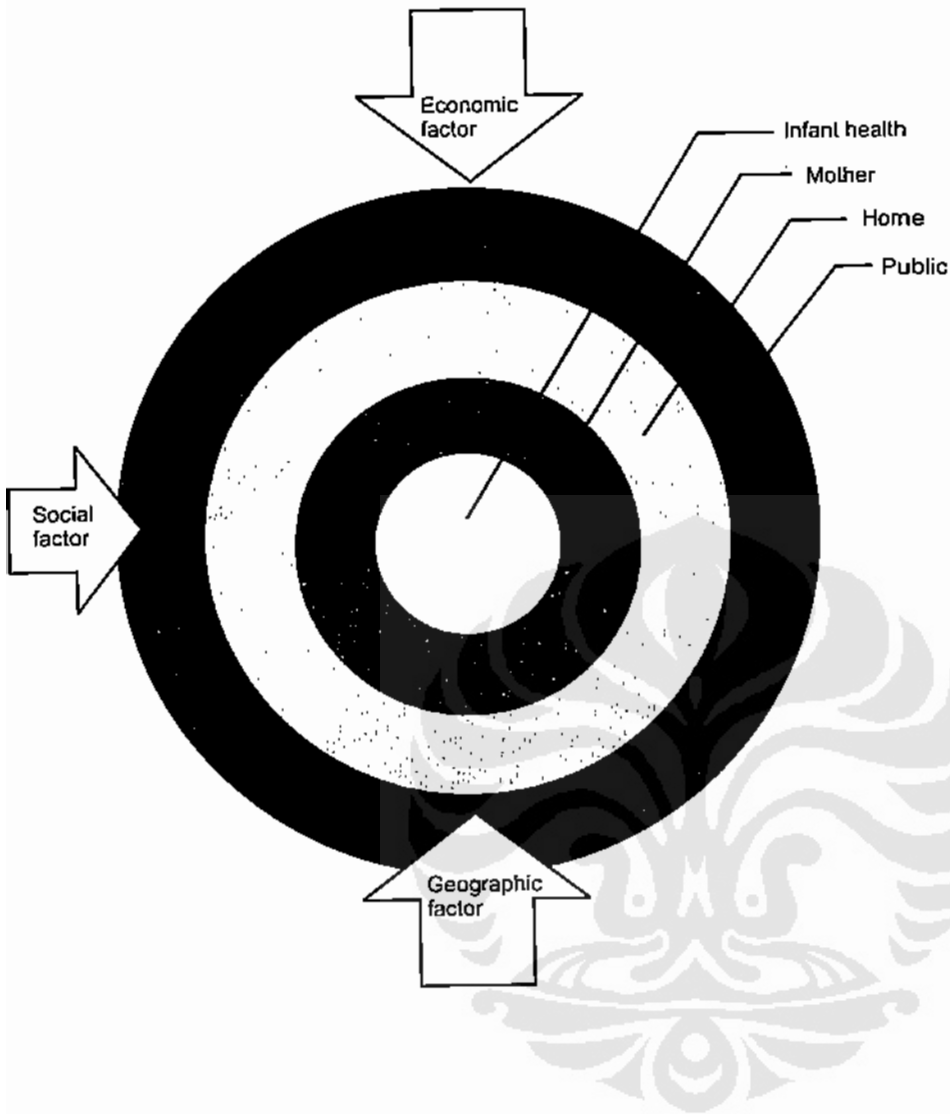DEMOGRAPHIC FACTORS ON INFANT AND CHILD MORTALITY

Table 1
LIST OF INDEPENDENT DEMOGRAPHIC VARIABLES FOR LOGISTIC REGRESSION ANALYSIS

Independent Variables	Type	Categories
Mother's age at marriage	Categorical	1= Less 15 years
		2= 15 years or higher
Mother's age at child birth	Categorical	1= Less 20 years
		2= 20 years or higher
Sex of children	Categorical	1= Male
		2= Female
Birth interval	Categorical	1= Less 2 years
		2= 2 years or longer
Breastfeeding practice*	Categorical	0= No
		1= Yes
Immunization practice of children	Categorical	1= Full
		2= Partial
		3= Not at all

Note: * Breastfeeding practice variable is not exclusive breastfeeding. Breastfeeding practice = 0 means never breastfeeding and breastfeeding practice =1 means ever breastfeeding.

3. RESULTS AND DISCUSSION

Descriptive statistics examines differentials in early childhood mortality by different demographic characteristics of the child and the mother. Table 2 shows that with regard to infant mortality the figure for male children (57.6%) was higher than the figure for female children (42.4%). However, with regard to child mortality, the pattern was reversed, with female death (52.5%) exceeding those for males (47.5%).

Table 2 shows that the incidence of infant and child mortality was high (62.0% and 61.4% respectively) when the age at marriage was less than 15 years. Mothers with age at marriage 20-24 years had lower infant and child mortality (4.6% and 5.7% respectively). Thus, mortality is gradually decreasing when the age at marriage is increasing. Table 2 indicates that infant and child mortality tended to be high (i.e. 58.95% and 53.2% respectively) for children born to young mothers (i.e. less than 20 years, but to a lower extent, those at older ages).

Table 2
PERCENTAGE OF INFANT AND CHILD MORTALITY BY DIFFERENT
DEMOGRAPHIC CHARACTERISTICS, BANGLADESH

Demographic characteristics	Infant mortality	Child mortality
Sex of Child		
Male	57.6	47.5
Female	42.4	52.5
Mother age at marriage		
Less 15 yrs	62.0	61.4
15-19	32.7	32.9
20-24	4.6	5.7
24+	0.7	-
Mother age at last birth		
<20 yrs	58.9	53.2
20-24	27.2	28.6
24+	13.9	18.4
Birth interval		
<2 yrs	73.3	71.5
2-3	14.3	12.0
4 yrs and above	12.4	16.5
Breastfeeding		
0-11 months	100.0	48.7
12-23 months	-	41.1
24+	-	10.2
Immunization practice of child		
Full	12.4	31.0
Partial	19.9	29.1
Not at all	67.8	39.9

Table 2 also indicates that infant and child mortality (73.3% and 71.5% respectively) was higher for children with a previous birth interval less than 2 years as for the children with previous of 4 years and above (12.4% and 16.5%). Therefore, children with short birth interval have higher infant and child mortality. Table 2 shows that the longer the birth interval, the longer the percentage of child mortality.

The immunization practice of children is an important influential factor on child's chance of survival. Table 2 shows that infant and child mortality was higher (67.8% and 39.9% respectively) for children who were not immunized and infant and child mortality (12.4% and 31.0% respectively) was lower for children who were immunized fully.

Logistic regression analysis can go some way towards identifying those variables, which are truly related to child mortality differentials. The variables included in this study are mother's age at marriage, mother's age at childbirth, sex of children, birth interval, breastfeeding practice and immunization practice of children. The category with the relative odds of 1.00 represents the reference category for that categorical variable. In this section Table 3 and 4 present the estimate of logistic coefficients, standard error of these estimates, wald chi-square, significance probability and relative odds calculated for each category of the categorical variables. We considered level of significance at 1% and 5% level for demographic characteristics.

Model 1 and 2 of logistic regression includes the infant and child mortality as the dependent variable and all of the demographic characteristics such as mother's age at marriage, mother's age at child birth, sex of children, birth interval, breastfeeding practice and immunization practice of children are independent variables. Here, three independent variables statistically and significantly affected on infant and child mortality. These variables were the sex of child, breastfeeding and immunization practice of children. The effect of other variables were not statistically significant. Mother age at marriage did not significantly affect on infant and child mortality because of small sample size.

Sex of children significantly affected infant and child mortality. Tables 3 indicates   probability of infant mortality for baby boys were 1.66 time more likely than the probability of infant mortality for baby girls. However, child girls had the chance of child mortality 1.62 times more like than child boys (Table 4). As expected, the infant mortality was higher among males than among females, a sex differential consistent with the higher biological risks faced by male children. Regarding infant mortality male children is higher than female children, which was the same as our study result. Chen and others (1981) argued that the sex differential in infant and child mortality may be due to the sex-biased health and nutrition behavior of mothers.

Breastfeeding practice had highly significant effect on both infant and child mortality. Table 3 indicates that the risk of infant mortality was 47 times higher among children who were not breastfed than among children who were breastfed (reference category). Table 4 also shows that breastfeeding practice lowered the risk of child mortality as much as 46 times. It is well known that the practice of breast-feeding can greatly reduce the morbidity and mortality. In poor hygienic environments, bacteria, parasites, and viruses can easily be transmitted to infants through the process of feeding by bottle. Latter some

times child infected repeated episodes of infections, particularly diarrhea, may leave a child weak and undernourished. Breastfeeding also has an indirect effect on the postpartum fecundity of mothers (Kennedy, 1990). The information presented here suggests that children who are breastfed are more likely to survive than those who are not breastfed.

Table 3
LOGISTIC REGRESSION ESTIMATES FOR THE EFFECT OF DEMOGRAPHIC CHARACTERISTICS WITH INFANT MORTALITY AS THE DEPENDENT VARIABLE, BANGLADESH 2004

Characteristics	Coefficient (β)	S.E of estimates	Wald	Significant	Odds ratio
Age at marriage					
Above 15 years (r.c)	-	-	-	-	1.000
<15 years	0.083	0.216	0.148	0.701	1.086
Mother's age at last birth					
<20 years (r.c)	-	-	-	-	1.000
Above 20 years	-0.204	0.219	0.870	0.351	0.816
Sex of Children					
Male (r.c)	-	-	-	-	1.000
Female**	-0.509	. 0.200	6.468	0.011	0.601
Birth Interval					
Above 2 years (r.c)	-	-	-	-	1.000
<2 years	0.004	0.232	0.000	0.987	1.004
Breastfeeding					
Yes (r.c)	-	-	-	-	1.000
No*	3.852	1.013	14.448	0.000	47.078
Immunization					
Full (r.c)	-	-	17.853	0.000	1.000
Partial**	0.557	0.274	4.130	0.042	1.746
Not at all*	1.062	0.254	17.500	0.000	2.893
Constant	0.345	0.256	1.813	0.178	1.412

Note:

r.c : reference category

* : significant at $p = 0.01$

** : significant at $p = 0.05$

Table 4
**LOGISTIC REGRESSION ESTIMATES FOR THE EFFECT OF DEMOGRAPHIC
CHARACTERISTICS WITH CHILD MORTALITY AS THE DEPENDENT
VARIABLE, BANGLADESH 2004**

Characteristics	Coefficient (β)	S.E of estimates (β)	Wald	Significant (β)	Odds ratio
Age at marriage					
Above 15 years (r.c)	-	-	-	-	1.000
<15 years	-0.105	0.215	0.237	0.626	0.901
Mother age at last birth					
Above 20 years (r.c)	-	-	-	-	1.000
<20 years	0.465	0.351	1.754	0.185	1.593
Sex of Children					
Male (r.c)	-	-	-	-	1.000
Female*	0.484	0.201	5.783	0.016	1.623
Birth Interval					
<2 years (r.c)	-	-	-	-	1.000
>2 years	-0.008	0.227	0.001	0.972	0.992
Breastfeeding					
No (r.c)	-	-	-	-	1.000
Yes*	3.822	1.013	14.233	0.000	45.70
Immunization					
Not at all (r.c)	-	-	19.016	0.000	1.000
Partial**	-0.568	0.275	4.272	0.039	0.567
Full*	-1.101	0.256	18.551	0.000	0.333
Constant	-0.623	0.358	3.082	0.079	0.534

Note:

   r.c : reference category
   *   : significant at $p = 0.01$
   ** : significant at $p = 0.05$

The immunization of children has significant effects on child's chances of survival. Table 3 indicates that the risks dying of infant were 2.9 and 1.8 times for infant higher who had not at all immunized and had partial immunization respectively than those of infant who had been fully immunized (reference category). Table 4 also shows that the risks of dying of children were 0.56 and 0.33 times lower among children who were immunized partially and fully respectively than those of children who were not immunized at all. The effect of immunization on infant and child mortality was much stronger.

4. CONCLUSION AND POLICY IMPLICATIONS

The analysis was carried out using logistic regression analysis. The infant and child mortality indicated that out of all the demographic variables that were included in the logistic regression to build the model, breastfeeding, sex and immunization practice of children were the significant predictors of infant and child mortality. The analysis results show that the risks of infant and child mortality was higher for children whose mother never breastfed and were not fully immunization at all. Immunization practice of children saves children from dangerous diseases. The children who are not immunized may have greater chance of being attacked by several severe diseases.

The analyses also indicate that the risks of infant mortality were found to be higher for male than in female children, but the risk of child mortality was higher for female than male children.

Therefore, an effective policies and recommendation are needed to reduce infant and child mortality in particular in Rajshahi District of Banglades. The policy implications and recommendations in this study are given below:

i). Infant and child mortality may be reduced through Expand Programme on Immunization (EPI).

ii). To encourage mother to breastfeed their children during neonate, postnatal, and childhood period. Therefore, it will increase nutritional status and it will reduce the infant and child mortality.

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