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Factors Affecting Infant and Child Mortality in Bangladesh: A Multivariate Analysis

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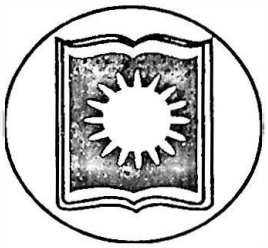
FACTORS AFFECTING INFANT AND CHILD MORTALITY IN BANGLADESH: A MULTIVARIATE ANALYSIS.



A Thesis
Submitted To The University Of Rajshahi
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For The Degree Of Master Of Philosophy

BY

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MAY, 2008

Dedicated to My
Beloved Parents and
Teachers

রাজশাহী বিশ্ববিদ্যালয়
UNIVERSITY OF RAJSHAHI

পরিসংখ্যান বিভাগ
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This is to certify that Md. Mogibul Islam has been working under my supervision. I am pleased to forward his thesis entitled "Factors Affecting Infant and Child Mortality in Bangladesh: A Multivariate Analysis" for the M. Phil. Degree of the University of Rajshahi.

Md. Mogibul Islam has fulfilled all the requirements of the regulations relating to the nature and prescribed period of research for submission of thesis for award of M. Phil. Degree of the University of Rajshahi.

21-05-08

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DECLARATION

I do hereby declare that the dissertation entitled, *"Factors Affecting Infant and Child Mortality in Bangladesh: A Multivariate Analysis"*, submitted to the Department of Statistics, Rajshahi University for the degree of Master of Philosophy in Statistics, is an original research work of mine. This work is carried out by me under the supervision and guidance of Professor Dr. Md. Nurul Islam, Department of Statistics, University of Rajshahi, Rajshahi, Bangladesh. The material embodied in this dissertation is original and no part of it in any form has been submitted to any other University or Institute for any degree or diploma. The sources incorporated in the dissertation have been duly referred and quoted for clarity.

21-05-2008

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Md. Mogibul Islam

ABSTRACT

The reduction of infant and child mortality in the developing countries is one of the most substantial achievements of human kind. However, in spite of various effective intervention programs, the infant and child mortality is considerably high in Bangladesh. Therefore, in this study, an attempt has been made to assess the levels, patterns and determinants of mortality in Bangladesh utilizing nationally representative data from Bangladesh Demographic and Health Survey (BDHS) 2004. The purpose of this study is also to identify user-related factors, which influence the infant and child mortality in Bangladesh. Differential pattern in infant and child mortality in Bangladesh is examined using bivariate analysis, logistic regression analysis and also factor analysis in multivariate approach.

The study results show that several socioeconomic, demographic and household variables affects infant and child mortality. These are: place of residence, division, mother's education, father's education, father's occupation, age of mother at birth of child, sex of child, preceding birth interval, availability of electricity, sources of drinking water, toilet facilities, exposure to mass media i.e. radio, TV and floor/wall/roof materials. Multivariate analysis results indicate that type of place of residence, sex of child, mother's education, father's occupation and division are important factors that have significant influence on infant and child mortality. The most significant predictors of neonatal, post-neonatal and infant mortality are mother's education and father's occupation. Father and mother's education both are persistent socioeconomic predictors of mortality. Construction materials of wall of houses are found significant for neonatal mortality. Floor materials are found significant for infant mortality. Furthermore, differential analysis shows that, male children experienced substantially higher mortality than female children did at neonatal, infantile and child periods but in post-neonatal period the relationship is opposite.

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INTRODUCTION

1.1 Background of the study

Bangladesh is the most densely populated country in the world, excluding city-states such as Hong-Kong and Singapore. The country has a population of about 140 million, with a corresponding population density of more than 900 per square kilometer. During the first half of the last century the population increased by only 45%. This slow increase was due to a combination of high birth rates and high death rates. In the second half of the century, population growth was rapid, tripling during the period. The relatively young age structure of the population indicates continued rapid population growth in the future. According to the 2001 census, 39% of the population is under 15 years of age, 57% are between 15 and 64 years, and 4% 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 future population size is reasonably consistent with the World Bank projections from 1994 (Bos et al., 1994), and the United Nations projections 1996 revision (United Nations, 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 Nations has revised their estimate for 2050 by 25 million (or 11percent) to 243 million, apparently on the basis of the decade long fertility plateau (United Nations, 2004).

This recent and very substantial upward revision of the mid-century population by the United Nations seems unduly pessimistic because a five-year delay in attaining replacement-level fertility adds only 3 percent to the population at any point in time. Nevertheless, Bangladesh still faces many decades of continued population growth, and efforts 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.

The promotion of child survival and health has long been an important aim of the wide range of policies adopted to improve the overall health status of a population. Important advances have been made in making accessible the means to combat the most common diseases of childhood and an increasing number of children are routinely vaccinated against diseases that are potential killers or causes of lifetime disability, such as measles and poliomyelitis. Low-cost intervention has made major inroads into reducing suffering and death from diarrhea diseases. Nevertheless, many countries are still experiencing unacceptably high level of infant and child mortality and even in countries with low average mortality in childhood at the national level there remain segments of the population that experience high mortality. Consequently, the 1990 World Summit for Children (United Nations Children's Fund, 1991) and the International Conference on Population and Development (United Nations, 1995a, chap. 1, resolution 1, annex) have called for action to (a) promote child survival and health and reduce disparities between and within developed and developing countries as quickly as possible; (b) improve the health and nutrition status of infants and children; and (c) promote breast-feeding as a child survival strategy.

Both the World Summit for Children and the International Conference on Population and Development set goals for the reduction of mortality among children. According to the programer of action of the International Conference on Population and Development, "countries should strive to reduce their infant and under 5 mortality rates by one-third, or to 50 and 70 per 1,000 live births respectively, whichever is less, by the year 2000, with appropriate adaptation to the particular situation of each country. By 2005, countries with intermediate mortality levels should aim to achieve an infant mortality rate below 50 deaths per 1,000 and an under 5-mortality rate below 60 deaths per 1,000 births. By 2015, all countries should aim to achieve an infant mortality rate below 35 per 1,000 live

births and an under 5-mortality rate 45 per 1,000 (United Nations, 1995a, chap. 1, resolution, annex, Para. 8.16).

The population of the area that now constitutes Bangladesh has grown from about 140 million in 2000 (BBS 1997) to about 123.4 million in mid 1998 (population reference bureau, 1998), making it the ninth most popular country in the world and one of the most densely populated. Muslim constitute about 90% of the population of Bangladesh, Hindu about 8% and others 2% (BBS, 1997).

The 1993-1994, 1996-1997, and 1999-2000 BDHS result show that Bangladesh continues to experience a fairly rapid decline in fertility. At current levels, a Bangladeshi woman will have an average 3.3 children during her reproductive period. In general, urban women rend to have smaller family than rural women (2.5 and 3.5 children per women, respectively). The low level of fertility is also found in Khulna (2.7) and Rajshahi (3.0) divisions. Fertility differentials by women's education status are notable; women who had no formal education have an average of 4.1 children, whole women with at least some secondary education have 2.4 children.

Bangladeshi couples have accepted the small family norm, about 60% of women prefer a two-child family, and another more than 20% consider a three child family ideal. Overall, the mean ideal family size among married women is 2.5 children and not changed since 1993-1994.

The desire for additional children declined noticeably in Bangladesh over the past decade. In 1991, 45% of married women with two children wanted to have another child in future; in the 1999-2000 survey the proportion is only 30%. More than half (52%) of currently married women in Bangladesh say they want no more children and an additional 7% have been sterilized. Twenty-four percent say they would like to wait two or more years before having their next child. Thus, the majority of married women want either to space their next birth or to limit childbearing altogether. This represents the proportion of women who are potentially in need of family planning services.

Thus examination and identification of reliable estimates of levels and trends of mortality are gaining increased interest. As about 50% of the total number of

deaths in many countries experienced with mortality under five, so mortality studies focuses more on infant and child mortality.

There is no doubt that infant and child mortality have been considered as important indicator for describing the mortality situation, health formation and indeed, the overall socio-economic condition of a country. There is only 75% to 80% of all children in developing countries reach their fifth birthday while over 97% of all in developed countries survive through age five (United Nation Children's Fund, 1984). Since these deaths are preventable with current medical technology, the united nation has set a target of 70 deaths under age five per 1,000 live births to be achieved in all nations by the year 2000.

Infant mortality has for a long time been regarded as a true reflection of a country's socio-economic and health conditions. The rate of loss in the first year of life attracted particular attention because:

a. Mortality is relatively high, the probability of dying in the first year of life after exceeding the values observed in the following fifty to sixty years of life.
b. It has a considerable impact on the average expectation of life and the rate of population growth.
c. It has disproportionate share in total mortality. and
d. It is sensitive to environmental and sanitary condition.

Malnutrition also makes a major contribution to the number of deaths. These condition results in a large "burden of disease" in developing countries. Infectious diseases influence nutritional status mainly by the absorption, metabolism and excretion of specific nutrients on the one hand and reducing food intake by affecting appetite on the children on the other hand. These cause an increased urinary loss of nitrogen and also reduce food intake. As a result protein energy malnutrition is frequently precipitated by an attack of an acute disease.

In developing countries in recent decades, infant and child mortality has experienced dramatic reduction through the combined effect of improvements in standards of living, better environmental and personal hygiene, existence of maternal and child welfare schemes, improved obstetric care, as well as prevention and treatment of diseases in infancy. Yet even in these countries, infant

mortality may still be regarded as a useful indicator for health. In so far as a higher rate in certain areas or specific groups may indicate that there is something wrong.

This decline in infant and child mortality has been mainly due to large-scale reduction in mortality after first week of life at which age, the infant is more sensitive to environmental hazards and response to the provision of health and preventive measures. This change has now to increasing concern for mortality in the early weekly of life, for fetal loss and to study of prenatal which is loss of life between the first weeks after delivery. Bangladesh is a poor country. The main health problem in Bangladesh is that of poverty which is related with illiteracy, unemployment, malnutrition, poor health, low status of the women and child and deteriorating environmental conditions makes child and people more to morbidity, slow their recovery and increases mortality.

Childhood mortality, because of its sensitivity to environmental conditions, particularly to infection and nutrition deficiency may be regarded as an even more useful indicator of social health hazard than is infant mortality rate, but frequently it is available in sufficient detail for adequate analysis in many clusters and countries childhood mortality still represent a serious problem and for substantive as well as analytic reasons all loss in the first year of life has to be studied as an entry.

Mortality situation is now a days very improved in spite of the improvements in the general mortality situation and thus in infant and child mortality over the last three decades in Bangladesh, the level of infant and child mortality is remain markedly high. For example, infant mortality has dropped from about 180 per 1,000 live births in mid 1960s to about 110 in mid 1980s (Hug and clekard, 1990). This has decreased to 94 in 1990, during the period 1989-93 and 1992-96 the infant and child mortality rate has declined six percent from 87 to 82 (Mitra, 1994: 92).

The factors that have been often examined in relation to child mortality in developing countries include various social, demographic and environmental factors. Mortality analysis in relation to these factors generally shows a complex situation because most of these are inter-related. Martin et al. (1983) showed how

these factors interact and how different populations or different segments of a population are influenced by these factors.

Further more, the fill health benefit of pursuing of several strategic child- specific intervention, such as oral dehydration theory, is limited without addressing personal habits of hygienic and sanitation. Maternal care is a key behavioral context in which to influence morbidity control among children and knowledge of how such important indicators as mother's education and reproductive patterns are associated with the risk of morbidity in children is useful for their world health palling. Since independence in 1971, the government of Bangladesh (GOB) has been following a policy of providing comprehensive health care particularly to rural people who constitute more than 80% of the total population. Afterwards, in 1985, with the beginning of the third five year plan, the government initiated institutionalization of maternal, and child care and family planning activities through a phased program on maternal and child health and planning (MCH-FP) services. The overall goal of the MCH program is to improve the condition of mother's and children. Regarding the alarming condition of child health, Bangladesh is a member of the World Health Organization (WHO) and as signatory of Alma-Ata declaration in 1978 is executed to achieve the goal of "public health care (PHC) as the key approach. The PHC is approach to recognize the components of the health and family planning infrastructure and its activities into a health care system, so a to be able to provide basis health care down to the grass roots levels; with community participation and inter-sectional support. This would in one hand promote self-reliance and on the other hand improve program coverage.

The study of infant and child mortality in developing countries is an important issue in public health programs. With the increasing emphasis on family planning programs in recent years, it becomes increasingly important to determine the general context of infant and child mortality levels trends and differentials. The purpose of this study is to report the infant and child mortality trends in Bangladesh, and levels among different subgroups of the population using the data from Bangladesh demographic and health survey (BDHS, 2004).

The United Nations has recently assessed that of the 10 developing country regions; only 3 (North Africa, South East Asia, and Latin America/Caribbean) were on track to achieve MDG 4 (United Nations, 2004). The target for

Bangladesh is to reduce under-five mortality from 151 deaths/1000 live births in 1990 to 50 in 2015. From 1991 to 2001 (mid-years of the BDHS 1993-94 and 2004), under-five mortality in Bangladesh declined by a third, i.e., about 4.1% per year, which compares well with the required annual decline of 4.3% needed to achieve the MDG of a two-third reduction in under-five mortality by 2015 from 1990 levels. However, if this estimate is disaggregated, between 1991 and 1997 the decline was more than 5.6% annually; but from 1997 till 2001, the decline has only been 1.6% per annum. The reduction in mortality appears to have slowed down and it is obvious that if the rate of reduction is not revived, Bangladesh will not achieve MDG4 (Table 1.1).

Table 1.1 Percent reduction in mortality per year, among children under five, Bangladesh 1991-2001. (BDHS, 2004. P-215).

	Percent reduction in mortality		
Infant and child mortality	1991 to 1994	1994 to 1997	1997 to 2001
Neonatal mortality	-2.6	-4.6	-0.8
Post neonatal mortality	-1.3	-10.4	-0.4
Child mortality (age 1-4 years)	-10.0	-6.6	-8.2

1.2 Objectives of the study

A rate of infant and child mortality reflects a country's level socio-economic development and quality of life.

On the basis of the above background, the present study attempts to determine and investigate the infant and child mortality differentials, for both urban and rural areas of Bangladesh. Bangladesh Demographic and Health Survey (BDHS-2004) data has been used in this study.

The main objectives of the study are as follows:

1. To study the socio-economic, Sanitation, Hygienic and Household characteristics of children.
2. Investigate infant and child mortality differentials between different demographic and socio-economic subgroups of the population.
3. Examine the effect of the different demographic, socio-economic and household factors on infant and child mortality in Bangladesh.

1.3 Literature Review

The Global infant mortality rate is estimated at 56 death per 1000 live births in 2000-2005, the result of 8 death per 1000 live birth in the more developed regions and 61 deaths per 1000 live births in the less developed regions. Over the 130

countries are expressed to achieve an infant mortality below 50 by 2000-2005, as called for in the programmer of action. However 60 countries (41 of which are least developed countries), accounting for 35% of the world population, will not meet that goal (United Nations, 2004).

In the analysis of global infant mortality, Japan had the lowest newborn death rate, 1.8 per 1,000 and four countries tied for second place with 2 per 1,000 – the Czech Republic, Finland, Iceland and Norway. The highest rate globally was in Africa and South Asia. With a newborn death rate of 65 out of 1,000 live births, Liberia ranked the worst (Hauck et al., 2006)

The extremely high level of maternal, infant and child mortality in Bangladesh are primarily caused by a few conditions such as unsanitary birth practices, neonatal tetanus, infantile diarrhoeal and other common childhood infections as well as unregulated high fertility (Chowdhury, 1998).

The WHO estimates were for 1995 for malaria and for 2001 for HIV/AIDS, but make use of results of epidemiological studies as far back as 1980. During this period, there have generally been an increase in overall trends in child mortality rates in sub-Saharan Africa, but this probably conceals substantial reductions in death from measles as a result of the EPI programme, and in diarrhoeal diseases, as result of oral re-hydration therapy. Globally re-hydration therapy gas reduced the number of children dying because of severe diarrhoeal by as much as two thirds since is was first introduced in 1979 (Martin et al., 2006).

Economic development is commonly associated with a transition from infectious to non-communicable diseases. Although neoplasm, diabetes and cardiovascular disease from lesser components of the overall mortality in the sites, there is evidence of health transitions in the southern African and Bangladesh sites, with rates for these conditions higher than elsewhere in sub-Saharan Africa. In most sites, infections diseases, with AIDS and malaria particularly frequent are mainly cause of death, although neoplasm, diabetes, cardiovascular disease and digestive disorders (including in the liver) are also important. There is evidence that South Africa and Bangladesh have high rates of non-communicable diseases as well as infectious diseases (WHO, 2006).

Toshio Kuroda (1998) found that, High fertility tends to be closely connected with high infant mortality. Infant mortality rates are extremely high in Pakistan and Bangladesh was fertility rates (TFR) are also very high. On the other hand, in Thailand and China, with low infant mortality rates, fertility rates are now below replacement level. Although Philippines fertility rate is higher than that of Bangladesh, the infant mortality of the Philippines is much lower than that of Bangladesh. Singapore's infant mortality rate stands out among other countries. According to data made available by a local statistician, TFR is 3.6 per 1000 live births in 1997. This is slightly lower than 3.7 of Japan in the same year, which was the lowest in the world. Now, Singapore has replaced Japan as the country with the world's lowest infant mortality rate.

A good number of studies have been done in the area of infant and child mortality in Bangladesh. Child mortality pattern and differentials may bring precious knowledge that can help policy-makers for third world health planning. Most of the researchers contributed on studying the levels, differentials and child mortality using traditional tabular analysis and life table techniques. Here, some of the previous works of Bangladesh as well as of other countries have been presented in resume form.

Factors affecting infant in the most direct manner are biological and hence biomedical, because death is biological process. For example, mosley (1983) groups those variables in to five categories: maternal fertility factors, environmental contamination with infection agents, availability of nutrients to the fetus and infant, injuries and personal disease control factors. And infant injuries and personal disease control factors, on the other hand, the effects of social, economic, cultural and geographical variables are indirect in the sense that they operate through the above-mentioned bio-medical factors. Then the bio-medical factors that exert direct in influence on infant mortality can be called intervening variables, since they intervene between social, cultural and geographical conditions and the event of the death.

Loss of life in early years of life is an outcome of socioeconomic, environment, biological and culture factors. Variations in the infant mortality rates in rural areas of developing countries have been primarily associated with the accessibility of health care services and education of the women, as well as husband's education, occupation and income (D'souza and Bhuiya, 1982; Flagg, 1982 Mostly and

Chan, 1984). Education of the mother has varied degrees of influence on mortality developing on difference in religion, electricity and household variables such as husband's education, occupation and income (Aksit and Aksit, 1989; Caldwell, 1979; Caldwell and McDonald, 1981; Ware, 1984). The effect of mother's education on infant mortality may also vary in different populations due to differences in social factors at the community level. Infant mortality may be the child managing childhood illness (Flegg, 1982).

Patterns of child mortality in many developing countries looked, Bas Zaire was examined across a number of social, medical, environmental, demographic and programmatic variables (e. g Black et al 1983; R Matoriekk and Ho, 1984 and Black R. 1984; Kasango project team, 1983; Makani et al. 1985). Most of the studies have been conducted by using a multivariate approach. (Yohannes A. G. et al. 1992) used logistic regression for the pattern and levels of child mortality based on the 1983 rural health survey of Ethiopia. They have focused on the age differentials in infant and child mortality, according to their work, the prevalence of mortality was higher among the children under one year than three or more years and then decreases as the children under one year than three or more years and then decreases as the children grow older. Another study of Botswana has confirmed the similar patterns of mortality by age. Where as Johanson and Mosk (1987) observed age differentials at second year of life than in older children, Devlieger et al. (1993) in the same proceeding reviewed the fact that a cross-sectional morbidity recorded during two successive quarterly surveys in preschool children in a rural Zairian area. They focused on morbid patterns and found that 3-6 months age group emerged as particularly vulnerable with the highest prevalence of all morbid patterns except for isolated cough. Their survey result ascertained that among all children's ages diarrhea and gastro-enteritis are the most common illness. This confirms over the developing world, where diarrhea, cholera, malaria, poliomyelitis were common diseases (Black, Merton and Brown 1983). The similar studies have been conducted by Mangani N. et al. (1988). They also showed diseases is largely affected by child's age.

Among other factors, Ahmed Al Kabir (1984) identified religion as one of the important covariates of infant mortality in Bangladesh. He found that infant mortality to Muslim mothers was significantly lower than mortality to mothers belonging to other religions. He also found that birth order of a child had a very

strong effect on the survival in the first year of life but the effect diminished thereafter.

M. Kabir, R.I. Chowdhury and R. Amin (1995) examined infant and child mortality levels and treands in Bangladesh by using data from the 1989 Bangladesh Fertility Survey and using life table analysis to confirm the changes in infant and child mortality. They found that both infant and child mortality declined from the mid 1970s but infant mortality declined more quickly. The level of infant mortality in 1989 was around 100 per 1000 live births while child mortality was 200 per 1000 live births. The decline in infant mortality is attributed to the introduction of improved public health measures and access to maternal and child health services.

A. K. Majumder (1991) used data from 1975-76 Bangladesh Fertility Survey and showed little evidence that breast-feeding is the intermediate factor through which birth intervals influence child survival in Bangladesh. Preceding birth interval, subsequent pregnancy and breast-feeding duration each have an independent influence on early mortality risk. Within a specific interval the risk of dying decreases with increase in duration of breast-feeding, and also with an increase in the time between the index birth and the next pregnancy. The death of immediately preceding child in infancy has a significant negative effect on the survival chance of the index child between ages 9 months and 5 years; this may be related to competition between siblings.

The study Shaik and Rahman (1991) observed that male infant mortality rate was higher both at rural and urban levels compared to that of female urban-rural differentials. Bhuian and Streatfield (1991) found that except mother's age all the variables mother's education, sex and economic condition of the household were significantly associated with risk of child death. The risk was 1.5 times higher for girls than boys.

Pandey A. et al. (1996) observed that no difference on ARI mortality was observed in their study which was proposed by WALIA et al. (1992), Cockburn et. Al. and Kumar et al. (1992) showed higher mortality in infant and child between 1-2 years respectively. From another study Van Lerberghe showed that in Kasongo the prevalence of respiratory problem was highest at 6-12 month and then gradually decreases with age. In the same proceeding Doubles R. M. et al.

(1994) mentioned the profoundly skewed distribution of burden of ARI mortality in both first and second years of life, although it also revealed a relatively normal distribution for the number of respiratory episodes in both of first 2 years of life. In addition, Bost L. et al. (1992) showed several illness i.e. small percentage of tuberculosis, a large percentage of coughs and cold illness of people of all ages, Kloos et al. (1996) claimed that lesser illness particularly common cold, diarrhea, most skin diseases and stomach ache, were under-reported, Kloos et al. (1996) also found that mothers tend to under report illness of their children.

The age of mother at the birth of the child is one of the important factors, which influence the level of infant and child mortality. Acsadi and Johnson (1986; 14) have indicated that the risk of dying before reaching the end of the first year of life is higher for infant born mother who were closer to the lower or upper limits of the reproductive periods. This argument is also supported by the UNICEF report (Grant 1991; 18) thus the relationship between infant mortality and "U" can describe age of mother or "J" shaved curves. This relationship between maternal age and infant mortality has been found in many studies Ahmed (1996), At Kabir, (1984) Retein, (1983) Game, (1983).

M. Rahman et al. (1985) worked through a logistic approach for the determinant of the covariates of the infant mortality in a rural area of Bangladesh named Matlab. They used ICDDRB, B data for their research purpose. According to their comments on the findings, the highest post-neonatal mortality among the infant of mothers aged under twenty might be due to several reason like premature births, unwanted pregnancies and so on. In their descriptive analysis, mother's age and previous stillbirths were found to be significant, but these were not significant in the logistic model. On the other hand, the large household size did not have significant effect in descriptive analysis, but logistic model showed this variable to have significant impact on the post-neonatal mortality.

E. Swenson et al. (1993) examined selected determinants of overall infant mortality in Vietnam by using data from 1988 Vietnam Demographic and Health Survey, and factors underlying neonatal and post-neonatal were also compared. Effects of community development characteristics, including health care, were studied by logistic regression analysis in a sub sample of rural children from the 1990 Vietnam Accessibility of Contraceptive Survey. He found that infant, neonatal and post-neonatal mortality rates showed comparable distribution by

birth order, maternal age, pregnancy intervals, mother's education and urban-rural residence. Rates were higher among first order birth after an interval of less than 12 months, births to illiterate mothers and to those aged under 21 or over 35 years of age. Logistic regression analysis showed that most significant predictor of infant mortality was residence in a province where overall infant mortality was over 40 per 1000 live births. In the sub sample, availability of public transport was the mist persistent community development predictor of infant mortality.

B. Gubhaju, K. Stratifield and A. K. Majumder (1991) showed the Nepal Fertility and Family planning Survey of 1986 demonstrated that demographic variables, previous birth interval and survival of preceding child, still predominated as determinants of infant mortality, particularly in rural areas of Nepal. However, in urban Nepal, where the level of socio-economic development is higher, an environmental variable, along with previous birth interval and survival of preceding child emerged as important in determining infant mortality.

Streatifield K. et al. 1992 also showed that facilities and improved water supply are directly associated with the infant and child mortality, Okedeji (1975) also concluded that three different studies form Grenada, Malaysia and Ethiopia ascertained that hygiene and sanitation tend to be consistent predictor of mortality. In another Ethiopian study it was also found that hygiene and sanitation affect on mortality. The Ethiopian government (1983) primary health care department mentioned that sanitation facilities show a strong association with child mortality and poor sanitation facilities attributed to diseases are highly correlated with sanitary levels. In a study D.Shouza and Bhuiya (1991) indicated that toilet facility as well as sources of drinking water appeared as important determinants of infant and child mortality in Bangladesh.

Access to quality of drinking water is strongly related to reduction of overall levels of mortality (Kohanes A.G. et al., 1992). Children drinking water from a piped sources experience lower mortality and morbidity than children drinking water from tube-well or other sources (Hill K. et al., 1996). Ahdon A.A et al. (1993) have given attention on water supply to reduce child mortality in the important study and observed that children whose families report piped, pumped as sources for drinking water had a lower prevalence of diseases than children whose families consumed water from other sources. Stratfield and Kezy (1987) also suggested piped water is normally assumed to be less contaminated than

other sources recognizing the sick children living in households which obtained their water from rivers and springs. Different study results confirmed that there exists association with water consumption and with the type water supply and diarrhea diseases (Esrey et al., 1992; J. P. Vangham et al., 1991). However, P et al. (1991) observed no relation between water supply and diarrhea diseases.

Examination of the socioeconomic and demographic differential of infant mortality based on the Egypt Contraceptive Prevalence Survey (ECPS) data by Mohiuddin Hamid (1984) showed the expected trend in mortality. The analysis of the selected demographic factors on infant mortality revealed the sex differential in infant mortality in favor of males. The analysis of the socioeconomic factors also showed the negative relationship with the infant mortality. The lowest infant mortality was observed among the birth with the higher status of father education, with educated mothers and fathers and with working mothers.

Mangani N. Et al. (1988) worked out a study in of the socioeconic factors, which affect on child mortality. They used cross sectional survey data collection in Bas-Zaire and logistic regression in the multivariate approach. Their objectives were to that better socioeconomic conditions result in lower risk of mortality. Fosu G. B. (1994) in the same proceeding examined the socioeconomic factors correlate with mortality differentials. They also observed that children with a lower socioeconomic status might be at a higher risk of diseases (which are related with infant and child mortality) than those with higher socioeconomic status and the poor health status of children is typically associated with high level of mortality exceptionally. Hill B. et al. (1992) observed mortality patterns are related with socioeconomic status and no major difference emerged by socioeconomic status but a slightly higher prevalence of measles pneumonia and diarrhea among those with lower socioeconomic status. In recent time Kabir M. et al. (1999) observed the socioeconomic correlates of under five morbidity and motility in Bangladesh 1994 and 1995. They have reported mortality differentially on the basis of place of residence, region of residence, level of income, possession of land, level of household education, wall materials, roof materials and access to source of drinking water. Their study finding in that mortality of children declines with the increased educational level of the household population and children of women who lived in houses with walls constructed from CI or cement sheet had a lower prevalence of mortality than children whose mother lived in houses with mud

walls. They also noticed that mortality rate was lower if the household income is higher and the higher the landholding was the prevalence of morbidity among under five children. From a study it is found that type of housing, well built including those of bricks, cement board are associated with infant and child mortality (Smith P. G. et al. 1991). Another studies Chowdhury J. et al. (1992) observed early childhood disease were affecting both moderate and low income families reflecting their surrounding unhygienic and diseases prone environment. In a subsequent study Clements J. D. et al. (1994) found that family size, family income, ownership of property, type of house construction are related with diarrhea and other diseases in urban Bangladesh. In a related study in Bangladesh it is found that several specific type of infant and child mortality related disease had higher incidence and longer duration in children from low-income households (Becker, Black and Brow, unpublished research). From another study result showed that certain indicators of socioeconomic status such as the floor and for construction materials, the of domestic animal owned, the possession of a radio, television, refrigerator, car, house or cattle is related to diseases (Smith G. D. et al., 1991). Declerque J. et al. (1988) also redressed an ingenious study which result showed that presence of electricity type of floor materials and possession of a working radio influence on child mortality.

Bangladesh mortality data found that, the births interval was the most important factor affecting infant and child mortality. He also suggested that attention should be given to mother's age at birth of the child and to the parity of the mother. M. Kabir (1982) in the same proceeding reviewed the fact that in Bangladesh context, infant mortality should be emphasized as a product of both material and nonmaterial aspects of a total traditional society which would need medical treatment and trained personnel for their for their prevention and care. A.K.M Alauddin Chowdhury (1982) found that economic development; higher social status and favorable maternal demographic factors are associated with the reduction of infant mortality. He observed the relative risk that there was a strong association between intermediate variable such as maternal environment, familiar environment and ecological environment and infant deaths. M. Kabir (1982) in the same proceeding observed that the levels and patterns of the infant and child mortality in Bangladesh varied by socioeconomic characteristics of mothers, but variations in some instances were not significant, for example, geographical region, Stan D'soza and Abbus Bhuiya (1982) in their study, entitled "Mortality

Differentials in a rural area of Bangladesh: results form "Matlab" thana revealed that there existed an inverse relationship between various levels of mortality and the socioeconomic status. The parameters utilized for assessing socioeconomic status-years of the education of the household head or the mother's occupation, area of dwelling ownership of cows-were all effective for demonstrating higher mortality rates for the lower social classes.

Education has found to have a negative association with infant mortality in many population (Trussell and Hammerslough, 1983). Cochrane (1980) summarized the results of ten studies and concluded that increasing mother's education was more important than increasing father's education in reducing mortality, a conclution not confirmed by Trussill and Preston (1982). Increased education might be expected to be associated with lower probability because it is a proxy for a increased command over resources, resulting in higher quality of clothing, shelter, nutrition, medical care, sanitary facilities and water supply. Caldwell (1979) also emphasized the importance female education in breaking traditional norms; alerting the sexual and generational balance of power may result in a reallocation of resources from the old to the young.

S. A. Megama (1980) readdressed an ingenious study of the socioeconomic determinants of infant and child mortality and represented a major improvement in infant and child mortality in Srilanka. The objective of the study was to provide an analysis of the mortality trends and differentials in relation to a wide-range of background variables. Basically the method of analysis used was life table technique of studying the history of a cohort. In his research, maturity and debility account for nearly 60% of all neonatal deltas. The result also shows that neonatal mortality varies by age of mother and birth order. The groups exposed to high risk at the neonatal stages are the parity one and higher parity infants as well as infants born to very young mother and to older mothers. In the stage of post-neonatal reread, effect of environment and of living play a key role over influencing mortality. Economic levels of the household environmental conditions and mothers understanding of all health care, all seen to have an independent impact on infant mortality. In contrast to neonatal mortality that mothers education level of understanding did not seem to be an important factor.

Poor nutrition may contribute to some extent to observe high infant and child mortality. Poor diet may make a child prone to illness, where as an ill child can

suffer nutritionally through food wastage, metabolic losses or anorexia (Herbert J. R 1984). This suggested several studies that once ill, poor nutrition delays recovery and leads impaired immune response (Benstock M. et al. (1991); Fochs S. C et al. (1997), Mosley and chin 1984; Venkatachary 1985). Devliger H. et al. (1993) also revalued that children with extreme malnutrition presents more frequently with signs of morbidity are associated with an increased long-term risk of death. This study reviewed the findings of mortality and nutritional status that improved relation increases immune system, which results in a decrease in the occurrence from acute diseases.

Education modifies women's beliefs about disease causation and cares and thus influences both domestic childcare practices and the use of modern care services (Caldwell 1979 Caldwell. Reddy and Caldwell 1983); that schooling enhances the women's knowledge of modern health care facilities; improves her ability to communicate with modern health care provide. And by increasing the value she places on good health, resulting heightened demand for modern health care services (Caldwell 1979 Schultz 1948, Caldwell and Caldwell 1984) and that maternal schooling reflects a higher standard of living and access to financial and other resources. Evidence from previous research suggested that maternal education has a positive effect on the use of health care services in Africa (Mbacke and Van de Wall 1987) and some Middle-Eastern countries (Tekce and Shorter 1984, Abbas Walker 1986), Asia (Akin et al. 1986 Wang et al. 1987; Stratified, Singarimbum and Diamond 1990 and Latin America (Fernandz 1984; Montein et al. 1987). Furthermore, both Barrera (1990) and Caldwell (1979, 1990) have argued that educated mothers are more likely than uneducated to take advantage of modern medicine and comply with recommended treatments because education change the mother's knowledge and perception of the importance of modern medicine in the care of her children. In a study of child nutrition in the Philippiens, Brera (1990) found that access to health care services benefited children of educated mothers more than children of uneducated mothers are more likely to take advantage of available public health care services than uneducated women. In Nigeria, Caldwell (Oribulage and Caldwell 1975; Caldwell 1979) also found that educated women benefited more from public health care service than did uneducated mothers.

Higher quality sanitary facilities and improved water supply are directly epidemiological associated with lower mortality (Puffer and Serrano, 1973). Physiological correlates include age of mother at the time of birth, birth order, parity, sex, etc. Children born to both relatively young and old women have higher mortality than those born to women in the prime reproductive ages (Norman, 1974). The pattern by birth is also typically U-shaped, with first mortality is not so universal as many belive, though except at the hight level of mortality, female do have decided advantages. The male disadvantage is greastest in infancy (Preston, 1976).

In case of India, Vaidyanathan et al. (1972) has reported mortality differencials by geographical location, rural-urban habitant, religion and caste, occupation, education, type of housing and lighting, landholding and income. He has shown an inverse relationship between occupational cades and mortality. Owners and cultivators have lower mortality than agricultural laborers. The U.N. Mysore population Study (1961) uses the type of housing and land holding status in rural area.

Fernando, D. N. et al. (1996) observed their study that mothers education has negative effect on child diseases. Both mothers and fathers higher primary education associated with significantly reduced the risk of illness. Togo et al. (1995) result shows that the prevalence of morbidity among children of mothers with no education is more than twice higher than that among children of mothers with primary education. However, Kenya, Zimbabwe, Bostwana, Uganda studies showed that mortality among children of mothers with primary educations higher than those of mothers level of schooling. In subsequent study Tski S. et al. (1993) scrutinized the probability of disease, which has a U-shape with maternal age for women with no schooling but a reverse U-shape among women with secondary schooling. They also declared illness perception is strongly negative and significant for uneducated mothers.

Lambrechts T. et al. (1997) have been observed that the children of unskilled labors have the highest mortality risks in each age range and each period and also have the lowest rets of improvement. Mortality is highest among the children of professional works, those involved in trade, and semi-skilled labors (who surprisingly have the fastest rates of improvements) the children of fathers

working in agriculture fall in between, both in level and if rate of improvement. Among other factors Ahmed All-Kabir (1949) identified religion as one of the important covariates of infant mortality in Bangladesh. He found that infant mortality to Muslim mothers was significantly lower than mortality to mothers belonging to the religions. He also found that birth order of a child had very strong effects on survival in the first year of life, but the effect diminished thereafter.

Among another factors, Fosu G.B. (1994) also observed that variations of mother knowledge of sources of modern family planning methods influencing on child mortality. He shows that the prevalence of mortality is more than 40% higher among children whose mothers know the sources of modern family planning method than among children whose mothers do not know such source. Analyzing the 1985 Bangladesh contraceptive and prevalence survey data Frankenberg and Martin (1988) found that current user have the lower child mortality than nonuser of contraception. The age of the mothers at the time of birth of child is one of the important factors, which influence the level of child mortality. Ascadia and Zhonson (1986) have indicated that the risk of dying before reaching the end of the first year of life is higher for infants born to mother who were closer to the lower or upper limit of the reproductive periods than to those who were in the prime of their child bearing periods. Higher quality sanitary facilities and improved water supply are directly associated with lower mortality (Puffer and Summer 1975).

Bost L. et al. (1992) worked through a logistic approach for the determination of the important covariates of child mortality using the data of Rural Health Survey of Ethiopia. In accordance to their research work, morbidity differs across different geographical areas and this may be attributed to variation in climate, environmental setting and socioeconomic factors. But in Bas Zaire study observed that the difference in urban and rural levels of reported disease occurrences are worth noting. In Previous research, Bartend W.E and Walmus B. F (1985) also suggested the importance of social and attitudinal variables in explaining differential mortality among a homogeneous poor urban population. In Kingston metropolitan area Jamica, Baily W. (1988) applied Poisson probability test in order to find child mortality. Islam N. M. et al. (1996) also showed there was mo significant differentials in mortality in accordance urban-rural residential status, In Bangladesh, a recent study it has been exhibited that the disease occurrence are

significant among people residing in rural areas than urban and statistical metropolitan areas (Rahman et al. 1997).

Another study in urban areas it is found that possession of either a television or radio is associated with significantly decrease infant and child mortality. From a recent study Langsten R. et al. (1995) it has been found that watching television for some time each day has a consistently negative effect on infant and child mortality.

Immunization is another factor, which are also related in infant and child mortality. Immunization initiative starts with an attack against six vaccine preventable diseases of children, which would serve as a catalyst in the development of primary health care in the developing world (Foege 1984). In Bangladesh. four out of five pregnancies received TT shots in the urban areas while only two three pregnancies being vaccinated in the rural areas (Chakraberty et al. 1996). A survey result expressed that among 12-23 months aged children at the time of the survey roughly 60% of the others had immunized for DPT, BCG, Polio and Measles (stratified et as, 1996).

Research work of Barrous F.C. et al. (1997) examined the relationship among body weight and infant and child mortality in developing countries. In their descriptive analysis, low body weight, regardless of age was strongly associated with the risk of dehydration. Low body weight was superior to more complex anthropometrical indicates, including weight for age, weight for height or weight for age also to early sign and symptoms during the episode. According to their comments and findings children with low weight for age, low height for age and low weight for height were associated with the risk of dehydration and low body weight may be associated with socioeconomic and environmental factors.

Many studies have demonstrative increased mortality risks among children born after short birth intervals (Hobcraft and others 1985). Maternal depletion is often cited as the primary mechanism responsible for the adverse effects of short birth intervals; two pregnancies have insufficient time of restore their nutritional reserves, a situation which is thought to adversely affect fetal growth. Competition among siblings is considered a plausible mechanism in the assertion between birth intervals and child survival, the newborn child has to complete with another young sibling for household resources and mother's care. The situation

may have a bearing on the nutrition of the youngest child (Winikoff, 1983; Boerma and other's 1992). First-born children of very young mother's are physical immature (Gubhare 1986) also infants have born to mothers physical immaturity (Gubhaju 1986). Also infants born to mothers who have experienced losing a child are at greater risk of dying while infants (Cleland and Ginnken 1988). Similarly infants born to mothers who are less than 19 years of age or 35 or more years of also at higher risk of dying while infants (Galley and others 1987). Breast-feeding could potentially be a confounding factor, since it affects both child survival and the length of the interval. Children with short preceding birth intervals are less likely than others to have ever born breast-fed, in our study the main demographic factors are age of mother at birth of child, sex, multiplicity of birth, parity, previous birth interval, birth order, miscarriage and still birth.

Seasonal have an influence on morbidity. Broeck J.VD. et. al. (1993) studies on morbid patterns in tropical area. They found cough was more prevalent in the dry season and all other morbid patterns were more prevalent in the rainy season while Park (1994) showed more preventive of patients was occurred during winter and spring months. A study of United States during 1973-1979 Himan et al. (1980) reported the highest incidence if this diseases was in the early May and September. Most of the studies consistently found that the high occurrence of measles was in March and April in Bangladesh (Islam, 1995). Withal et al. (1987) also observed that teeth is common and humid areas than in mountainous region which id dry and cold (Lesotho).

At last very essential and important reports which are reported by Edmonston and Bairagi (1982). They mentioned in the proceeding of the conference of infant and child mortality in Bangladesh that researcher on infant and child mortality in Bangladesh need more refinements both in conceptual framework and methodological point of view. They suggested using the multivariate analysis with the available data.

Moria Inkelas, Mark A. Schuster, Lynn M. Olson, Christina H. Park, Neal Halfon in 2004 in order to: 1) assess how many children have a specific clinician for well-child care; 2) identify the health insurance, health care setting, and child and family determinants of having a specific clinician; and 3) assess how parents chose pediatric clinician. Data from the National Survey of Early Childhood Health (NSECH) a nationally representative survey of health care quality for the

young children fielded by the National Center for Health Statistics in 2000, were used to describe well-child care setting for children aged 4 to 35 months. Parents reported the usual child setting of well-child care, whether their child has a specific clinician for well-child care, and selection method for those with a clinician. Bivariate and logistic regression analysis are used to identify determinants of having a specific clinician and of provider selection method, including health care setting, insurance, managed care, and child and family characteristics. Results: Nearly all young children aged 4 to 35 months in the United States (98%) have a regular setting, but only 46% a specific clinicians for well-child care. The population of young children who have a single clinician is highest among privately insured children (51%) and lowest among publicly insured children (37%) and uninsured children (28%). In multivariate logistic regression including health care and socio-demographic factors, odds of having specific clinicians vary little by health care setting. Odds are lower for children who are publicly insured (odds ratio: 0.7; 95% confidence interval: 0.45-0.97) and for Hispanic children with less acculturate parents (OR: 0.6; 95% CI: 0.39-0.91). Odds are higher for children in a health plan with gate keeping requirements (OR: 1.4; 95% CI: 1.02-1.88). Approximately 13% of young children with a specific clinician were assigned to that provider. Assignment rather than parent choice is more frequent for children who are publicly insured, in managed care, cared for in a community health center/public clinic, Hispanic, and of lower income and whose mother has lower education. In multivariate logistic regression, only lack of health insurance, care in a community health center, and managed care participation are associated with lack of choice.

In 2004 Jeannette A. Rogowski found that much of the decline in childhood mortality over the past two decades is attributable to improvement in neonatal intensive care for very low birth weight infants. Yet large and persistent disparities persist in the quality of neonatal intensive care across hospitals. Improving care for infants now served by hospitals with poor outcomes can greatly reduce infant mortality, particularly among minority infants who are more likely to be very low birth weight and cared for by hospitals with poor outcomes. Referral of high-risk births to hospitals with the best outcomes is another promising strategy.

Brahmbhatt H, Gray RH. In 2004 to estimate child mortality associated with reasons for the non-initiation of breastfeeding and weaning caused by preceding morbidity, compared with voluntary weaning as a result of maternal choice. Demographic and Health Survey were analyzed from 14 developing countries. Woman reported whether they initiated lactation or weaned, and if so, their reason for non-initiation or stopping breastfeeding were classified as voluntary choice or as a result of preceding maternal/infant illness. Rates of child mortality and survival analysis were estimated, by reasons for non-breastfeeding or weaning. RESULTS: Mortality was highest among never-breastfeeding children. Child mortality among women who never initiated breastfeeding was significantly higher than among women who weaned. Preceding maternal/infant morbidity was the most common reason for not breastfeeding (63.9%), and the mortality of children never breastfed because of preceding morbidity was higher than in children not breastfed as a result of maternal choice; 326.8 per 1000 versus 34.8 per 1000, respectively. Mortality among breastfed children who were weaned because of preceding morbidity was higher than among those weaned voluntarily; 19.2 per 1000 versus 9.3 per 1000, respectively. Failure to initiate location was significantly more frequent among women reporting complications of delivery and with low birth weight infants.

Abrams EJ. Wiener J, Carter R, kuhn L, Palumbo, Nesheim S, Lee F, Vink P and Bulterys M. in 2003 showed that maternal health factors and early pediatric antiretroviral therapy influence the rate of perinatal HIV-1 diseases progression in children. This article assesses the influence of maternal health characteristics, paediatric treatment patterns and early initiation of potent antiretroviral therapy upon the likelihood of dying secondary to HIV infection or reaching the category C illness for HIV-1 infected, were included. Univariate analysis showed that Children born to mothers with class C diseases, HIV-1 RNA viral load>1,00,000 copies/ml, or CD4 cell count<200, progress more rapidly than children born to mother with less advanced diseases whereas there was no difference according to timing of children's infection. Multivariate analysis showed an increased risk of progress if mothers had class C disease [relative risk (RR), 1.7; 95% confidence interval (CD), 1.0-2.7] or HIV-RNA>1,00,000 copies/ml (RR, 2.4; 95% CI, 1,2-4.6), controlling for child antiretroviral therapy and year of birth. Using the long inclusion period of this study, the authors assessed the effect of epidemiological and clinical trends and showed that the results were consistent over time. Children

treatment effect could hardly be investigated in this study as the time of enrolment; only the sickest children were treated. Despite this bias, the author found a significant protective effect if protease inhibitor containing regiments compared with no treatment. This study highlights the strong relationship between mother and infant illness, and the benefits of starting early powerful antiretroviral therapy for children who acquired HIV infection parentally.

Sheila W patton, MD, FRCPC1, shaila Misri, MD, FRCPC2, Maria R Corral, MD, FRCPC3, Katherine F perry, MD, FRCPC4 Annie J Kuan, BA5 in 2002 to see whether exposing developing infants to antipsychotic medication during pregnancy and location is associated with increased risks of teratogenic, neonatal, and long-term neurobehavioral sequelae; whether schizophrenia itself affects pregnancy outcome; and whether the course of schizophrenia symptoms is altered by pregnancy and lactation.

We summarize the results from articles identified vea a Medline search for the period January 1, 1966, to December 1, 2001. **Results**: Women with schizophrenia are at increased risk for obstetrical outcomes, including preterm delivery, low birth weight, and neonates who are small for their gestational age, A lack of information in the literature makes it difficult to comment on the relative risk of exposing developing infants to atypical anti psychotics. However, typical anti psychotics appear to carry an increased risk of congenital malformations when the fetus is exposed to phenothiazines during weeks 4 to 10 of gestation, Lack of information also precludes an understanding of whether changes associated with pregnancy and lactation significantly alter the course of schizophrenia symptoms.

1.4 Organization of the study

This study has been organized into seven chapters. The first chapter is the introductory one that deals with background, objectives and the review of earlier studies. Chapter two deals with data, methodology and limitation of the study. Chapter three presents some demographic, socio-economic and health survey results of the sample data. Infant and child mortality differentials by selected independent variables are examined in chapter four. Chapter five attempt to identify the determinants of infant and child mortality. Chapter six gives us factor analysis results. Finally, chapter seven summarizes the findings and draw conclusion.

CHAPTER TWO

DATA, METHODOLOGY AND VARIABLES

CHAPTER TWO

DATA, METHODOLOGY AND VARIABLES

2.1 Introduction

In order to examine the objectives of this study, data from the 2004 Bangladesh Demographic and Health Survey (BDHS) is used. The 2004 Bangladesh Demographic and Health Survey (BDHS) is a nationally representative sample survey design to provide information on basic national indicators of social progress including fertility, contraceptive knowledge and use, fertility preference, childhood mortality, maternal and child health, nutritional status of mothers and children and awareness of AIDS.

The 2004 BDHS provides a comprehensive look at levels and trends in key health and demographic parameters for policy makers and program managers. The fertility has declined from 6.3 children per woman in 1975 to 3.3 in 1999-2000. The pace of fertility decline has slowed in the most recent period compared to the rapid decline during the 1980s and 1990s. The BDHS 1999-2000 findings also show the increasing trend of contraceptive use, declining childhood mortality, and improving nutritional status.

The findings of this survey important in assessing the achievements of the health and population sector Programs. The 2004 BDHS will furnish policy makers, planners and program managers with factual, reliable and up-to-date information in evaluating current programs and in designing new strategies for improving health and family Planning Services for the people of Bangladesh.

The Bangladesh Demographic and Health Survey (BDHS) is intended to serve of a source of the population and health data for policy makers and the research community. In general, the objectives of the BDHS surveys are to-

1. Assess the overall demographic situation in Bangladesh
2. Assist in the evaluation of the population and health programs in Bangladesh
3. Advance survey methodology.

More specifically, the objective of the BDHS survey is to provide up-to-date information on fertility and childhood mortality levels; nuptiality; fertility preferences; awareness, approval, and use to family planning methods; breastfeeding practices; nutrition levels; and maternal and child health. This information is intended to assist policy marks and administrators in evaluating and designing programs and strategies for improving health and family planning services in the country.

This chapter provides a brief description of the study area, data organization, sampling technique, data collection, data processing, and all other related issues relevant to the study. Also an account of study methods and limitation of the data has also provided.

The 2004 BDHS survey was conducted under the authority of the National Institute for Population Research and Training (NIPORT) of the Ministry of Health and Family Welfare. The survey was implemented by Mitra and Associates, a Bangladeshi research firm located in Dhaka. ORC Macro of Calverton, Maryland, provided technical assistance to the project as part of its International Demographic and Health Surveys program, and financial assistance was provided by the U.S. Agency for International Development (USAID)/ Bangladesh.

2.2 Implementing organization

The 1999-2000 BDHS survey was conducted under the authority of the National Institute for Population Research and Training (NIPORT) of the Ministry of Health and Family Welfare. Mitra and Associates implemented the survey, a Bangladeshi research firm located in Dhaka. Macro International Inc. Calverton, Maryland, provided technical assistance to the project as part of its International Demographic and Health Survey program, and financial assistance was provided by the U.S. Agency for International Development (USAID)/Bangladesh.

2.3 Sample design

The sample for the 2004 BDHS covered the entire population residing in private dwellings units in the country. Administratively, Bangladesh is divided into six divisions. In turn, each division is divided into zilas, and in turn each zila into

upazilas. Each urban area in the upzilas is divided into wards, and into mahallas within the ward; each rural area in the upazila is divided into union parishads (UP) and into mouzas within the Ups. The urban areas were satisfied into three groups, i) Standard metropolition areas, ii) Municipality areas, and iii) Other urban areas. These divisions allow the country as a whole to be easily separated into rural and urban areas.

For the 2001 census, subdivisions called enumeration areas (EAs) were created based on a convenient number of dwellings units. Because sketch maps of EAs were accessible, EAs were considered suitable to use as primary sampling units (PSUs) for the 2004 BDHS. In each division, the list of EAs constituted the sample frame for the 2004 BDHS survey.

A target number of completed interviews with eligible women for the 2004 BDHS was set at 10,000, based on information from the 1999-2000 BDHS. The 2004 BDHS 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 target sample was allocated to each group area according to urban and rural areas, the number of PSUs was calculated in terms 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 points from 3 October 2003 to December 2003. A systematic sample of 10,811 households was then selected from these lists. All ever-married women age 10-49 in the selected households were eligible respondents for the women's questionnaire. For the men's survey, 50 percent of the selected households were chosen through systemic sampling. Interviewers interviewed one randomly selected man, regardless of marital status, in the age group 15-54, from each of the selected households. It was expected that the sample would yield interviews with approximately 10,000 ever-married women age 10-49 and 4,400 men age 15-54.

Sample size

In 2004 BDHS, data we have 6908 less than five years age of children and 484 children are dead cases.

2.4 Questionnaires

The BDHS used a household Questionnaire, a Women's Questionnaire, a men's Questionnaire and a Community Questionnaire. The content of these questionnaires was based on MEASURE DHS model questionnaire. These model questionnaires were adapted for use in Bangladesh during a service of meeting with the Technical Task Force, which consisted of representatives from NIPORT, Mitra and associates, USAID/Dhaka, ICDDR, B's Center for Health and Population Research, Bangladesh, Pathfinder/Dhaka, and ORC Macro (see Appendix D for a list of members). Draft questionnaires were then circulated to other interested groups and were reviewed by the BDHS Technical Review Committee (see Appendix D). The questionnaires were developed in English and then translated into and printed in Bangla. In addition, two version of a Verbal Autopsy Questionnaire were used. One version was for neonatal deaths (0-28 days old at death) and the other was for deaths among older children (age 29 days to 5 years at death). The verbal autopsy instruments were developed using the previous two BDHS verbal autopsy surveys, the WHO verbal autopsy questionnaire, and the instrument used since 2003 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. In addition, information was collected about the dwelling itself, such as the source of water, type of toilet facilities, materials used to construct the house, and ownership of various consumer goods. The arsenic level of the water used by households for drinking was also tested. The Household Questionnaire was also used to record the heights and weights of all children less than six years of age.

The Women's Questionnaire was used to collect information from ever-married women age 10-49. These women were asked question on the following topics:

i) Background characteristics (age, education, religion, etc.)
ii) Reproductive history
iii) Knowledge and use of family planning methods

iv) Antenatal and delivery care
v) Breastfeeding and weaning practices
vi) Vaccinations and health of children under age five
vii) Marriage
viii) Fertility preferences
ix) Husband's background and respondent's work
x) Awareness of AIDS and other sexually transmitted diseases
xi) Causes of death of children under five years of age

The Men's Questionnaire was used to collect information from men age 15-54 weather ever married or not. The men were asked questions on the following topics:

i) Background characteristics (including respondent's work)
ii) Health and life style (illness, use of tobacco)
iii) Marriage and sexual activity
iv) Participation in reproductive health care
v) Awareness of AIDS and other sexually transmitted diseases
vi) Attitudes on women's decision making roles
vii) Domestic violence

The Community Questionnaire was completed for each sample cluster and included questions about the existence of development organizations in the community and the availability and accessibility of health and family planning services.

The Verbal Autopsy Questionnaire was used for collection of open-ended information including narrative stories on the following topics:

i) Identification including detailed address of respondent
ii) Informed consent
iii) Detailed age description of deceased child
iv) Information about caretaker or respondent of deceased child
v) Detailed birth and delivery information
vi) Open-ended section allowing the respondent to provide a narrative history
vii) Maternal history including questions on prenatal care, labor and delivery, and obstetrical complications

viii) Information about accidental deaths
ix) Detailed signs and symptoms preceding death
x) Treatment module and information on direct, underlying; and
xi) Contributing causes of death from the death certificate, if available.

The survey questionnaires, with the exception of the Verbal Autopsy Questionnaire, are included in Appendix E.

2.5 Training and Fieldwork

The BDHS Women's Questionnaire was pretested in September 2003 and the men's Questionnaire was pretested in December 2003. For the pretest, male and female interviewers were trained at the office of Mitra and Associates. After training, the team conducted interviews in various locations in the field under the observation of staff from Mitra and Associates and members of the Technical Task Force (TTF). Altogether, 108 Women's and 45 Men's Questionnaires were completed. Based on observations in the field and suggestions made by the pretest field team, the TTF made revision in the wording and translations of the questionnaires.

In November 2003, candidates for field staff positions for the main survey were recruited. Recruitment criteria included educational attainment, maturity, ability to spend one month in training and at least four months in the field, and experience in other surveys. Training for the main survey was conducted for four weeks (1 December to 30 December 2003). Initially, training consisted of lectures on how to complete the questionnaires, 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 places close to Dhaka. Trainees whose performance was considered superior were selected as supervisors and field editors.

Fieldwork for the BDHS was carried out by 12 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 Associates also fielded four quality control teams of two persons each to check on the field teams. Additionally, USAID, ORC Macro and NIPORT monitored the fieldwork by visiting teams in

the field. Fieldwork commenced on 1 January 2004 and was completed on 25 May 2004. Fieldwork was implemented in five phases.

2.6 Data Processing

All questionnaires for the BDHS were periodically returned to Dhaka for data processing at Mitra and associates. The processing of the data collected began shortly after the fieldwork commenced. The processing operation consisted of office editing, coding of open-ended questions, data entry, and editing inconsistencies found by the computer programs. The data were processed on six microcomputers working in double shifts and carried out by 10 data operators and two data entry supervisors. The concurrent processing of the data was an advantage since the quality control teams were able to advisor field teams of problems detected during the data entry. In particular, tables were generated to check various data quality parameters. Data processing commenced on 12 January 2004 and was completed by 24 June 2004.

2.7 Methodology

One of the objectives of the study is to provide a brief description of infant and child mortality in Bangladesh. This study considers Bivariate analysis of infant and child mortality for some selected independent variables. For the sake of brevity, multivariate analysis to identify the net and interaction effects of covariates for infant mortality is also performed using logistics regression and Factor analysis.

Measures of Mortality Used in this Analysis

According to the expert group of World Health Organization (WHO), mortality may be defined in different ways. In this analysis, the following set of rates were examined:

1. The neonatal mortality rate or the probability of child dying during the first months (0-28 days) of life;
2. The post neonatal mortality rate or the probability of child dying during 1-11 months of life; and,
3. The infant mortality rate or the probability of child dying in the first year of life

4. The child mortality rate or the probability of dying between 1 (one) to 4 (four) years of life.

2.7.1 Dependent variable: Child mortality

A subdivision of mortality in the first year of life by shorter age periods is an essential analytical tool for a better understanding of the forces at work and to provide important clues for public health action. This is due to the fact that underlying courses varies with the age and consequently, the importance to be attached to the specific preventive and curative measures are to a substantial extent, determined by age pattern of child mortality.

Neonatal deaths are generally defined as death under 28 days of life whereas post-neonatal deaths cover the rest of the first year of life i.e. the deaths from 28 days to under 1 year. The basic reason for this distinction is that the post-neonatal death is particularly sensitive to environmental influences and exogenously factors play an important role. Post-neonatal is then more responsive to the improvements in the socioeconomic environment and on the basis of the present day knowledge and technology, easier to bring under control the neonatal mortality.

Infant Mortality Rate (IMR)

Infant mortality is one of the more sensitive measures of a community's health since data can be tracked in increments of months as opposites to years, said Georges Benjamin, executive director of American Public Health Association (APHA) at a press conference. The IMR measures the risk of death during the first year of life. It relates the number of death under one year of age to the number of live births during the same time period. It is expressed as the number of infant deaths per 1,000 live births.

Infant mortality rate (IMR) is defined by

$$IMR = \frac{D_0}{B} \times 1000$$

Where, D_0=Number of infant deaths (deaths in the first year of life) in a year and

B =Total live births in that year.

Infant mortality rate is divided into two parts

(a) Neonatal mortality rate and

(b) Post-neonatal mortality rate.

Neonatal mortality rate (NMR):

NMR measures the risk of death before reaching 28 days or 1 month of life. This rate relates the number of deaths less than 28 days of age to the total number of live births. It is expressed as the number of neonatal deaths per 1,000 live births. Neonatal mortality rate (NMR) is defined as

$$NMR = \frac{D_{<1month}}{B} \times 1000$$

Where, D_{1month}=the number of infant deaths under 1 month of age in a year and

B= Total live births in that year.

Post-Neonatal Mortality Rate (PNMR):

PNMR measures the risk of death during the period from 28 to 364 days of age. It is expressed as the number of post-neonatal deaths per 1,000 live births. Mathematically it is denoted by

$$PNMR = \frac{D_{1-11months}}{B} \times 1000$$

Where, $D_{1\text{-}11month}$= Number of infant deaths between first and eleven months completed of age in a year and

B= Total live births in that year.

2.7.2 Independent variables

The demographic factors can be divided into two classes. The first refers to those demographic factors, which affect the health of the mother to the extent of exposing her offspring to a higher risk of mortality. The second class refers to the sex and age of the child. There are significant differentials in mortality at different ages of infanthood, and there is a need to analyze them separately, e.g. neonatal and post-neonatal mortality. The main independent variables are type of place of residence, division, mothers highest educational levels, fathers education levels, fathers occupation, watches television every week, listens to radio every week, source of drinking water, type of toilet facilities, has electricity, main floor materials, main wall materials, main roof materials, sex of child, preceding birth interval, month of breast-feeding, received BCG, received POLIO, received MEASLES etc.

2.7. 3 Bivariate Analysis

To determine the factors which is influence infant and child mortality and to select covariates for multivariate analysis, in a bivariate analysis, the use of percentage is a advantageous first step for studying the relationship between two variables, though this percentages do not allow for quantification or testing of that relationship. In order to assess, regarding various indexes that measure the extent of association as well as statistical test of hypothesis that there is mot association, chi-square test of independence is performed to test the existence of inter relationship among the categories of two qualitative variables. In this study, some of the independent variables are quantitative such as child's age, mother's age at child's birth, mother's current age, birth order, subsequent birth interval, breast-feeding. In view of performing differential analysis, it is required to make these variables into categorical by differentiating each quantitative variable into various categories on the basis of their respective standard ranges (Macleod) that are given in the conceptual framework section.

2.7. 4 Linear Logistic Regression Model

In addition to the bivariate analysis of mortality differentials, this study uses multivariate regression to determine the relative effects of each variable on overall infant mortality, neonatal and post-neonatal mortality for both urban and rural areas.

Various alternative statistical models exist for analyzing the mortality risk over time. Proportional hazard (Cox, 1972) describes the hazard for failure rate for a change of state in continuous time. Although the proportional hazard model can incorporate change in mortality risk from exogenous variables, the computational algorithm usually limit those models to smaller sample sizes (Edmonston, 1982).

Several statistical models exist for dichotomous survival data. It should be stated at the outset that a linear probability function estimated by ordinary least square, is inappropriate (Merlov and press, 1973). Ordinary Least Square (OLS) provides inefficient estimates and imprecise predictions. Especially noticeable with the OLS estimates is the lack of restriction to mortality data is the preponderance of observations in which a child lives, and therefore the dependent variable is usually 0. Unfortunately, the OLS linear probability function is sensitive to extreme splits

in the dichotomous dependent variable. The estimators are thus greatly influenced by the nature of dependent variable.

Among alternative statistical models for multivariate analysis of dichotomous mortality data are log-linear, logistic and transformed equation models. Emonston et al. (1981) reviewed the use of various statistical procedures for mortality data for Bangladesh and reports were generally similar substantive to findings for alternative questions. This study reports the results from multivariate logistic regression estimation. The logistic transformation is an algebraically simple and computationally straightforward method for multivariate prediction of a binary dependent variable (Bishop et. al. 1975: PP 357-361).

Suppose that there are n individuals, to some of whom the survival related events occurred. They are called the "success", and the others are the "failure", Let Y_i=1, if the i-th individual is a success and Y_i=0, if the i-th individual is failure. Suppose that for each of the n individuals, p independent variables (mortality characteristics) X_{i1}, X_{i2}, - - - -, X_{ip} are measured. These variables can be either qualitative, such as sex and religion, or quantitative, such as parity, education, family size, etc. The problem is to relate the independent variables X_{i1}, X_{i2}, - - - -, X_{ip} to the dichotomous dependent variable Y_i. One possible method is the ordinary linear regression analysis technique. Assume that Y_i's are normally distributed with Pi and standard deviation σ^2; P_i is defined as the probability of success, that is,

$$P_i=Pr\ (y_i=1)$$
$$Q_i=1-P_i=Pr\ (y_i=0),\ i=1, 2, \ldots, n \qquad (1)$$

is linearly dependent on X_{ij}'s. The model may be written as

$$P_i=B_0+\sum B_j x_{ij} \qquad (2)$$

The least square technique is applied to estimate the coefficients B_j. Consequently, for a new individually, P_i can be estimated by substituting the X_{ij}'s values into Equation (2).

This method, treating dichotomous dependent variable as it is qualitative, has several limitations, as mentioned earlier. Since Y_j's are not normally distributed, no method of estimation that is linear in the Yi's will in general be fully efficient. Another limitation is that it is possible for the least squares estimates obtained

from model (2) to lead to a fitted value that does not satisfy the condition $0 \leq P_i \leq 1$, could be used; however, computations become very complicated.

Because of the above limitations, equation (2) is not an appropriate model for dichotomous or binary dependent variables. The linear logistic model suggested by much more appropriate. In this model, the dependence of the probability of success on independent variable i-d assumed to be,

$$P_i = \frac{\exp(B_0 + \sum B_j x_{ij})}{1 + \exp(B_0 + \sum B_j x_{ij})} \quad (3)$$

and, $$Q_i = 1 - P_i = \frac{1}{1 + \exp(B_0 + \sum B_0 x_{ij})} \quad (4)$$

Where, Bj's are the unknown coefficients.

Equation (3) and (4) look complicated; however, the logarithm of the ratio of P_i and $1-P_i$ turns out to be simple linear function of X_{ij}.

We define,

$$\text{Logit}(P_i) = \ln\left\{\frac{P_i}{1 - P_i}\right\} \quad (5)$$

The logit is the logarithm of the odds (death) of success, that is, the logarithm of the ratio, the probability of success to the probability of failure. It is also called the logistic transform of Pi and equation (5), a linear model. It has several nice properties. First as P_i increases, so does logit (P_i). Second, logit (P_i) varies over the whole real line, whereas P_i is bounded only between 0 and 1. If $P_i < 0.5$, logit (P_i) is positive.

So, we see that the logistic regression model can be expressed in two equivalent ways. First we can fit a linear model in the logit scale,

$$\text{Logit}(P_i) = B_0 + \sum B_j x_{ij} \quad (6)$$

Second, it is almost equivalent to modeling the logit of the probability of the success as a linear function of the independent variables, as given in the equation (3). The equation (3) expresses the model as an S-shaped curve in the original probability scale. Equation (6) is the most useful analog for dichotomous response data of the ordinary regression model for normally distributed data.

Now the question is how to estimate the coefficients B_j's. Cox suggested the maximum likelihood method. Let Y_1, Y_2, - - - -, Y_n. Be the dichotomous

observation on the n individuals. The likelihood function contains a factor (3) whenever $Y_i=1$ and equation (4) whenever $Y_i=0$.

Thus the likelihood is

$$L(B_0, B_1, \ldots\ldots, B_p)=\frac{\prod \exp\{y_i(b_0+\sum B_j x_{ij})\}}{\prod\{1+\exp(B_0+\sum B_j x_{ij})\}} \quad (7)$$

The log-likelihood function is then,

$$\ln L(B_0,B_1,\ldots\ldots, B_j)=\sum_{i=1}^{n} y_i\left(B_0+\sum_{j=1}^{p} B_j x_{ij}\right)-\sum_{i=1}^{n}\ln\left\{1+\exp\left(B_0+\sum B_j x_{ij}\right)\right\} \quad (8)$$

The maximum likelihood estimates of Bj's that maximize LL in equation (8) can be obtained by taking derivatives of equation (8) with respect to Bj and then equating to zero. Thus,

$$\frac{dLL(B_0, B_1,\ldots\ldots B_p)}{d B_j}=0$$

that is, $$\sum_{i=1}^{n} y_i x_{ij}-\sum_{i=1}^{n}\frac{x_{ij}\exp(B_0+\sum B_j x_{ij})}{1+\exp(B_0+\sum B_j x_{ij})}=0 \quad (9)$$

This can be done by an iterative procedure, if the Newton-Raphson method is used; we need the second derivative of LL. Therefore,

$$I^{*}_{j1,j2}=-\sum\frac{x_{ij1}x_{ij2}\exp\left(B_0+\sum_{j=1}^{p} B_j x_{ij}\right)}{\left\{1+\exp\left(B_0+\sum_{j=1}^{p} B_j x_{ij}\right)\right\}^2}, \; j_1=1,2, \text{ - - - -, p and } j_2=1,2, \text{ - - - -,p}$$

Let $I_{j1j2}=(-)I^{*}_{j1,j2}$. The inverse of the I matrix, I-1 is the asymptotic covariance matrix of the Bj's. Equation (9) is too complicated to solve by hand for the Bj's when p is small. Computer programs for solving equation (9) iteratively are available, e.g. Lee (1974), Morabito and Marubini (1976), Engelman estimation of the unknown coefficients. It computes the maximum likelihood-estimates for the regression coefficients.

2.8 Limitation of the Study

The infant and child mortality was carried out to collect information on various demographic and socioeconomic variables. The variables are age of respondents, place of residence, religion, region of residence, birth order, multiplicity of birth, education, occupation, etc. The whole data collection process was very

systematic, methodical and up to date. But even then, there were limitations because of the illiteracy and ignorance of the people, the age was very essential determinants, but in this situation the relevant result was not found, because the people of rural areas do not know the exact birthday of their children. It was based on respondent's personal reports or satisfaction and as a result birth interval may be subject to error. Also many people do not know their exact age. They gave an approximate age on which we had to depend.

CHAPTER THREE

PROFILE OF THE VARIABLES

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3.1 Introduction

Any survey research, it is important to know the background characteristics of the study or target population. This chapter provides brief profile of the background characteristics. This assessment leads to the interpretation of the results and to examine any cause effect relationship among the study variables. For statistical analysis of infant and child mortality in Bangladesh, it is necessary to study the demographic, socioeconomic, and selected sanitation and hygienic characteristics. So it is required to study their characteristics at the outset of the analysis. It is know that, the frequency distribution gives us a picture of the pattern of distributions in different groups. For this examination of each variable individually over the frequency distribution is necessary.

Now, we will first examine some important background characteristics i.e. selected independent variables, which are considered to be important in relation to the mortality status through their respective frequency distribution. The selected variables can be broadly be grouped into four groups: Socioeconomic characteristics are: division, residence, education of mother, education of father, father's occupation, has electricity. Also the hygienic, sanitation and household characteristics i.e. sources of drinking water, type of the toilet facility, main floor material, main wall material, main roof material, watch TV every week, listen to radio every week and immunization. The demographic characteristics are child age, sex of child, birth order number, child is alive and breast-feeding status.

All the results are shown in tables or figures are produced by using Computer Software SPSS (Statistical Package for the Social Sciences) version 10.0 for windows program and Microsoft Excel packages program.

3.2 Socioeconomic Characteristics

The socioeconomic conditions of the people create differentials in the level of morbidity. Socioeconomic factors have a high influence on mortality level. The distribution of economic conditions and social benefits is closely related with morbidity patterns of a community the variables reflecting the picture of social

and economical status of a community are termed as socioeconomic variable. In the present section the frequency distribution of selected socioeconomic variable is discussed below.

Table 3.1 Percentage of Children by Selected Socioeconomic Characteristics, BDHS-2004.

Background Characteristics	Number	Percent (%)
Region/Division		
Barisal	752	10.9
Chittagong	1503	21.8
Dhaka	1531	22.2
Khulna	866	12.5
Rajshahi	1312	19.0
Sylhet	944	13.7
Type of place of residence		
Urban	2073	30.0
Rural	4835	70.0
Has electricity		
No	4067	58.9
Yes	2833	41.0
Missing	8	.1
Mother's Education level		
No education	2541	36.8
Primary	2148	31.1
Secondary	1827	26.4
Higher	392	5.7
Father's education level		
No education	2663	38.5
Primary	1879	27.2
Secondary	1657	24.0
Higher	704	10.2
Missing	5	.1
Father's occupation		
Did not work	87	1.3
Prof., Tech., Manag. and sales	1877	27.2
Agric-self employed	42	.6
Agric-employee, household & domestic	1780	25.8
Skilled manual	1693	24.5
Unskilled manual	1418	20.5
Missing	11	.2

Figure 3.1 Percentage of place of residence

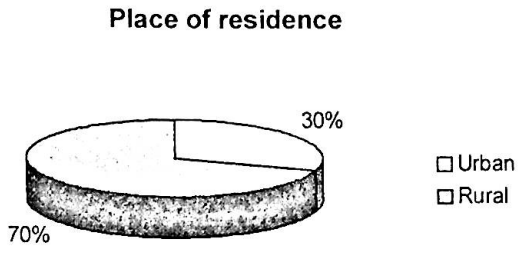
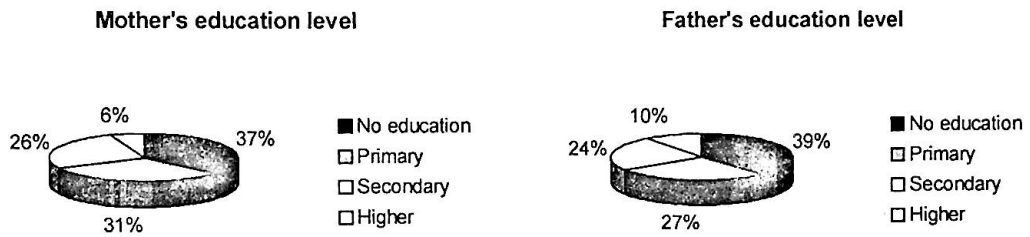


Figure-3.2 Percentages of Mother and Father's education level



Bangladesh is predominantly a rural country with 76.9 percent of the population found living in villages, according to the 2001 Bangladesh population census. Our BDHS data, we see that the majority 70.0 percent of children is in rural areas and 30.0 percent of children live in urban areas. It is very lower proportion and is most probably due to definitional changes. Because, a definition of urban area was employed in the IMPS (Integrated Multipurpose Master Sample) frame from the BDHS sample was drawn. The result in the above table 3.1 provided that Dhaka division contains the highest proportion of children 22.2 percent and lowest proportion 10.9 percent of children are in Barisal division. The others divisions contain 21.8, 12.5, 19.0, and 13.7 percent respectively in Chittagong, Khulna, Rajshahi and Sylhet.

Electrification may have an impact on infant and child mortality due to modernization effect. Most of the children 58.9 percent had no electricity in their household. This is due to the fact that most of the children are living in rural areas and consequently most of the rural areas have no electricity. The data also provide

that only 41.0 percent children have electricity in their households and missing 0.1 percent.

The above table also shows that below fifty percent (36.8 percent) mother of children had not received any formal education, where 31.1 percent mothers of children has primary education, 26.4 percent had secondary education and only 5.7 percent had higher level of education. So we see that majority mothers of children are illiterate. The low level of literacy due to cultural norms and religious values, those discourage female education, particularly at the secondary and higher level.

Father's education is also important variable generally it is likely that higher educated people belong to higher economic class. These study shows that fathers of children are seem to be lower educated than their mother. On the table 3.1 shows 38.5 percent fathers of children are illiterate, which the comparable figure for the mother is 36.8 percent, among other categories 27.2 percent fathers are primary educated, while 24.0, and 10.2 percent are secondary and higher education level respectively.

The father's occupation may be a reasonable indicator of broad socioeconomic status, but it is only loosely related to income. In our study the main occupation of father's is professional Technical Manager and sales with the number is 27.2%, other occupation are agriculture-self employed, agriculture-employee, skilled manual and unskilled manual with respective is 0.6%, 25.8%, 24.5% and 20.5%. The number of do not work is 87 i.e. 1.3%.

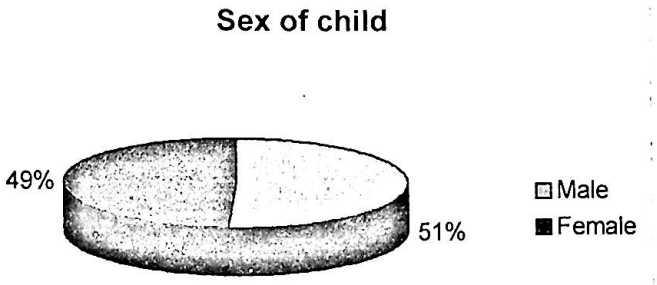
3.3 Demographic Characteristics

The infant and child mortality is not only affected by socioeconomic but also affected by demographic factors. Changes are mortality level can be attributed to demographic factors. The frequency distributions of selected demographic variables are discussed given below.

Table 3.2 Percentage of children by selected demographic characteristics BDHS-2004, Bangladesh.

Background Characteristics	Number	Percent (%)
Child Age		
0 years	1273	18.4
1 years	1243	18.0
2 years	1316	19.1
3 years	1306	18.9
4 years	1237	17.9
Missing	533	7.7
Child is alive		
No	484	7.0
Yes	6424	93.0
Sex of child		
Male	3512	50.8
Female	3396	49.2
Birth order number		
1	2049	29.7
2	1729	25.0
3	1217	17.6
4	757	11.0
5	445	6.4
6	298	4.3
7+	413	6.0
Breast Feeding		
0 Month	286	4.1
1-11 Month	1559	22.6
12-17 Month	993	14.4
18-23 Month	946	13.7
24+ Month	3124	45.2
Total	6908	100.0

Figure-3.3 Percentage of sex of child



For studies on the determinants of infant and child mortality age is few to be important factor, which is responsible for morbidity. A disease is an outcome of a contribution of socio-cultural, personal, biological and medical factors. These factors are observed to have considerable impact on the level of morbidity. From table 3.2 shows that 18.4 percent children age are 0 years, 18.0 percent children are 1 years, 19.1 percent are 2 years, 18.9 percent are 3 years and 17.9 percent children are 4 years.

From table we see 7.0 percent child is not alive and alive is 93.3 percent. The distribution by sex of the child indicates that boys are higher in number than girls but different is small. Number of male child is 3512 i.e. 50.8 percent where the percentage of female children is 3396 i.e. the number of female child is 49.2 %. The distribution relating to birth order indicates that large proportions 29.7 % of the children are of the first birth order. The proportions of children of second and third order are also very high 25.0% and 17.6% respectively. Among other groups nearly 11.0% to have birth order four and 6.4%, 4.3% and 6.0 claimed to have five, six, and seven respectively.

From table 3.2 it has been found that mother breastfeed their children 1-11 months is 22.6%, 12-17 months breast-feed is 14.4; similarly 18-23 and 24+ are 13.7% and 45.2% respectively and others 4.1% child cannot get any breastfeed from their mothers.

3.4 Sanitation, Hygienic and Household Characteristics

Table 3.3 and 3.4 shows the percentage of children by selected sanitation, hygienic and household characteristics such as sources of drinking water, sanitary facility, toilet facility, listen to radio, watches TV in every week. These are also socioeconomic characteristics and very important indicators of the health condition of children.

Children living in households getting their drinking water from a piped sources (either inside or outside the compound) have much lower mortality risk than children getting their water from tube wells or other sources. Though the risk for families getting their water from tube well are very similar to the risk for families getting their water from other sources. Sources of water refers to the situation at the time of the survey, so trends cannot be interpreted rigorously, but mortality decline in each age range is lowest for households getting their drinking water from a tube well.

Table 3.3 Percentage of children by selected Sanitation and Hygienic characteristics BDHS-2004.

Bacground Characteristics	Number	Percent
Source of drinking water		
Piped inside dwelling	366	5.3
Piped outside dwelling	139	2.0
Tube well	5831	84.4
Shallow tube well	29	.4
Deet tube well	248	3.6
Surface well/other well	80	1.2
Pond/tank/lake	144	2.1
River/stream	60	.9
Other	2	.0
Missing	9	.1
Type of toilet facility		
Septic tank/modern toilet	748	10.8
Water sealed/slab latrine	1066	15.4
Pit latrine	2255	32.6
Open latrine	1898	27.5
Hanging latrine	156	2.3
No facility/bush/field	777	11.2
Missing	8	.1
Total	6908	100.0

The people of Bangladesh usually use tube-well, supply water, river, tank and pond as their sources of water for their household work. Tube-well is considered to give the purified water in a rural area of Bangladesh but in urban areas, pipe water is regarded as purified water. Since our study is rural based (70.0%) so our table result indicates tube-well or piped are the major sources of drinking water. About 84.4% children obtain drinking water from tube-well and 5.3 % children obtain drinking water from piped inside dwelling and the low percent (about 10 %) depends on other sources of water including piped outside dwelling, surface well, pond, tank, lake, river and other places.

Infant and child mortality is also affected by sanitary facility. Better sanitary facilities reduce mortality. The better sanitation is a primary health care practice, which can easily be achieved without much financial improvement. Children who use well latrine assumed to have lower mortality level than the children who do not use. It is found that most of the part 32.6% of the children has pit latrine. Others toilet facilities are septic tank/modern, water sealed/slab latrine, open latrine, hanging latrine and no facility with respective percentage is 10.8, 15.4, 27.5, 2.3 and 11.2 respectively.

Table 3.4 Percentage of the children by selected household characteristics, BDHS- 2004.

Background Characteristics	Number	Percent (%)
Main roof material		
Katcha (bamboo/thatch)	651	9.4
Tin	5607	81.2
Cement/concrete/tiled	633	9.2
OTHER	5	.1
Missing	12	.2
Main wall material		
Jute/Bamboo/mud (katcha)	3232	46.8
Wood	154	2.2
Brick/cement	1372	19.9
Tin	2134	30.9
OTHER	4	.1
Missing	12	.2
Main floor material		
Earth/Bamboo (katcha)	5648	81.8
Wood	40	.6
Cement/concrete	1200	17.4
OTHER	1	.0
Missing	19	.3
Has television		
No	5203	75.3
Yes	1695	24.5
Missing	10	.1
Has radio		
No	4677	67.7
Yes	2223	32.2
Missing	8	.1

Houses of our country are made from different things or materials. The people build their house with whatever things they can get easily. Most of the village's people build such a house one needs the sheets of corrugated iron wood, nails and sewer's. In towns and cities people build houses of corrugated iron sheet or bricks. In order to build a brick house one needs bricks, cement, concrete and iron roods. In Chittagong hill tracts people build house of bamboo, wood and stone. In low-lying areas some people build their house on platforms to protect themselves from floods. Some people also live in tents and in boats too. From table 3.4 shows that in roofing materials 81.2% are made by tin, 9.4% are made by katcha (bamboo/thatch) earth, 9.2% are made by cement/concrete/tiled and only 0.1% are others.

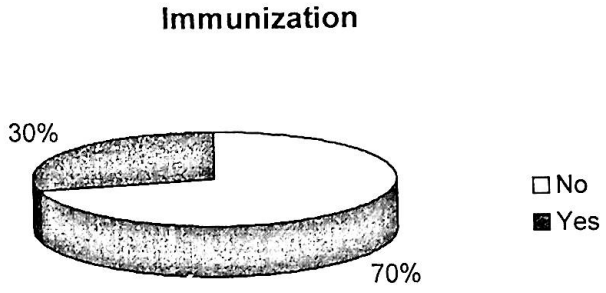
In case of wall materials the majority 46.8% are the Jute/Bamboo/mud (or natural wall), 30.9% are made by tin, 19.9% are brick/cement and only 2.2% are wood and rest others or missing wall. And in floor material 81.8% are made by earth or bamboo, 17.4% are made by cement or concrete and only 0.6% is made by wood. It is important to recognize that income can only affect child morbidity through other variables. Then we may say that the ownership of various types of items such as radio, television, agricultural level etc. expressed in terms of ownership of wealth. Wealth is closely related to income, of curse past income has been diverted to produce wealth and wealth may in turn, be used to produce current income. As a result the possession of durable goods is another indicator of a household of children's socioeconomic level, through affect on child health. From table 3.4 indicate that possession of durable consumer goods among household or children are not very common because of hardship.

From table 3.4, we see that 75.3% mothers have no TV and only 24.5% has TV that is very low. Again, only 32.2 % mother's has radio and 67.7% has no radio.

Table-3.5 Percentage of the children selected household health characteristics, BDHS- 2004.

Bacground Characteristics	Number	Percent (%)
Received BCG		
No	627	9.1
Vacc. date on card	2422	35.1
Reported by mother	3351	48.5
Vacc. marked on card	23	.3
Missing System	485	7.0
Received DPT 3		
No	1667	24.1
Vacc. date on card	1917	27.8
Reported by mother	2824	40.9
Vacc. marked on card	16	.2
Missing	484	7.0
Received POLIO		
No	1556	22.5
Vacc. date on card	1904	27.6
Reported by mother	2936	42.5
Vacc. marked on card	27	.4
DK	1	.0
Missing	484	7.0
Received MEASLE		
No	2138	30.9
Vacc. date on card	1479	21.4
Reported by mother	2772	40.1
Vacc. marked on card	26	.4
DK	8	.1
Missing	1	.0
System	484	7.0
Services received in temporary health clinic (Immunization)		
No	4871	70.5
Yes	2037	29.5
Total	6908	100.0

Figure-3.4 Percentage of taking immunization



From table 3.5 we found that 9.1% children have not been taken BCG, 35.1% children take vaccine date on card and 48.6% children's mother reported. Among table-3.5 we are seen 24.1% children not received DPT 3 that is large number of children 27.8% and 40.9% children are vaccine dated on card and reported by mother respectively. The received POLIO and received MEALSLE are given in table. We see from table the services received in temporary health clinic (Immunization) only 29.5% children received and 70.5% are not going there.

CHAPTER FOUR

DIFFERENTTIALS OF INFANT AND CHILD MORTALITY

CHAPTER FOUR

DIFFERENTTIALS OF INFANT AND CHILD MORTALITY

4.1 Introduction

For a given variable of research interest, mortality data analysis is primarily conducted through bivariate analysis. When the data are considerably numerous, they may be summarized by using a two-way table. For each variable, a suitable number of classes is taken. In this analysis, the infant mortality rate and its differential, neonatal and post-neonatal mortality rates are calculated for each category of the variable. Normally, for all women in category k. we simply sum the number of dead infants, sum the number of children born to these mothers and compute the ratio of the two. These ratios are termed as infant mortality rates. Ratios for different categories are compared to each other. Bivariate analysis is particularly important to check for the mortality differentials with respect to the different levels of each of the selected independent variables. As was noted earlier, studies in mortality differentials are useful in at least three ways. First, such studies provide information for assessing inequality among people with respect to longevity and health. Second, data on mortality differentials help to identify those underprivileged segments of population who experience high mortality levels. Finally, studies on mortality differentials improve our understanding of determinants of mortality and their interrelationships (United Nations, 1985).

Infant and child mortality are very sensitive factors to assess overall health situation of any society. They may vary between different socio-economic, demographic and sanitation/ household characteristics. This variation may be employed in explaining differentials in over mortality, in deciding priorities for child health action, in designing intervention programs and in assessment and monitoring of child health problems and programs. Socio-economic factors have strong influence on mortality levels. Mortality is strongly related with development level of the country. Although infant and child mortality depends on child and mother's demographic characteristics, socio-economic and environmental factors also have strong influence on their mortality. A few public

health program such as immunization, better water supplies and improve sanitation can reduce mortality drastically. Using data from BDHS-2004 survey sections delineates the socio-economic and demographic differentials in infant and child mortality levels of the country.

4.2 Socio-economic Differentials

Socio-economic condition of people in the community has strong impact on mortality. These factors affect mortality through the level of nutrition, sanitation and pure water supply. The socio-economic condition of the people does create differential in access of these basic items. It is observed by the experts of international organization, is that the high mortality of developing countries is associated with, among other factors, poverty, ignorance, malnutrition, inadequate quality of housing, lack of personal and environmental hygiene and low level of immunity. It is a circular relation that socio-economic and demographic structure of the country. This section will evaluate the differentials in mortality by various socio-economic elements.

Most of the developing countries, several socio-economic elements have been identified to study the infant and child mortality differentials. Factors like as education, occupation, income, housing condition, household assets, sanitation, sources of drinking water etc. are important predictors of infant and child mortality differentials. In this section, we examine the mortality differentials due to socio-economic characteristics.

All the results are shown in tables or figures are produced by using Computer Software SPSS (Statistical Package for the Social Sciences) version 10.0 for windows program and Microsoft Excel packages program.

4.2.1 Infant and child mortality by type of place of residence

In Bangladesh 76.9 percent people live in rural areas (Bangladesh population census 2001). Differentials mortality by urban and rural residence as an important phenomenon widely observed in the developing countries (Mitra, 1979; Ruticka, 1983). Urban-rural residence in socio-economic status, access to health care, and environmental conditions may give rise to mortality variations by residence.

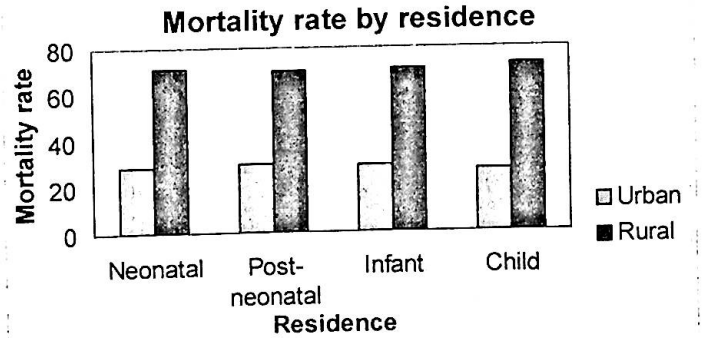
With the progress in science and medicine, with the developments in the field of public health and education, and also with the improvements in culture and behavior, infant and child mortality rates have declined considerably both in urban and rural areas. However, it is true that as a result of these changes, mortality situation has improved comparatively more in urban areas than in rural areas.

For Bangladesh, better survival for urban children was also observed in many studies. Using the data from the Bangladesh Fertility Survey (BFS), Mojumder and Islam (1993) also indicated higher child mortality levels in rural than in the urban areas in Bangladesh.

Table 4.1 Neonatal, Post-neonatal, Infant and Child mortality rate by residence, BDHS 2004.

	Neonatal	Post-neonatal	Infant	Child
Residence				
Urban	79(28.8%)	44(29.9%)	123(29.2%)	17(27.0%)
Rural	195(71.2%)	103(70.1%)	298(70.8%)	46(73.0%)
Total	274	147	421	63

Figure-4.1 Infant and child mortality rate by place of residence



From table 4.1 we see the infant and child mortality for urban and rural areas are presented that the mortality rates were higher in rural than urban areas. Neonatal mortality in urban areas is 28.8 % where in rural areas it is so high 71.2 %. Post-neonatal mortality in urban areas is 29.9 %, where in rural areas is 70.1%. So in total infant mortality are 123 (29.2 %) in urban and 298 (70.8 %) in rural areas. And finally child mortality in urban areas is 27.0 % and rural areas are 73.0 %.

4.2.2 Infant and child mortality by mother's education level

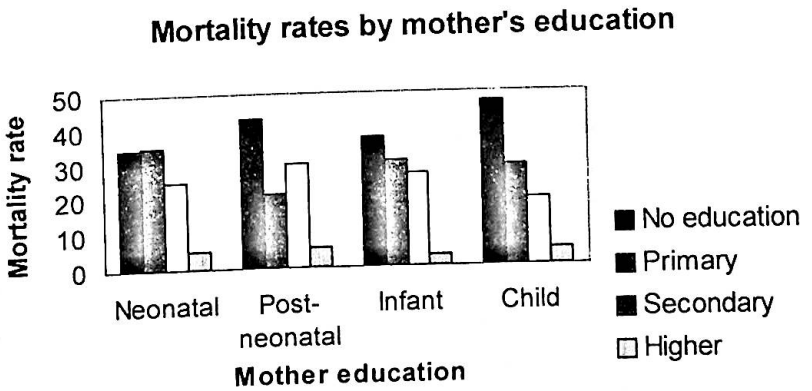
Among the socio-economic factors, education is the most influential factor in differentiating the infant and child mortality rates. Social scientists very often use level of education as an index for socio-economic status.

Mother's education is to some extent a reflection of the standard of living of the family. It is one of the important factors associated with declining the level of infant and child mortality. Mother's education seems to be directly related with the life of a child (Caldwell, 1978). Though mother's education is likely to be related to father's education, family income, housing etc. There is no doubt that an educated mother can provide better care of child than the mother with no education or a lower level of education. Education makes a mother socially advanced, free from tradition and changes her pattern of behavior and attitude (Dandekar, 1967). Educated mothers have better knowledge of hygiene and give adequate feeding to the child. Thus mother's education is not only considered as an index of socio-economic conditions but also considered to be an important determinant of infant and child mortality.

Table 4.2 Neonatal, Post-neonatal, Infant and Child mortality rate by Mother's Education level, BDHS-2004.

Mother's Education	Neonatal	Post-neonatal	Infant	Child
No education	95 (34.7%)	63 (42.9%)	158(37.5%)	30 (47.6%)
Primary	96 (35.0%)	31 (21.1%)	127(30.2%)	18 (28.6%)
Secondary	69 (25.2%)	44 (29.9%)	113(26.4%)	12 (19.0%)
Higher	14 (5.1%)	9 (6.1%)	13 (3.0%)	3 (4.8%)
Total	274	147	421	63

Figure-4.2 Infant and child mortality rate by mother's education level



From the table 4.2 shows the different mortality according to the mother education level. In these table four level of the education of mother have been considered: Mother's with no education, primary education, secondary education and higher. At all four mortality levels, we notice markedly lower mortality rates with increasing education. It is observed that infant mortality rate is 37.5 % in mother with no education, 30.2 % in mother with primary education, 26.4 % with secondary and only 3.0 % with higher education. In the same way child mortality also declined with the increase of mother education. Similarly, children mortality in same way i.e. 47.6 %, 28.6 %, 19.0 % and 4.8 % is no education, primary, secondary and higher respectively.

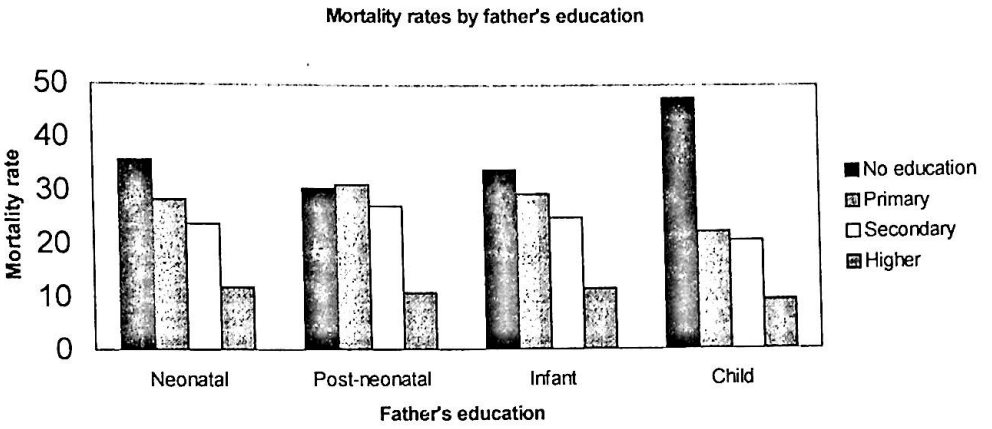
4.2.3 Infant and child mortality by Father's education and Father's occupation

Father's education is very important factor in a family. Because of he is head of the family. Occupation shows a considerable influence in the variation of mortality level. Father's occupation is an important predictor on infant and child mortality differentials. A person's whose occupation in the reflection of "The physical environment, his social milieu, his educational background, his income and his life style". For this reason, occupation is taken as an index of socio-economic status. Father's occupation determines the economic status, nutrition and housing condition, health care facilities, clothing etc. of a family. In other wards, it is related with health and life of a child in a family. So, father's occupation may be counted as an important determinant of infant and child mortality in a population.

Table-4.3 Neonatal, Post-neonatal, Infant and Child Mortality rate by Father's Education and Occupation level, BDHS 2004.

	Neonatal	Post-neonatal	Infant	Child
Father's education level				
No education	98 (35.8%)	45 (30.6%)	143(34.0%)	30(47.6%)
Primary	78 (28.5%)	46 (31.3%)	124(29.5%)	14 (22.2%)
Secondary	65 (23.7%)	40 (27.2%)	105(24.9%)	13 (20.6%)
Higher	33 (12.0%)	16 (10.9%)	49(11.6%)	6 (9.5%)
Father's Occupation				
Agriculture	78 (28.5%)	37 (25.2%)	115(27.3%)	25 (39.7%)
Labor	112 (40.9%)	70 (47.6%)	182(43.2%)	18 (28.6%)
Prof	10(3.6%)	4(2.7%)	14(3.3%)	2(3.2%)
Others	74(27.0%)	36 (24.5%)	110 (26.1%)	18 (28.6%)
Total	274	147	421	63

Figure-4.3 Infant and child mortality rate by father's education



In our societies father is the main income earner and decision-maker of a family. So father's education plays an important role in earning income, which on turn assures nutrition, clothing and housing etc. In other words, there may be direct relationship between father's education and access to child health facilities. The study results show that neonatal mortality rate is 35.8%, 28.5% 23.7% and 12.0% for father with no education, primary, secondary and higher education respectively. Similarly, for infant mortality rate is 34.0%, 29.5%, 24.9% and 11.6% for father with no education, primary, secondary and higher education respectively. Also child mortality rates are 47.6%, 22.2%, 20.6% and 9.5% for the same category respectively. However one may think that education of household head does not contribute in determinants of the neonatal mortality, as we know that mortality due to mother's biological cases. But for the infant and child, the expected inverse relationship between the mortality levels and education is clear.

Also, table-4.3 presents the infant and child mortality rates by father's occupation. It appears from the result that infant and child mortality rate is lower for the professional father that is 3.3% and 3.2% but is greater for laborer father that is 43.2% and 28.6. For agriculture father, infant and child mortality rate is also high which is 27.3% and 39.7%.

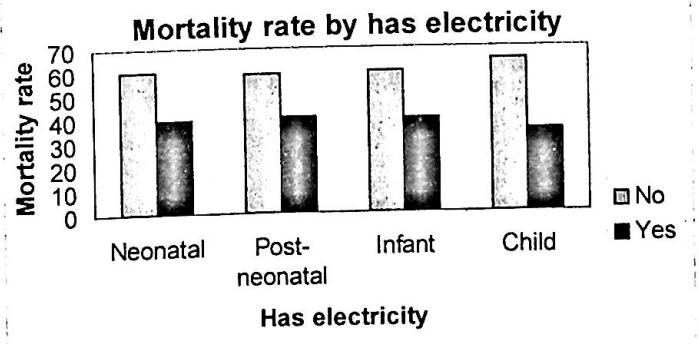
4.2.4 Infant and child mortality rate by socio-economic characteristics, BDHS-2004.

The variation in mortality situation among region exists almost in every country in the world. The regional difference occurs primarily due to differential exposure of the individuals to the amenities available for prevention and treatment. In Bangladesh a slight regional differences does exist a mortality rates. The divisions are somewhat different items of their level of socio-economic development. Variations in infant and child mortality among the six administrative divisions are found to be insignificant.

Table-4.4 Neonatal, Post-neonatal, Infant and Child mortality rate by Socio-economic characteristics, BDHS 2004.

Socio-economic Characteristics	Neonatal	Post-neonatal	Infant	Child
Region / Division				
Barisal	29(10.6%)	19(12.9%)	48(11.4%)	5(7.9%)
Chittagong	64 (23.4%)	33 (22.4%)	97(23.0%)	12 (19.0%)
Dhaka	59 (21.5%)	31 (21.1%)	90(21.4%)	11 (17.5%)
Khulna	39 (14.2%)	18 (12.2%)	57(13.5%)	9 (14.3%)
Rajshahi	53 (19.3%)	27 (18.4%)	80(19.0%)	22 (34.9%)
Sylhet	30 (10.9%)	19 (12.9%)	49(11.7%)	4 (6.3%)
Has electricity				
No	166 (60.4%)	87 (59.2%)	253(60.1%)	41(65.1%)
Yes	108 (39.6%)	60 (40.8%)	168(39.9%)	22 (34.9%)
Total	274	147	421	63

Figure-4.4 Infant and Child mortality rate by has electricity



From table 4.4 we found that in chittagong division, neonatal, post-neonatal and infant mortality is (23.4%, 22.4%, 23.0% respectively) the highest of all other divisions and lowest neonatal and infant mortality is Barisal division is 10.6% and 11.4% respectively and khulna division post-neonatal mortality is12.2%. The child mortality is the highest division is Rajshahi (34.9%) and lowest is Sylhet division (6.3).

Electricity is the essential factor of our present world. Households having electricity are in general, indicates of higher socioeconomic status. Electrified household is associated with lower infant and child mortality if electrification encourages the development of antinatalist sentiment in traditional societies. In our study, the results indicated that better household sanitation and electricity are associated with lower childhood mortality. From table-4.4 represents the infant and child mortality rate by two categories: household electrification and non-electrification status. Here the neonatal mortality rate is 36.9% for which family have electricity and 60.4% for families without electricity. In the child mortality we see that the rate is 65.1% for which family with no electricity and compared to only 34.9% for household with electricity.

4.3 Demographic Characteristics

In the literature of cross-nation studies, four demographic factors are found to be important predictors of child survival. These are: sex of child, age of mother at the time of birth and multiplicity of birth. The predictors are mot limited to these only. The present study going on to investigate the infant and child mortality differentials by the following demographic factors, sex of child, birth order, age of mother at birth of child and breast-feeding.

4.3.1 Infant and child mortality by sex

Differentials between sexes in mortality are due to biological and social factors. Mortality data, complied by United Nation, reveal that in almost all countries male has higher mortality than females. In contrast to the above result, many investigations showed that females had higher mortality than males at most ages except during the first month of life in Bangladesh observed higher female than male mortality rates in these investigations were explained by reasons both social medical in nature. Socially women in Bangladesh enjoy lower status than men.

Daughters in this society traditionally cannot inherit an equal share of the father's property.

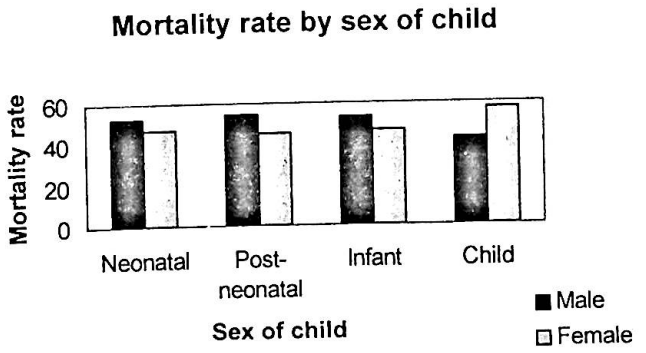
Contrary to the above findings, Mitra (1979) indicated a consistent pattern of sex differentials in child mortality, according to which female children are exposed to have lower risk of death than male children both in rural and urban areas. Infant and child mortality, that is, mortality during the first year after birth is higher, for male than for females in most available death for different countries and different historical properties.

In particular societies like Bangladesh mortality levels are generally favorable for male. Preferences for sons over daughter are seen to be stronger. Sons always get better care in terms of food, clothing and medical care than female children. These differentials remain unchanged throughout their life.

Table-4.5 Neonatal, Post-neonatal, Infant and Child mortality rate by Sex of Child, BDHS-2004.

	Neonatal	Post-neonatal	Infant	Child
Sex of child				
Male	144 (52.6%)	80 (54.4%)	224(53.2%)	27 (42.9%)
Female	130 (47.4%)	67 (45.6%)	197(46.8%)	36 (57.1%)
Total	274	147	421	63

Figure-4.5 Infant and child mortality rate by sex of child



This expectation seems to be true when looking at table-4.5. In the table we see that male mortality is higher than female mortality except child mortality. Neonatal mortality for male child is 52.6% where it is 47.4% for female child. Again child mortality is 42.9% for male children and 57.1% for female children.

4.3.2 Infant and child mortality rate by demographic characteristics

Many studies have should that multiple birth have many times higher infant and child mortality rate than single birth, but this difference declines sharply as the age of children increases. Babies of multiple births usually become physically week when they are born. Breast milk is normally no sufficient for feeding more than one baby at their early ages. Sometimes parents do not have money to buy external food substitute. Besides taking care of more than one baby itself is a big task. The compound effect of several factors result in high mortality of multiples births.

Table 4.6 Neonatal, Post-neonatal, Infant and Child mortality rate by Demographic characteristics, BDHS-2004.

	Neonatal	Post-neonatal	Infant	Child
Birth order				
1-2	138(50.4%)	76(51.7%)	214(50.8%)	33(52.4%)
3-4	85 (31.0%)	40 (27.2%)	125(29.7%)	16 (25.4%)
5-6	34 (12.4%)	15 (10.2%)	49(11.6%)	10 (15.9%)
7+	17 (6.2%)	16 (10.9%)	33(7.9%)	4 (6.3%)
Age of Mother				
<20	65 (23.7%)	30 (20.4%)	95(22.5%)	12 (19.0%)
20-34	180 (65.7%)	96 (65.3%)	276(65.6%)	46 (73.0%)
>=35	29 (10.6%)	21 (14.3%)	50(11.9%)	5 (7.9%)
Month of Breastfeeding				
0	161(58.8%)	14(9.5%)	175(41.6%)	2 (3.2%)
1-12	0	129 (87.8%)	129(30.6%)	17 (27.0%)
13+	0	0	0	43 (68.3%)
Never Breastfeeding	113 (41.2%)	4 (2.7%)	117(27.8%)	1(1.6%)
Total	274	147	421	63

In table 4.6 we found that the neonatal, post-neonatal, infant and child mortality rate. Hence we show that if the birth order is 1-2 then infant mortality is so high it is 50.8% and child mortality is 52.4%. When birth order is 3-4 then infant and child mortality rate is 29.7%, 25.4%, when 5-6 then 11.6%, and 15.9% and in the

last when birth order is 7 and up (i.e. 7+) then infant and child mortality is 7.9% and 6.3% respectively.

Many studies in Bangladesh as well as in other developing and developed countries have shown that early age mortality, specially during infancy varies with mother's age at birth. Mother's age at the time of confinement has clear relation with probability of dying for children. For neonatal and post-neonatal period, the probability of dying shows a U-shape relation with age of mother. The shape changes to J-shaped as the children increases. However it appears that mother's age is much influential factor on mortality differential for children under one year of age but not over one year of age. From the above table it is shown that infant mortality is so high i.e. 65.6% when mother's age group is 20-34 and in the same age group child mortality is 73.0%. For <20 and >=35 age groups of mother infant and child mortality is 22.5% & 11.9% and 19.0% & 7.9% respectively.

4.4 Sanitation, Hygienic and Household characteristics

Here we will describe the neonatal, post-neonatal, infant and child mortality rate by selected sanitation, hygienic and household characteristics such as sources of drinking water, sanitation facility, toilet facility, listen/watches radio/ TV in every week main floor/wall/roof material. These are also socio-economic characteristics and important indicators of the health condition of children.

4.4.1 Infant and child mortality by sources of drinking water

A source of drinking water is an influential indicator in the variation of infant and child mortality. One may except that as the improvement of the resources of drinking water increases the infant and child mortality is also decreases. The present study going on to investigate whether such relationship exists or not.

Table 4.7 Neonatal, Post-neonatal, Infant and Child mortality rate by sources of drinking water, BDHS-2004.

Sources of drinking water	Neonatal	Post-neonatal	Infant	Child
Tube-well	225(82.1%)	123 (83.7%)	348 (82.7%)	58(92.1%)
Pipe and others	49 (17.9%)	24 (16.3%)	73 (17.3%)	5 (7.9%)
Total	274	147	421	63

From table 4.7 we found that the infant and child mortality rate for different sources of drinking water. It is clear from the table infant mortality is higher (82.7%) for the respondents who used tube-well water. Comparatively respondents whose sources of drinking water is pipe their mortality rate is lower than those using other (i.e. pond, river, stream and other) sources of drinking water.

4.4.2 Neonatal, Post-neonatal, Infant and Child mortality rate by Sanitary Facility.

Sanitation is the most important determinant of infant and child mortality. Use of sanitary latrine is supposed to be health related practice and it is expected that household with better sanitation facility will have lower infant and child mortality. This is one of the components of primary health care practice, which can easily be achieved without any financial improvement. People who use sanitary latrine have lower death than people who do not use.

Table-4.8 Neonatal, Post-neonatal, Infant and Child mortality rate by Sanitary Facility, BDHS 2004.

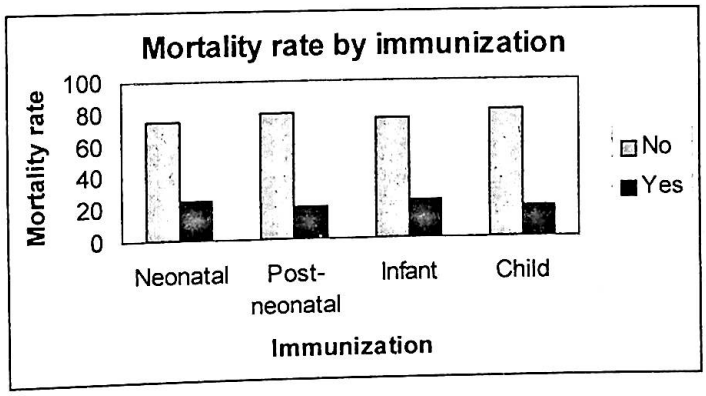
	Neonatal	Post-neonatal	Infant	Child
Toilet/Sanitary Facility				
Septic tank/ modern toilet	32 (11.7%)	18 (12.2%)	50(11.9%)	3 (4.8%)
Slab/Pit latrine	124 (45.3%)	77 (52.4%)	201(47.7%)	31(49.2%)
Others	118 (43.1%)	52 (35.4%)	170(40.4%)	29(46.0%)
Total	274	147	421	63

In Bangladesh, as in many other developing countries, children from high socio-economic background experience lower mortality than those from low socio-economic environments. It is generally expected that household with better facilities will have lower infant mortality. This expectation seems to be true when looking at table-4.8. The table presents that household having better sanitary latrines has considerably lower infant and child mortality compared to those without such facilities, i.e. both infant and child mortality increases when the sanitary condition diseases.

Table-4.9 Neonatal, Post-neonatal, Infant and Child mortality rate by hygienic and household characteristics, BDHS-2004.

	Neonatal	Post-neonatal	Infant	Child
Main Wall Material				
Natural Wali	117 (42.7%)	71 (48.3%)	188(44.7%)	34 (54.0%)
Brick/Cement	54 (19.7%)	27 (18.4%)	81(19.2%)	9 (14.3%)
Tin/Others	103 (37.6%)	49 (33.3%)	152(36.1%)	20 (31.7%)
Main floor materials				
Cement/Concrete	49 (17.9%)	29 (19.7%)	78(18.53%)	6(9.5%)
Earth/Bamboo/Others	225 (82.1%)	118 (80.3%)	343(81.47%)	57 (90.5%)
Main roof material				
Katcha (bamboo/thatch)	24 (8.8%)	24(16.3%)	48(11.46%)	8 (12.7%)
Tin	219 (80.5%)	113 (76.9%)	332(79.24%)	52 (82.5%)
Cement/concrete/tiled	29 (10.7%)	10 (6.8%)	39(9.31%)	3 (4.8%)
Watching TV every week				
No	207 (75.5%)	114 (77.6%)	321(76.2%)	48(76.2%)
Yes	67 (24.5%)	33 (22.4%)	100(23.8%)	15 (23.8%)
Listen to radio every week				
No	198(72.2%)	94(63.9%	192(69.3%)	41(65.1%)
Yes	76(27.8%)	53(36.1%)	129(30.7%)	22(34.9%)
Immunization				
No	204 (74.5%)	117(79.6%)	321(76.2%)	51 (81.0%)
Yes	70 (25.5%)	30 (20.4%)	100(23.8%)	12 (19.0%)
Total	274	147	421	63

Figure-4.6 Infant and child mortality rate by immunization



The materials of wall divided into three categories: brick or cement, natural wall and tin or others. From table-4.9 the neonatal, post- neonatal, infant and child mortality were higher among those children lived in the house constructed by natural wall. The mortality rates are 42.7%, 48.3%, 44.7% and 54.0%. The materials of floor are categorized into two categories: cement or concrete and earth or bamboo or others. From tables we see that the mortality differentials with

respect to these levels of materials of floor. The neonatal, post-neonatal, infant and child mortality rates were highest among those children who lived in the house in the floor of that had been constructed by earth/ bamboo/other. The materials of roof are divided into three categories: bamboo or thatch, tin and cement or concrete or tiled. The table shows that neonatal, post-neonatal, infant and child mortality were higher among those children who lived in the house the roof had been constructed by tin materials.

TV is at present are of the most powerful media. It plays a very strong role for mass media. It broadcasts some programs concerning public health awareness. If even an illiterate man watches that health-based programs, it is a must that he will realize the importance of role of health and cleanliness. When a household watches to TV at least once a week achieves some degree of awareness relating to health and various kinds of diseases. This awareness leads a family to take some measures that are beneficial for health. In such a family the children get some health facility, which protect them from various diseases and decreases the rate of infant and child mortality. Table-4.9 represents that neonatal mortality rate is 24.5% lower for the people who watches TV once a week than those who did not watches 75.5%. Infant and child mortality is low (76.2% and 76.2) for the person who watches TV (23.8% and 23.8%)every week respectively.

Radio is another very introduced mass media. In present times it become an instrument of mere a few taka. Even the poorest quarter of the population is able to manage a radio for its simplest enjoyment. When a household listen to radio once a week gets many information concerning health hence achieve some quality of health knowledge. Acquiring this knowledge a family can take some measures for the benefit of its children's health. In such a family we can assume that the rate of infant and child mortality reduces to a great extent. It appears from the results that infant and child mortality rate is lower for the people who listen to radio once a week than those who did not listen.

CHAPTER FIVE

INFANT AND CHILD MORTALITY:

Association and Logistic Regression

CHAPTER FIVE

INFANT AND CHILD MORTALITY:
Association and Logistic Regression

5.1 Introduction

Infant and child mortality level of a country depends on the socio-economic situation and demographic characteristics of its people. It is known that the death is preceded by a shorter or longer illness- a process that is mostly biological in nature. It is further known that infectious diseases and malnutrition are the main causes of high under five mortality in the poor nations of the world and both of them are consequences of biosocial interactions.

Moseley and Chan have developed a theoretical framework in which they treat available health care and nutritional status of mothers and children as proximate variables, through which social, economic and demographic factors affect child mortality. An infant's survival during the first month of life has been found to be closely associated with mother's health and nutritional status during pregnancy. Galway et al. showed that malnourished mother's tend to produce infant with low birth weights who have a higher than average risk of infant mortality.

On the other exogenous health-care variable, which Moseley and Chan characterize as environmental contamination, adversely affect child survival. They include mother's exposure to postpartum infections and family's lack of access to safe drinking water, sanitary toilets or disease prevention measure such as inoculation programs. The introduction of sanitary toilet facilities has been found to reduce infant mortality in the Philippines and in Malaysia. Improved water supply and sanitation proved to be significant factors in the decline of infant mortality in Malaysia among mother who were not breast-feeding.

The risk of dying among the malnourished children is considerably higher than among the better-nourished children. Measles, malaria, diarrhea and other communicable diseases are prominent killers of infant in developing countries where malnutrition is widespread.

Demographic factors such as a child's birth order and sex, the mother's age, the duration of the preceding and following birth intervals and whether the mother has prior experience of child loss are known to affect child survival in many

population. Gubhaju (1989) showed that first-born children of very young women are at especial risk of infant mortality because of mother physical immunity. A mother's experience of losing a child is strongly associated with her greater risk of subsequent infant and child mortality. Galway et. al. indicated that a higher risk of infant and child mortality was also observed among older women, especially after age 35. Social and economic factors have been found to be affecting a child's changes of survival in many populations. This includes ethnicity, the family's socio-economic status, the mother's work pattern, her education, the parent's sex preference and their place of residence. Higher family income can generally be taken as an indicator of better nutrition and greater access to health facilities, which improved an infant's chances of survival.

The bivariate analysis just described are sometimes difficult to interpret because variable may cover in way which make them appear all to be related to child mortality differentials. To examine the relative of all the independent variables simultaneously, we need to apply some multivariate techniques. We shall use multivariate logistic regression technique as well as Factor Analysis also have been employed in the analysis to identified the contribution of the independent variables on child and infant mortality.

Multivariate analysis can go some way towards identifying those variables, which are truly related to child mortality differentials. Some characteristics such variable includes mother's education, father's education, partner's occupation, electricity, watches television every week and listen to radio every week. Certain other characteristics are treat as demographic, sanitation, hygienic and household characteristics, example of such variables are sources of drinking water, sanitary facilities, main floor material, main wall material, main roof material, current age of respondent, month of breast-feeding and immunization.

5.2 Determinants of mortality

The present chapter is intended to investigate the effect of selected socio-economic and demographic factors. Here we shall try to study the variables, which affects infant and child mortality as well as neonatal, post-neonatal mortality. To identify these variables we apply logistic regression analysis technique. In the following subsection we have describe the method of logistic regression analysis. As we know in multivariate approach, the unit of analysis is the individual child and the dependent variable is a dichotomy denoting whether or not the child survived through the age interval in question (month 0, months 1-

11, infant and child). The analysis indicates that the probability of survival through infancy varies according to characteristics of the child, its parents and some other related factor. The variables are associated with each other. For example, higher order births occur to older mothers, little educated household members are likely to be poorly occupied, they are likely to use unhygienic water and latrine and so forth. This association makes the mortality differentials difficult to interpret.

Main effect logistic regression models were used to determine the relative effects of demographic, socio-economic and health practice related characteristics neonatal, as well as the infant and child mortality. Regression analysis was performed on socio-economic and demographic, sanitation, hygienic, household characteristics separately. In our study different models have been considered with four different dependent variables for socio-economic and demographic, sanitation, hygienic household characteristics separately.

The considered models and the dependent variables are given below.

For socioeconomic factors

Model 1: 1, if neonatal mortality occurs and 0, if neonatal mortality does not occur.

Model 2: 1, if Post-neonatal mortality occurs and 0, if Post-neonatal mortality does not occur.

Model 3: 1, if infant mortality occurs in infertile period of life and 0, if infant mortality does not occur in infertile period of life.

Model 4: 1, if child mortality occurs between 1 to 4 years of life and 0, if child mortality does not occur between 1 to 4 years of life.

For Demographic, Sanitation, Hygienic and Household Characteristics.

Model 1: 1, if neonatal mortality occurs and 0, if neonatal mortality does not occur.

Model 2: 1, if Post-neonatal mortality occurs and 0, if Post-neonatal mortality does not occur.

Model 3: 1, if mortality occurs in infertile period of life and 0, if mortality does not occur in infertile period of life.

Model 4: 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.

Table 5.2 (a) data coding of socioeconomic variables.

Independent variables	Type	Categories
Residence	Categorical	1= Urban 2= Rural
Division	Categorical	1=Barisal 2=Chittagong 3=Dhaka 4=Khulna 5=Rajshahi 6=Sylhet
Mother's education	Categorical	0=No education 1=Primary 2=Secondary 3=Higher
Father's education	Categorical	0=No education 1=Primary 2=Secondary 3=Higher
Father's occupation	Categorical	1= Agriculture 2= Labor 3= Professional 4= Others

Table 5.2 (b) Data coding of demographic, sanitation, hygienic and household characteristics.

Independent variables	Type	Categories
Sex of child	Categorical	1=Male 2=Female
Birth order of child	Categorical	1= "1-2" 2= "3-4" 3= "5-6" 4= "7+"
Main floor material	Categorical	1=Cement/concrete 2=Earth/Bamboo
Main wall material	Categorical	0=Natural wall 1=Brick/cement 2=Tin/other
Main roof material	Categorical	1=Katcha(Bamboo/thatch) 2=Tin 3=Others (Cement/concrete/tiled)

Continued

Independent variables	Type	Categories
Religion	Categorical	0=Islam 1=Hinduism/others
Age of mother at birth Or (Current age of respondent)	Categorical	1= "<20" 2= "20-34" 3= ">=35"
Months of breast feeding	Categorical	0= "0" 1= "1-12" 2= "13+"
Immunization	Categorical	0=No 1=Yes

The value is used to identify the significant effects to assess the relative importance of the selected variables in the model. The odds ratio has a clear interpretation and is straightforward. An odds ratio of greater than 1.00 suggested as increased likelihood of the event occurring (i.e. mortality), while an odds ratio less than 1.00 indicates a decreased likelihood of the event occurring. The categories with the relative odds of 1.00 represent the reference category for that categorical variable.

In this section table 5.2.1, 5.2.2, 5.2.3 and 5.2.4 represent the estimates of logistic coefficient, standard error of these estimates, Wald chi-square, significance probability and relative odds calculated for each category of the categorical variables. The dependent variables are fitted to the logistic model at a time. Because of the small sample size and as mortality is a rare event, especially for urban areas in Bangladesh. We consider level of significance at 1%, 5% and 10% level for both socio-economic and demographic, sanitation, hygienic and household characteristics.

Infant and child mortality are affected by demographic, sanitation, hygienic and household's characteristics i.e. birth order, the sex of the child and length of interval between births. Child mortality shows differentials mortality by birth order. A mother's poor health and poor nutrition and economic factors may explain the differentials mortality by birth order and may also have neonatal, post-neonatal consequences such as impaired location and render her unable to give adequate care to her children.

Many studies have demonstrated increased mortality risks among children born after short birth intervals. Maternal depletion is often cited as the primary mechanism responsible for the adverse effects of short birth intervals. Women with sort intervals between two pregnancies have insufficient time to restore their nutritional reserves, a situation that is through to adversely affect fetal growth. Competition among siblings is considered a plausible mechanism in the association between birth intervals and child survival. The newborn child has to complete with another young sibling for households resources and mother's care. The situation may have a bearing on nutrition of youngest child. First born children of very young mother's are at risk of dying while infants, because of their mother's physical immaturity. Breast-feeding could potentially be a confounding factor, since it affects both child survival and the length of the birth interval. Children with sort preceding birth intervals are less likely than others birth intervals.

5.2.1 Model 1. Socio-economic, Demographic, Hygienic and Household characteristics of neonatal mortality

Model 1 of logistic regression includes the neonatal mortality as the dependent variable and of the selected socioeconomic, demographic, hygienic and household characteristics are the same as independent variable. According to the fitted model as shown in table 5.2.1, eight independent (or explanatory) variables out of 14 independent variables are statistically significant at 1%, 5% and 10% level of significance. These significant predictors of neonatal mortality are division, father's occupation, birth order, main wall material, main roof material, age of mother at birth, months of breast-feeding and immunization. The other independent variables are statistically insignificant on neonatal mortality.

Table-5.2.1 Logistic regression estimates for the socio-economic, demographic, hygienic and household characteristics with neonatal mortality as the dependent variables in Bangladesh.

Variables & Characteristics	Estimated Coefficients (B)	S.E. of estimates (B)	Wald Chi-squire (Statistic)	Significant (P- value)	Odds ratio
Residence					
Urban	-0.365	0.290	1.588	0.208	0.694
Rural	-	-	-	-	1.000
Division					
Barisal	-0.728	0.271	7.214	0.007*	0.483
Chittagong	-0.462	0.205	5.048	0.025**	0.630
Dhaka	-0.175	0.195	0.805	0.370	0.840
Khulna	-0.391	0.241	2.627	0.105	0.677
Rajshahi	-0.228	0.203	1.265	0.261	0.796
Sylhet	-	-	-	-	1.000
Mother's education					
No education	-	-	-	-	1.000
Primary	-0.155	0.152	1.040	0.308	0.856
Secondary	-0.236	0.184	1.636	0.201	0.790
Higher	-0.249	0.411	0.368	0.544	0.779
Father's education					
No education	-	-	-	-	1.000
Primary	-0.206	0.160	1.657	0.198	0.813
Secondary	0.008	0.174	0.002	0.961	1.009
Higher	-0.556	0.339	2.695	0.101	0.574
Father's occupation					
Agriculture	0.416	0.233	3.186	0.074***	1.515
Labor	0.391	0.204	3.679	0.055***	1.479
Professional	-0.195	0.635	0.095	0.758	0.823
Others	-	-	-	-	1.000
Sex of child					
Male	0.098	0.238	0.168	0.682	1.103
Female	-	-	-	-	1.000
Birth order number					
1-2	-1.234	0.598	4.260	0.039**	0.291
3-4	-0.765	0.465	2.703	0.100***	0.465
5-6	-0.306	0.450	0.462	0.497	0.736
7+	-	-	-	-	1.000
Main floor materials					
Cement/concrete	-0.483	0.546	0.782	0.377	0.617
Earth/Bamboo	-	-	-	-	1.000

Continued

Variables & Characteristics	Estimated Coefficients (B)	S.E. of estimates (B)	Wald Chi-squire (Statistic)	Significant (P- value)	Odds ratio
Main wall material					
Jute/Bamboo/mud	-	-	-	-	1.000
Brick/cement	-0.635	0.288	4.881	0.027**	0.530
Tin/others	0.161	0.537	0.090	0.764	1.175
Main roof Materials					
Bamboo/thatch	0.645	0.348	3.433	0.064***	1.905
Tin	0.466	0.291	2.570	0.109	1.593
Others	-	-	-	-	1.000
Religion					
Islam	-	-	-	-	1.000
Hinduism/Others	0.145	0.231	0.395	0.530	1.156
Age of mother at birth					
<20	0.645	0.348	3.433	0.064***	1.905
20-34	0.466	0.291	2.570	0.109	1.593
>=35	-	-	-	-	1.000
Month of breast feeding					
0	-	-	-	-	1.000
1-12	-11.572	6.279	3.397	0.065***	0.000
13+	-4.081	0.164	617.054	0.000*	0.017
Immunization					
No	-	-	-	-	1.000
Yes	-1.106	0.324	11.638	0.001*	0.331
Constant	3.721	1.049	12.580	0.000	41.310

Infant and child mortality differs across different geographical areas and this may be attributed to variation in climate environmental settings and socio-economic elements. In Bangladesh a slight regional differences does exists in mortality rates. The divisions are somewhat different on the basis of their level of socio-economic development. Table 5.2.1 indicates that the risk of neonatal mortality for Barisal, Chittagong, Dhaka, Khulna and Rajshahi have respectively 0.483, 0.630, 0.840, 0.677 and 0.796 times lower risk than Sylhet division. The other regional variable i.e. urban and rural has no significant effect on neonatal mortality.

Mother's educational statuses also have insignificant effect on neonatal mortality in our given data. It is evident that the risk of neonatal mortality for primary,

secondary and higher level have 0.856, 0.790 and 0.779 times lower than the mother of no education.

Father's education status also has highly effect on neonatal mortality. From the table it is shown that the risk of neonatal mortality for primary and higher level of father have 0.813 and 0.574 times lower than no education and secondary level of father have 1.009 times higher than the father of no education level.

Occupation of father has statistically significant effect on neonatal mortality. Here we see that the risk of neonatal mortality for agriculture and labor occupation have respectively 1.515 and 1.479 times higher than others group. The categories professional have a lower likelihood of occurring neonatal mortality than other. Also see that agriculture and labor are significant. The reason for this difference is that belonging to the family having no occupation is generally undernourished. Consequently, they often fail to supply the necessary energy requirements of the children in the womb. This lead to lower weight of the infant and in turn gives a greater risk of infant mortality.

Sex of child is statistically insignificant on neonatal mortality. The odds coefficient 1.103, which mean that male neonatal mortality are 1.103 times higher to occur than female neonatal mortality. Neonatal mortality for the birth order 1-2, 3-4 and 5-6 have respectively 0.291, 0.465 and 0.736 times lower risk than the birth order 7+. Neonatal mortality of first birth is more likely to die because of lack of hygienic knowledge of mother and non-developed secondary sexual organ affect the mortality. Another reason is that in the case of first birth, mother is generally is experienced. Decreasing location of mother also affect infant mortality.

Main wall material brick/cement has significant effect on neonatal mortality. Here we see that at 5% level wall is significant. The respondent who live in house made and tin/others by is 1.175 times more likely to have children losses in the neonatal period than the respondents whose house is made by tin/others natural wall (Jute/bamboo/mud).

Main roof materials have significant effect on neonatal mortality. The respondent who live in house made by bamboo/thatch and tin are respectively 1.905 and 1.593 times higher risk than others.

Religion has no significant effect on neonatal mortality of Bangladesh. The risks of neonatal mortality for Hinduism/other are 1.156 times higher than religion of Islam.

Age of mother at first birth has significant effect on neonatal mortality. Odds ratio for the age group <20 and 20-34 is 0.656 and 0.828 times lower than >=35 age group. Mothers of breast-feeding also have significant effect for the 1-12 and 13+ months. And the risk of neonatal mortality for this age group lowers than reference group.

The other variables such as floor materials have no significant effect on neonatal mortality.
Immunization is the most important factor for health. We see that immunization have significant effect on neonatal mortality in Bangladesh. In the above table for neonatal mortality are taken immunization 0.331 times that is lower than who are not taken.

5.2.2 Model 2. Socioeconomic, Demographic, Hygienic and Household Characteristics of post-neonatal mortality.

Model 2 of logistic regression includes the post-neonatal mortality as the dependent variable and all of the selected socio-economic related characteristics as the independent variables. According to the fitted model as shown in table 5.2.2, we see that 5 independent (or explanatory) variables out of 14 independent variables are statistically significant at 1%, 5% and 10% level. This significant predictor of post-neonatal mortality is mother's education, birth order number, main roof material, month of breast-feeding and immunization. The other independent variables are statistically insignificant on post-neonatal mortality.

Table-5.2.2 Logistic regression estimates for the socio-economic, demographic, hygienic and household characteristics with post-neonatal mortality as the dependent variables in Bangladesh.

Variables & Characteristics	Estimated Coefficients (B)	S.E. of estimates (B)	Wald Chi-squire (Statistic)	Significant (P-value)	Odds ratio
Residence					
Urban	-0.007	0.217	0.001	0.974	0.993
Rural	-	-	-	-	1.000
Division					
Barisal	-0.577	0.329	3.065	0.080***	0.562
Chittagong	-0.502	0.263	3.634	0.057***	0.605
Dhaka	-0.133	0.247	0.291	0.590	0.875
Khulna	-0.872	0.374	5.445	0.020**	0.418
Rajshahi	-0.606	0.288	4.416	0.036**	0.546
Sylhet	-	-	-	-	1.000
Mother's education					
No education	-	-	-	-	1.000
Primary	-0.412	0.216	3.633	0.057***	0.662
Secondary	-0.591	0.283	4.358	0.037**	0.554
Higher	-1.210	0.710	2.905	0.088***	0.298
Father's education					
No education	-	-	-	-	1.000
Primary	-0.195	0.221	0.781	0.377	0.823
Secondary	-0.112	0.246	0.207	0.649	0.894
Higher	-0.787	0.529	2.210	0.137	0.455
Father's occupation					
Agriculture	-0.227	0.519	0.192	0.662	0.797
Labor	-0.101	0.205	0.244	0.621	0.903
Professional	-0.092	0.207	0.197	0.657	0.912
Others	-	-	-	-	1.000
Sex of child					
Male	0.125	0.176	0.503	0.478	1.133
Female	-	-	-	-	1.000
Birth order number					
1-2	-0.713	0.308	5.341	0.021**	0.490
3-4	-0.669	0.288	5.378	.020**	0.512
5-6	-0.049	0.323	0.023	0.880	0.952
7+	-	-	-	-	1.000
Main floor Materials					
Cement/concrete	-0.084	0.130	0.417	0.518	0.920
Earth/Bamboo	-	-	-	-	1.000

Continued

Variables & Characteristics	Estimated Coefficients (B)	S.E. of estimates (B)	Wald Chi-squire (Statistic)	Significant (P-value)	Odds ratio
Main wall material					
Jute/Bamboo/mud	-	-	-	-	1.000
Brick/cement	-0.429	0.376	1.302	0.254	0.651
Tin/others	-0.077	0.283	0.074	0.785	0.926
Main roof Materials					
Bamboo/thatch	0.870	0.392	4.929	0.026**	2.386
Tin	0.261	0.339	0.590	0.442	1.298
Others	-	-	-	-	1.000
Religion					
Islam	-	-	-	-	1.000
Hinduism/Others	0.499	0.378	1.750	0.186	1.648
Age of mother at birth					
<20	-0.092	0.396	0.054	0.816	0.912
20-34	-0.162	0.316	0.262	0.608	0.850
>=35	-	-	-	-	1.000
Month of breast feeding					
0	-	-	-	-	1.000
1-12	0.656	0.295	4.944	0.026**	1.928
13+	-4.123	0.572	52.021	0.000*	0.016
Immunization					
No	-	-	-	-	1.000
Yes	-0.926	0.214	18.77	0.000*	0.396
Constant	-4.753	0.911	27.238	0.000	0.009

Type of place of residence has significant effect on post-neonatal mortality. The risk of post-neonatal mortality in urban areas is 0.993 times lower than rural areas. All of the divisions are statistically significant for post-neonatal mortality except Dhaka division. Sylhet division has higher post-neonatal mortality than all other division. The mortality rate for Barisal, Chittagong, Dhaka, Khulna and Rajshahi division are respectively 0.562, 0.605, 0.875, 0.418 and 0.546 times lower risk than Sylhet division.

Mother's education has significant effect on post-neonatal mortality. Mother's education in urban and rural both areas with primary, secondary and higher level of education are respectively 0.662, 0.554, and 0.298 times lower risk to have children losses at post-neonatal period than the mothers with no education level.

The category secondary has a lower likelihood of occurring post-neonatal mortality than those of no education. The reasons for these different remain the same as that for mother's education, which have discussed earlier.

Father's education has insignificant effect on post-neonatal mortality. The risk of post-neonatal mortality for primary, secondary and higher is respectively 0.823, 0.894 and 0.455 times lower than no education level.

Father's occupation has highly insignificant effect on post-neonatal mortality. Here we observed that all categories of father's occupation are statistically insignificant. The risk of post-neonatal mortality for agriculture, laborer and professional are respectively 0.797, 0.903, 0.912 times lower than others. Sex of child is statistically insignificant on post-neonatal mortality. The risk of male mortality is 1.133 times higher than female child.

Main floor materials have no significant on post-neonatal mortality. The risk of post-neonatal mortality for cement/concrete is 0.920 times lower than earth/bamboo materials.

Main wall is also insignificant effect on post-neonatal mortality. The risk of post-neonatal mortality for brick/cement and tin/others are respectively 0.651 and 0.926 times lower than natural wall (Jute/bamboo/mud).

Main roof materials have significant on post-neonatal mortality. Odds ratio for bamboo/thatch and tin are respectively 2.386 and 1.298 times higher than others material.

Most of the people in our country are religious. Religion has no significant effect on post-neonatal mortality in Bangladesh. Odds ratio for Hinduism/others is 1.648 times higher than Islam.

Age of mother at first birth have highly insignificant effect on post-neonatal mortality. The risk of post-neonatal mortality for the mother whose age is <20 and 20-34 have (0.912 and 0.850) lower risk than of mother whose age is >=35 i.e. high risk when age is >=35.

Month of breast-feeding have significant effect on post-neonatal mortality in Bangladesh.

Immunization has significant effect on post-neonatal mortality in Bangladesh. The risk for taken immunization is 0.396 times lower than who are not taken

5.2.3 Model 3. Socioeconomic, Demographic, Hygienic and Household characteristics of infant mortality

Model 3 of logistic regression includes the infant mortality as the dependent variables and all of the selected socio-economic, demographic, hygienic and household characteristics as the independent variables. According to the fitted model as shown in table 5.2.3, five independent (or explanatory) variables out of 14 independent variables are statistically significant at 1%, 5% and 10% level of significance. The significant predictors of infant mortality are division, mother's education, father's education, birth order number, main wall material, main roof material, age of mother, duration of breast-feeding and immunization.

Table-5.2.3 Logistic regression estimates for the effect of socioeconomic, demographic, hygienic and household characteristics variables on infant mortality as the dependent variables in Bangladesh.

Variables & Characteristics	Estimated Coefficients (B)	S.E. of estimates (B)	Wald Chi-squire (Statistic)	Significant (P-value)	Odds ratio
Type of place of residence					
Urban	-0.093	0.180	0.264	0.607	0.911
Rural	-	-	-	-	1.000
Division					
Barisal	-0.690	0.212	10.560	0.001*	0.502
Chittagong	-0.494	0.165	8.983	0.003*	0.610
Dhaka	-0.167	0.156	1.146	0.284	0.846
Khulna	-0.554	0.204	7.406	0.007*	0.575
Rajshahi	-0.364	0.168	4.725	0.030**	0.695
Sylhet	-	-	-	-	1.000
Mother's education					
No education	-	-	-	-	1.000
Primary	-0.340	0.147	5.318	0.021**	0.712
Secondary	-0.465	0.185	6.334	0.012**	0.628
Higher	-0.720	0.397	3.294	0.070***	0.487
Father's education					
No education	-	-	-	-	1.000
Primary	-0.260	0.151	2.957	0.085***	0.771
Secondary	-0.063	0.167	0.143	0.705	0.939
Higher	-0.660	0.316	4.347	0.037**	0.517
Father's occupation					
Agriculture	-0.034	0.174	0.038	0.846	0.967
Labor	0.171	0.149	1.314	0.252	1.186
Professional	0.029	0.500	0.003	0.953	1.030
Others	-	-	-	-	1.000
Sex of child					
Male	0.099	0.145	0.468	0.494	1.104
Female	-	-	-	-	1.000
Birth order number					
1-2	-0.480	0.211	5.174	0.023**	0.619
3-4	-0.188	0.197	0.907	0.341	0.829
5-6	-0.044	0.230	0.036	0.849	0.957
7+	-	-	-	-	1.000
Main floor Materials					
Cement/concrete	-0.194	0.274	0.502	0.479	0.824
Earth/Bamboo	-	-	-	-	1.000

Continued

Variables & Characteristics	Estimated Coefficients (B)	S.E. of estimates (B)	Wald Chi-squire (Statistic)	Significant (P-value)	Odds ratio
Main wall material					
Jute/Bamboo/mud	-	-	-	-	1.000
Brick/cement	-0.338	0.181	3.485	0.062***	0.713
Tin/others	-0.371	0.310	1.431	0.232	0.690
Main roof Materials					
Bamboo/thatch	0.776	0.293	7.015	0.008*	2.172
Tin	0.557	0.249	5.006	0.025**	1.745
Others	-	-	-	-	1.000
Religion					
Islam	-	-	-	-	1.000
Hinduism/Others	0.183	0.230	0.631	0.427	1.200
Age of mother at birth					
<20	-0.675	0.266	6.423	0.011**	0.509
20-34	-0.631	0.216	8.518	0.004*	0.532
>=35	-	-	-	-	1.000
Month of breast feeding					
0	-	-	-	-	1.000
1-12	-2.981	0.159	353.040	0.000*	0.051
13+	-4.213	0.161	687.377	0.000*	0.015
Immunization					
No	-	-	-	-	1.000
Yes	-0.276	0.134	4.248	0.039**	0.759
Constant	-0.791	0.609	1.690	0.194	0.453

Logistic regression shows that types of place residence have no significant effect on infant mortality and but all division have significant effect on infant mortality except Dhaka division. Sylhet division have higher likely mortality rate than all other division. The mortality rate for Barisal, Chittagong, Dhaka, Khulna and Rajshahi division are respectively 0.502, 0.610, 0.846, 0.575 and 0.695 times lower than Sylhet division.

Mother's education is the most important factor affecting infant mortality rate. And it has significant effect on infant mortality. Here we see that all the categories are significantly associated with infant mortality. The risk of mortality for primary, secondary and higher is respectively 0.712, 0.628 and 0.487 times lower than no education level. Father's education that is also significantly associated

with infant mortality. The risks of infant mortality for primary, secondary and higher are 0.771, 0.939, and 0.517 times lower respectively for no education level.

Father's occupation has no significant effect on infant mortality. The risk of mortality for laborer and professional are respectively 1.186, 1.030 times higher than others and lower is agriculture (i.e.0.967). Sex of child has no significant effect on infant mortality. Birth order number is significant effect on infant mortality. Similarly main wall material, main roof and mother age have significant effect on infant mortality. The infant mortality rate for the house whose roof materials is made by bamboo/thatch and tin has 2.172 and 1.745 times higher than those house made by other.

Main materials of floor have no significant effect on infant mortality. The respondent who live in house made by concrete/cement are 0.824 times lower likely to children losses in infant period than the respondents whose house have been constructed by earth/bamboo.

Main wall materials have significant effect infant mortality. The respondent who live in house made by brick/cement and tin/others are 0.713 and 0.690 times likely to children losses in infant period than the respondents whose have been constructed by natural wall (Jute/bamboo/mud).

Religion has no significant effect on infant mortality in Bangladesh. Odds ratio for Hinduism/others is 1.200 times higher than Islam.
Age of mother at birth have highly significant effect of infant mortality in Bangladesh. Odds ratio for the mothers age >20 and 20-34 are respectively 0.509 and 0.532 times lower than the age >=35.
Month of breast-feeding have significant effect on infant mortality in Bangladesh.
Immunization is also significant effect on infant mortality.

5.2.4 Model 4. Socioeconomic, Demographic, Hygienic and Household characteristics of child mortality

Model 4 of logistic regression includes the child mortality as the dependent variables and all other selected socioeconomic, demographic, hygienic and household characteristics as the independent variables. According to the fitted

model as shown in table 5.2.4 four independent (or explanatory) variables are statistically significant at 1%, 5% and 10% level of significance. These significant predictors of child mortality are type of place residence, division, mother's education, father's occupation, birth order, main floor material, main wall material, religion and immunization.

Table-5.2.4. Logistic regression estimates for the effect of socioeconomic, demographic, hygienic and household characteristics variables on child mortality as the dependent variables in Bangladesh.

Variables & Characteristics	Estimated Coefficients (B)	S.E. of estimates (B)	Wald Chi-squire (Statistic)	Significant (P-value)	Odds ratio
Type of place of residence					
Urban	0.539	0.294	3.372	0.066***	1.715
Rural	-	-	-	-	1.000
Division					
Barisal	0.509	0.692	0.542	0.461	1.664
Chittagong	0.716	0.589	1.479	0.224	2.047
Dhaka	0.513	0.600	0.732	0.392	1.671
Khulna	1.103	0.616	3.205	0.073***	3.012
Rajshahi	1.377	0.556	6.122	0.013**	3.962
Sylhet	-	-	-	-	1.000
Mother's education					
No education	-	-	-	-	1.000
Primary	-0.834	0.334	6.247	0.012**	0.434
Secondary	-0.495	0.379	1.713	0.191	0.609
Higher	-0.948	1.176	0.649	0.420	0.388
Father's education					
No education	-	-	-	-	1.000
Primary	0.079	0.297	0.070	0.791	1.082
Secondary	-0.526	0.419	1.578	0.209	0.591
Higher	-0.990	0.869	1.298	0.255	0.372
Father's occupation					
Agriculture	-0.409	0.337	1.476	0.224	0.664
Labor	-0.631	0.307	4.213	0.040**	0.532
Professional	-4.874	10.366	0.221	0.638	0.008
Others	-	-	-	-	1.000
Sex of child					
Male	-0.356	0.257	1.911	0.167	0.701
Female	-	-	-	-	1.000
Birth order number					
1-2	-0.559	0.406	1.891	0.169	0.572
3-4	-0.929	0.399	5.427	0.020**	0.395
5-6	-0.651	0.492	1.753	0.186	0.521
7+	-	-	-	-	1.000
Main floor Materials					
Cement/concrete	-1.837	0.828	4.920	0.027**	0.159
Earth/Bamboo	-	-	-	-	1.000

Continued

Variables & Characteristics	Estimated Coefficients (B)	S.E. of estimates (B)	Wald Chi-squire (Statistic)	Significant (P-value)	Odds ratio
Main wall material					
Jute/Bamboo/mud	-	-	-	-	1.000
Brick/cement	-1.448	0.626	5.345	0.021**	0.235
Tin/others	-.124	0.276	0.201	0.654	0.884
Main roof Materials					
Bamboo/thatch	0.711	0.777	0.837	0.360	2.036
Tin	0.491	0.677	0.526	0.468	1.634
Others	-	-	-	-	1.000
Religion					
Islam	-	-	-	-	1.000
Hinduism/Others	1.669	1.016	2.699	0.100***	5.308
Age of mother at birth					
<20	0.328	0.623	0.277	0.599	1.388
20-34	0.399	0.478	0.694	0.405	1.490
>=35	-	-	-	-	1.000
Month of breast feeding					
0	-	-	-	-	1.000
1-12	-0.020	0.287	0.005	0.944	0.980
13+	-0.291	0.750	0.151	0.698	0.748
Immunization					
No	-	-	-	-	1.000
Yes	-0.622	0.326	3.645	0.056***	0.537
Constant	-7.314	2.067	12.517	0.000	0.001

Types of place of residence have significant effect on child mortality. Odds ratio for the urban is 1.715 times higher risk than rural areas. Divisions also have significant effect on child mortality. All the divisions are not statistically significant effect on child mortality. Here we see that Khulna and Rajshahi division are statistically significant. The risk for Barisal, Chittagong, Dhaka, Khulna and Rajshahi division are respectively 1.664, 2.047, 1.674, 3.012 and 3.962 times higher than Sylhet division.

Mother's educational status we see that significant effect on child mortality. Only primary educational level is significant at 5%. In the table it is evident that the risk of child mortality for primary, secondary and higher level have .434, .609 and .388 times lower than the mother of no education.

Father's education status also has highly effect on child mortality. The risk of child mortality for secondary and higher level of father have 0.591 and 0.372 times lower than no education and primary educational level of father have 1.082 times higher than the father of no education level.

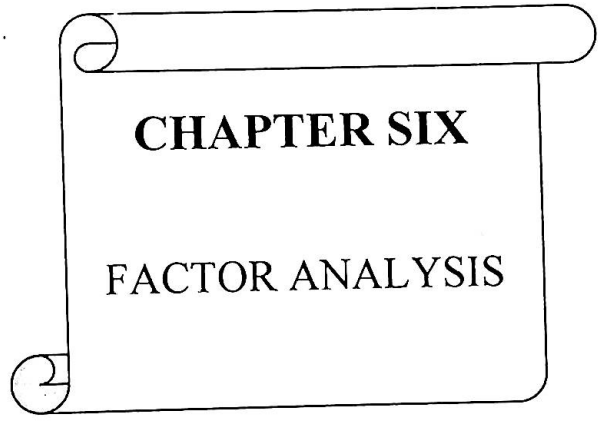
Father's occupation has also significant effect on child mortality. Here we observed that only labor categories of father's occupation are statistically significant. The risk of child mortality for agriculture, laborer and professional are 0.664, 0.532, 0.008 times lower than others. Sex of child is statistically insignificant on child mortality. The risk of male mortality is 0.701 times lower than female child.

Birth order number has significant effect Child mortality. Child mortality for the birth order 1-2, 3-4 and 5-6 have respectively 0.572, 0.395 and 0.521 times lower risk than the birth order 7+.

Main floor and wall material cement/concrete and brick/cement has significant effect on child mortality. Here we see that at 5% level of significant for both factors. All elements are lower risk than reference elements. Main roof materials have insignificant effect on child mortality. The respondent who live in house made by bamboo/thatch and tin are respectively 2.036 and 1.634 times higher risk than others.

Religion has significant effect on child mortality at 10% level. Odds ratio for Hinduism/others is 5.308 times higher than Islam.

Age of mother at first birth has insignificant effect on child mortality. Odds ratio for the age group <20 and 20-34 is 1.388 and 1.490 times higher than >=35 age group. Mothers of breast-feeding have no significant effect for the 1-12 and 13+ months. And the risk of child mortality for this age group lowers than reference group. The immunization has significant effect on child mortality at 10% level. The risk of taken immunization is 0.537 times lower from reference types.


CHAPTER SIX
FACTOR ANALYSIS

CHAPTER SIX

FACTOR ANALYSIS OF SOCIO-ECONOMIC, DEMOGRAPHIC, SANITATION, HYGIENIC AND HOUSEHOLD VARIABLES

6.1 Introduction

Factor analysis attempts to determine a possible underlying pattern of relationships so that the data may be reordered and reduced to a smaller set of factors.

Factor analysis is a statistical data reduction technique used to explain variability among observed random variables in terms of fewer unobserved random variables called **factors**. The observed variables are modeled as linear combinations of the factors, plus "error" terms. Factor analysis originated in psychometrics, and is used in behavioral sciences, social sciences, marketing, product management, operations research, and other applied sciences that deal with large amount of data. The analysis will isolate the underlying factors that explain the data.

The statistical algorithm deconstructs the rating (called a raw score) into its various components, and reconstructs the partial scores into underlying factor scores. The degree of correlation between the initial raw score and the final factor score is called a *factor loading*. There are two approaches to factor analysis: "principal component analysis" (the total variance in the data is considered); and "common factor analysis" (the common variance is considered).

The basic assumption of factor analysis is that underlying dimension, or factors, can be used to explain complex phenomena. Observed correlation's between variables result from their sharing these factors. For examples, correlation's between test scores might be attributable to such shared factors as general intelligence, abstract reasoning, and reading comprehension.

The correlation's between the community variables might be due to factors like amount of urbanization, the socioeconomic lavel or welfare of the communality, and the population stability. In this chapter we proceed to identify the dimensions for selected 15 variables. The variables were: residence, division, mother's education, father's education, father's occupation, sex of child, birth order of child, main floor material, main wall material, main roof material, religion,

mother's age (age of mother at child birth), breastfeeding (month of breastfeeding), immunization and age at child death (months-imputed). The data was taken from BDHS-2004. The mathematical model for the factor analysis appears somewhat similar to a multiple regression equation. Each variable is expressed as a linear combination of factors, which are not actually observed.

In general, the model for the i-th standardized variables is written as-

$$X_i = A_{i1}F_1 + A_{i2}F_2 + \ldots\ldots\ldots\ldots\ldots + A_{ik}F_k + U_i$$

Where the F's are the common factors, the U is the unique factor, and the A's are the constants used to combine the k factors. The unique factors are assumed uncorrelated with each other and with the common factors.

The general expression for the estimate of the j-th factor

$$Fj = W_{j1}X_1 + W_{j1}X_2 + \ldots\ldots\ldots\ldots\ldots + WjpXp$$

Where Wj's are known as factor score coefficients, and p is the number of variables.

We proceed with the factor analysis in four steps:

- First the correlation matrix for all variables is computed. Variables that do not be related to other variables can be identified from the matrix and associated statistics. The appropriateness of the factor model is also be evaluated. At this step we also decided what to do with cases that have missing values for some of the variables.
- In second step, factor extraction- the number of factor necessary to represent the data and the method of calculating them- is determined. At this step, we also ascertain how well the chosen model fits the data.
- The third step, rotation, focuses on transforming the factors to make them more interpretable.
- At the fourth step, scores for each factor is computed for each case. These scores can be used in a variety of other analysis.

6. 2 Examinations of correlation matrix

Table-6.1 shows the correlation of all possible combination of 15 (fifteen) variables. The variables were classified into two groups. Socio-Economic group: residence, division, mother's education, father's education and father's occupation; and Demographic, Sanitation, Hygienic and Household group: sex of child, birth order of child, main floor material, main wall material, main roof material, religion, mother's age (age of mother at child birth), breastfeeding (month of breastfeeding) and immunization and also both group contains the only one variable is age at child death (months-imputed).

6. 3 Sampling adequacy

Before performing the factor analysis, it is important to investigate whether a particular data set is suitable for the analysis or not. This can be done by Kaiser-Meyer-Olkin (KMO) statistic, where the statistic is given by

$$KMO = \frac{\sum\sum_{i \neq j} r_{ij}^2}{\sum\sum_{i \neq j} r_{ij}^2 + \sum\sum_{i \neq j} a_{ij}^2}$$

Where, r_{ij} ($i \neq j = 1, 2, 3, \ldots, p$) is the simple correlation coefficient of i-th and j-th variable and a_{ij} is the partial correlation coefficient of those two variables. The value of KMO approaches unity if a_{ij} approaches zero. In that case the factor analysis will be fruitful. It implies that the factor analysis will not be accepted if KMO value is small. Kaiser (1974) has mentioned that the factor analysis is excellent if KMO is greater than or equal to 0.90, it is meritorious if $0.80 \leq KMO \leq 0.90$, middling if $0.70 \leq KMO \leq 0.80$, mediocre if $0.60 \leq KMO \leq 0.70$, miserable if $0.50 \leq KMO \leq 0.60$, and unacceptable if $KMO < 0.50$.

The KMO value is 0.647 indicating adaptation of the technique of factor analysis is near middling. Therefore, we proceed to adopt factor analysis of the willingness of reading of infant and child mortality in order to assess the dominant components.

In another point factor analysis needs to clarify. That is, should we take the willingness of reading of infant and child mortality of all fifteen probable variables? From the above discussion it is clear that we can proceed to adopt factor analysis including all twelve schedules of willingness of reading of mortality to assess the most dominant components that capture the inherent peculiarities of the structure of willingness of reading of infant and child mortality. Factor analysis involves the following steps-

1. Selecting and measuring group of variables
2. Determining the number of components or factors to be considered
3. Extracting a set of component from the correlation matrix
4. Rotating the components or factors to increase interpretability and
5. Interpreting the results.

The results of factor analysis using principal component extraction method and varimax rotation are obtained using the packages SPSS Version 10.0.

Table-6.1 Correlation matrix for selected 15 variables

Correlation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Residence	1.000	.184	-.116	-.156	-.131	.003	096	-.391	-.179	-.147	.062	.013	-.041	-.034	-.020
Region	.184	1.000	-.051	-.134	-.028	.035	-.050	-.063	-.242	.015	.091	-.042	.001	-.046	-.151
Education of Mother	-.116	-.051	1.000	.588	-.173	-.087	-.383	.195	.237	.282	.075	-.273	.119	.016	-.058
Education of Father	-.156	-.134	.588	1.000	-.186	-.054	-.208	.254	.308	.251	.008	-.082	.035	-.057	-.059
Occupation	-.131	-.028	-.173	-.186	1.000	.032	-.093	-.044	-.076	-.121	.000	-.108	-.004	.015	-.070
Sex of child	.003	.035	-.087	-.054	.032	1.000	.057	-.003	-.017	-.060	-.043	.014	-.057	.004	035
Birth order number	.096	-.050	-.383	-.208	-.093	.057	1.000	-.068	-.043	-.170	-.059	.754	-.116	-.071	.111
Main floor material	-.391	-.063	195	.254	-.044	-.003	-.068	1.000	.413	.386	-.057	.055	.129	.047	-.099
Main wall material	-.179	-.242	.237	.308	-.076	-.017	-.043	.413	1.000	.379	-.067	-.005	.043	.031	-.024
Main roof material	-.147	.015	.282	.251	-.121	-.060	-.170	.386	.379	1.000	-.027	-.063	.139	011	-.077
Religion	.062	.091	.075	.008	.000	-.043	-.059	-.057	-.067	-.027	1.000	-.007	.084	.035	-.077
Mother's age	.013	-.042	-.273	-.082	-.108	.014	.754	.055	-.005	-.063	-.007	1.000	-.038	-.108	.111
Breastfeeding	-.041	.001	.119	.035	-.004	-.057	-.116	.129	.043	.139	.084	-.038	1.000	.008	-.155
Immunization	-.034	-.046	.016	-.057	.015	.004	-.071	.047	.031	.011	.035	-.108	.008	1.000	-.067
Age at death	-.020	-.151	-.058	-.059	-.070	.035	.111	-.099	-.024	-.077	-.077	.111	-.155	-.067	1.000
Residence		.000	.005	.000	002	.477	.018	.000	000	001	.088	.386	.186	.232	.334
Region	.000		.132	.002	.273	.219	.136	.083	.000	.374	.023	.179	.490	.155	.000
Education of Mother	.005	.132		.000	.000	.028	.000	.000	.000	.000	.050	.000	.004	.361	.104
Education of Father	.000	.002	.000		.000	.121	.000	000	.000	.000	.433	.036	.220	.106	.100
Occupation	002	.273	.000	.000		.242	.020	.170	.049	.004	.497	.009	.461	.374	.063
Sex of child	.477	.219	.028	.121	.242		.105	.476	.357	.094	.173	.376	.105	.466	221
Birth order number	.018	.136	.000	.000	.020	.105		.069	.171	.000	.098	.000	.005	.062	.007
Main floor material	.000	.083	.000	.000	.170	.476	.069		.000	.000	.106	.116	.002	.154	.015
Main wall material	.000	.000	.000	.000	.049	.357	.171	.000		.000	.073	.458	.171	.248	.302
Main roof material	.001	.374	.000	.000	.004	094	.000	.000	.000		.278	.086	.001	.408	.047
Religion	.088	.023	.050	.433	.497	.173	.098	.106	.073	.278		.440	.033	.224	.047
Mother's age	386	.179	.000	.036	.009	376	000	.116	.458	.086	.440		.203	.009	007
Breastfeeding	.186	.490	.004	.220	.461	.105	.005	.002	.171	.001	.033	.203		.430	.000
Immunization	.232	.155	.361	.106	374	.466	.062	.154	.248	.408	.224	.009	.430		.071
Age at death	.334	.000	.104	.100	.063	.221	.007	.015	.302	.047	.047	.007	.000	.071	

Kaiser-Meyer-Olkin Measure of Sampling Adequacy= 0.647, Bartlett's Test of Sphericity= 1265.586, Degrees of freedom= 105, Significance= 0.000, The socioeconomic conditions of the people create differentials in the level of mortality. Socioeconomic factors have a high influence on mortality level. The distribution of economic conditions and social benefits is closely related with mortality patterns of a community the variables reflecting the picture of social and economical status of a community are termed as socioeconomic variable.

6.4 Estimation of Factor scores related to Socioeconomic and death variables structure

The correlation matrix for 6 variables in the first group is shown in table-6.2. Since one of the goals of factor analysis is to obtain "factor" that help explain these correlation' the variables must be related to each other for the factor model to be appropriate. If the correlations between the variables are small, it is not to be expected that they share common factor. In the above table most of the coefficient are less then 0.5 in absolute value. All of the variables are not large correlations in the set.

The Bartlett's test of sphericity can be used to test the hypothesis that the correlation matrix is an identity matrix. That is all diagonal terms are 1 (one) and the off diagonal terms are 0 (zero). The test requires that the data be a sample from a multivariate normal population. Our computed value of the test statistics for sphericity (best on the chi-square transformation of the determinant of the correlation matrix) is very large (293.524) and the related significance level is small. So, it appears that the population matrix is identity. That is in this situation use of the factor model should be appropriate. Also our computed value of Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) measure of sampling adequacy gives a value of 0.548 that indicates so as to we can happily proceed with the factor investigation.

Table-6.2 Correlation co-efficient between Groups –1 variable

Variables	Place	Region	Mother's. Education	Father's Education.	Father's Occupation	Age at death
Place residence	1.000	.182	-.117	-.155	-.131	-.031
Region	.182	1.000	-.059	-.143	-.025	-.143
Mothers education	-.117	-.059	1.000	.590	-.176	-.059
Fathers education	-.155	-.143	.590	1.000	-.187	-.061
Father's occupation	-.131	-.025	-.176	-.187	1.000	-.063
Age at death (months-imputed)	-.031	-.143	-.059	-.061	-.063	1.000

Determinant of the Correlation matrix = 0.543

Kaiser-Meyer-Olkin Measure of Sampling Adequacy = 0.548

Bartlett's Test of Sphericity =293.524, Degrees of Freedom = 15

Significance = 0.000

Now, our analysis is to factor extraction to determine the factors. We are obtained estimates of the initial factors from principal component analysis. The first principal component is the combination that accounts for the largest amount of variance in the sample. The second principal component accounts for the next largest amount of variance and is uncorrelated with the first. Successive components explain progressively smaller portions of the total sample variance, and all are uncorrelated with each other. The initial Statistic (Communality, eigen values corresponding to each factor, percentage of variation accounted by the factors and cumulative percentage) is shown in table-6.3. In the above table of first two columns gives the information about the variables whereas the last four columns give information about the factors we are interested. It is possible to compute, as many principal components as there are variables. If all the principal components are used, they can exactly represent each variable, but nothing has been gained since there are as many factors (Principal Components) as variables. Several procedures have been proposed for determining the number of factors to use in a model. One criterion suggests that three factors that for variance greater than unity (the eigen value is greater than unity) should be included. But it is not always a good solution. Another procedure is to examination the scree plot (plot of the eigen values).

Table-6.3 Initial Statistics for Group-1 Variables

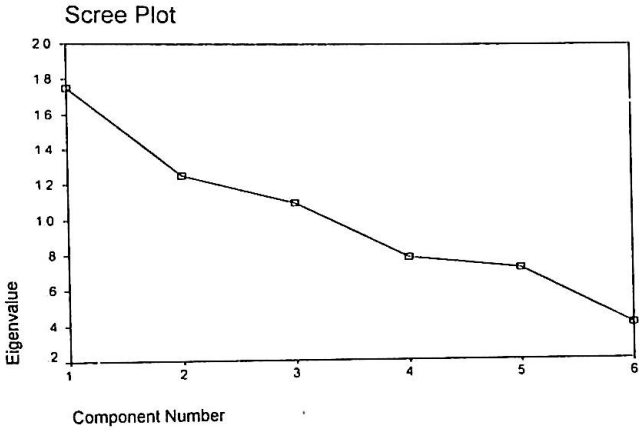
Variables	Communality	Factor	Eigen value	Percent of Variance	Cumulative Percent of Variance
Place residence	1.000	1	1.751	29.182	29.182
Region	1.000	2	1.251	20.848	50.029
Mothers education	1.000	3	1.093	18.224	68.253
Fathers education	1.000	4	0.784	13.073	81.326
Father's occupation	1.000	5	0.718	11.970	93.296
Age at death (months-imputed)	1.000	6	0.402	6.704	100.000

The above table-6.3 we see the total variance by each factor is listed in the column labeled eigen value (column-4). The next column contains the percentage of the total variance attributable to each factor and the last column shows cumulative percent of variance. We that the variance (29.18%) due to first factors eigen value is 1.751 and variance (20.85%) due to second factors eigen value is 1.251 and variance (18.22%) due to third factors eigen value is 1.093 because all the

variables are expressed in standardized form. To deduce the number of common factors we take the criteria of eigen value greater than one.

Also, it is observed from table that there are three eigen value greater than unity and almost 68.253% of the total variance is attributable to the factors. Also the scree plot shown in Figure-6.1 suggests that a model with three factors may be adequate to represent the data.

Figure- 6.1 Scree Plot Group-1 Variables



Table–6.4 contains the coefficients value. These coefficients are called factor loadings, since they indicate how much weight is assigned to each factor. Factors with large coefficients (in absolute value) for a value are closely related to the variable. The matrix of factor loadings is called the pattern matrix. Further the variables mother's education (0.365) and father's education (0.866) have high loadings for the factor-1 and the variables place of residence (0.642) and region (0.649) have high loadings for the factors-2 and also age of death (0.768) has high loading for factor-3.

To judge how well the three factors model describes the original variables. We can compute the proportion of the variance of each variable explained by the three-factor model.

Table 6.4 Factor loading (Component Matrix) related three factors for Group-1 Variables.

Variables	Factor-1	Factor-2	Factor-3
Place of residence	-0.317	0.642	0.312
Region	-0.288	0.649	-0.246
Mother's Education	0.836	0.168	-0.092
Father's education	0.866	0.082	-0.073
Father's occupation	-0.343	-0.482	-0.576
Age at death	-0.038	-0.387	0.768

Extraction Method: Principal Component Analysis. 3 components extracted.

Since the factors are uncorrelated, the total proportion of variance explained is just the sum of the variance proportions explained by the common factor is called the communality of the variables.

The communalities for our selected variables are shown in table-6.5 together with the percentage of variances accounted for by each of the retained factors. We see that the communalities for all of cumulative are greater than 0.5 and variable father's education is the largest value. That is maximum portion of variation for that variable is explained by the three factors. The lowest value of communality is .565 in variable region. It is observed that almost 68.253% of total variation is explained by these three factors.

Table-6.5 Final statistic for Group-1 Variables

Variables	Communality		Factor	Eigen Value	Percent of Variance	Cumulative Percent of Variance
	Initial	Extraction				
Place of residence	1.000	0.610	1	1.751	29.182	29.182
Region	1.000	0.565	2	1.251	20.848	50.029
Mother's Education	1.000	0.735	3	1.093	18.224	68.253
Father's education	1.000	0.761				
Father's occupation	1.000	0.682				
Age at death (months-imputed)	1.000	0.742				

Although the factor matrix obtained in the extraction phase indicates the relationship between the factors and the individual variable, it is usually difficult to identify meaningful factors based on this matrix. Often the variables are factors do not appear correlated with maximum variables. Since one of the goals of factor analysis is to identify factors that are substantially meaningful (in the sense that

they summarize sets of closely related variables) the rotation phase of factor analysis attempts to transform the initial matrix into one that is easier to interpret.

Thus on a purely descriptive basis, we would judge a three-factor model with the factor loadings displayed above as providing a good fit to the data. The estimated communalities for place of residence, region, mother's education, father's education, father's occupation and age at death are 0.610, 0.564, 0.735, 0.762, 0.682 and 0.741 respectively. No one of the communalities is too small, so all variables included in the factor analysis. The analysis of the factor model proceeds by imposing conditions that allow one to uniquely estimate factor loadings and specific variance. The loading matrix is then rotated (multiplied by an orthogonal matrix), where the rotation is determined by some "ease-of-interpretation" criterion. Once the loadings and specific variances are obtained, factors are identified and estimated value for the factors themselves (called factor scores) are frequently constructed.

Varimax Rotation: This method of rotation has been proposed by Kaiser (1958) and it is applicable if factor analysis is done by Principal Factor Method. Due to this rotation a small number of loadings is found larger and maximum loadings reach to zero [Harman (1976), Rummel (1970)].

Table-6.6 Rotated Factor Matrix and estimated communalities with uniqueness for Group-1 Variables

Variables	Factor-1	Factor-2	Factor-3	Estimated Communalities	Uniqueness
Place of residence	-0.235	0.724	0.176	0.610	0.390
Region	-0.168	0.391	0.619	0.564	0.436
Mother's Education	0.856	0.008	0.050	0.735	0.265
Father's education	0.871	-0.051	-0.020	0.762	0.238
Father's occupation	-0.374	-0.702	0.223	0.682	0.318
Age at death (months-imputed)	-0.148	0.159	-0.833	0.741	0.259

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization. Rotation converged in 7 iterations.

From matrix algebra, we know that an orthogonal transformation corresponds to a rigid rotation (or reflection) of the co-ordinate axes. For this reason an orthogonal transformation of the factors loadings, and the implied orthogonal transformation of the factors, is called factor rotation. The above Table-6.6 gives the Rotation (Varimax Rotation with Kaiser Normalization) factor matrix for our selected

variables and they are sorted in descending order of magnitude. From the above result it is observed that father's education is the largest loading (i.e-.871) associated with factor-1. Also there are only one variable mother's education (i.e-.856) have larger loading associated with factor-1, but the rest four variables give smaller (and negative value) loadings. Similarly, we see that (i.e-.724) have larger loadings of place of residence in factor-2. Again, Factor-3 has taken large loading (i.e-.619) in variable region.

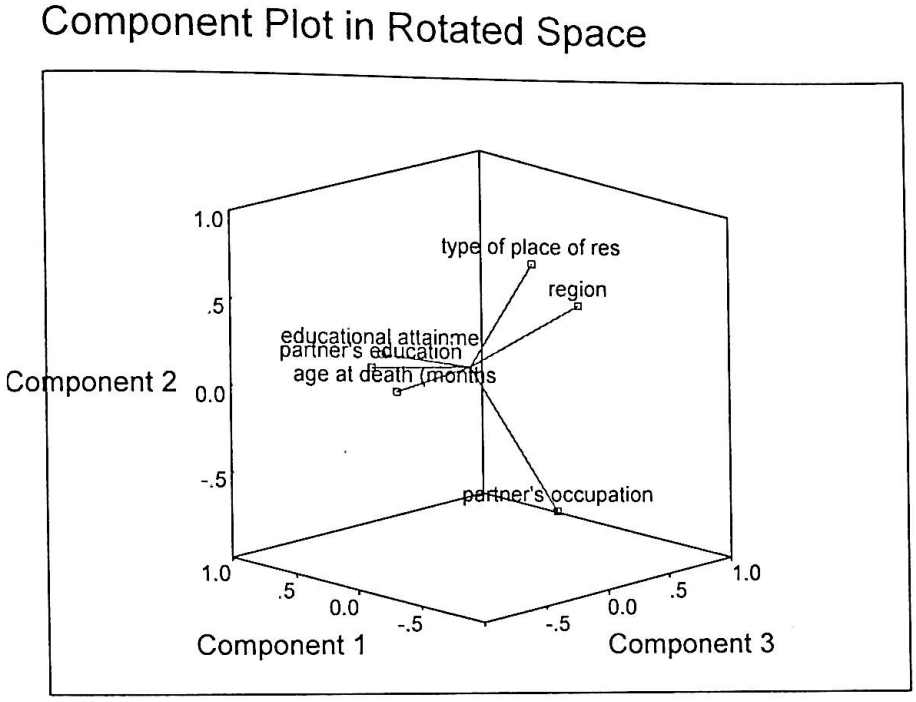
Thus we may conclude that the variables father's education and mother's education are closely related to factor-1, whereas residence and region are closely related to factor-2. Since factor–1 contains the indicators with larger loadings, which represented the infant and child mortality factor. Again, factor-2 contains the indicators with larger loadings, which represented the socioeconomic structure of communality; we may identify the factor-2 as socioeconomic factor. Also we are shown in Figure-6.2.

Table-6.7 Factor (Component) Transformation Matrix for Group-1 Variables

Component	Factor-1	Factor-2	Factor-3
Factor-1	0.986	-0.083	-0.145
Factor-2	0.154	0.793	0.589
Factor-3	-0.066	0.603	0.795

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Figure- 6.2 Component plot in rotated space for Group-1 variables.



Here we discuss weather the factors are orthogonal or not, the factor loading are the standardized regression coefficient in the multiple regression equation with the original variable as the dependent variable and factors as the independent variables in the following forms. The amount of variation explained by these three factors for each variables are obtained from the column labeled communality in table-6.6 earlier.

$$\begin{aligned}
\text{Place of residence} &= -0.235F_1+0.724F_2+0.176F_3 \\
\text{Region} &= -0.168F_1+0\ .391F_2+\ 0.619F_3 \\
\text{Mother's Education} &= \ 0.856F_1+0.008F_2+\ 0.050F_3 \\
\text{Father's education} &= \ 0.871F_1-\ 0.051F_2-\ 0.020F_3 \\
\text{Father's occupation} &= -0.374F_1-0.702F_2+\ 0.223F_3 \\
\text{Age at death} &= -0.148F_1+\ 0.159F_2-\ 0.833F_3
\end{aligned}$$

Finally the factor scores for these three factors are computed by regression method are shown in table-6.8.

In factor analysis, interest is usually centered on the parameters in the factor model. However, the estimated values of the common factors, called factor scores, may also be required. These quantities are often used for diagnostic purposes as well as inputs to a subsequent analysis.

Table-6.8 Component Score Coefficient Matrix for Group-1 Variables

Variables	Factor-1	Factor-2	Factor-3
Place of residence	-0.119	0.595	0.102
Region	-0.068	0.290	0.508
Mothers education	0.497	0.016	0.076
Fathers education	0.502	-0.029	0.019
Father's occupation	-0.217	-0.607	0.220
Age at death (months-imputed)	-0.116	0.180	-0.738

We see the above table that of all the values father's education (0.502) and mother's education (0.497) in Factor-1 are the highest score, place of residence (0.595) in Factor-2 and region (0.508) in Factor-3.

Comment: Data reduction is accomplished by replacing the standardized data by these simple factor scores. The simple factor scores are frequently low correlated with the factor scores obtained by the more complex least squares and regression methods.

6.5 Estimation of Factor scores Related to Demographic, Sanitation, Hygienic and Household Structure

In previous section we shown factor analysis that various socioeconomic variables with age at death variable have important bearing on the level of the countries concerned. Now we have performed an analysis Demographic, Sanitation, Hygienic and Household structures 10 variables as sex of child, birth order of child, main floor material, main wall material, main roof material, religion, mother's age (age of mother at child's birth), breastfeeding, immunization and age at child death (months-imputed). The correlation matrix for 10 variables is shown in table-6.9. The data in the table show that most of the coefficients are less than 0.5 in absolute value.

Table-6.9 Correlation Co-efficient between Groups –2 variables

	Sex of child	Birth order	Main floor	Main wall	Main roof	Religion	Mother age	Breastfeeding	Immunization	Age at death
Sex of child	1.000	.057	-.003	-.017	-.060	-.043	.014	-.057	.004	.035
Birth order	.057	1.000	-.068	-.043	-.170	-.059	.754	-.116	-.071	.111
Main floor	-.003	-.068	1.000	.413	.386	-.057	.055	.129	.047	-.099
Main wall	-.017	-.043	.413	1.000	.379	-.067	-.005	.043	.031	-.024
Main roof	-.060	-.170	.386	.379	1.000	-.027	-.063	.139	.011	-.077
Religion	-.043	-.059	-.057	-.067	-.027	1.000	-.007	.084	.035	-.077
Mother age	.014	.754	.055	-.005	-.063	-.007	1.000	-.038	-.108	.111
Breastfeeding	-.057	-.116	.129	.043	.139	.084	-.038	1.000	.008	-.155
Immunization	.004	-.071	.047	.031	.011	.035	-.108	.008	1.000	-.067
Age at death	.035	.111	-.099	-.024	-.077	-.077	.111	-.155	-.067	1.000

Determinant of the Correlation matrix = 0.232
Kaiser-Meyer-Olkin Measure of Sampling Adequacy = 0.566
Bartlett's Test of Sphericity = 691.610, Degrees of Freedom = 45
Significance =0.000

All the variables have small correlations, but only large correlation has between birth order & mother's age (i.e. 0.754). It is noted that each of the variables birth order, religion and age at death have more negative correlations with other variables.

Our computed value of the test statistics for the sphericity (based on chi-square transformation of the determinant of the correlation matrix) is very large (691.610). So, it appears unlike that the population correlation matrix is identity. That is in this situation use of the factor model should be appropriate. Again since our computed value of Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy gives 0.566, which indicates that we can comfortably proceed with the factor analysis.

Now, our analysis is factor extraction to determine the factors. We will obtain estimates of the initial factors based on the principal component analysis. The initial statistics (communality, eigen values corresponding to each factor, percentage of variation accounted by the factors and cumulative percentage) are shown in table-6.10 from where we may determine the minimum number of factors should be extracted for subsequent analysis.

Another procedure to determine the number of factors should be extracted is to the Scree Plot (plot of the eigen values) shown in figure-6.3.

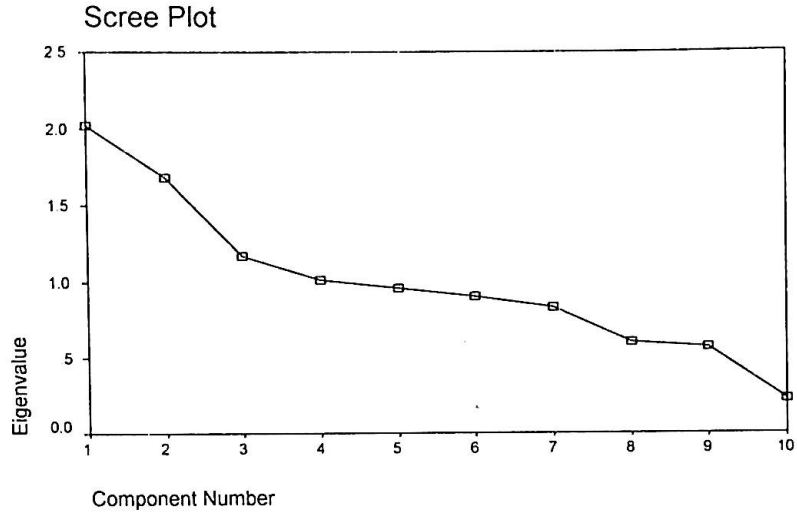
Table-6.10 Initial Statistics (Initial Eigenvalues) for Group-2 Variables

Variables	Communality	*	Factor	Eigen value	Percent of Variance	Cumulative Percent of Variance
Sex of child	1.000	*	1	2.020	20.198	20.198
Birth order	1.000	*	2	1.684	16.840	37.038
Main floor	1.000	*	3	1.175	11.751	48.789
Main wall	1.000	*	4	1.016	10.164	58.953
Main roof	1.000	*	5	0.961	9.612	68.565
Religion	1.000	*	6	0.905	9.047	77.612
Mother age	1.000	*	7	0.829	8.295	85.907
Breastfeeding	1.000	*	8	0.606	6.059	91.966
Immunization	1.000	*	9	0.576	5.764	97.730
Age at death	1.000	*	10	0.227	2.270	100.000

In the above table contains Eigen values, Percentage of variation explained by each value and cumulative percentage of variation explained up to some eigenvalues. It may be observed that the first factors (F_1) with the highest eigenvalue of 2.020 explain slightly more than 20.2% of total variation. The second factor (F_2) with the highest eigen value 1.684 explains a little more than 16.84% of total variation, the third factor (F_3) with the eigen value 1.175 explains 11.75% and so on. Only four eigenvalues are greater than 1.0 (one) with two eigen values are nearly 1.0 (one) and first six factors (F_1, F_2, F_3, F_4, F_5, F_6) explains more than 77.612 % of total variation. All the ten eigenvalues related to ten factors altogether explain 100% of total variation.

On the other hand, it is often suggested that it is better to the factors with eigenvalues greater than or nearly 1.0 (one). Accordingly only six factors could necessarily explain variation. The scree test (Figure-6.3) suggests that four principal factors seen to be sufficient capture the observed.

Figure-6.3 Scree Plot Group-2 Variables



The total variance explained by each factor is listed in column contains the percentage of the total variance attributable to each factor. Also the scree plot shown in figure-6.3 suggest that a model with six factors may be adequate to represent the whole set of data.

Table-6.11 Factor (Component Matrix) Matrix for Group-2 Variable

Variables	Factor-1	Factor-2	Factor-3	Factor-4	Factor-5	Factor-6
Sex of child	-0.124	0.022	-0.317	0.594	0.687	0.230
Birth order number	-0.692	0.589	0.179	0.113	-0.049	-0.076
Main floor material	0.534	0.574	-0.025	0.092	0.023	0.030
Main wall material	0.507	0.552	-0.193	0.021	-0.093	0.147
Main roof material	0.621	0.425	-0.049	-0.113	-0.009	0.119
Religion	0.028	-0.186	0.599	0.068	-0.072	0.754
Mother's age	-0.592	0.683	0.256	0.039	-0.031	-0.012
Breastfeeding	0.334	0.048	0.563	-0.091	0.330	-0.164
Immunization	0.181	-0.114	0.058	0.744	-0.564	-0.099
Age at death	-0.319	0.079	-0.508	-0.249	-0.211	0.451

The above table-6.11 contains the coefficients that the related variables to the first six factors. Where each row contains the coefficient use to express a standardized variables interims of the factor. These coefficients are called factor loadings, since they indicate how many weights is assigned to each factor. It is observed from the above table that factor-1 contains the variables main floor material (0.534); main wall material (0.507) and main roof material (0.621) are higher loadings. Again, the variables birth order number (0589), main floor material (0.574), main wall material (0.552) and mother's age (0.683) have high loadings in Factor-2. The variables religion (0.599) and month of breastfeeding (0.653) have higher loading in Factor-3. The variables sex of child (0.594) and immunization (0.744) has

higher loading in Factor-4. The only variable sex of child (0.687) has higher loading in Factor-5, and the only variables religion (0.754) have high loading in Factor-6.

Table-6.12 Final statistic for Group-2 Variables

Variables	Communality		*	Factor	Eigen value	Percent of Variance	Cumulative % of Variance
	Iitial	Extraction					
Sex of child	1.000	0.993	*	1	2.020	20.198	20.196
Birth order	1.000	0.879	*	2	1.684	16.840	37.038
Main floor	1.000	0.625	*	3	1.175	11.751	48.789
Main wall	1.000	0.630	*	4	1.016	10.164	58.953
Main roof	1.000	0.595	*	5	0.961	9.612	68.565
Religion	1.000	0.973	*	6	0.905	9.047	77.612
Mother age	1.000	0.884	*				
Breastfeeding	1.000	0.575	*				
Immunization	1.000	0.931	*				
Age at death (months-imputed)	1.000	0.676	*				

In the above Table-6.12 the communalities are shown. Most of the communalities are very high and all of the value is high. These communalities give the percentage of variation for each variable is explained by the six factors.

The estimated communalities for sex of child, birth order number, main floor material, main wall material, main roof material, religion, mother's age at child birth, month of breastfeeding, immunization, age at death (months-imputed) are 0.994, 0.880, 0.626, 0.629, 0.594, 0.974, 0.884, 0.574, 0.930 and 0.675 respectively.

Table-6.13 Rotated Factor Matrix and estimated communalities with uniqueness for Group-2 Variables

Variables	Factor-1	Factor-2	Factor-3	Factor-4	Factor-5	Factor-6	Estimated Communalities	Uniqueness
Sex of child	-0.018	0.018	-0.034	-0.004	0.996	-0.016	0.994	0.006
Birth order	-0.099	0.927	-0.083	0.000	0.036	-0.052	0.880	0.120
Main floor	0.769	0.059	0.152	0.059	0.049	-0.048	0.626	0.374
Main wall	0.786	0.004	-0.086	0.047	0.004	-0.039	0.629	0.371
Main roof	0.746	-0.134	0.087	-0.072	-0.079	0.027	0.594	0.406
Religion	-0.056	-0.018	0.064	0.039	-0.016	0.982	0.974	0.024
Mother's age	0.035	0.936	-0.030	-0.071	-0.012	0.029	0.884	0.116
Breastfeeding	0.134	-0.037	0.703	-0.184	-0.055	0.155	0.574	0.426
Immunization	0.037	-0.061	0.012	0.961	-0.005	0.040	0.930	0.070
Age at death	0.006	0.069	-0.791	-0.199	-0.014	0.072	0.675	0.325

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

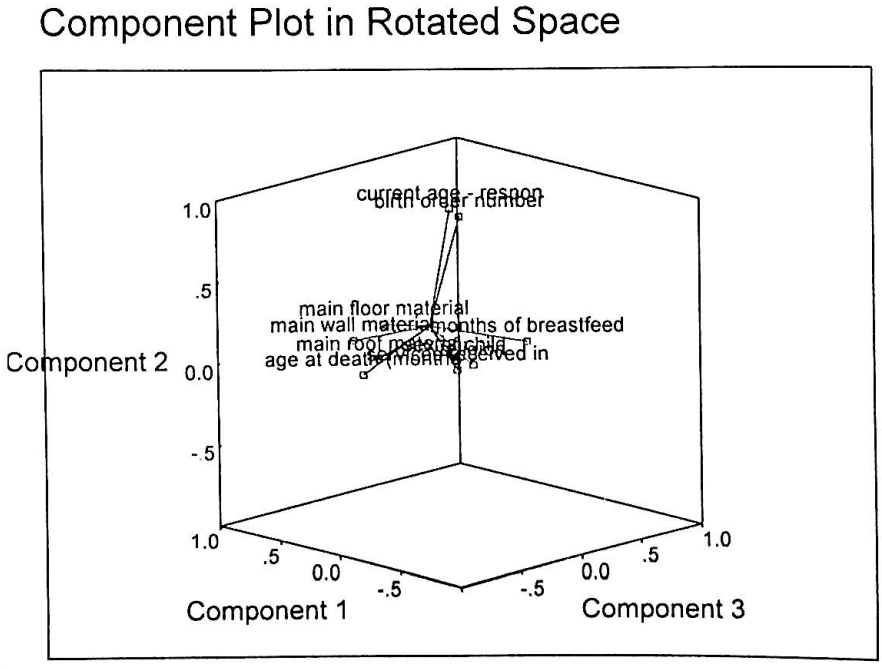
The given table shows the rotated Component matrix. It is observed that main floor material, main wall material and main roof material have higher loadings in Factor-1 and values are 0.769, 0.786 and 0.746 respectively. Similarly, Factor-2 shows that birth order number (0.927) and mother's age (0.936) have the highest loadings. Factor-3 shows that only month of breastfeeding (0.703) has high loading. Factor-4 shows immunization (0.961) has the highest loading. Factor-5 shows only sex of child (0.996) has the highest loading and last Factor-6 shows religion (0.982) have the highest loading. Thus we can see that variables main floor material, main wall material and main roof materials are highly correlated in Factor-1. Again, birth order number and mother's age are highly correlated in Factor-2. Also we are shown this result in Figure-6.4.

Table-6.14 Factor (Component) Transformation Matrix for Group-2 Variables

Component	1	2	3	4	5	6
1	0.679	-0.640	0.329	0.114	-0.088	0.028
2	0.695	0.700	-0.022	-0.096	0.018	-0.132
3	-0.144	0.284	0.709	0.045	-0.293	0.555
4	-0.008	0.111	0.120	0.780	0.602	0.041
5	-0.047	-0.053	0.391	-0.590	0.700	-0.067
6	0.184	-0.068	-0.470	-0.138	0.232	0.817

Rotation Method: Varimax with Kaiser Normalization.

Figure-6.4 Computed plot in rotated space



We know that whether the factor are orthogonal or not, the factor loadings are the standardized regression coefficients in the multiple regression equation with the original variables as the dependent variable and factors as the independent variables.

Now, we may represent our variables in the following forms. The amount of variation explained by these six factors for each variable are obtained from the column labeled communality in Table-6.13 and they are described in earlier.

Sex of child	=	$-0.018F_1+0.018\ F_2- 0.034\ F_3- 0.004\ F_4+0.996\ F_5-0.016\ F_6$
Birth order	=	$-0.099F_1+ 0.927\ F_2-0.083\ F_3+0.036\ F_5- 0.052\ F_6$
Main floor	=	$.769F_1+ .059\ F_2 + .152F_3 + .059F_4 + .049F_5 - .048F_6$
Main wall	=	$0.786F_1+ 0.004F_2 - 0.086F_3 + 0.047F_4 + 0.004F_5 - 0.039F_6$
Main roof	=	$0.746F_1 - 0.134F_2 + 0.087F_3 - 0.072F_4 - 0.079F_5 + 0.027F_6$
Religion	=	$-0.056F_1- 0.018\ F_2 + 0.064F_3 + 0.039F_4 - 0.016F_5 + 0.982F_6$
Mother age	=	$0.035F_1+ 0.936F_2 - 0.030F_3 - 0.071F_4 - 0.012F_5 + 0.029F_6$
Breastfeeding	=	$0.134F_1- 0.037\ F_2 + 0.703F_3 - 0.184F_4 - 0.055F_5 + 0.155F_6$
Immunization	=	$0.037F_1 -0.061F_2 + 0.019F_3 +0.961F_4 - 0.005F_5 + 0.040F_6$
Age at death	=	$0.006F_1+ 0.069F_2- 0.791\ F_3-0.199\ F_4- 0.014\ F_5+ 0.072\ F_6$

The factor matrix presents the loadings by which the existence of a pattern for the variables can be ascertained. The factor score matrix gives a score for each case on these patterns.

Factor scores are linear combinations of variables that are used to estimate the cases scores on the factors or components. These factor scores are particularly useful when one wants to perform further analysis involving the factors that identified in the factor analysis. Finally, Factor (component) score coefficient matrix are given below-

Table-6.15 Component Score Coefficient Matrix for Group-2 Variables

	Components					
Variables	1	2	3	4	5	6
Sex of child	0.015	-0.019	0.018	-0.021	0.995	0.030
Birth order	-0.026	0.528	0.021	0.063	0.004	-0.032
Main floor	0.424	0.069	0.069	0.048	0.068	-0.020
Main wall	0.456	0.018	-0.153	0.041	0.014	0.013
Main roof	0.415	-0.053	-0.013	-0.091	-0.053	0.056
Religion	0.015	0.014	-0.044	0.016	0.029	0.987
Mother age	0.050	0.540	0.047	-0.012	-0.033	0.052
Breastfeeding	0.014	0.034	0.602	-0.210	-0.010	0.091
Immunization	0.008	0.029	-0.024	0.951	-0.019	0.019
Age at death	0.092	-0.038	-0.709	-0.173	-0.044	0.162

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

These scores are standardized which means they have been scaled so that they have a mean of zero and all of the values lie between +1.00 and –1.00. If those scores greater than +1.00 or less than –1.00, therefore they are usually high or low. The factor weight matrix and is used compute the factor scores.

CHAPTER SEVEN

DISCUSSION AND CONCLUTION

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7.1 Introduction

This chapter reviews the results obtained in the previous chapter. Infant and child mortality is powerful indicators to assess overall health situation of a society. They may vary between different socio-economic statuses. These variations may be employed in explaining differentials, in deciding priorities for child health action in designing intervention programs and in assessment and monitoring of child health problems and programs. Socio-economic factors have strong influence on mortality levels. Besides a minimum number of public health programs such as immunization, better water supplies and improved sanitation can reduce mortality drastically. The present study attempted to investigate the trends in infant and child mortality followed by differential study with respect to some socio-economic and demographic characteristics the bivariate analysis is done to examine relative importance of socio-economic, environmental and demographic factors as the determinants of infant and child mortality. The analysis further went on to identify the factors affecting infant and child mortality both at national and regional levels. This investigation has been based on data from the Bangladesh Demographic and Health Survey 2004. The purpose of this chapter is to summarize some general and specific finding found in earlier chapters and to draw some conclusions.

7.2 Summery of findings

Various studies unveiled the significance of the relationship of mortality with demographic characteristics of mother and children such as sex of the child, birth order, month of breast feeding, birth intervals. In this section we have investigated infant and child mortality across a series of socio-economic and demographic characteristics and major dynamic of mortality.

Sex of child is one of the important demographic characteristics. Differentials between sexes in mortality are due to biological and social factors. In contrast to the above result, many investigations showed that females had higher mortality than males at most ages except during the first months of life. In Bangladesh

observed higher female than male mortality rates in their investigation were explained by reasons both social and medical in nature. Socially women in Bangladesh enjoy lower status than men. Daughters in this society traditionally cannot inherit an equal share of the father's property. In our analysis we see that sex difference is not so high. The infant mortality rate for sex is not almost same. But male infant and child mortality rate is higher than female infant and child mortality rate except in first month of life.

Among the demographic characteristics, mother's age at birth child appeared to be a significant differential of infant and child mortality rates. These are associated with mother of younger age that is less than 20 and mother of ages 35 and above. Lack of knowledge on child bearing active of younger mother and pre-occupation with household work of older mother probably.

The present study shows the positive relation between parity & infant and child mortality. Infant mortality rate are higher for first birth. Birth order is closely linked with mother's age, so it is not surprising that mortality risks are elevated among first births, which are generally to older mothers. Looking at the results we may say that younger mothers are not so conscious abut hygienic and other things and older women seem to suffer from under nutrition and this may affect the newly born babies who die soon after birth due to insufficient breast milk.

The analysis of mortality risk of young children in the five-year preceding the survey suggested that, in addition to parental education and preceding birth interval. Shorter prior birth intervals have very high chances of dying for all ages of children. Children having less than 2 years of prior birth interval have very high risk of death. The risk decline as the interval increases. Infant and child mortality rates for previous birth interval less than 2 years are high. Effective use of family planning methods can solve this problem.

Mortality risks vary sharply by education of parents. The risk of a child dying in any one of the 3 categories is high if the mother has no education than if the mother has secondary and higher education, with primary education in between. Differentials are somewhat less pronounced for father's education. In particular, the benefit of secondary education over high primary is quite modest. Education affects almost all aspects of human life including demographic and health behavior. The effect of education on child survival is largely mediated through

improved reproductive behaviors, contraceptive use family health and hygienic, improved preventive care, less morbidity etc. Education has become more wide spread over time in Bangladesh. Despite this improvement, levels of educational attainment remained low in Bangladesh.

Occupation also has strong association with infant and child mortality. The children of laborer have the highest mortality risks in each age range and each period and also have the lowest rates of improvement. Mortality is lowest among the children of professional workers, those involved in laborers. The children of fathers working in agriculture fall in between both in level and in rate of improvement.

In our study shows that better sources of drinking water reduces the infant and child mortality. Children living in households getting their drinking water from piped (either inside or outside the compound) and other have higher mortality risks than children getting their water from tube-well.

Better sanitation condition also reduces the infant and child mortality. Infant and child mortality rates were comparatively lower among respondent who had better toilet facilities available to them. Present study shows that respondents who use septic toilet have the lowest infant and child mortality rate while the highest infant mortality rate was observed among the respondents who use open latrine and those who have other.

Radio and Television is one of the most introduced and powerful media. For radio, now a day it has become an instrument of mere a few taka. Even the poorest quarter of the population is able to manage a radio for it's simplest enjoyment. Radio is not only enjoyment, it plays a vital and most important role to make the people aware concerning among public related affairs like health education etc. For television, it is not so cheap as radio but it plays very strong role for mass media. It broadcasts some programs concerning public health awareness. It is more suitable mass media because every man who is not read or writes watches this health based programs. When a household listen to radio or television at least once week achieve some degree of awareness relating to health and various kinds of diseases. This awareness leads a family to take some measures, which are beneficial for health. In such a family the children get some health facilities which protect them from various disease and decreases the rate of infant and child

mortality. Thus we can assume that a family watch and listen to television and radio at least once a week is conscious about the health of its children for which the rate of infant and child mortality is lower.

Access to electricity is related to reduction of overall of infant and child mortality. Households with electricity are associated with lower infant and child mortality. The child mortality index was slightly longer for respondents without electricity than for those with electricity. These differentials due to that a household having electricity may have radio or television and they may also have better social status. They are related with mass communication that are they learning many things form many health programs. That is why they are conscious about diseases, child care and hygienic. As a result infant and child mortality rate is lower for household with electricity.

Logistic regression implies that divisions have significant effect both on infant and child mortality. But individually all of the division are not significant for infant and child mortality. Barisal, Chittagong, Khulna, Rajshahi divisions have significant effect while in the case of Infant mortality and Dhaka division have no significant effect, with reference to Sylhet division. The odds ratio of all of the divisions are lower for infant mortality than Sylhet division. Again, Khulna and Rajshahi division have significant effect while in the case of mortality and, Barisal, Chittagong and Dhaka division have no significant effect, with reference to Sylhet division. The odds ratio of all of the divisions are higher for child mortality than Sylhet division.

Also mother's education have significant effect both on infant and child mortality. Individually all of the categories are significant for infant mortality. But individually all of the categories are not significant for child mortality. Only primary education has significant effect of infant and child mortality. The odds ratio of all of the Mother's education is lower for child mortality than no education.

Also father's educations (primary and higher) have significant effect on infant mortality and all of the odds ratio are lower than no education. But all of the father's educations categories are not significant for child mortality. The odds ratio of all of the Father's education is lower (secondary and higher) for child mortality than no education but not primary.

Father's occupation have significant effect only child mortality in labor type and all of the odds ratio are lower than others type. But all of the father's occupations categories are not significant for infant mortality. The odds ratio of all of the Father's occupation is lower (agriculture) for infant mortality than others but not labor and professional type.

Sex of child have no significant both infant and child mortality. Birth order number have significant effect both infant and child mortality. The odds ratio all of the category are lower for infant and child mortality than reference category. Main floor material have significant in infant mortality but not significant for child mortality. The odds ratios are lower for infant and child mortality than reference category. Main wall material have significant for both infant and child mortality. The odds ratio is lower for infant and child mortality than reference category. Main roof material has significant only for infant mortality but not for child mortality. The odds ratios are higher for infant and child mortality than reference category. Religion have significant in child mortality but not significant for infant mortality. The odds ratios are higher for infant and child mortality than reference category. Age of mother at birth have significant in infant mortality but not significant for child mortality. The odds ratios are lower for infant but higher for child mortality than reference category.

Month of breast-feeding have significant in infant mortality but not significant for child mortality. The odds ratios are lower for infant and child mortality than reference category. Finally, immunization has significant in infant child mortality. The odds ratios are lower for infant and child mortality than reference category.

In chapter six we proceed to identify the dimentions of our selected 15 (fifteen) variables applying the multivariate factor analysis approach. The variables were Residence, Division, Mother's education, Father's education, Father's Occupation, Sex of child, Birth order of child, Main floor Material, Main wall Material, Main roof Material, Religion, Mother age (Age of mother at birth), Breastfeeding (Month of breastfeeding), Immunization and Age at death (Month-imputed) from BDHS-2004 data in our country Bangladesh.

At initial it is observed that the variables are classified into two groups, such as- the socio-economic variables are Residence, Division, Mother's education, Father's education and Father's Occupation belongs to first group with Age at

death. Again, other Demographic, Sanitation, hygienic and Household variables are Sex of child, Birth order of child, Main floor Material, Main wall Material, Main roof Material, Religion, Mother age (Age of mother at birth), Breastfeeding (Month of breastfeeding) and Immunization with Age at death in second group.

We obtained estimates of the initial factors from principal components analysis. The first component is the combination that accounts for the largest amounts of variance in the sample. The second principal component accounts for the next largest amount of variance and is uncorrelated with the first and similarly, the third principal component. Successive components explain progressively smaller portions of the total sample variance and all are uncorrelated with each other.

We have represented our variables in the following forms. The amount of variation explained by these three factors for each variables are obtained from the communalities of the variables.

	Models	Communalities
Place of residence	$= -.235F_1 + .724F_2 + .176F_3$	.610
Region	$= -.168F_1 + .391F_2 + .619F_3$	.565
Mother's Education	$= .856F_1 + .008F_2 + .050F_3$	.735
Father's education	$= .871F_1 - .051F_2 - .020F_3$	.761
Father's occupation	$= -.374F_1 - .702F_2 + .223F_3$	.682
Age at death	$= -.148F_1 + .159F_2 - .833F_3$	.742

Finally, the factor scores for these three factors are computed by regression method for BDHS-2004 data based on the factor scores coefficient.

It is observed that are three eigen value greater than unity and almost 68.253% of the total variance is attributable to the first three factors. Also the scree plot suggests that a model with three factors may be adequate to represent the whole set of data. It is also observed that factor-1 contains mother's education (0.836) and father's education (0.866) larger loadings for maximum variables than factor-2 and factor-3. The factor loadings are the standardized regression co-efficient in the multiple regression equation with the original variable as the dependent variable and factors as the independent variables. The amount of variation explained by these three factors for each variable are obtained from the communalities of the variables.

Finally, scores for these three factors are computed based on the factor score co-efficient matrix. For each factor, the factor scores are obtained by multiplying the standardized values of the original variables by the corresponding factor score co-efficient.

Models	Communalities
Sex of child=-.018F_1+ .018 F_2- .034 F_3- .004 F_4+ .996 F_5-.016 F_6	.994
Birth order= -.099F_1+ .927 F_2- .083 F_3+ .036 F_5- .052 F_6	.880
Main floor= .769F_1+ .059 F_2 + .152F_3 + .059F_4 + .049F_5 - .048F_6	.626
Main wall= .786F_1+ .004F_2 - .086F_3 + .047F_4 + .004F_5 - .039F_6	.629
Main roof= .746F_1 - .134F_2 + .087F_3 - .072F_4 - .079F_5 + .027F_6	.594
Religion= -.056F_1- .018 F_2 + .064F_3 + .039F_4 - .016F_5 + .982F_6	.974
Mother age= .035F_1+ .936F_2 - .030F_3 - .071F_4 - .012F_5 + .029F_6	.884
Breastfeeding= .134F_1-.037F_2 +.703F_3 - .184F_4 - .055F_5 + .155F_6	.574
Immunization= .037F_1- .061F_2+.019F_3+.961F_4 - .005F_5 + .040F_6	.930
Age at death=.006F_1+ .069F_2- .791 F_3- .199 F_4- .014 F_5+ .072 F_6	.675

It is observed that there are three eigen value greater than unity and almost 77.612% of the total variance is attributable to the first six factors. Also the scree plot suggests that a model with three factors may be adequate to represent the whole set of data. The factor loadings are the standardized regression co-efficient in the multiple regression equation with the original variable as the dependent variable and factors as the independent variables. The amount of variation explained by these six factors for each variable are obtained from the communalities of the variables.

In course of factor analysis the selected 15 (fifteen) variables are divided into two groups. First: Socio-economic group and second: Demographic, Sanitation, Hygienic and Household group. From the first group we extracted 3 (three) factors based on principal component analysis with varimax rotation. Similarly, from the second group we extracted 6 (six) factors based on principal component analysis. Scores for those factors are also computed.

Thus we may conclude that the variables father's education and mother's education are closely related. Again birth order number and mother's age is closely related, which represented the infant and child mortality factor.

Environment is one of the main factor of infant and child mortality because which diseases are fully related in infant and child mortality are transmitted by infectious agents, food, water and air indices strongly related to environmental contamination used to measure the risk of infection care. Sources of water for bathing, cooking, cleaning and storage practice for food, the presence of latrine or toilet and use of soap and water that determine the focal contamination. Most of the developing countries in the world follow western ideas at health and hygienic and greater utilization of facilities, which are the main factors for better health and health intervention programs. Provision of health service should eliminate certain diseases in developing countries in according to the assumption of the biomedical approach.

7.3 Major findings

This study has identified the population subgroups in which children have the higher risk of premature death. They are as follows:

More infant and child mortality occurs

1. For respondents whose households are in rural areas.
2. Families where mother and father have a low level of education.
3. Mother's whose birth order is generally higher and who have close birth interval.
4. Respondents whose age at birth of child less than 20 years and for every older mother that is whose age at birth of child 35 and above have higher infant and child mortality.
5. Families where sources of drinking water are not tube-well.
6. Families where father have a low level of working status.
7. Household with open latrine or hanging latrine and those who have no facility also experienced very high infant and child mortality.
8. Household without electricity and
9. Respondent who do not listen to radio or televisions at least once a week.

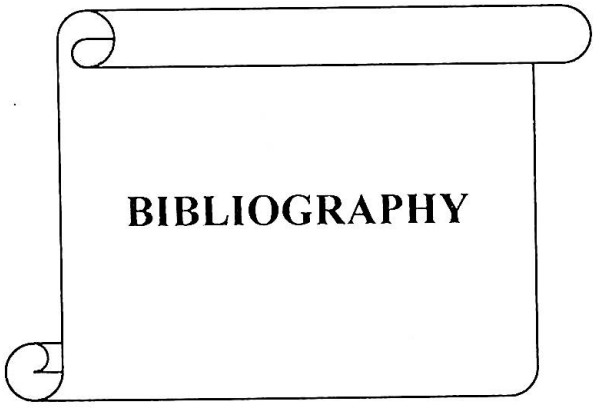
7.4 Policy Implication and Recommendations

Findings of this study may have some policy implications, merit additional comment and recommendations that would help to Government to achieve substantial improvement in child survival. Longer birth interval and postponement of the first birth until age 20 or older should have a considerable positive impact

on child survival. Increasing the age at marriage (at least 20 years) for female and encouragement of longer spacing of pregnancies have been suggested for reducing infant mortality. Finally the following recommendations can be stated for policy implications.

1. An increase in both male and female education or literacy and consequently a probable raise in the social status can be expected to result in improved infant and child survival in Bangladesh. The educational attainment of spouses up to secondary level may considerably reduce infant and child mortality. Education may provide better labor force participation and create awareness for the use of contraceptive methods. This may also help in rising the age at first birth, which in turn, may contribute to a reduction in infant and child mortality.
2. Higher order births 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 births.
3. Housing conditions should be improved to decreases mortality in the first year of life, particularly in rural areas.
4. The government should take a balanced program of family planning incorporating simultaneous practice of breast-feeding and use of modern contraception. So that women have longer birth interval.
5. Electrification throughout the country, particularly in the rural areas has been one of priorities of the government development plan during the recent year. Thus, continuation of electrification is expected to result in further improvement in infant and child mortality in Bangladesh.
6. Mass-media promotion program should be taken understanding about diseases and encourage of taking treatment. Mass media like television, radio have a tremendous influence on mother's awareness about mortality.
7. Pure drinking water in the household is ascertained so that children do not suffer from infectious diseases liked diarrhea. So government should take necessary step in this regard to undertake necessary steps for child survival.
8. Toilet facility should be develop and encourage people to build hygienic toilet at their home.

9. Birth should be reduced to very young (<20 years) mothers for postponement of premature birth, unwanted pregnancies, unstable material unions, and to older (>=35 years) mothers to avoid pregnancy complication due to reductions in reproductive capacity and other biological factors to higher pregnancy older.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