# Effects Of Demographic And Household Variables On Infant And Child Under-five Mortality: An Application Of Logistic Model

M Hossain, M Islam

**Citation**

M Hossain, M Islam. *Effects Of Demographic And Household Variables On Infant And Child Under-five Mortality: An Application Of Logistic Model*. The Internet Journal of Health. 2008 Volume 8 Number 2.

**Abstract**

Infant and child are the assets of a country. Women are at the heart of development because they bear children and they are nearly half of the total population. Infant and child mortality is powerful indicators to assess overall health situation of a country. Demographic and household factors have strong influence on infant and child mortality. So, the aim of this study is to identify the effects of demographic and household variables on infant, child and under-five mortality of Charghat Thana in Rajshahi District, Bangladesh. For this, a number of 800 rural women have been interviewed through a structured questionnaire by purposive sampling technique. In this study, logistic regression model is employed to determine which factors effect on infant, child and under-five mortality. In this analysis, it is indicated that age at marriage, birth order, birth interval, household conditions, source of drinking water and breastfeeding practices have significant effects on infant, child and under-five mortality.

## INTRODUCTION

Bangladesh is one of the most density-populated countries in the world. Bangladesh is a small country of 147570 square kilometers area with a population of around 150 million people (934 people per square kilometers) (U.N, 2007) 150 million population in 2007 (CIA, 2007). The populations of Bangladesh are mostly poor and maximum of them lives in rural areas. Infant and child mortality is an important indicator for describing the overall social, economical and cultural well being of a country. Infant mortality in Bangladesh is one of the highest in Asian countries. There is substantial decline in the infant mortality rate in Bangladesh. It was 150 per 1000 live births in 1975, to 53 in 2007 and under-5 mortality is 71 (UN, 2007).

Infant and child mortality are affected by birth order, the sex of the child and length of birth interval. Child mortality showed different levels by birth order, starting high, then falling and rising again. A mother's poor health and poor nutritional status may also have postnatal consequences such as impaired lactation (Retherford, 1989) and render her unable to give adequate care to her children. Some studies show that infant mortality is higher for boys than for girls but child mortality is lower for boys (Huq and Cleland, 1990; Kabir and Chowdhury, 1992) same as Rahman et al. (2005).

Many studies have demonstrated increased mortality risks among children born after cited as the primary mechanism responsible for the adverse effects of short birth intervals. Woman with short birth intervals between two programs have insufficient time to restore their nutritional reserves a situation, which is thought to adversely affect fetal growth. Competition among siblings is considered a plausible mechanism in the association between birth intervals. The situation may have a bearing on the nutrition of the young's child (Winikoff 1983; Boerma and Bicego, 1992).

Hong and Rathavuth (2006) showed that levels of infant and child mortality in many developing countries remain unacceptably high, and they are disproportionably higher among high-risk groups such as newborn and infant of multiple births, particularly in countries where advanced medical cares are available only at regional referral levels with limited access by the poor rural women and children. This study examined the relationship between high-risk infant of multiple birth and infant mortality in Bangladesh. Multiple births are strongly negatively associated with infant survival in Bangladesh independent of other risk factors. This evidence suggests that improving maternal and child health at the community level, screening for high-risk pregnancies and making referral services for these conditions more accessible to the rural women and children

will key to improve child survival in Bangladesh. So, it is important to identify that demographic and household factors effect on infant, child and under-five mortality.

Thus, the purpose of the present work is to identify the factors affecting infant, child and under-five mortality in rural area of Charghat Thana of Rajshahi district, Bangladesh.

This paper is constructed as follows: Sources of data of the study are included in section 2. Section 3 contains methodology of this study. Results and discussion are described in section 4. Lastly, section 5 concludes conclusion and recommendations.

## SOURCES OF DATA OF THE STUDY

In this study, a number of 800 respondents were questioned during survey period in 2007. The respondents were randomly interviewed by some selected questions from several villages in the rural area of Charghat Thana of Rajshahi district, Bangladesh by purposive sampling technique. Various socio-economic, demographic and household variables were considered at the time of data collection but in this analysis demographic and household variables are considered. A number of 246 respondents out off 800 respondents had infant, child and under-five mortality.

## METHOD

The data of this study is acquired from several villages in the rural area of Charghat Thana of Rajshahi district, Bangladesh by applying purposive sampling technique.

Cox (1970) discovered the logistic regression model that can be used not only to identify risk factors but also to predict the probability of success. Furthermore, Lee (1980) and Fox (1984) developed this model. This model expresses a qualitative dependent variable as a function of several explanatory variables, both qualitative and quantitative. Logistic regression is a form of regression, which is used when the dependent is a dichotomy and the independents are of any type. In logistic analysis different mortality is treated as dependent variable. The considering models and the dependent variables chosen in the model are given in the following:

### Figure 1

$$Model\,1:\ Y_1=\begin{cases}1, & if\ the\ mortality\ is\ occured\ under\ age\ 1\ year\ of\ life\\ 0, & otherwise\end{cases}$$

$$Model\ 2:Y_2=\begin{cases}1, & if\ the\ mortality\ is\ occured\ between\ age\ 1\ year\ and\ under\ 5\ years\ of\ life\\ 0, & otherwise\end{cases}$$

$$Model\ 3:Y_3=\begin{cases}1, & if\ the\ mortality\ is\ occured\ under\ age\ 5\ years\ of\ life\\ 0, & otherwise\end{cases}$$

Respondent's age, age at marriage, birth order, birth interval, household condition, sources of drinking water and breastfeeding are considered as explanatory variables in this model.

## RESULTS

The infant, child and under-five mortality is not only affected by socio-economic characteristics, but also affected by demographic and household factors. The frequency distribution of respondent by some selected demographic and household variables are shown in Table 1.

### Figure 2

Table 1: Percentage of respondents by some selected demographic and household characteristics

| Characteristics | Number of respondents | Percentage |
|---|---|---|
| **Mothers age (in years)** | | |
| <20 | 178 | 22.2 |
| 20-34 | 602 | 75.3 |
| >=35 | 20 | 2.5 |
| **Age at marriage (in years)** | | |
| <20 | 315 | 39.4 |
| 20-34 | 452 | 56.5 |
| 35+ | 33 | 4.1 |
| **Birth order** | | |
| 1 | 194 | 24.2 |
| 2-3 | 538 | 67.3 |
| 4+ | 68 | 8.5 |
| **Birth interval (in months)** | | |
| <24 | 248 | 31.0 |
| 24-36 | 429 | 53.6 |
| 37+ | 123 | 15.4 |
| **Household condition** | | |
| Parka | 667 | 83.4 |
| Tin | 130 | 16.2 |
| Other | 3 | 0.4 |
| **Sanitation facility** | | |
| Hygienic | 791 | 98.9 |
| Unhygienic | 9 | 1.1 |
| **Sources of drinking water** | | |
| Tube well | 680 | 85.0 |
| Piped | 59 | 7.4 |
| Other | 61 | 7.6 |
| **Duration of Breastfeeding (in months)** | 156 | 19.5 |
| <12 | 628 | 78.5 |
| 12-24 | 16 | 2.0 |
| 25+ | | |

The association of infant mortality, child mortality and under five mortality by demographic and household characteristics is examined through Chi-square test. The results of Chi-

square test are demonstrated in Table 2.

**Figure 3**

Table 2: Association of infant, child and under-five mortality with respect to demographic and household characteristics by chi-square ( ) test

| Demographic and household characteristics | Infant mortality | | Child mortality | | Under-five mortality | |
|---|---|---|---|---|---|---|
| | $\chi^2$-test | Sig. | $\chi^2$-test | Sig. | $\chi^2$-test | Sig. |
| Mothers age | 9.10 | Sig*** | 5.81 | Sig** | 11.39 | Sig*** |
| Age at marriage | 11.27 | Sig*** | 17.99 | Sig*** | 12.65 | Sig*** |
| Birth order | 9.77 | Sig*** | 3.63 | Insig. | 11.42 | Sig*** |
| Birth interval | 12.23 | Sig*** | 2.53 | Insig. | 15.34 | Sig*** |
| Household condition | 9.61 | Sig*** | 8.35 | Sig*** | 17.34 | Sig*** |
| Sanitation facility | 0.061 | Insig. | 0.90 | Insig. | 0.311 | Insig. |
| Sources of drinking water | 3.65 | Insig. | 4.14 | Insig. | 10.42 | Sig*** |
| Duration of breastfeeding | 59.62 | Sig*** | 119.1 | Sig*** | 186.4 | Sig*** |

***Significance at p<0.01 and **Significance at p<.0 05.

Infant, child and under-five mortality are affected by some demographic and household characteristics that is identified by logistic regression model and the findings of the models are presented in Table 3.

**Figure 4**

Table 3: Logistic regression estimates for the effect of demographic and household variables on infant, child and under-five mortality as the dependent variables

| Demographic and household characteristics | Infant mortality | | Child mortality | | Under-five mortality | |
|---|---|---|---|---|---|---|
| | Coefficient ($\beta$) | Odds ratio | Coefficient ($\beta$) | Odds ratio | Coefficient ($\beta$) | Odds ratio |
| **Mothers age** | | | | | | |
| <20(Ref) | - | 1.000 | - | 1.000 | - | 1.000 |
| 20-34 | -0.282 | 0.754 | -0.112 | 0.894 | -0.349 | 0.706 |
| >=35 | 0.885 | 2.422 | -0.944 | 0.389 | 0.481 | 1.618 |
| **Age at marriage** | | | | | | |
| <20(Ref) | - | 1.000 | - | 1.000 | - | 1.000 |
| 20-34 | 0.205 | 1.228 | -0.572 | 0.564* | 0.003 | 1.003 |
| >=35 | -0.138 | 0.871 | 0.382 | 1.465 | 0.202 | 1.224 |
| **Birth order** | | | | | | |
| 1(Ref) | - | 1.000 | - | 1.000 | - | 1.000 |
| 2-3 | 1.836 | 6.274*** | 0.558 | 1.747 | 3.046 | 2.032*** |
| 4+ | 1.702 | 5.487*** | 0.446 | 1.562 | 3.416 | 1.458*** |
| **Birth interval** | | | | | | |
| <24(Ref) | - | 1.000 | - | 1.000 | - | 1.000 |
| 24-36 | -1.502 | 0.223 | -3.830 | 0.022** | -1.427 | 0.240 |
| 37+ | -1.247 | 0.287 | -0.037 | 0.964 | 0.627 | 1.871 |
| **Household Conditions** | | | | | | |
| Pacca (Ref) | - | 1.000 | - | 1.000 | - | 1.000 |
| Other | -5.566 | 1.621** | 1.058 | 1.522 | -1.175 | 0.875*** |
| **Sources of drinking water** | | | | | | |
| Tube well (Ref) | - | 1.000 | - | 1.000 | - | 1.000 |
| Piped | 0.181 | 0.834* | 0.779 | 0.459 | 0.429 | 0.651 |
| Others | 0.819 | 0.441 | 1.648 | 0.193** | 1.332 | 0.264*** |
| **Sanitation facility** | | | | | | |
| Unhygienic (Ref) | - | 1.000 | - | 1.000 | - | 1.000 |
| Hygienic | 0.129 | 1.137 | -3.749 | 0.024 | -0.311 | 0.733 |
| **Breastfeeding practices** | | | | | | |
| <12(Ref) | - | 1.000 | - | 1.000 | - | 1.000 |
| 12-24 | -1.291 | 0.275*** | -2.674 | 0.096*** | -2.574 | 0.076*** |
| 25+ | -6.624 | 0.001 | -8.156 | 0.012 | -8.166 | 0.001 |
| **Constant** | -0.978 | 0.376 | -0.268 | 0.763 | 0 .999 | 2.715 |

***Significance at p<0.01, **Significance at p<.0 05,
*Significance at p<0.10 Ref: Reference

## DISCUSSION

In Table 1, it is seen that fewer percentage of mothers (22.3%) are young age (20 years), the lowest percentage (2.5%) of mothers older age (35 years and above) and the highest percentage (75.3 %) of mothers belong to middle age (20-34 years). From the same table it is found that, the lowest proportion mothers (4.1%) are age at marriage (35 years and above), the highest proportion of mothers (56.5%) married in the group age (20-34 years) or early age at marriage and 39.4% of age at marriage under 20 years. The distribution relating to birth order indicates that a larger proportion (67.3%) of the mothers 2-3 births order. Among others groups, nearly 24.2% reported to have one of first birth order and 8.5% mothers have multiple birth order. In this study area, 31.0% of mother's birth intervals less than 24 months, 53.6% mother's birth interval are 24-36 months and only 15.4% mother's births interval 37+ months respectively. Table 1 show that in house 83.4% are made of pacca, 16.3% are made of tin and 0.4% is made of others materials such as

bamboo, katcha and jute etc. About 85% mothers obtain drinking water from tube well, 7.4% mothers obtain drinking water from piped and only 7.6% mothers obtain drinking water other sources such as pond, tank, river and lake. It is found from the sample that 1.1% has unhygienic sanitation facility and 98.9% are using hygienic latrine. The results show that about 19.5%, 78.5% and 2.0% children breastfed less than 12 months, 12-24 months and 25 or more months respectively.

Infant mortality is significantly associated with mother's age, age at marriage, birth order, birth interval, household condition and breastfeeding. The degrees of association between age at marriage, birth order, birth interval, breastfeeding and household condition are more. But, sanitation facility and sources of drinking water have statistically insignificant association with infant mortality. Child mortality is significantly associated with mother's age, age at marriage, household condition and breastfeeding. But, birth order, birth interval, sanitation facility and sources of drinking water have insignificantly effect on child mortality. Under-five mortality is significantly associated with mother age, age at marriage, birth order, birth interval, household condition, sources of drinking water and breastfeeding. But, under-five mortality is statistically insignificant with sanitation facility.

From Table 3 it is observed that infant mortality for birth order 2-3 and 4+ have 6.274 and 5.487 times higher risk than that of the birth order one. Sources of drinking water have also significant influence on infant mortality. In this case odds ratio 0.834 and 0.441 that is infant mortality for the household whose sources of drinking water is piped and others sources such as ponds, canal, river etc, have 0.834 and 0.441 times less than risk household whose sources of drinking water is Tube well. Breastfeeding has significant effect on infant mortality. In this case, odds ratio is 0.275 and 0.001, that is, infant mortality for the respondents whose breastfeeding is 12-24 and 25+ months there are 0.275 and 0.001 times less risk than that of the respondents whose breastfeeding is less than 12 months. For infant mortality mother's age, age at marriage, birth interval, and sanitation facility are insignificant.

In study areas, child mortality for birth order 2-3 and 4+ respectively has 1.747 and 1.562 time higher risk than the birth order one. Infant and child mortality rates are lower among children whose households use piped water than those who use water from other sources. In this case, odd ratio is 0.459 and 0.193, that is, child mortality for the household whose sources of drinking water is piped and other sources, especially water from ponds, canals and rivers etc, have 0.459 and 0.193 times less risk than the risk household of whose sources of drinking water is tube well. The child mortality for the birth interval of 24-36 and 37+ months have 0.022 and 0.964 times less than the risk of birth interval less than 24 months of respondents. Breastfeeding has significant effect on child mortality. In this case, odds ratio is 0.096 and 0.012, that is, child mortality for the respondents whose breastfeeding is 12-24 and 25+ months there are 0.096 and 0.012 times less risk than that of the respondents whose breastfeeding is less than 12 months. The other variables such as mother age, household condition, sanitation facility are not statistically significant so, discussion of them is left out in the study.

Birth order is one of the most important significant factors affecting under-five mortality. It has positive effects on under-five mortality children with birth order 3-4 and birth order 4+ have higher risk to under-five mortality of life than the children with birth order one. Household conditions effects on under-five mortality. Respondents who live in house made by others thing such as katcha, jute etc., is 0.875 times less risk to have children losses in the under-five mortality than the respondents whose house have been constructed by “pacca”. The reason for there differentials due to the case that the higher social class people are likely to constructed their house by pacca and people in higher social class have more ability to take curative as well as preventive measures of health. Breastfeeding has significant effect on under-five mortality. In this case, odds ratio is 0.076 and 0.001, that is, under-five mortality for the respondents whose breastfeeding is 12-24 and 25+ months there are 0.076 and 0.001 times less risk than that of the respondents whose breastfeeding is less than 12 months. The other variables such as mother age, age at marriage, sanitation facility and birth interval are insignificant for under-five mortality.

## CONCLUSION AND RECOMMENDATIONS

Among the demographic and household characteristics, mothers age and age at marriage appeared to be a significant differential of infant, child and under-five mortality. The age at marriage is an important factor for infant and child mortality. The analyses indicate that survival status for children was lower for multiple birth order, with survival status increasing for first and second birth order. Survival

status decreased with higher births order, i.e. for fourth and higher birth order. The high mortality among higher births order may be related to the age of mother at the time of child's birth, usually considered to be at high risk are births to older mothers. Breastfeeding practices have strong significant effect on infant, child and under-five mortality. The findings of the present study may help planners and policy makers to take appropriate decision to reduce infant and child mortality in the country. Therefore, the following recommendations are suggested on the basis of the present study:

Age at marriage especially for women should be increased to reduce infant and child mortality especially for rural areas as Bangladesh is rural dominant country and hence fertility would also be decreased as well.

Higher birth order should be decreased. Children with higher birth order have a higher probability of death because of the effect of repeated pregnancies in depleting a woman's resources and straining her reproductive system. These effects are likely to be compounded by the fact that higher parity women are more likely to have closely spaced birth.

It should be encouraged mothers to breastfeed their children during infant and childhood period. Therefore, nutritional status will be increased and hence, infant and child mortality will be diminished substantially and dramatically.

## CORRESPONDENCE TO

Dr. Mohammed Rafiqul Islam Ph. D. Associate Professor Department of Population Science and Human Resource Development University of Rajshahi, Rajshahi-6205, Bangladesh. e-mail: rafique_pops@yahoo.com

## References

1. Boerma, J.T. and Bicego, G.T. (1992). "Preceding birth intervals and child survival": Searching for path ways of influence. Studies in Family Planning, 23(4): 243-256.
2. CIA. (2007). "The CIA world fact book 2005-2007", U.S. department of state. Area Handbook of the US Library of Congress
3. Cox, D.R. (1958). "Regression and life tables (with discussion)". Journal of the Royal Statistical Society Series, 34(2): 187-220.
4. Hong and Rathavuth. (2006). "Effect of multiple birth on infant mortality in Bangladesh". Journal of Pediatrics and Child Health, 42(10): 630-635(6).
5. Huq, M.N and Cleland, J. (1990). "Bangladesh fertility survey 1989". Main report. National Institute of Population Research and Training (NIPORT). Dhaka, Bangladesh.
6. Kabir, M. and Chowdhury, R.I. (1992). "Infant and child mortality levels and trends" Secondary analysis of the 1989 BFS data. National Institute of Population Research and Training. Dhaka, Bangladesh
7. Rahman, M. M, Islam, M. R. and Ali, M. K. (2005). "Effects of demographic characteristics on infant and child mortality: A case study of Rajshahi District, Bangladesh. Journal of Population, 12(2):161-173.
8. Retherford, R.D., Choe, M.K., Thapa, S. and Gubhaju, B.B. (1989). "To what extent does breastfeeding explain birth interval effects on early children mortality?" Demography, 26(3): 439-450.
9. U.N. (2007). "U.S. department of state, 2007".Bureau of South Asian Affairs 2007.
10. UN. (2007). Population Data Sheet 2006. Economic and Social Commission for Asia-Pacific (ESCAP). Bangkok, 14: 59-75.
11. Winikoff, B. (1983). "The effects of birth spacing on child and maternal health". Studies in Family Planning, 14(10): 231-245.

## Author Information

**Mohammed Mosharaf Hossain, M.Sc.**
Research Fellow, Department of Population Science and Human Resource Development, University of Rajshahi

**Mohammed Rafiqul Islam, Ph.D.**
Associate Professor, Department of Population Science and Human Resource Development, University of Rajshahi