PN-ACN-492

Working Paper No. 27

Levels and Correlates of Mortality in Zone 3 of Dhaka City, 1995

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MCH-FP Extension Project (Urban)
Health and Population Extension Division

ICDDR,B
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1997

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B

Urban MCH-FP Extension Project

Urban FP/MCH Working Paper No. 27

Levels and Correlates of Mortality in Zone 3 of Dhaka City, 1995

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1997

ICDDR,B Working Paper No. 80

C

Editing: M. Shamsul Islam Khan

Layout Design and Desktop Publishing: SAKM Mansur
Roselin Sarder
Md. Yousuf

Cover Design: Asem Ansari

ISBN: 984-551-103-1

1997

Published by:
International Centre for Diarrhoeal Disease Research, Bangladesh
GPO Box 128, Dhaka 1000, Bangladesh
Telephone: 880-2-871751 (10 lines): Cable: CHOLERA DHAKA, Telex: 675612 ICDD BJ;
Fax: 880-2-883116,880-2-886050 and 880-2-871568

Printed by: Sheba Printing Press, Dhaka, Bangladesh.

Foreword

I am pleased to release these reports on urban Maternal and Child Health and Family Planning issues which are based on the operations research activities of the MCH-FP Extension Project (Urban) of the Centre. Over the years, the Centre has acquired a unique expertise on urban development matters that ranges from operations research on reproductive health, child survival and environmental issues to providing technical assistance for capacity building to service delivery organizations working in urban areas.

This work has produced important findings on the health conditions and needs of city dwellers, particularly the poor and those living in slums. The research has also identified service delivery areas in which improvements need to be made to enhance effectiveness. Together, these research findings have been translated into interventions currently being applied in government and non-government settings.

In order to carry out this innovative work, the Centre has established a partnership effort known as the Urban MCH-FP Initiative, with different ministries and agencies of the Government of Bangladesh and national non-government organizations, notably Concerned Women for Family Planning, a national NGO with wide experience in the delivery of MCH-FP services. The partnership receives financial and technical support from the United States Agency for International Development (USAID).

The overall goal of the partnership is to contribute to the reduction of mortality and fertility in urban areas. In practice, this joint work has already resulted in the development and design of interventions to improve access, coordination and sustainability of quality basic health services to urban dwellers with emphasis on the needs of the poor and those living in slum areas.

The Centre looks forward to continuing this collaboration and to assist in the wider dissemination and application of sustainable service delivery strategies in collaboration with providers in government, the NGOs and the private sector.

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Acknowledgements

The MCH-FP Extension Project (Urban) is funded by the United States of Agency for International Development (USAID) under the Cooperative Agreement No. 388-0071-A-00-3016-00 with the International Centre for Diarrhoeal disease Research, Bangladesh (ICDDR,B). The ICDDR,B is supported by the aid agencies of the Governments of Australia, Bangladesh, Belgium, Canada, Japan, the Netherlands, Norway, Saudi Arabia, Sri Lanka, Sweden, Switzerland, the United Kingdom, and the United States; international organizations including Arab Gulf Fund, European Union, the United Nations Children's Fund (UNICEF), the United Nations Development Programme (UNDP), and the World Health Organization (WHO); private foundations including Aga Khan Foundation, Child Health Foundation, Ford Foundation, Population Council, Rockefeller Foundation, Thrasher Research Foundation and the George Mason Foundation; and private organizations including, East West Center, Helen Keller International, International Atomic Energy Agency, International Centre for Research on Women, International Development Research Centre, International Life Sciences Institute, Karolinska Institute, London School of Hygiene and Tropical Medicine, Lederle Praxis, National Institute of Health (NIH), New England Medical Centre, Procter & Gamble, RAND Corporation, Social Development Center of Philippines, Swiss Red Cross, the Johns Hopkins University, the University of Alabama at Birmingham, the University of Iowa, University of Goteborg, UCB Osmotics Ltd., Wander A.G. and others.

The authors would like to express their appreciation to Golam Mostafa for his assistance with the life expectancy calculations and to Radheshyam Bairagi, Abbas Bhuiya, Robert Black, Andres De Francisco, Aminul Islam, Thomas Kane, Aye Aye Thwin, and Jeoren van Ginnekin for their thoughtful comments on earlier drafts of this paper.

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Summary

This report describes the levels and correlates of mortality for the Zone 3 population of Dhaka City for the 1995 calendar year on the basis of findings from the Urban Panel Survey of the MCH-FP Extension Project (Urban) of the International Centre for Diarrhoeal Disease Research, Bangladesh. The expectation of life at birth is 63 years, and three-fourths of all deaths occurring before the age of 50 were to infants during their first six months of life. Nine of the 10 infant deaths also occurred during the first six months of life. The infant mortality was 96 per 1,000 live births, considerably higher than the urban infant mortality rates of 57 estimated by the Bangladesh Bureau of Statistics and 81 estimated by the 1993-1994 Bangladesh Demographic and Health Survey. Mortality rates among the 5-35-year-old age groups appeared to be lower in Zone 3 than in other parts of Bangladesh.

Bivariate and multivariate analyses identified maternal education, number of living children, maternal employment, housing attributes, and monthly family income to be risk factors for infant mortality.

The mortality rates for children aged less than five years who were severely impoverished were 2.6-3.2 times greater than for children from less impoverished homes. Since one-quarter to two-thirds of infants and children were at increased risk of death because of their socioeconomic status (depending on the definition being employed), the removal of severe impoverishment as a risk factor could reduce mortality of children aged less than five years by as much as 34-51 per cent.

I. Introduction

Throughout the developing world, there is "an urgent need to systematically improve the information base for urban health development ... and to develop mechanisms for the prompt submission of analysed information to the responsible authorities and for feedback to the public" (Rossi-Espagnet et al., 1991). Bangladesh is no exception to this.

Although the health conditions of the urban people of developing countries are generally more favourable than those of the rural people, such a comparison does not, however, take into account several important facts: the socioeconomic characteristics of the urban population are much more heterogeneous than those of the rural populations, and the subgroups within the urban population with the least favourable socioeconomic characteristics are likely to have a health status which is even worse than that of rural inhabitants (Harpham, 1986; Stephens, 1995; Tanner and Harpham, 1995).

Harpham *et al.* (1985) noted,

> "The magnitude of the health problems of the urban poor rarely emerge in city health statistics. This is because the 'unofficial' squatter, shanty town or slum inhabitants do not appear in the statistics or because they are obscured by the enormous difference that exists between their health status and that of the urban elite. There is an urgent need for studies of intra-urban differentials in health to replace the misleading averages currently used."

To date, relatively little information is available on population-based mortality rates for subgroups in urban Bangladesh. The purpose of this report is, therefore, to provide an assessment of mortality for the entire population of Zone 3 of Dhaka City and its subgroups, as recorded by the vital events registration system of the Urban Panel Survey. This survey is a research activity of the MCH-FP Extension Project (Urban) of the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B). This report describes the levels of mortality in Zone 3 of Dhaka City, and explores the association of age, sex, and socioeconomic status with mortality. Emphasis is given on mortality of children aged less than five years.

II. Bangladesh urban mortality in context

Until 1961, less than 5% of the population of Bangladesh was living in an urban area (BBS, 1984). During the past two decades, however, the urban population of Bangladesh has grown from 6 million in 1974 (BBS, 1984) to 21 million in 1994 (BBS, 1995), and it is anticipated to grow to 50 million by the year 2014 (UNICEF, 1993; BBS, 1991). The current annual growth rate of the urban population is 6.1% compared to an overall national population growth rate of 1.9% (World Bank, 1994). Dhaka City is projected to have a population of 18.5 million in the year 2014, which would make it the ninth largest city in the world (UNFP, 1996).

Stephens (1995) recently stated that in developing countries, "growth in urban populations is synonymous with the growth of urban poverty - an estimated 30-70% of urban populations in developing countries are living in conditions of extreme material deprivation

characterized by inadequate environmental services including water, sanitation and waste disposal, as well as poor quality shelter and limited access to social services including health and education." These conditions exist in Bangladesh for a major proportion of the urban population.

There is considerable evidence from Bangladesh to suggest that mortality rates in urban areas are considerably lower than those in rural areas. Recent data from a national prospective sample registration system, for instance, indicate that the urban infant mortality rate is 57 deaths per 1,000 live births, 28% less than the rural rate of 79 (BBS, 1995). Similarly, mortality rates of urban children aged 1-4 years are currently estimated at 7.7 deaths per 1,000 children of that age group, 38% less than the rural rate of 12.5 (BBS 1995). The 1993-1994 Demographic and Health Survey, using information obtained from a cross-sectional retrospective survey, estimated that during the previous decade the infant mortality rate was 21% less in urban areas (80.9 versus 102.6), and the overall mortality rate for 1-4-year-old children was 36% less (36.3 versus 56.4) (Mitra et al.,1994).

The mortality rates for women of reproductive age (15-49 years) are 38-60% less in urban than in rural areas (Mitra et al., 1994). While comparisons of maternal mortality between urban and rural populations are not currently available, the overall national maternal mortality ratio is currently estimated to be 4.5 maternal deaths per 1,000 live births (Progotir Pathey, 1995).

Information on intra-urban variations in mortality for Bangladesh is almost non-existent. However, information collected by the MCH-FP Extension Project (Urban) between 1991 and 1993 from a representative sample of slum populations in Dhaka City indicates that the infant

mortality was 134-142 deaths per 1,000 live-births (Baqui et al., 1993; Baqui, 1997). But no information is currently available on the infant mortality rate for Dhaka's non-slum urban population.

III. Design and Methodology

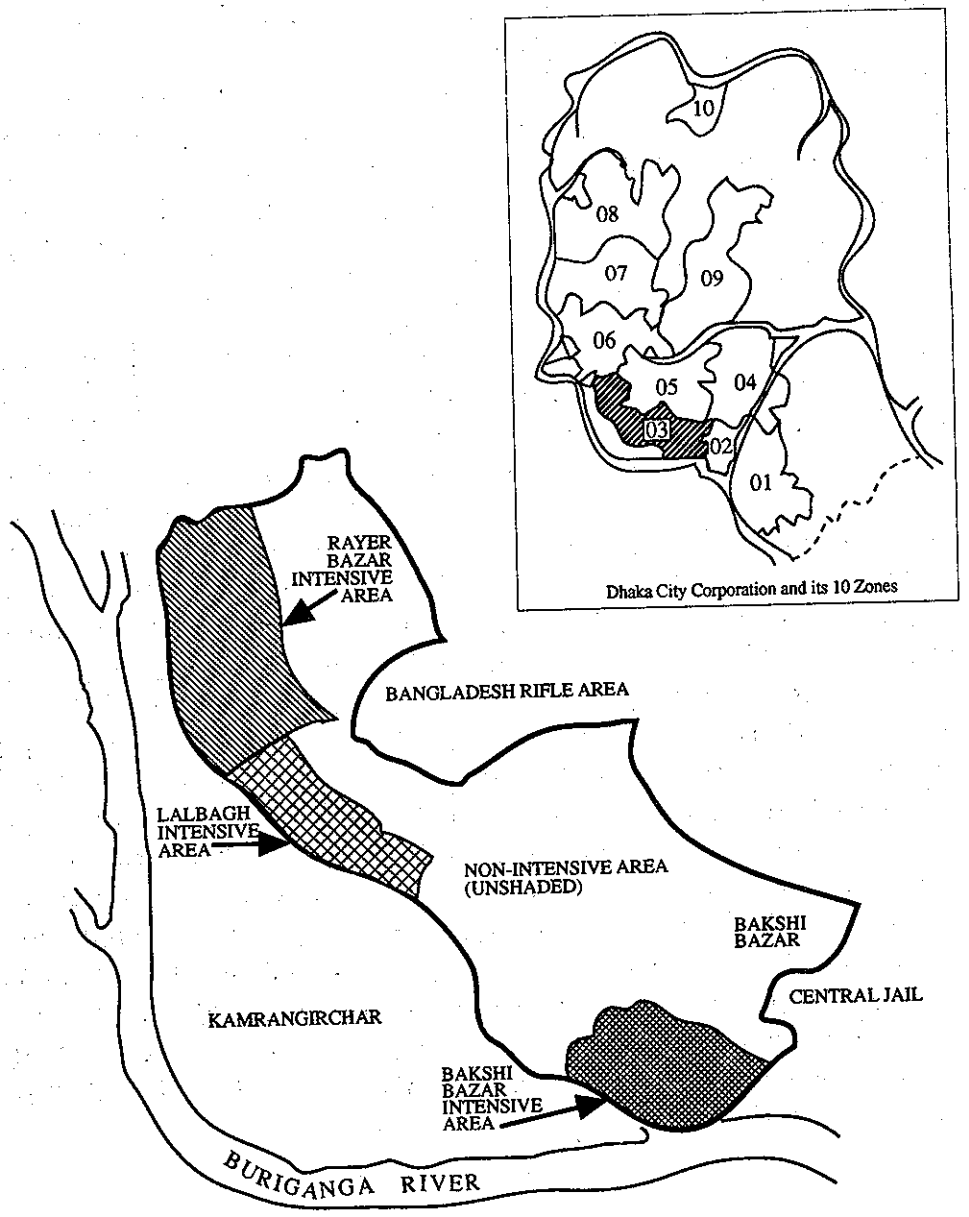
The data used for preparing this report are drawn from the Urban Panel Survey of the MCH-FP Extension Project (Urban) of ICDDR,B. The Project is a collaborative effort with the Government of Bangladesh and the Concerned Women for Family Planning, a leading national NGO providing maternal/child health and family planning services. The project's goal is to strengthen urban MCH-FP services through operations research. Many of these operations research activities are carried out in Zone 3, an area in the southwestern section of Dhaka City bordering the Buriganga River which has a population of approximately 450,000 persons (Fig. 1).

The Urban Panel Survey is a longitudinal health survey of 5,940 households containing 30,840 persons in 160 geographic clusters in Zone 3. The purpose of the Urban Panel Survey is to monitor sociodemographic and health indicators and to assess the effects of project operations research interventions. The clusters were selected by using a multi-staged areal sampling procedure. Data were collected from each household every three months by a visiting field interviewer who questions one representative of each household, usually the mother, and than completes a questionnaire concerning the use of health and family planning services as well as changes in health status. The data for the current study were collected between November 1994 and March 1996.

Prior to initiating the survey, Zone 3 was divided into four geographic areas as shown in Fig. 1, and each of these four areas was further divided into neighbourhoods of up to 200 households which are called Primary Sampling Units (PSU). Each PSU was characterized as being predominantly slum or non-slum. Then, 15 slum and 25 non-slum PSUs were selected from each of the four areas, using a probability-proportionate-to-size (PPS) sampling method. On the basis of detailed mapping, each PSU was divided into clusters, each having approximately 40 households. Then, one cluster was randomly selected from each PSU, yielding 160 sampled clusters.

At the time of the baseline interview, the birth date of each household member was recorded along with other basic health and sociodemographic information. Every three months, all of the households in each geographically defined cluster selected for inclusion in the Urban Panel Survey were visited. All vital events (births, deaths, and migrations) within that household occurring since the previous visit were recorded by the interviewer. In-migrants were registered as household residents when they had been present in the household for at least two consecutive months. Similarly, those who had been absent from the household for at least two consecutive months were no longer categorized as residents but were classified as out-migrants. Infants who had been born to mothers who were residents of the household were also considered to be residents of the household regardless of where the birth actually took place. Mortality rates are based on used the number of deaths recorded in 1995 by the Urban Panel Survey among Zone 3 residents, regardless of the actual location of the death. The denominator for all age-specific mortality rates beyond the first year of life is the mid-year population for the same particular group being analyzed. For infant, neonatal, and post-neonatal mortality rates, the denominator is the number of live births while for the perinatal mortality rate, the denominator is the total number of births (live births and stillbirths).

Fig.1. Map of Dhaka City and Zone 3



Since the probability of household selection in the Urban Panel Survey varied for the four geographic areas in Zone and for the slum/non-slum stratum within each area, all findings reported here have been weighted to be representative for Zone 3 as a whole. The weighing procedure helps to make the data more representative of Zone 3 as a whole. Occasionally in the tables, there are minor discrepancies due to rounding produced by the weighing process. The confidence interval for each mortality rate has been calculated using a standard error which is equal to the probability of death divided by the square root of the number of deaths observed, a method described more fully elsewhere (Selvin, 1991). Thus, the 95% confidence interval for a particular mortality rate is:

+/- 1.96 x 1,000 x (standard error of the probability of death).

Wherever possible, analysis has been limited to sub-groupings of the population for which at least 20 deaths have been observed.

Socioeconomic status has been measured in two separate ways: by a household physical characteristics index and by reported monthly family income. The Household Index score was constructed for each household by simply adding the number of favourable characteristics present for each house. The housing characteristics making up the index and the scores for computing the index are as follows:

roof[1]	non-pucca roof = 0, pucca roof = 1
wall	non-pucca wall = 0, pucca wall = 1

[1] *Pucca* refers to cement or brick, while non-*pucca* refers to less permanent materials, such as bamboo, tin, wood, or *jhupri*. *Jhupri* is a dwelling made from pieces of scrap material, such as plastic sheets, pieces of bamboo, or pieces of tin.

number of rooms	one room = 0, two or more rooms = 1
sanitation	primitive or no latrine = 0, latrine with no water seal = 1, latrine with water seal = 2
khat[2]	no khat = 0, khat = 1
almirah[3]	no almirah = 0, almirah = 1
table/chair	table or chair not present = 0, table or chair present = 1
radio	no radio = 0, radio = 1
TV	no TV = 0, TV = 1
fridge	no fridge = 0, fridge = 1.

A logistic regression analysis of infant mortality was carried out using the same weighted data for all variables included in the bivariate analysis except for previous birth interval, whose correlation with the number of living children was 0.70 and was, therefore, excluded from the model to avoid problems associated with multicollinearity. After including all variables except previous birth interval, only those variables with a significant association with the dependent variable were maintained in the final logistic regression model.

A measure of the public health significance of selected characteristics on mortality was computed, using the methods described by Northridge (1995). This measure, called the population attributable risk percentage (PAR%), is determined from the following equation:

$$[(Rate_{\text{total population}} - Rate_{\text{unexposed}})/(Rate_{\text{total population}})] \times 100\%.$$

All computations were carried out using EPI INFO version 6.1 and SPSS version 6.1 software. Confidence intervals for the logistic regression odds ratios were computed, using PEPI (Computer Programs for Epidemiologic

[2]A *khat* is a wooden bed which is raised above the floor. Those without a *khat* usually sleep on the floor.

[3]An *almirah* is a bureau.

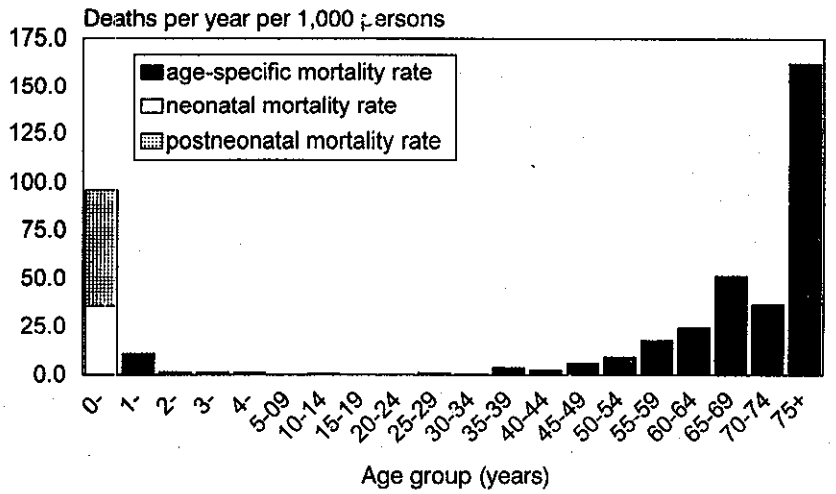
Analysis) version 2.05. Life expectancy has been calculated using the same procedure employed by the ICDDR,B Matlab Demographic Surveillance System (Mostafa et al., 1996).

IV. Results

1. Mortality by Age

Figure 2 and Appendix Tables 1 and 2 show the age-specific mortality rates for Zone 3 during 1995. The crude mortality rate is 6.1 per 1,000 population. For the five-year age groups between five years and 55 years of age, the mortality rates are less than 10 per 1,000 population. Beginning at age 55, the mortality rates increase moderately and then, at age 75, increase markedly.

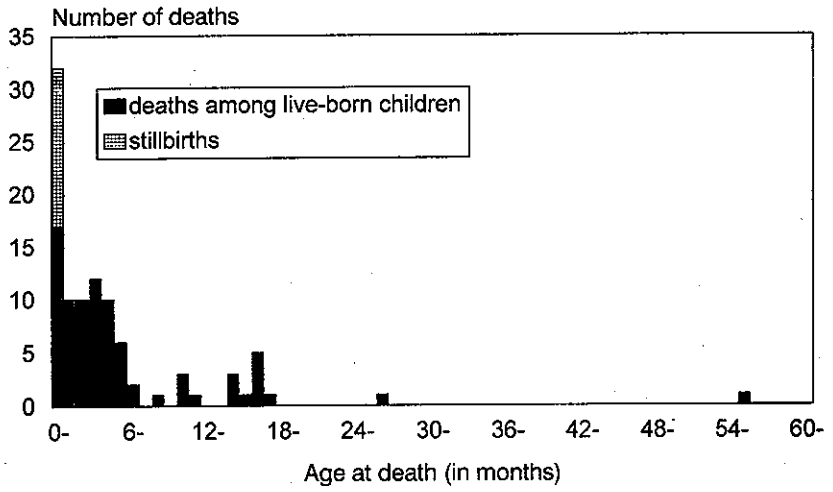
Fig. 2. Age-specific mortality rates in Zone 3 of Dhaka City, 1995



Data obtained from Appendix Table 1 and 2

In the 0-4-year-old age group, mortality was concentrated during the first year of life: 88% of all deaths of live-born children aged less than five years occurred during the first year of life (Fig. 3). One-third (32.5%) of the deaths of children aged less than five years, occurred during the first month of life, and another half (49.3%) occurred at the age 1-5 months. Thus, 83.4% of the deaths of children aged less than five years occurred during the first six months of life.

Fig. 3. Age at death among children aged less than five years in Zone 3 of Dhaka City, 1995



During the neonatal period, deaths were concentrated on the first day of life (day 0) and also on days 3-9 (Fig. 4). Forty-one per cent of the neonatal deaths occurred on the first day of life, and 31 per cent (10/32)

occurred at 4-14 days of life. The perinatal mortality rate is 36.2 per 1,000 infants born (live and stillbirths combined). The post-neonatal mortality rate is approximately twice as great at the neonatal mortality rate (60.2 versus 35.7). During the post-neonatal period, 48 deaths occurred from one to five months of age, but only six deaths occurred from six to 11 months of age. Thus, the 0-5-month mortality rate was eight times that of the 6-11-month mortality rate. This marked reduction in risk with increasing age during the first five years of life is also shown in Fig. 5, where the average daily risk of death has been computed for different ages during the first 59 months of life.

The life expectancy at birth is 62.6 years, and the total life expectancy at 5 and 45 years of age is 70.3 and 71.9 years respectively (Fig. 6 and Appendix Table 4).

Fig. 4. Age at death among infants in their first month of life, Zone 3 of Dhaka City, 1995

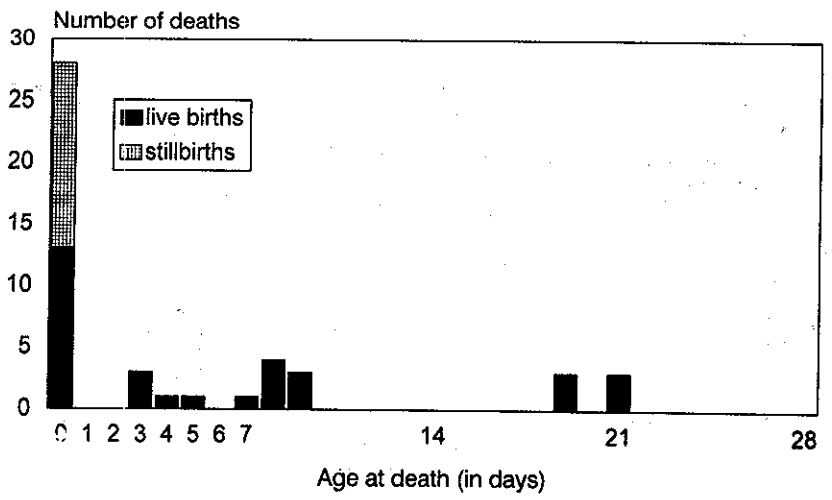
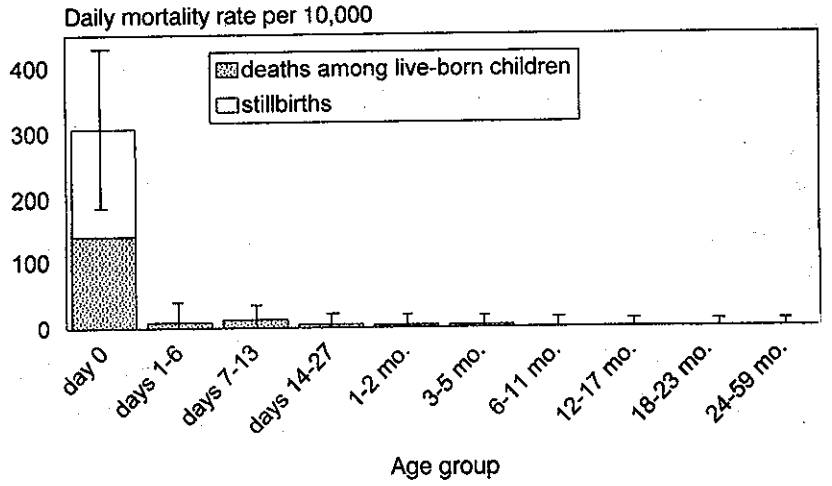
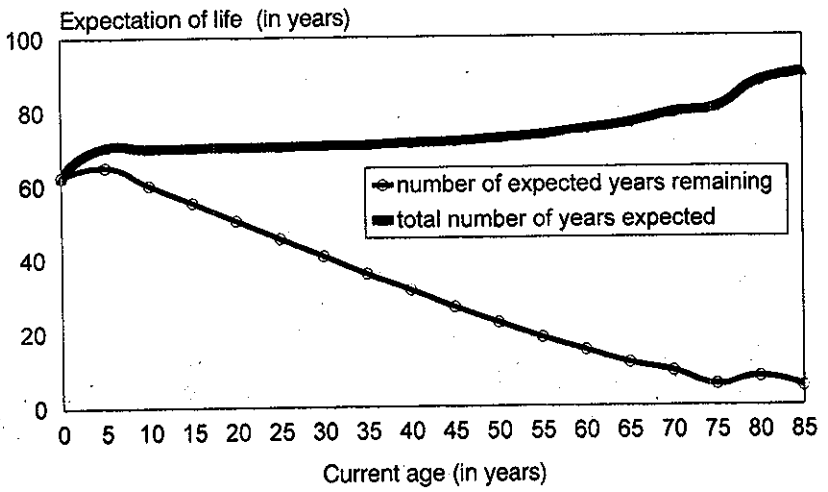


Fig. 5. Daily risk of death by age group for children aged less than five years in Zone 3 of Dhaka City, 1995



95% confidence limits shown as well; data obtained from Appendix Table 3

Fig. 6. Expectation of life by age in Zone 3 of Dhaka City, 1995



Data obtained from Appendix Table 4

2. Mortality by Sex

A comparison of the mortality rates by sex for specific age groups, as shown in Table 1, demonstrates that there were no significant differences in mortality by sex in any age group. For the 45-64-year-old age group, the risk of mortality among the males was twice as great as among the females, but this difference was not statistically significant.

Table 1. Mortality rates by age group and sex in Zone 3 of Dhaka City, 1995

Age group	Sex	No. of deaths in age group (weighted)	Mid-year population at risk (weighted)	Mortality rate	95% confidence interval
0-11 months	male	45	402*	111.9	79.2-144.6
	female	41	495*	82.8	57.5-108.2
12-59 months	male	5	1,532	3.3	0.4-6.1
	female	6	1,520	3.9	0.8-7.1
0-4 years (age groups collapsed)	male	50	1,938	25.8	18.6-33.0
	female	47	1,951	24.1	17.2-31.0
5-44 years	male	13	12,550	1.0	0.5-1.6
	female	12	13,106	0.9	0.4-1.4
45-64 years	male	21	1,686	12.5	7.1-17.8
	female	9	1,432	6.3	2.2-10.4
65+ years	male	19	351	54.1	29.8-78.5
	female	30	306	98.0	63.0-133.1
Total	males	103	16,525	6.2	5.0-7.4
	females	100	16,795	6.0	4.8-7.1

* for this age group, the number of live births recorded during 1995 was the denominator.

3. Mortality by Socioeconomic Group

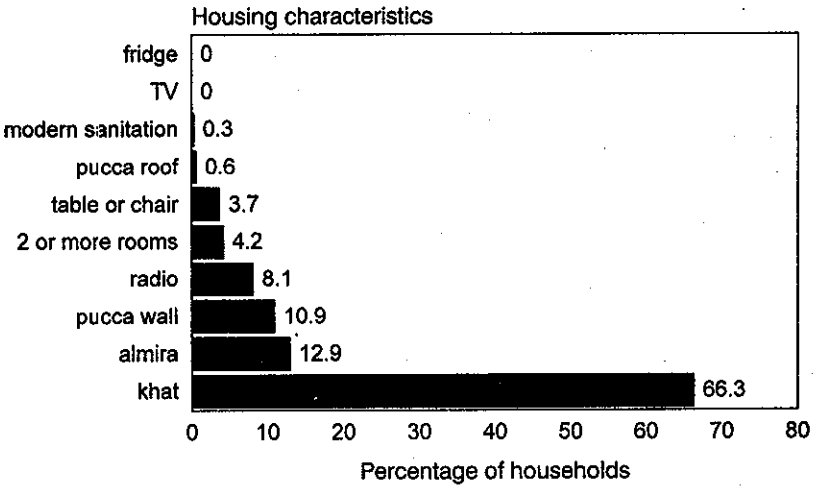
Tables 2 and 3 present an analysis of mortality rates by age group and socioeconomic status combined. Here, we have categorized households by a Household Index score, whose construction was described in the Design and Methodology section, and by reported monthly household income. A household with a score of <3 typically is a one-room dwelling with a wall and roof made of non-permanent material, with only one room, and with no latrine (Fig. 7). Very few of these households have any amenities beyond a khat. Twenty per cent of the population lived in a household with an index score of <3, and 64% of the households reported an average monthly income of less than Tk 5,000.

The infant and 0-4-year mortality rates showed a marked difference between children living in households with a Household Index of <3 and those living in households with a more favourable index. There was also a marked difference between children living in households with a monthly income of less than Tk 5,000 compared to those children living in households with higher incomes[4] (Fig. 8). The ratios of the rates obtained by dividing the rate for the higher socioeconomic group into the rate for the lower socioeconomic group are 2.9 and 3.2, as shown in Fig. 7.

An examination of the findings for the other age groups revealed no apparent relationship between Household Index score and mortality rate. However, the effect of Household Index Score in the 0-4-year age group was so strong that the effect even persisted when all age groups were combined together. Thus, the overall (crude) mortality rate for those with a Household Index score of <3 was almost twice as great as that for those living in other households (9.3 versus 5.1), and this difference was statistically significant (Table 2). There were no significant differences in mortality by household income for the older age groups (Table 3).

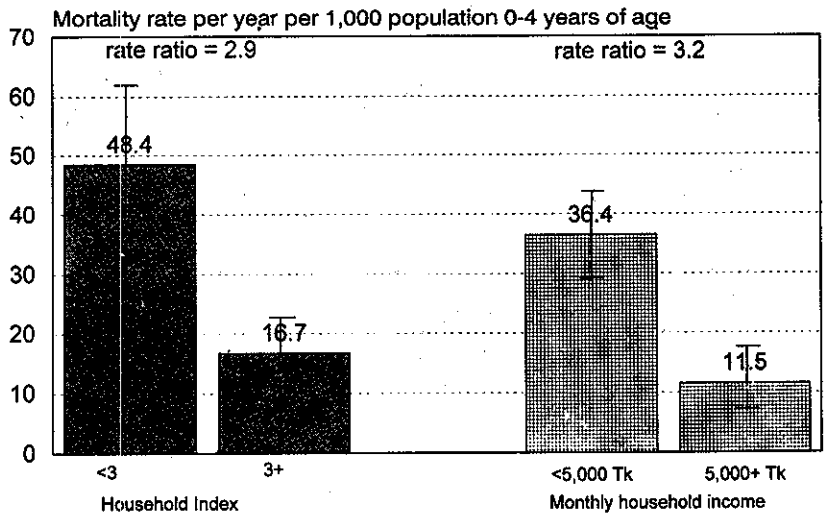
[4]Tk 40 is approximately US$ 1, so Tk 5,000 is approximately $125.

Fig. 7. Housing characteristics of those with a Household Index score of <3



Data obtained from Appendix Table 5

Fig. 8. Mortality rates for children aged less than five years in Zone 3 of Dhaka City by Household Index and monthly income



95% confidence intervals shown; see text for definition of Household Index

Table 2. Mortality rates by age group and Household Index Score in Zone 3 of Dhaka City, 1995

Age group	Household index score	Population (weighted)	No. of deaths (weighted)	Mortality rate per 1,000	95% confidence intervals
0-4 years	<3	1,013	49	48.4	34.8-61.9
	3-5	1,231	19	15.4	8.5-22.4
	6-8	914	14	15.3	7.3-23.3
	9+	724	15	20.7	10.2-31.2
5-75+ years	<3	5,665	15	2.6	1.3-4.0
	3-5	8,245	23	2.8	1.6-3.9
	6-8	7,184	34	4.7	3.1-6.3
	9+	8,253	30	3.6	2.3-4.9
All age groups combined	<3	6,677	64	9.6	7.2-11.9
	3-5	9,476	42	4.4	3.1-5.8
	6-8	8,098	48	5.9	4.3-7.6
	9+	8,977	45	5.0	3.5-6.5
0-4 years (Household Index categories collapsed)	<3	1,012	49	48.4*	34.9-62.0
	3+	2,869	48	16.7*	12.0-21.5
All age groups combined (Household Index categories collapsed)	<3	6,677	64	9.6*	7.2-11.9
	3+	26,551	135	5.1*	4.2-5.9

* difference in mortality rate is statistically significant ($p < .05$)

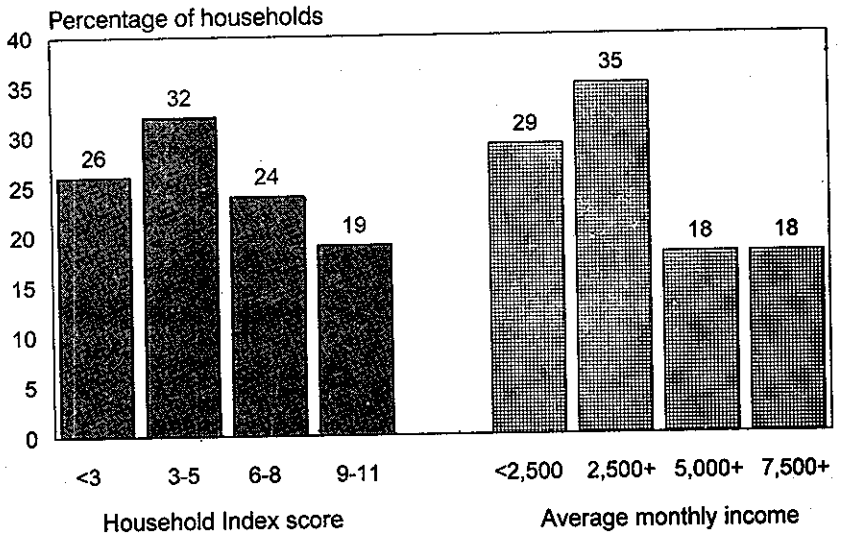
Table 3. Mortality rates by age group and reported monthly household income in Zone 3 of Dhaka City, 1995

Age group	Reported monthly household income (Tk)	Population (weighted)	No. of deaths (weighted)	Mortality rate per 1,000	95% confidence intervals
0-4 years	<2,500	1,145	39	34.1	23.4-44.8
	2,500-4,999	1,376	45	32.7	23.1-42.3
	5,000-7,499	701	7	10.0	2.6-17.4
	7,500+	667	6	9.0	1.8-16.2
5-75+ years	<2,500	7,334	20	2.7	1.5-3.9
	2,500-4,999	9,714	29	3.0	1.9-4.1
	5,000-7,499	5,439	24	4.4	2.6-6.2
	7,500+	6,944	32	4.6	3.0-6.2
All age groups combined	<2,500	8,479	59	7.0	5.2-8.7
	2,500-4,999	11,090	74	6.7	5.2-8.2
	5,000-7,499	6,140	32	5.2	3.4-7.0
	7,500	7,610	39	5.1	3.5-6.7
0-4 years (income categories collapsed)	<5,000	2,521	84	33.3*	26.2-40.4
	5,000+	1,369	13	9.5*	4.3-14.7
All age groups combined (income categories collapsed)	<5,000	19,569	133	6.8	5.6-8.0
	5,000+	13,751	71	5.2	4.0-6.4

* difference in mortality rate is statistically significant ($p < .05$)

A Household Index score of <3 and a reported monthly household income of <Tk 5,000 per month are strong risk factors for childhood mortality. As Figure 9 indicates, 26% and 64% of the households having a child aged less than five years were exposed to these two risk factors, respectively.

Fig. 9. Distribution of households by Household Index and monthly income



Fifty-one per cent of the deaths of children aged less than five years occurred among those living in households having a Household Index score of <3. In contrast, 26% of children aged less than five years lived in such households. Eighty-three per cent of the deaths of children aged less than five years occurred among those living in households with a monthly reported income of Tk 5,000 or less, while 64% of the children aged less than five years lived in such households.

Table 4 shows the results of the analysis of the population attributable risk percentage (PAR%) for those relationships in Tables 2 and 3 for which the differences in mortality rates were statistically significant. These findings indicate that if it were possible to eliminate the risk factors associated with (or caused by) a Household Index of <3 or a monthly household income of <Tk 5,000, the 0-4-year mortality rates would be reduced by 34-51%.

Table 4. Population attributable risk percentage (PAR%) for socioeconomic variables

Socioeconomic variable	0-4-year-mortality rate	PAR%
Household Index score		
<3	48.4	
3+	16.7	
all households	25.2	34%
Monthly family income		
<Tk 5,000	33.3	
Tk 5,000+	9.5	
all households	25.2	62%

4. Bivariate and Multivariate Analyses of Risk Factors for Infant Deaths

A bivariate analysis of the differences in infant mortality rates by various risk factors, as shown in Table 5, indicates that the following four variables have a statistically significant association with the risk of infant deaths: mother's education, number of living children, Household Index score, and family monthly income. The risk of infant death is almost four times greater for those whose mothers have less than six years of education compared to those whose mothers have six or more years; the risk is almost three times greater among first-born infants compared to later-born infants; the risk is 2.3 times greater among those whose family Household Index score is <3 compared to those whose family Household Index score is 3+, and the risk is 2.4 times greater among those whose family monthly household income is $<$Tk 5,000 compared to those whose family household income is Tk 5,000+.

Table 5. Infant mortality rates by selected family sociodemographic characteristics

Family socio-demographic characteristic	Attribute	No. of births (weighted)	No. of infant deaths (weighted)	Infant mortality rate	95% confidence interval
Sex of index child	male	402	45	111.9	79.2-144.6
	female	495	41	82.8	57.4-108.2
Mother's age	<20	241	32	132.8	86.8-178.8
	20-24	328	21	64.0	36.6-91.4
	25-29	207	23	111.1	65.7-156.5
	30+	122	9	73.8	25.6-122.0
Mother's age (categories collapsed)	<20	241	32	132.8	86.8-178.8
	20+	656	54	82.3	60.4-104.3
Mother's education	none	379	45	118.7	84.0-153.4
	1-5 years	285	34	119.3	79.2-159.4
	6-10 years	197	5	25.4	3.2-47.6
	11+ years	36	2	55.5	0-132.5
Mother's education (categories collapsed)	<6 years	664	79	119.0	92.7-145.2
	6+ years	234	7	29.9	7.8-52.1
Number of living children in family, including most recently born child	1	350	55	157.1	115.6-198.7
	2	254	17	66.9	35.1-98.7
	3	293	11	37.5	15.4-59.7

Table 5 (cont'd)

Family socio-demographic characteristic	Attribute	No. of births (weighted)	No. of infant deaths (weighted)	Infant mortality rate	95% confidence interval
Number of living children in family, including most recently born child (categories collapsed)	1	350	55	157.1*	115.6-198.7
	2+	547	29	53.0*	33.7-72.3
Previous birth interval	none (first-born child)	382	39	102.1	70.1-134.1
	< 24 months	72	9	125.0	43.3-206.7
	24+ months	443	37	83.7	56.7-110.7
Mother works for money	yes	114	18	157.9	85.0-230.8
	no	783	68	86.8	66.2-107.5
Father's occupation	unskilled manual or none	209	27	129.2	80.5-177.9
	skilled manual or non-manual	606	52	85.8	62.5-109.1
Household Index score	<3	231	39	168.8	115.8-221.8
	3-5	333	18	54.1	29.1-79.1
	6-8	170	14	82.4	39.3-125.5
	9+	160	15	93.8	46.4-141.2

Table 5 (cont'd)

Family socio-demographic characteristic	Attribute	No. of births (weighted)	No. of infant deaths (weighted)	Infant mortality rate	95% confidence interval
Household Index score (collapsed)	<3	231	39	168.8*	115.8-221.8
	3+	663	47	70.9*	50.6-91.2
Family monthly income	<Tk 2,500	277	36	130.0	87.5-172.4
	Tk 2,500-4,999	322	37	114.9	77.9-151.9
	Tk 5,000-7,499	140	6	42.9	8.6-77.1
	Tk 7,500+	158	6	38.0	7.6-68.4
Family monthly income (categories collapsed)	<Tk 5,000	599	73	119.1*	91.4-146.8
	Tk 5,000+	298	12	49.8*	24.6-75.1

* difference in mortality rate is statistically significant ($p < .05$)

The findings of the multivariate logistic regression, as shown in Table 6, indicate that when the effects of the other variables included in the analysis were controlled, the following four variables have a significant influence on the risk of death: mother's education, number of living children, employment status of the mother, and Household Index score. Infants with a mother having less than six years of education have a risk of death during the first year of life which is 3.5 times that for other children. The risk of death for infants in families with no other children is no different from that for infants in families with two children, but the risk of

death for those with three or more children is 2.2 times greater than for those with two children. The risk of death for infants born to mothers who are income earners is 2.6 that for infants whose mothers are not income earners, and the risk for infants living in families whose Household Index score is <3 is 2.5 times that for infants living in households with higher index scores.

Table 6. Logistic regression estimates of the effects of family household sociodemographic variables on infant mortality

Covariate	Reference category for covariate	Covariate attribute	Odds ratio	95% confidence limits
Sex	male	female	ns	nc
Age of mother	<20	20+	ns	nc
Education of mother	6 years+	<6 years	3.47	1.57-7.71
Number of living Children	2 children	1 child	0.64	0.32-1.29 (ns)
	2 children	3+ children	2.22	1.27-3.88
Mother employed?	no	yes	2.63	1.54-4.47
Husband's occupation	manual unskilled or none	manual skilled or non-manual	ns	nc
Household index score	3+	<3	2.51	0.59-3.98 (ns)
Average monthly Income	Tk 5,000+*	<Tk 5,000*	ns	nc

-2 log likelihood: 541.7; number of observations: 953; degrees of freedom: 5

note:1. the data are weighted to be representative of Zone 3;
2. ns- not statistically significant (and was, therefore, not included in the final logistic regression model)
3. nc- 95% confidence interval could not be calculated because the covariate was not included in the final logistic regression model.

* Tk 5,000 is equivalent to approximately US$125.

There were no significant interaction effects observed. Just as in the bivariate analysis, sex of the infant, maternal age, and father's occupation has no significant association with infant deaths. Although reported monthly income, when divided into categories of <Tk 5,000 and Tk 5,000+, demonstrates a significant association with infant mortality in the bivariate analysis, this relationship does not persist after controlling for the other variables in the multivariate model. The bivariate analysis did not reveal a significant association between maternal employment and infant mortality, but the multivariate analysis demonstrateds a strong relationship. Another difference between the bivariate and the multivariate analyses is that infants in families with three or more children are at lower risk of death, but after controlling for the effects of other independent variables, the risk of death for infants in families with three or more children becomes greater than for infants in families with only two children.

V. Discussion

1. Major Findings

The findings from this analysis demonstrate a major influence of two separate determinants of mortality, namely age and socioeconomic status. The youngest infants and the infants in the most severely impoverished households are at markedly greater risk of death. While both of these effects are well- known, it is the magnitude of the two effects in the Zone 3 population which is remarkable.

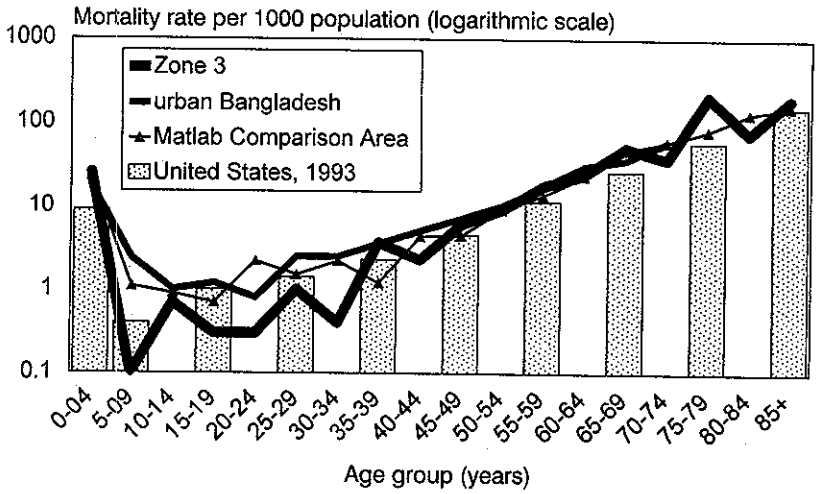
The period from birth to the end of the first six months of life is far and away the time of greatest risk of death in the Zone 3 population of Dhaka City. Three-fourths of all deaths (including stillbirths) which

occurred among persons less than 50 years of age occurred among those less than six months of age.

After the first six months of life, the risk of death declines markedly. Fewer than one in 10 deaths among infants 0-11 months of age occurred between 6 and 11 months of age, and after the first year of life, mortality remains at 11 deaths or less per 1,000 population per year until 50 years of age, when death rates begin to rise. As Figure 10 shows, the age-specific death rates for Zone 3 are similar to those in the Matlab comparison area (reported by ICDDR,B) and urban Bangladesh (reported by the Bangladesh Bureau of Statistics) except that the rates for persons in the 5-35-year-old age groups appear to be slightly lower in Zone 3. Figure 10 also compares these rates with the most recent rates available from the United States. Although 0-4-year mortality in Zone 3 is higher than in the United States, the rates for the other age groups in Zone 3 are similar, if not better, than in the United States.

The number of deaths included in our analysis is not large enough to permit a meaningful analysis of the sociodemographic determinants of mortality for five-year age groups beyond childhood, but an analysis of these older age groups combined reveals that there is no notable difference in mortality rates by sex or socioeconomic status. There is no evidence that women of reproductive age (15-44 years of age) have any excess mortality compared to men of the same age group (data not shown).

Fig. 10. Comparison of mortality by age group in Zone 3 of Dhaka City with that for Matlab, urban Bangladesh, and the United States



References: BBS, 1995; Mostafa et al., 1996; DHHS, 1996.

2. The Effects of Severe Impoverishment on Mortality of 0-4-year-old Children

The fact that there were a greater number of deaths in children aged less than five years than in the older age group has made possible a more detailed analysis of risk factors during childhood. There is a significantly greater 0-4-year mortality in the lowest socioeconomic groups. The attributable proportion of mortality associated with living in a household with a Household Index score of <3 is 67%. If the mortality rate for this high-risk group were the same as that for those children living in

households with more favourable index scores, the overall 0-4-year-old mortality rate would be reduced by one-third, that is from 25.2 to 16.7. Similar findings were obtained when households were characterized by reported monthly income. Severe impoverishment is associated with a threefold increased risk of death, and 31-51% of the mortality among 0-4-year-old children in the Zone 3 population can be attributed to severe impoverishment.

The findings are consistent with a threshold effect for childhood mortality and raise the possibility that if the poorest families could improve their income, substantial improvements in childhood mortality might be possible.

3. Analysis of Mortality by Sex

The lack of any significant differences in 0-4-year mortality rates by sex contrasts with earlier reports from the slums of Dhaka (Baqui et al., 1993) in which female infant mortality was 22% higher than male infant mortality (156.3 versus 127.8) and in which 1-4-year female mortality was 217% higher than 1-4-year male mortality (10.4 versus 4.8). Although previous reports from Bangladesh have also identified higher childhood mortality rates after the first year of life among females (Bhuiya and Streatfield, 1991; D'Souza and Chen, 1980, Mitra et at. 1994), survival of females at birth now exceeds that of males in Matlab (Datta and Bairagi, 1997). The infant mortality rate for males in our study is higher than for females, although the difference is not statistically significant. Multiple studies from Africa have reported higher male than female infant mortality (Gbenyon and Locoh, 1992). Although the 1-4-year mortality rates calculated in our study are based on a very small number of deaths, there is no indication that female mortality is higher.

4. Risk Factors for Infant Death

As in numerous other studies in Bangladesh and elsewhere, low educational level of the mother is a significant risk factor for infant death (see for instance, see Bhuiya and Streatfield, 1991; Caldwell, 1981 and 1991; Cleland and van Ginnekin, 1988; Mitra et al., 1994). Better-educated mothers generally have more control over the care of their infants and are more likely to seek appropriate preventive and curative health services. Better-educated mothers themselves are better nourished, are able to provide their infants with better nourishment, and live in more hygienic environments.

In many studies, parity generally has U-shaped relationship with infant mortality, with higher mortality rates observed among first-born infants, lower rates among second and third-born infants, and higher rates among higher-order births (Jain and Visaria 1988). In our study population, the relatively small number of infant deaths among higher parity births precludes the analysis of rates among fourth order and higher infants. However, the logistic regression analysis did reveal that infants in families with three or more children are over twice as likely to die as infants in families with only two children.

The strong association between family income and infant mortality is apparently explained by the effect of income on several family characteristics, including the number of children, whether the mother works for money, and the Household Index score. These variables remain as significant predictors of infant mortality in the multivariate logistic regression analysis, while income does not.

The multivariate logistic regression analysis identified maternal employment (defined as working for money either in the home or outside the home) as a significant risk factor for infant death, increasing the risk of death by well over two times. Thirteen per cent of Zone 3 infants have working mothers.

A Household Index score of <3 is a major risk factor for infant mortality, both in the bivariate and the multivariate analyses. Further analyses are needed regarding the degree to which housing quality itself directly influences mortality and the degree to which housing quality is associated with other variables which themselves exert an independent influence on infant mortality. But, at least for this analysis, controlling for other basic sociodemographic characteristics does not reduce the strength of this risk factor for infant deaths.

One study of squatter settlements in Jordan concluded that housing quality is a causally relevant determinant of child mortality and "community upgrading, even when chiefly physical, will have favorable effects on health and child survival" (Tekçe and Shorter, 1984). In the case of Zone 3 (and perhaps other urban areas of Bangladesh as well), it is possible that minimal improvements in monthly income in the poorest households could possibly have a significant impact on infant and child mortality.

5. Other Research on Social Determinants of Mortality

Although there is a long tradition of research in developed countries regarding social differentials in mortality, this field of investigation is still relatively new in developing countries, particularly in urban areas (Duncan et al., 1995). Although there has been some progress in identifying the

"proximate" causes of child mortality (Mosley and Chen, 1984), there is nonetheless a powerful tendency to focus on the immediate medical causes of death rather than on the social processes which set the stage on which the biological events leading to death can more readily occur (Kunitz, 1987). Thus, a better understanding of the effects and mechanisms of what Link and Phelan (1995, 1996) refer to as "fundamental social causes" of disease is needed. As Syme (1986) has remarked, "it is surprising that one of the most persistent and pervasive observations in public health remains so little understood." Further qualitative studies are needed to better understand the pathways of influence of the social causes on mortality (Ewbank, 1995).

6. Strengths and Limitations of the Study

The data reported here are from one of the few high-quality demographic surveillance systems in the developing world. These data have been obtained from a population which has a wide range of socioeconomic conditions, from the worst squalor imaginable to comfortable upper-middle class conditions. Thus, the data are unique, and they are important because of their richness and quality. Even so, it should be pointed out that these data are from the first year of operation of the surveillance system, and it is possible that some births or deaths were not registered, especially since the vital events were registered only every three months at the time of a household interview.

There were only 204 deaths (unweighted) of all age groups recorded in one year in the Urban Panel Survey's sample of 33,288 persons. Meaningful comparisons between subgroups, particularly those of the older age groups, were not possible because of the small number of deaths in each subgroup. As the Urban Panel Survey continues to function

during the coming years and as the number of deaths entered into the database increases, more detailed analyses of mortality by subgroup will be possible. As more maternal deaths are registered in the future, analyses of maternal mortality will become possible.

There is some concern that the perinatal and neonatal death rates observed in our study are under-estimates of the true rates since other studies have reported higher rates for urban Bangladesh (Mitra et al., 1994) and for the Dhaka urban slum population (Antelman, 1997).[5] The data for this report have been obtained from the first year of the Urban Panel Survey. If under-reporting is in fact present, perhaps it will decrease in subsequent years as the quality of the survey improves and as the population becomes more accustomed to reporting vital events.

A major drawback of this study is the lack of information about birth weights. In Antelman's study of 1,593 pregnant slum women, 45% gave birth to infants whose birth weight was less than 2.5 kg. The risk of infant mortality is greatly increased among low-birth-weight infants (Walsh et al., 1993; Wilcox and Russell, 1983). There is evidence in Bangladesh that maternal nutritional status is correlated with maternal education and household economic status (Baqui et al., 1994) and that maternal nutritional status is correlated with the offspring's nutritional status as well as risk of death (Baqui et al., 1994; Rahman et al., 1993). The association between poor maternal nutrition (as assessed by maternal height) and low birth weight is well-established (Kramer, 1987).

[5]The urban neonatal per1,000 live birth mortality rate for Bangladesh reported by Mitra et al. (1994) was 44 for the 1984-1994 period compared to 36 in this report. The Dhaka slum perinatal mortality reported by Antelman (1997) was 75 per 1,000 births compared to 61 among those in our study with a Household Index score of <3, which represents the most severely impoverished segment of the slum population.

Information on the causes of death would have enriched the analysis, particularly for childhood deaths. A verbal autopsy protocol has been carried out for all under-five deaths and will be the subject of a later report. Analyses of the relationship between health-promoting behaviours such as immunization and breast-feeding and subsequent risk of death will be instructive and will be carried out in the future.

Since the Urban Panel Survey utilizes a representative sample of geographic clusters of household in Zone 3, inferential techniques have had to be employed to assess whether differences in mortality rates are statistically significant or not. The statistical techniques used here to measure confidence intervals for mortality rates are based on sound statistical principles and are simple to apply in practice (Selvin, 1991).

VI. Programmatic and Policy Implications

Future efforts directed toward improvements in mortality in the Zone 3 population, and presumably in other urban areas of Bangladesh, need to focus on those who are at the highest risk of death, namely severely impoverished pregnant women and their infants, particularly during the first six months of life. This high-risk group is in special need of services which are aimed at preventing the main known immediate and proximate causes of infant mortality. Further reductions in infant mortality will require, among other things, providing this high-risk group with a package of basic health services.

Other studies from Bangladesh and elsewhere indicate that the major immediate causes of mortality among infants aged less than six months include obstetric emergencies, low birth weight, prematurity,

neonatal tetanus, diarrhoea, and pneumonia (Baqui et al., 1993 and 1997; Bhatia, 1989; Fauveau et al., 1990; Mavalankar et al., 1991; Mostafa et al., 1996). The more proximate causes of mortality in this group include a maternal age of less than 20, lack of education among mothers, malnutrition of mothers and children, lack of prenatal care, lack of exclusive breast-feeding, lack of adequate maternal immunization against tetanus, and birth intervals of less than 24 months (Baqui et al., 1994; Fraser et al., 1995; Mavalankar, 1991; Mostafa et al., 1996; Steinglass et al., 1993; Victoria et al., 1987; Working Group, 1989). Chronic malnutrition, as manifested by low maternal height, is a major risk factor for low-birth-weight newborns who, in turn, are at increased risk of death (Antelman, 1997; Baqui et al., 1994).

Thus, logical deduction suggests that promoting improved nutrition and delayed childbearing among severely impoverished adolescent girls might lead to improvements in the mortality of their offspring. Other components of the package of services which would appear to be appropriate include prenatal care and tetanus immunization, learning about the warning signs of pregnancy and childbirth, access to emergency obstetric care if the need arises, attendance of their delivery by someone trained in safe-delivery techniques, the practice of exclusive breast-feeding during the first five months of life of their newborns, learning about the warning signs of pneumonia, access to appropriate antibiotic treatment if the need arises, and learning how to manage episodes of childhood diarrhoea.

If this basic package of services could be delivered to severely impoverished women and their infants, further reductions in mortality should occur. We estimate that less than 1% of the overall population with

a Household Index score of <3 is pregnant or under six months of age.[6] A basic package of services provided for this small segment of the population could have an impact on infant mortality which is affordable and feasible for Bangladesh.

Aside from the potential mortality impact of strengthening basic preventive and curative health services for severely impoverished pregnant women and infants during the first six months of life, the findings of our study suggest that efforts to assist the poorest families in increasing their income could make a major impact on infant and child mortality.

Continued attention to the immediate and underlying risk factors for death will be needed in order to target highly specific services to those segments of the population at greatest risk.

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[6]This figure is derived in the following manner. Children aged 0-59 months constitute 12 per cent of the Zone 3 population (data from Appendix Table 1). Twenty-six per cent of children aged 0-59 months live in a household with a Household Index score of <3, and approximately 10% of these are in their first six months of life (since six months is one-tenth of the length of time from birth to 59 months of age). Thus, 0.3% of the population is composed of severely impoverished infants during their first six months of life (0.12 x 0.26 x 0.10). In addition, at the time of the Baseline Household Survey carried out in Zone 3 in late 1994, 4% of married women of reproductive age identified themselves as being pregnant, and these pregnant women constitute approximately 3% of all women of reproductive age. These women constitute 26% of the overall population (data from Table 1), and severely impoverished pregnant women constitute approximately 26% of this group as well. Thus, approximately 0.2% (.03 x .26 x .26) of the population is composed of severely impoverished pregnant women. Altogether, this suggests that only 0.5% of the population (0.3% + 0.2%) constitutes a critical target group for an essential package of services which is aimed at reducing infant mortality.

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Appendix

Table 1. Age-specific mortality rates by five-year age groups in Zone 3 of Dhaka City, 1995

Age group (years)	No. of deaths in age group (weighted)	Mid-year population (weighted)	Mortality rate (per 1,000)	95% confidence interval
0-4	98	3,889	25.2	20.2-30.2
5-9*	0	4,403	0.0	0.0-0.7
10-14	3	4,592	0.7	0.0-1.4
15-19	1	3,517	0.3	0.0-0.9
20-24	1	3,999	0.3	0.0-0.8
25-29	3	2,961	1.0	0.0-2.2
30-34	1	2,516	0.4	0.0-1.2
35-39	7	1,892	3.7	1.0-6.4
40-44	4	1,775	2.3	0.1-4.5
45-49	7	1,154	6.1	1.6-10.6
50-54	9	980	9.2	3.2-15.2
55-59	8	453	17.7	5.5-29.9
60-64	13	531	24.5	11.2-37.8
65-69	14	273	51.3	24.4-78.2
70-74	8	220	36.4	11.2-61.6
75-79	15	71	211.3	104.4-318.2
80-84	4	54	74.1	1.5-146.7
85+	8	41	195.1	59.9-330.3
75+ (categories collapsed)	27	166	162.7	100.3-224.1

* The formula for the confidence interval of this special case (since the probability of death is 0) is (3/n x 1,000) where n is the population at risk (Selvin, 1991).

Table 2. Age-specific mortality rates during the first five years of life in Zone 3 of Dhaka City, 1995

Age group	No. of deaths in age group (weighted)	Mid-year population (weighted)°	Mortality rate (per 1,000)	95% confidence interval
28 weeks of gestation-6 days (perinatal period)	33	912*	36.2	23.8-48.5
0-27 days (neonatal period)°°	32	897†	35.7	23.3-48.1
1-5 months°°	48	897†	53.5	38.4-68.7
6-11 months°°	6	897†	6.7	1.3-12.0
1-11 months (post-neonatal period)°°	54	897†	60.2	44.1-76.3
0-11 months (infant mortality rate)°°	86	897†	95.9	75.6-116.2
0-11 months (0-11-month mortality rate)	86	837‡	102.7	81.0-124.4
12-23 months	9	817	11.0	3.8-18.2
24-35 months	1	737	1.4	0-4.1
36-47 months	1	713	1.4	0-4.1
48-59 months	1	785	1.3	0-3.8
0-4 years	98	3,889	25.2	20.2-30.2
1-4 years	12	3,052	3.9	1.7-6.1

° births are for the calendar year; age-group populations are mid-year populations
°° rate per 1,000 live births
* number of births (includes 897 live births and 15 stillbirths)
† number of live births
‡ number of infants aged 0-11 months

Table 3. Daily risk of death by age group in children aged less than five years in Zone 3 of Dhaka City, 1995

Age group	Length of age period (in days)	No. of deaths observed (weighted)	Average no. of deaths per day	Population (weighted)[°]	Mortality rate per 10,000 population per day (risk)	95% confidence interval
day of birth	1	28	28.0[°°]	912[*]	307.0	193-421
1-6 days	6	5	0.83	884[†]	11.1	0-30
7-13 days	7	8	1.14	879	18.6	0-37
14-27 days	14	6	0.43	871	3.6	0-20
1-2 months	61	20	0.33	865	2.2	0-17
3-5 months	91	28	0.31	845	0.4	0-17
6-11 months	182	7	0.04	817	0.4	0-5
12-18 months	182	10	0.05	817	0.6	0-6
18-23 months	182	0	0.00	817	0.0	0-4
24-59 months	1,096	2	0.00	2,235[‡]	0.0	0-2

[°] The population for each age group during the first year of life has been assumed to be the number of live births minus the number of deaths among those of a younger age

[°°] We assume here that the deaths for all stillbirths occurred on the date of delivery

[*] 15 stillbirths + 897 live births

[†] 897 live births - 13 deaths among live-born infants on day 0 = 884

[‡] population of age group

Table 4. Abridged life table for Zone 3 of Dhaka City, 1995

Age at beginning of the period (in years)	Age-specific mortality rate per 1,000 ($_nm_x$)	Probability of death during the period x 1,000 ($_nq_x$)	No. of members of synthetic cohort beginning age period (l_x)	Total no. of years of life expected within the cohort (T_x)	No. of years of expected life remaining (e^0)
0	95.9	95.9	10,000	626,449	62.6
1	11.0	10.9	9,041	617,143	68.3
2	1.4	1.4	8,942	608,161	68.0
3	1.4	1.4	8,930	599,225	67.1
4	1.3	1.3	8,917	590,301	66.2
5	0.0	0.0	8,906	581,390	65.3
10	0.7	3.5	8,905	536,864	60.3
15	0.3	1.5	8,874	492,410	55.5
20	0.3	1.5	8,861	448,071	50.6
25	1.0	5.0	8,847	403,798	45.6
30	0.4	2.0	8,803	359,663	40.9
35	3.7	18.3	8,786	315,688	35.9
40	2.3	11.4	8,625	272,132	31.6
45	6.1	30.1	8,526	229,237	26.9
50	9.2	45.0	8,269	187,202	22.6
55	17.7	85.0	7,897	146,719	18.6
60	24.5	115.8	7,226	108,804	15.1
65	51.3	228.3	6,389	76,644	11.7
70	36.4	167.5	4,930	46,213	9.4
75	211.3	668.9	4,105	23,525	5.7
80	74.1	313.4	1,359	10,531	7.7
85+	195.1	1,000.0	933	4,782	5.1

Table 5. Household characteristics of those persons living in a household with a Household Index score of <3 in Zone 3 of Dhaka City, 1995

Housing characteristic		percent (n=6,667) (weighted)
roof	non-permanent material	99.4
	pucca*	0.6
wall	non-permanent material	90.2
	pucca*	9.8
total number of rooms	1	95.7
	2+	4.3
sanitation	none or open hole (including hanging latrine)	79.9
	latrine without water seal	19.8
	latrine (or toilet) with water seal	0.4
khat (wooden bed raised off the floor)	no	68.7
	yes	31.3
table or chair	no	96.4
	yes	3.6
almirah (bureau)	no	84.7
	yes	15.3
radio	no	93.2
	yes	6.8
TV	no	100.0
	yes	0.0
fridge	no	100.0
	yes	0.0

*permanent material, such as concrete or brick

Publications List of MCH-FP Extension Project (Urban)

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2. Baqui AH, Plajor N, Silimperi DR. "The Prevention and Treatment of Diarrhoea in Dhaka Slums" May 1993 (ICDDR,B Working Paper No 32) (Urban FP/MCH Working Paper No 4) *ISBN: 984-551-007-8.*

3. Laston SL, Baqui AH, Paljor N, Silimperi DR. "Immunization Beliefs and Coverage in Dhaka Urban Slums" May 1993 (ICDDR,B Working Paper No 33)(Urban FP/MCH Working Paper No 5) *ISBN: 984-551-008-6*

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MCH-FP Extension Work at the Centre

An important lesson learned from the Matlab MCH-FP project is that a high CPR is attainable in a poor socioeconomic setting. The MCH-FP Extension Project (Rural) began in 1982 in two rural areas with funding from USAID to examine how elements of the Matlab programme could be transferred to Bangladesh's national family planning programme. In its first years, the Extension Project set out to replicate workplans, record-keeping and supervision, within the resource constraints of the government programme.

During 1986-89, the Centre helped the national programme to plan and implement recruitment and training, and ensure the integrity of the hiring process for an effective expansion of the work force of governmental Family Welfare Assistants. Other successful programme strategies scaled up or in the process of being scaled up to the national programme include doorstep delivery of injectable contraceptives, management action to improve quality of care, a management information system, and developing strategies to deal with problems encountered in collaborative work with local area family planning officials. In 1994, this project started family planning initiatives in Chittagong, the lowest performing division in the country.

In 1994, the Centre began an MCH-FP Extension Project (Urban) in Dhaka (based on its decade long experience in urban health) to provide a coordinated, cost-effective and replicable system of delivering MCH-FP services for Dhaka urban population. This important event marked an expansion of the Centre's capacity to test interventions in both urban and rural settings. The urban and rural extension projects have both generated a wealth of research data and published papers.

The Centre and USAID, in consultation with the government through the project's National Steering Committees, concluded an agreement for new rural and urban Extension Projects for the period 1993-97. Salient features include:

- To improve management, quality of care and sustainability of the MCH-FP programmes
- Field sites to use as "policy laboratories"
- Close collaboration with central and field level government officers
- Intensive data collection and analysis to assess the impact
- Technical assistance to GoB and NGO partners in the application of research findings to strengthen MCH-FP services.

The Division

The reconstituted Health and Population Extension Division (HPED) has the primary mandate to conduct operations research to scale up the research findings, provide technical assistance to NGOs and GoB to strengthen the national health and family planning programme.

The Division has a long history of accomplishments in applied research which focuses on the application of simple, effective, appropriate and accessible health and family planning technologies to improve the health and well-being of the underserved and population-in-need. There are several projects in the Division which specialize in operations research in health, family planning, environmental health and epidemic control measures which cuts across several Divisions and disciplines in the Centre. The MCH-FP Extension Project (Rural), of course, is the Centre's established operations research project but the recent addition of its urban counterpart - MCH-FP Extension Project (Urban), as well as Environmental Health and Epidemic Control Programmes have enriched the Division with a strong group of diverse expertise and disciplines to enlarge and consolidate its operations research activities. There are several distinctive characteristics of these endeavors in relation to health services and policy research. First, the public health research activities of these Projects focus on improving programme performances which has policy implications at the national level and lessons for international audience. Secondly, these Projects incorporate the full cycle of conducting applied programmatic and policy relevant research in actual GoB and NGO service delivery infrastructures; dissemination of research findings to the highest levels of policy makers as well as recipients of the services at the community level; application of research findings to improve programme performance through systematic provision of technical assistance; and scaling-up of applicable findings from pilot phase to the national programme at Thana, Ward, District and Zonal levels both in the urban and rural settings.

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