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Special Research Report

Causes of Childhood Deaths in Bangladesh:

RESULTS OF A NATION-WIDE VERBAL AUTOPSY STUDY

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

ICDDR,B
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MCH-FP Extension Project (Urban)

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Causes of Childhood Deaths in Bangladesh:

RESULTS OF A NATION-WIDE VERBAL AUTOPSY STUDY

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Foreword

I am pleased to release this report on causes of childhood deaths in Bangladesh which is based on a nation-wide verbal autopsy study. The study was conducted collaboratively by MCH-FP Extension Project (Urban) of ICDDR,B and the National Institute for Population Research and Training (NIPORT) with financial assistance from USAID/Bangladesh and technical assistance from the Johns Hopkins University, USA and oversight from a Technical Advisory Committee and a National Steering Committee.

Reliable information on cause-specific childhood mortality in a community is needed for efficient design of health care delivery and for monitoring health progress. Very little is known from conventional sources about the cause of death structure in Bangladesh, partly because of deficiencies in the registration of deaths, and partly because relatively few deaths are attended by a qualified physician. The study reported here was undertaken in order to update the information available on cause of death among children under five, taking advantage of advances in verbal autopsy methodology and of the national Bangladesh Demographic and Health Survey conducted in 1993-94. The results of this study should be invaluable to policy-makers and program managers to prioritize health interventions so that the benefits from scarce health resources are maximized.

Over the years, the Centre has acquired a unique expertise on matters that ranges from both basic and applied research on child survival, reproductive health, and environmental health issues to providing technical assistance for capacity building to service delivery organizations. In order to carry out this innovative works, the Centre has established partnerships with different ministries and agencies of the Government of Bangladesh and national non-government organizations (NGOs). The overall goal of these partnerships is to contribute to the reduction of mortality and fertility and to improve the quality of life in Bangladesh. The Centre looks forward to continuing these activities and to assist in the wider dissemination and application of sustainable service delivery strategies in collaboration with the government, the NGOs and the private sector.

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Abstract

Knowledge of the causes of death structure, so far it relates to major available interventions, is important for health sector planning. Very little is known from conventional sources about the cause of death structure in Bangladesh, partly because of deficiencies in the registration of deaths, and partly because relatively few deaths are attended by a qualified physician. This study was undertaken to update the information available on causes of death among children aged less than five years, taking the advantage of advances in verbal autopsy methodology, and of the Bangladesh Demographic and Health Survey (BDHS) conducted in 1993-1994. The study revealed that about one of the four deaths were associated with acute lower respiratory infections (ALRIs) and about one-fifth of the deaths were associated with diarrhoea. Neonatal tetanus and measles remained important causes of death. Drowning was a major cause of death in children aged 1-4 years. Research and programmatic actions that will enable mothers to identify different grades of acute respiratory infections (ARIs), particularly pneumonia cases, will encourage timely and appropriate care-seeking, and strengthening of ARI case management at the primary care facilities would be important priorities. While the promotion of oral rehydration therapy for watery diarrhoea and the use of antibiotics for dysentery should continue, broader preventive interventions, including provision for safe water, sanitation, improvements in personal hygiene, and measures to improve general nutritional status of children, will require more attention. Further intensification of immunization programme, and innovative experimental interventions to reduce deaths from drowning should be designed and tested. A cause could not be assigned to about 15 percent of deaths. Further improvements of the verbal autopsy instrument are needed.

Introduction

Knowledge of the cause of death structure, so far it relates to major available interventions, is important for health sector planning. Very little is known from conventional sources about the cause of death structure in Bangladesh, partly because of deficiencies in the registration of deaths, and partly because relatively few deaths are attended by a qualified physician. For an understanding of the cause of death structure of children, interview-based diagnoses (verbal autopsies) have been used in a number of settings. Deaths recorded in the Matlab area by the International Centre for Diarrhoel Disease Research, Bangladesh (ICDDR,B) surveillance system have been classified by probable causes, using a questionnaire applied by the lay field workers (1-5). The 1987-1988 Diarrhoel Morbidity and Treatment Survey (DMTS) identified deaths through a retrospective survey, and then applied a verbal autopsy study to identify probable causes of death (6). The second Bangladesh Fertility Survey (BFS-II), carried out in 1989, asked a series of questions about the signs and symptoms associated with child deaths, reported as occurring in the last five years prior to the survey (7). A third nationwide survey conducted in 1992-1993 by the Control of Diarrhoeal Disease Programme, Government of Bangladesh, estimated the levels and causes of child mortality at a national level (8).

The study reported here was undertaken to update the information available on the causes of death among children aged less than five years, taking advantage of advances in verbal autopsy methodology and of the Bangladesh Demographic and Health Survey (BDHS) conducted in 1993-1994 (9). The study was a joint collaboration of ICDDR,B and the National Institute for Population Research and Training (NIPORT),

conducted with financial assistance from USAID/Bangladesh and technical assistance from the Johns Hopkins University Institute for International Programs, and oversight from a Technical Advisory Committee and a National Steering Committee. Data were collected through a follow-up survey in early 1995 by Mitra and Associates on deaths that were identified from the 1993-1994 Bangladesh Demographic and Health Survey. Deaths included were those of children aged less than five years in the last five years before the survey. The verbal autopsy instrument was adapted from an instrument used by the MCH-FP Extension Project (Urban), ICDDR,B to make it suitable for use by the lay interviewers and for algorith-based computerized identification of causes of death.

Preliminary results of the study were reported at the seminar on "Determinants of Child Health in Bangladesh" held under the auspices of NIPORT on 29 in August 1995. This report presents the final results of the study, taking into account the useful comments made on the earlier draft at the Seminar.

Methods and Procedures

Description of the sample:

The 1993-1994 BDHS employed a nationally representative two-stage sample. The BDHS sample was selected from the Integrated Multi-Purpose Master Sample (IMPS), created on the basis of 1991 census data by the Bangladesh Bureau of Statistics. The details of the sampling methodology have been published elsewhere (9). Since one objective of BDHS was to provide separate estimates for each of the five divisions of

the country as well as for urban and rural areas, it was necessary to increase the sampling rate in certain areas. Appropriate weighing factors have been applied during analyses.

Data Collection and Management Procedures:

Collection and management of data involved the following four specific activities: (a) identification of deaths from the 1993-1994 BDHS data file, (b) recruitment and training of field workers, (c) field interviews, and (d) computerization of data.

Deaths of children aged less than five years in the preceding five years of the 1993-1994 BDHS were identified from the BDHS data file and the required information about the deceased children and their households were derived. This information included name of the child, name of the child's mother, the child's sex, month and year of birth, age at death, and household geographical identifiers (division, district, thana, union, village/ mohalla/ block, household number, and the name of household head).

Ten interviewing teams were deployed for the collection of data. Each interviewing team was composed of one male supervisor, two female interviewers, and one logistical assistant. The data collection was completed over a three-month period from December 1994 to February 1995.

Three quality control teams were employed to monitor the work of the interviewing teams. Each quality control team had two members – one male quality control officer and one female quality control officer. The

members of the senior professional staff of the survey organization also made frequent field visits to ensure that the interviewing teams worked in strict compliance with the study methodology.

Field personnel for the study, including interviewers, supervisors, and quality control officers, were recruited from among those who previously worked at Mitra and Associates. They were all provided training to conduct interviews using the study questionnaire before they were finally employed to work for the study.

A manual was prepared to guide the data collection work. The manual contained detailed instructions as to (i) how to locate the household to be visited, (ii) how to identify the correct child, (iii) whom to interview for the information sought in the study questionnaire, (iv) how to ask a specific question, and (v) how to record/code its responses.

The training on interviewing was conducted for two weeks. The manual was used as a reference material during the training. The training covered the following topics:

A. The purpose of the study and its methodology

B. i) What is interviewing
   ii) Techniques of interviewing
   iii) Importance and techniques of rapport building

C. How to locate the household to be visited and identify the correct child

D. i) Introduction to the questionnaire
   ii) Types of questions in the questionnaire
      (a) Pre-coded questions
      (b) Open-ended questions
      (c) Skip instructions
      (d) Probing
      (e) Filter questions
   iii) Definition of different key terms used in the questionnaire
   iv) Intent of asking a question
   v) Key words in the question

E. How to administer the questionnaire

F. i) How interviewers will be supervised
   ii) How their work will be monitored
   iii) How their performances will be evaluated

G. i) Introducing assignment sheets and techniques of using it
   ii) How to edit a questionnaire
   iii) How to deal with non-response cases.

Training methods included classroom lectures and field practices. Training was imparted by the members of the senior professional staff of Mitra and Associates and ICDDR,B.

Besides the classroom lectures and field practices, the trainees were taken to a children's hospital to acquaint them with live-examples of the signs and symptoms of the diseases recorded in the study questionnaire. Interviews were conducted in Bangla by Bangladeshi interviewers trained to use the instrument and in the local vocabulary. Efforts were made to interview the mothers whenever possible. In absence of the mother, an adult relative who had the closest contact with the child during the terminal illness was interviewed.

Description of the instrument:

The verbal autopsy (VA) questionnaire was divided into five parts: (i) a face sheet to record the name, address, mother's name, date of birth, date of death, and gender of the deceased child from the BDHS database; (ii) a section with questions and filters to correctly identify the household of the deceased child or if the household was not found, to record the reason for it; (iii) an open-ended section to record the mothers' unprompted description of the illness that led to the child's death; (iv) a pre-coded section of prompted responses about specific symptoms and signs relating to the illness; and (v) a final section to record the direct, underlying and contributing causes of death from the death certificate, if it is available. The approach, adopted in the pre-coded section of the verbal autopsy questionnaire, was to start with a highly sensitive question about a given cause of death (for instance, for diarrhoea, "During the two weeks before (NAME) died, did he/she have frequent loose or liquid stools?") that should not exclude any positives. This was followed by a series of more specific questions to eliminate false positives (for example, for diarrhoea, "Did the loose or liquid stools continue until death?", taken

as a necessary condition of a confirmed diarrhoea diagnosis). Some of the specificity filters are simple yes/no questions, such as the loose or liquid stools continuing to death cited above, whereas others required numeric answers, such as questions about the maximum numbers of diarrhoea stools (Annex-1).

Computerization of data:

Data were computerized, using the SOSDATA double entry programme. This programme has built-in checks against erroneous entry of data into the computer. Another SOSDATA programme was used for finding out inaccuracies, if any, still remaining in the file, by conducting internal consistency checks between interrelated variables. Since the SOSDATA programme was only capable of evaluating simple expressions for consistency checks, FORTRAN and SPSS/ PC programmes were used for consistency checks involving the evaluation of complex expressions.

Assigning causes of deaths:

The attribution of causes of death from the BDHS verbal autopsies followed a hierarchical process whereby certain `diagnoses' were viewed as more certain, and thus given priority over others. The order in which steps were performed is, therefore, relevant. The first three steps resulted in exclusive categorization of cause. In step 1, all deaths in the first three days of life (age 0 to 3 days) were grouped together in `early perinatal' category. They were not further sub-classified, because it is extremely difficult to arrive at any meaningful determination of causes of death from verbal autopsies for very young babies. In step 2, deaths which were reported to be the result of an accident were classified as accidental. The

type of accident was then subdivided into drowning and others. In step 3, deaths that appeared to be from neonatal tetanus were next removed. If the age at death was from 4 to 14 days, and there were convulsions in the two weeks (or less if the child died before reaching two weeks) before death, and either the child cried normally after birth but stopped crying in the final illness or the child suckled normally after birth but stopped suckling in the final illness or both, the cause was `confirmed' as neonatal tetanus, and no further attempt was made to attribute the death to some other cause.

The subsequent steps were not exclusive, so that one confirmed diagnosis did not preclude another. In step 4, acute lower respiratory infection (ALRI) was confirmed if the child had a cough in the two weeks before death that started at least three days before death, and lasted at least until the day before death, and had at least two of the following six specific symptoms (noisy breathing, stridor, grunting, wheezing, nostril flaring, chest indrawing). ALRI was also confirmed if difficult breathing was reported in the two weeks before death, starting at least one day before death, and lasting to death, and at least two of the specific symptoms mentioned above were reported. Even if ALRI was confirmed, other diagnoses were attempted. In step 5, watery diarrhoea was confirmed if frequent loose or liquid stools were reported in the two weeks before death, starting from 1 to 13 days before death, and continuing until death, without blood in the stool, a combined peak number of day and night stools of 6 or more, and at least two of the five specific symptoms (weakness, dry mouth, sunken eyes, depressed fontanelle, no or very little urine) were reported. A confirmation of watery diarrhoea did not preclude some other diagnoses. In step 6, dysentery was

confirmed if all the requirements for watery diarrhoea were met, with the additional requirement of blood in the stool. In step 7, persistent diarrhoea was confirmed if frequent loose or liquid stools were reported in the two weeks before death, starting 14 or more days before death, and continuing until death. In step 8, measles was confirmed if the age at death was 6 months or more, a measles-type rash without water in the eruptions appeared in three months before death, accompanied by fever , and one or more of the specific symptoms (dry cough, red or runny eyes, or running nose during the illness with a rash) were reported. Results of step 4 to 8 have been presented in combinations: confirmed ALRI, confirmed watery diarrhoea, confirmed dysentery, confirmed measles, confirmed ALRI and watery diarrhea, measles followed by ALRI or diarrhoea, and so on.

If one or more confirmed diagnoses had been made by this stage, no further attempt was made to find further causes. If no confirmed diagnosis had yet been made, however, information was used for further diagnosis as follows: Step 9: If no cough, difficult breathing, loose stools or measles-like rash were reported, age at death was less than one month, and it was reported that there was something physically wrong with the baby at birth, cause was confirmed as a congenital abnormality. Step 10: If the conditions in Step 9 were met, except for physical abnormality at birth, but the duration of delivery was reported to be longer than usual and the duration of labour was 12 hours or more, cause was confirmed as complications of delivery. Step 11: If the conditions in Step 9 were met, except for physical abnormality at birth, but the pregnancy lasted 7 months or less, and the baby was reported to be much smaller than normal, the death was attributed to prematurity. Step 12: If no conditions were met in

step 1-11 and the age at death was less than one month, the death was considered as `Other Neonatal'.

If no confirmed diagnosis had been made by this point, possible diagnoses were considered as follows: Step 13: Possible ALRI was diagnosed if a cough or difficult breathing were reported without any further condition. Step 14: Possible diarrhoea was diagnosed if loose or liquid stools were reported. Step 15: Possible ALRI and diarrhoea was diagnosed if both step 14 and 15 were positive. Step 16: Possible malnutrition was diagnosed if the child was reported to have been very thin when the final illness started or if the child's feet were reported to have swollen.

If no diagnosis had been made by this point, the cause of death was considered as 'not identified'.

Analysis plan:

The attributed causes of death have been presented by age groups, sex, time period (before 1992, 1992 and later), place of residence (rural vs. urban), mother's education, and division of residence. Time period was of interest for two reasons: to see whether there was any evidence of recall lapse for the deaths that occurred more than three years before the interviews and if the data were consistent over this period to see if there was any change in the cause structure of death.

Results

Table 1 summarizes the attributed causes of death resulting from the exercise for the three age groups (neonatal, postneonatal and 12-59 months) and for all deaths of children aged less than five years in the last five years before the 1993-1994 BDHS. The largest single category of confirmed deaths was from ALRI (18.9%), with a further 5.3% of deaths confirming symptoms of ALRI in combination with some form of diarrhoea, and an additional 7.3% of deaths attributed to `possible' ALRI or ALRI and diarrhoea. The second largest confirmed diagnosis was diarrhoea. If all deaths from diarrhoea (watery, persistent and dysentery) are put together, 13.1% of the deaths were associated with confirmed symptoms of diarrhoea with a further 5.9% of `possible' diarrhoea. The third largest confirmed diagnosis was accident (8.8%), mostly drowning (7.7%). The next largest category of confirmed diagnoses was neonatal tetanus, accounting for about one death in 20 (5.4%) but about 15% in neonates. Deaths due to measles alone were few (0.7%), but a further 2.8% were confirmed as measles followed by ALRI or diarrhoea. 'Possible malnutrition' with no other identifiable symptoms accounted for 5.5% of the deaths. Malnutrition was also associated with about one-third of the ALRI deaths and about half of the diarrhoea and measles deaths. Overall, about 40% of the deaths associated with confirmed symptoms of ALRI and/or diarrhoea and/or measles were associated with malnutrition (data not shown). For 15.5% of the deaths no cause could be identified from the verbal autopsy, and another 17.1% were classified as `early perinatal deaths', occurring in the first three days of life with no attempt to identify their cause further.

Table 1. Percentage distribution of apparent causes of deaths of children aged less than five years by age group, 1988-1993

Causes of death	Age group			
	Neonatal	01-11 months	12-59 months	Total
Confirmed diagnoses				
Accident	0.0	4.4	20.9	8.8
Drowning	0.0	3.1	18.9	7.7
Others	0.0	1.3	2.0	1.1
Neonatal tetanus	14.9	0.0	0.0	5.4
Measles	0.0	0.0	1.9	0.7
Measles followed by ARI, diarrhoea	0.0	3.6	5.1	2.8
Acute respiratory infection	11.0	30.1	18.3	18.9
Dehydrating diarrhoea	1.7	6.6	4.6	4.1
Persistent diarrhoea	0.0	4.6	3.5	2.6
Dysentery	0.0	0.9	2.4	1.1
ARI and watery diarrhoea	1.0	5.1	2.9	2.8
ARI and persistent diarrhoea	0.0	3.1	3.0	2.0
ARI and dysentery	0.0	0.4	1.0	0.5
Congenital abnormality	0.9	0.0	0.0	0.3
Prematurity	0.0	0.0	0.0	0.0
Possible diagnoses				
Possible ARI	6.3	8.6	4.0	6.1
Possible diarrhoea	0.0	5.6	8.6	4.7
Possible ARI and diarrhoea	0.3	2.0	1.3	1.2
Early perinatal	47.6	0.0	0.0	17.1
Malnutrition	1.5	6.6	8.6	5.5
Not identified	14.8	18.5	13.9	15.5
Number of deaths (un-weighted)	311	232	285	828

There were major differences in the cause of death structure by age group. In the neonatal period, almost half of the deaths (47.6%) were classified in the `early perinatal' group, and for a further 14.8% no cause could be identified. Neonatal tetanus was the largest confirmed cause of death (14.9%), followed by ALRI (12.0% confirmed and a further 6.3% `possible'). Congenital abnormalities, complications of delivery, and prematurity appeared to be minor problems on the basis of these data, though it has to be remembered that children reported as live-born only appear in the BDHS birth histories.

In the post-neonatal age group, the importance of ALRI as the major killer of Bangladeshi children was even more pronounced. Nearly one-third (30.1%) of all deaths in this age group were attributed to ALRI alone, with a further 8.6% having confirmed ALRI diagnoses in combination with some form of diarrhoea, and a further 10.6% of `possible' diagnoses. Watery diarrhoea alone or in combination with ALRI accounted for 11.7% of the deaths, persistent diarrhoea alone or in combination with ALRI for 7.7% of the deaths, and dysentery alone or in combination with ALRI for 1.3%. In total, 20.7% of all deaths in this age group were diarrhoea or dysentery-related, with a further 7.6% of possible diarrhoea. Malnutrition with no other identifiable symptoms accounted for 6.6% of the deaths, and was also associated with about half of the diarrhoea and ALRI deaths (data not shown). For 18.5% of the deaths in this age group, no cause could be identified.

ALRI was also the most important cause of death in children aged 1-4 years of age as well (18.3% alone, 6.9% in combination with diarrhoea, and a further 5.3% possible). About one of the five deaths in

this age group was due to accident (20.9%); 18.7% from drowning alone. The other important causes of deaths were watery diarrhoea (4.6% alone, a further 2.9% in combination with ALRI, and a further 9.9% possible), 'possible' malnutrition (8.6), persistent diarrhoea (3.5% alone, and a further 3.0% in combination with ALRI), and measles (only 1.9% alone, but a further 5.1% followed by ALRI or diarrhoea). No cause could be assigned to 13.9% of the cases.

Table 2 shows deaths by cause for all children aged less than five years by time period (before 1992, in 1992 and later) and by sex. The only major changes were a decline in the proportion of deaths due to drowning, an increase in the proportion of deaths due to ALRI, and a slight decrease in the proportion of deaths for which no cause could be identified. The other major causes of death – diarrhoea, tetanus and measles – were of similar magnitude within a percentage point or so for both periods.

The distribution of causes of deaths by sex did show some substantial differences. Girls were less likely to die from ALRI, slightly less likely to die from drowning, and more likely to die from malnutrition, measles, and diarrhoea. The percentage of girls in the `early perinatal' category (14.0%) was substantially lower than that of boys (20.4%). Overall, the number of deaths of girls was actually slightly higher than the number of deaths of boys.

Table 2. Percentage distribution of apparent causes of deaths of children aged less than five years by time period and sex of child, 1988-1993

Causes of death	Time period		Sex of child	
	1989-91	1992-94	Male	Female
Confirmed diagnoses				
Accident	10.1	6.3	8.9	8.6
Drowning	8.9	5.4	8.4	7.0
Others	1.2	0.9	0.5	1.6
Neonatal tetanus	5.2	5.7	4.9	8.5
Measles	1.0	0.0	0.2	1.2
Measles followed by ARI, diarrhoea	2.3	3.9	2.5	3.2
Acute respiratory infection	17.8	21.2	22.0	16.0
Dehydrating diarrhoea	3.8	4.6	3.3	4.9
Persistent diarrhoea	2.2	3.2	2.1	3.0
Dysentery	1.1	1.1	0.8	1.4
ARI and watery diarrhoea	3.0	2.4	2.6	3.1
ARI and persistent diarrhoea	1.9	2.1	1.1	2.8
ARI and dysentery	0.4	0.5	0.2	0.7
Congenital abnormality	0.1	0.7	0.7	0.0
Prematurity	0.0	0.0	0.0	0.0
Possible diagnoses				
Possible ARI	5.8	6.6	5.3	6.9
Possible diarrhoea	4.6	4.9	4.2	5.1
Possible ARI and diarrhoea	1.3	1.0	1.4	0.9
Early perinatal	17.0	17.5	20.4	14.0
Malnutrition	5.9	4.7	4.3	6.7
Not identified	16.6	13.5	15.1	15.9
Number of deaths (un-weighted)	536	292	410	418

Table 3. Percentage distribution of apparent causes of deaths of children aged less than five years by residence and education of mothers, 1988-1993

Causes of death	Place of residence		Mother's education	
	Urban	Rural	None	Some
Confirmed diagnoses				
Accident	4.1	9.0	8.4	9.5
Drowning	4.1	7.9	7.4	8.5
Others	0.0	1.1	1.0	1.0
Neonatal tetanus	9.0	5.2	6.4	3.1
Measles	0.0	0.7	0.9	0.2
Measles followed by ARI, diarrhoea	8.3	2.6	3.2	2.2
Acute respiratory infection	15.8	19.1	18.8	19.3
Dehydrating diarrhoea	3.9	4.1	3.7	5.0
Persistent diarrhoea	5.6	2.4	2.1	3.6
Dysentery	0.0	1.2	1.1	1.1
ARI and watery diarrhoea	2.8	2.8	2.3	4.0
ARI and persistent diarrhoea	2.1	2.0	2.0	1.9
ARI and dysentery	0.7	0.5	0.6	0.2
Congenital abnormality	0.0	0.3	0.5	0.0
Prematurity	0.0	0.0	0.0	0.0
Possible diagnoses				
Possible ARI	6.3	6.1	5.6	7.1
Possible diarrhoea	5.9	4.6	5.2	3.5
Possible ARI and diarrhoea	1.5	1.1	1.1	1.2
Early perinatal	18.6	17.1	15.9	19.9
Malnutrition	0.9	5.7	5.9	4.6
Not identified	14.7	15.6	16.5	13.3
Number of deaths (un-weighted)	75	753	559	269

Table 3 shows the overall cause of death structure by type of place of residence (at the time of the survey) and by mother's education. It should be noted that the overall number of urban deaths (n = 75) was very low, less than 10 percent of the total. Drowning was only half as common in urban as in rural areas, while neonatal tetanus and persistent diarrhoea were about twice as common and measles was almost three times as common. ALRI and malnutrition were more important causes of death in rural than in urban areas.

There was some differences in the distribution of causes of deaths by mother's education. Neonatal tetanus and measles deaths were less common for the children of women with some education, but ALRI and diarrhoea deaths were slightly more common. Deaths were substantially more likely to be from the `early perinatal' group among the children of the mothers with some education. The proportion of deaths for which no cause could be identified was lower for the children of women with some education (Table 3).

Table 4 shows cause of death structures for all deaths of children aged less than five years by division (the divisions of Barisal and Khulna are combined because of small numbers of deaths in each one individually; the division of Sylhet had not been formed at the time these data were collected). Drowning appeared to be most common in Chittagong, and least common in Rajshahi and Barisal/Khulna. Neonatal tetanus and measles appeared to be least common in Rajshahi. The proportion of deaths from ALRI appears to be high in Barisal/Khulna, while

Table 4. Percentage distribution of apparent causes of deaths of children aged less than five years by division of residence, 1988-1993

Causes of death	Division of residence of mother			
	Barisal/ Khulna	Chitta-gong	Dhaka	Rajshahi
Confirmed Diagnoses				
Accident	6.9	12.5	8.1	4.6
Drowning	4.8	12.0	7.2	2.8
Others	2.1	0.5	0.9	1.4
Neonatal tetanus	5.9	5.6	5.4	4.5
Measles	1.8	0.4	0.8	0.0
Measles followed by ARI, diarrhoea	2.1	2.6	4.1	1.8
Acute respiratoryi infection	21.7	18.0	20.4	16.2
Dehydrating diarrhoea	3.2	4.9	4.4	2.9
Persistent diarrhoea	2.6	3.5	1.2	2.9
Dysentery	1.3	2.2	0.4	0.0
ARI and watery diarrhoea	4.2	3.1	2.9	1.2
ARI and persistent Diarrhoea	3.4	1.1	2.0	2.3
ARI and dysentery	0.8	0.0	0.4	1.2
Congenital abnormality	1.3	0.0	0.4	0.0
Prematurity	0.0	0.0	0.0	0.0
Possible diagnoses				
Possible ARI	8.7	5.1	7.6	3.5
Possible diarrhoea	4.1	4.9	3.1	7.2
Possible ARI and diarrhoea	1.3	0.7	1.6	1.2
Early perinatal	22.0	11.2	15.8	26.4
Malnutrition	2.6	6.2	5.3	6.7
Not identified	6.3	17.8	16.0	17.5
Number of deaths (un-weighted)	163	230	250	185

deaths from diarrhoea were low in Rajshahi and Barisal/Khulna. The proportion of deaths allocated to the `early perinatal' category was much higher in Rajshahi and Barisal/Khulna than in Dhaka or Chittagong, while the proportion of deaths for which no cause could be identified was much lower in Barisal/Khulna than elsewhere.

Discussion

Reliable information on cause-specific childhood mortality in a community is needed for efficient design of health-care delivery system and for monitoring health progress (1). Although a number of studies analyzed causes of child death in Bangladesh, most of the data came from the Matlab field area of ICDDR,B (1-5) with occasional data from the MCH-FP Extension Projects (10). Data collected by ICDDR,B are considered to be of high quality, but are limited by the fact that they come from relatively small areas and may not represent the experience of the nation as a whole. Very few studies analyzed causes of child death from nationally representative samples. Kamal et al. (7) presented cause of death information for children aged less than five years by analyzing the 1989 Bangladesh Fertility Survey data; all deaths of children aged less than five years that occurred in the sampled households in the last five years preceding the survey were included. Osiniski et al. (6) as part of a diarrhoea morbidity and treatment survey studied probability samples of 7,621 rural and 7,328 urban households in 1987-1988 and determined the causes of death in all reported deaths of children aged less than five years in 12 months before the interview. Salway et al (8) presented data from a national survey conducted by the National Control of Diarrhoeal Diseases Programme in 1992-1993; all deaths of children aged less than five years in the last five years prior to the survey were studied. These studies used limited number of questions to ascertain the most important causes of

deaths in children, and two of the three studies had a major focus to ascertain deaths due to diarrhoea. Despite these limitations, these studies provided useful information for planners and policy-makers. The study reported here was undertaken to update the information available on causes of death among children aged less than five years, taking the advantage of advances in verbal autopsy methodology and of the Bangladesh Demographic and Health Survey conducted in 1993-1994. As different national level studies used different questioning procedures, varying length of recall period, and different algorithms for assignment of causes of deaths, the results from these studies should be compared with caution.

This study found that ALRIs were the most important killer of Bangladeshi children. About one of the four deaths of children aged less than five years were associated with a confirmed diagnosis of ALRI; about two of the five infant deaths were associated with a confirmed diagnosis of ALRI. Despite the methodological differences, these findings are consistent with the findings of Salway et al (8) who estimated that about 23% of the deaths of children aged less than five years were associated with ALRI. In the study by Kamal et al (7), only 10% of the deaths of children aged less than five years were attributed to ALRI. The authors, however, stated that they perhaps overestimated tetanus and prematurity and underestimated ALRI as the causes of death. A number of studies reported that the vast majority of the ALRI deaths are due to pneumonia (11-13). Effective case management strategies for pneumonia are available (12, 13, 14-16). However, the success of the case management strategies is largely dependent on the early recognition of pneumonia cases and appropriate care-seeking by the parents. Improvements in care-seeking can significantly reduce deaths due to ALRI (17). This can be achieved by using the recent developments in qualitative research. The Focussed Ethno-

graphic Study method provides an excellent framework for analysis and better understanding of cultural patterns and related behaviours allowing design of culturally appropriate interventions to improve preventive and care-seeking behaviours (18).

Diarrhoea was associated with 19% of the child deaths – about 13% had confirmed symptoms of diarrhoea. Of the children who died with confirmed symptoms of diarrhoea, about half had either persistent diarrhoea or dysentery. The proportions of deaths found to be associated with diarrhoea are similar across studies; about 20-30% of the deaths of children aged less than five years in Bangladesh are associated with diarrhoea (6, 8). It seems that oral rehydration therapy has not eliminated deaths from watery diarrhoea. ORT can prevent deaths due to acute watery diarrhoea only if administered in quantities adequate both for rehydration and for maintaining hydration in the presence of continuing fluid loss. Although the knowledge about ORT in Bangladesh is almost universal, it is not used in all episodes and even if used, often the quantity taken is not adequate (19). The role of ORT in persistent diarrhoea and dysentery is questionable (20-21). Furthermore, about half of the diarrhoea-associated deaths had concomitant malnutrition. Thus, while appropriate fluid and dietary management of all episodes of diarrhoea and antibiotic therapy for dysentery cases should remain the cornerstone of diarrhoea management, broader preventive interventions, including provision for safe water, sanitation, improvements in personal hygiene, and measures to improve general nutritional status of children deserve more attention (22-24).

Perhaps the most surprising result of this study was that one in every 12 deaths of children aged less than five years during the period

1988-1993 was caused by drowning. Innovative interventions with an aim of reducing deaths from drowning should be designed and tested.

Although deaths due to both neonatal tetanus and measles declined over the last decade, these conditions remained important killers of children in Bangladesh. The proportion of neonatal deaths due to tetanus had declined from about 24% in 1987-1988 (6) to about 15%. Measles remained associated with 7% of the deaths in children aged 1-4 years - down from 11% in 1987-1988 (6). These declining trends suggest the effect of TT and measles immunization. Further improvements in child survival are possible by intensifying the immunization programme (25, 26).

Large 'early perinatal' and 'not identified' categories resulted from the fact that many deaths could not be accounted for. Further improvements in the verbal autopsy instrument can be useful to account for some of these deaths. Congenital abnormalities, complications of delivery, and prematurity appear to be minor problems as indicated by these data, though it has to be remembered that only children reported as live-born appear in the BDHS birth histories. Some live-born children who die very shortly after birth may not be reported as live-births, and will, thus, not be covered, and in theory no still-born children will be reported. It was thought that these causes could also have been underestimated since all deaths occurring in the first three days of life were categorized as 'early perinatal.' In a subsequent step, these causes were allowed in these early deaths, but only about 2% additional neonatal cases had sign/symptoms suggestive of one of these causes. These confirmed the difficulty of identifying a cause when death occurs very early in the life.

From the comparison of causes of deaths before 1992, and 1992 and later, no conclusions can be drawn about trends, but at the same time there is no clear evidence of adverse effects of increased recall lapse on the quality of data.

The distribution of the cases of deaths by sex does show some substantial differences. Girls are less likely to die due to ALRI, slightly less likely to die from drowning, and more likely to die due to malnutrition, measles, and diarrhoea. As the overall numbers of male and female deaths are very similar, and person years of exposure to risk among girls and boys are likely to be fairly similar, therefore differences in proportionate structure can be roughly interpreted in terms of risk. The percentage of girls in the `early perinatal' category (14%) is substantially lower than that of boys (20.4%). Overall, the number of female child deaths is actually slightly higher than the number of male child deaths.

The rural-urban differences should be interpreted with caution as the number of urban deaths was too low. Higher risks of deaths due to measles and neonatal tetanus in urban areas might be due to a lower vaccine coverage – the vaccine coverage was indeed lower in urban centres until early 1990s (27). The higher risk of deaths due to measles in urban might also be in part due to over crowding in urban centres (28). Higher risk of deaths due to ALRI in rural areas might be due to less awareness of the disease and more limited access to curative health services.

Mother's education is the factor most consistently found to be associated with differentials in child mortality around the world (29). However, in this study the children of mothers with some formal education had more or less similar cause-of-death patterns to those of

women with no education. Deaths due to both neonatal tetanus and measles were less common for the children of mothers with some education presumably due to the of higher vaccine coverage. Deaths due to ALRI and diarrhoea were slightly more common in children of mothers with some education; this might perhaps be due to improved reporting by literate mothers. Deaths were substantially more likely to be from the `early perinatal' group among the children of the mothers with some education. This finding might well be associated with lower overall mortality risks among the children of mothers with some education, since the death rates of young neonates fall least quickly as overall child mortality declines. The proportion of deaths for which no cause could be identified was lower for the children of mothers with some education, perhaps because these women were better able than the women with no education to observe and report on the signs and symptoms associated with the death of a child.

The differences by division might be due to differences in the vaccine coverage, water and sanitation conditions, health services availability, mother's education, etc.

Conclusion and policy implication

The findings of this study reveal that ALRIs are the most important killer of young children in Bangladesh. Research and programmatic actions that will enable mothers to identify different grades of ALRIs, particularly pneumonia cases and will encourage timely and appropriate care-seeking by the mothers, and strengthening of ALRI case management at the primary care facilities would be important priorities. Although ORT has reduced the importance of diarrhoea as a cause of death, diarrhoea is still associated with about one-fifth of the child deaths. Thus, while the

promotion of ORT for watery diarrhoea and antibiotic treatment for dysentery should continue, broader preventive interventions, including provision for safe water, sanitation, and improvements in personal hygiene, will require more attention. Malnutrition was an important contributory cause of deaths; it was associated with about 40 percent of deaths with confirmed symptoms of ALRI and/or diarrhoea and/or measles. Thus, more efforts to improve nutritional status of children may have broad effect across many 'causes' of deaths. Neonatal tetanus and measles remain important causes of death – this calls for a further intensification of the immunization programme. Drowning is a major cause of death in children aged 1-4 years - innovative experimental interventions should be designed and tested to reduce this accidental deaths. No cause could be assigned to a small proportion of deaths, which indicates that further improvements of the verbal autopsy instrument is needed.

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Annex-1

BANGLADESH DEMOGRAPHIC AND HEALTH SURVEY 1993-1994

FOLLOW-UP VERBAL AUTOPSY STUDY, 1994-1995

PREVIOUS PAGE BLANK

Verbal Autopsy Instrument
Face Sheet
(TO COMPLETE IN OFFICE)

DIVISION _____ DISTRICT _____
THANA _____ UNION _____
VILLAGE/MOHALLA/BLOCK _____
CLUSTER NUMBER _____ HOUSEHOLD NUMBER _____
NAME OF HOUSEHOLD HEAD _____
NAME OF MOTHER _____ ORDER NO. _____
NAME OF DEAD CHILD _____ ORDER NO. _____
SEX OF CHILD |___| MALE |___| FEMALE
DATE OF BIRTH |___|___| MONTH 19 |___|___|
AGE AT DEATH 1 |___|___| DAYS (if less than 1 month)
2 |___|___| MONTH (if less than 2 years)
3 0 |___| YEARS

RECORD OF INTERVIEW

INTERVIEWER VISITS	1	2	3	FINAL VISIT	SUPERVISOR'S SIGNATURE	DATA ENTRY DATE
DATE	___	___	___	___		___
INTERVIEWER'S NAME	_____				_____	
RESULT*	___	___	___			

*RESULT CODES:
1 COMPLETED
2 NO HOUSEHOLD MEMBER AT HOME
3 MOTHER/KNOWLEDGE RESPONDENT NOT PRESENT
4 MOTHER/KNOWLEDGE RESPONDENT POSTPONED
5 MOTHER/KNOWLEDGE RESPONDENT REFUSED
6 DWELLING VACANT/DESTROYED/NOT FOUND

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NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP TO
001	INTERVIEWER: INTRODUCE YOURSELF, EXPLAIN OBJECTIVES OF STUDY, THEN ASK HOUSEHOLD HEAD OR OTHER RESPONSIBLE ADULT INFORMANT QUESTION 002		
002	Our records show that a child named (NAME), the (son/daughter) of (MOTHER'S NAME), died in this household in the last 6 years. Is this correct?	YES ..... 1 NO 2	---> 004
003	INTERVIEWER: TRY TO FIND OUT WHAT THE PROBLEM IS. SEE INSTRUCTIONS FOR FURTHER DETAILS.	H/H MOVED ..... 1 NEIGHBOURING H/H .... 2 H/H NOT KNOWN ..... 3 OTHER (.....) ..... 7 NOT KNOWN 8	---> 900 ---> 900 ---> 900 ---> 900 ---> 900
004	INTERVIEWER: IDENTIFY RESPONDENT MOST KNOWLEDGE ABOUT (OR WHO WAS (NAME)'S CARETAKER DURING) (NAME)'S LAST ILLNESS. (SEE INSTRUCTIONS FOR DETAILS).		
005	What is (MAIN RESPONDENT)'s name?	_____	NO CODE
006	What is (RESPONDENT'S NAME)'S relationship to (NAME)?	MOTHER ..... 1 FATHER ..... 2 MOTHER'S SISTER ..... 3 FATHER'S SISTER ..... 4 MOTHER'S MOTHER ..... 5 FATHER'S MOTHER ..... 6 OTHER FEMALE ..... 7 OTHER MALE 8	---> 100
007	Is (NAME)'s mother still alive?	YES ..... 1 NO ..... 2 DON'T KNOW 8	

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP TO
100	I would like to ask you some questions about (NAME). First, however, I would like to explain the reasons for this study, and obtain your consent to participate. (READ INFORMED CONSENT STATEMENT).		
101	Did (NAME) show any signs of life after birth, such as crying or taking a breath?	YES ..... 1 NO 2	---> 103
102	INTERVIEWER: PROBE TO FIND OUT WHETHER THIS CHILD WAS BORN DEAD OR ALIVE:	BORN DEAD ..... 1 BORN ALIVE 2	---> 900
103	On what date (day, month and year) was (NAME) born?	DAY ..... |__|__| MONTH ..... |__|__| YEAR ..... 19|__|__|	
104	On what date (day, month and year) did (NAME) die?	DAY ..... |__|__| MONTH ..... |__|__| YEAR ..... |__|__|	---> 107
105	INTERVIEWER: CALCULATE AGE AT DEATH OF THE CHILD	DAYS ..... 1 |__|__| MONTHS ..... 2 |__|__|	
106	INTERVIEWER: CHECK AGE AT DEATH WITH FACE SHEET. TRY TO RECONCILE DIFFERENCES IN MONTH AND YEAR OF BIRTH AND AGE AT DEATH.		
107	Was (NAME) a boy or a girl?	BOY ..... 1 GIRL 2	
108	Please tell me about the course of the disease or condition from which (NAME) died. What did you first notice about the disease or condition?	.... |__|__|	

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP TO
109	How many days before (NAME) died did you first notice this illness?	LESS THAN 24 HOURS . 0 0 DAYS ..... |__|__| DON'T KNOW 9 8	
110	Then what did you observe as the illness or condition progressed?	.... |__|__|	
111	What do you (= THE RESPONDENT) think was the (name of the) condition from which (NAME) died?	..... |__|__| DON'T KNOW 9 8	
112	INTERVIEWER: WAS THIS A DEATH FROM INJURY, POISONING, BITE, BURN OR DROWNING?	YES ..... 1 NO 2	===> 200
113	CATEGORIZE THE TYPE OF INJURY/ACCIDENT:	DROWNING ..... 1 BURN ..... 2 POISON ..... 3 INJURY FROM FALL ..... 4 TRAFFIC ACCIDENT ..... 5 BITE ..... 6 VIOLENCE ..... 7 OTHER 8	===> 900
200	Now I would like to ask you about some specific signs and symptoms which you may have noticed during the illness which led to (NAME)'s death		
201	INTERVIEWER: CHECK AGE AT DEATH OF CHILD FROM QUESTION 105 AGE AT DEATH LESS THAN 30 DAYS ☐	AGE AT DEATH 30 DAYS OR OLDER ☐	===> 300

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP TO
202	For how many months {had you/had the mother} been pregnant when (NAME) was born?	MONTHS ..... |__|__| DON'T KNOW 9 8	
203	Did the combined labour and delivery seem to take the normal amount of time, or was it longer than usual, or shorter than usual?	NORMAL TIME ..... 1 LONGER THAN USUAL ... 2 SHORTER THAN USUAL ... 3 DON'T KNOW 8	
204	How long {were you/was the mother} pushing before the baby came out?	LESS THAN 1 HOUR ..... 1 1 TO 2 HOURS ..... 2 3 TO 6 HOURS ..... 3 7 TO 11 HOURS ..... 4 12 TO 24 HOURS ..... 5 MORE THAN 24 HOURS .. 6 DON'T KNOW 8	
205	Was (NAME) a singleton or one of a multiple birth?	SINGLETON ..... 1 MULTIPLE ..... 2 DON'T KNOW 8	
206	Was (NAME) born normal, or was there something physically wrong with his/her head, body or limbs?	NORMAL ..... 1 MALFORMATION ..... 2 INJURY ..... 3 DON'T KNOW 8	
207	Was (NAME) bigger than usual, about the usual size, slightly smaller than usual, or much smaller than usual?	BIGGER THAN USUAL .... 1 ABOUT USUAL SIZE ..... 2 SLIGHTLY SMALLER ..... 3 MUCH SMALLER ..... 4 DON'T KNOW 8	
208	Did (NAME) breathe normally during the first day of life?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
209	Did (NAME) cry normally during the first day of life?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
210	Did (NAME) suckle normally when first put to the breast or given a bottle?	YES ..... 1 NO ..... 2 DON'T KNOW 8	

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP TO
211	Did (NAME) have convulsions or spasms in the 2 weeks before death (or in the period to death if the child died in the first 2 weeks of life)?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
212	Did (NAME) stop crying during his/her final illness?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
213	Did (NAME) stop suckling (breast or bottle) during his/her final illness?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
300	During the two weeks before death, did (NAME) have a cough?	YES ..... 1 NO ..... 2 DON'T KNOW 8	 ===> 310 ===> 310
301	How many days before death did the cough start?	LESS THAN 24 HOURS . 0 0 DAYS ..... |__|__| DON'T KNOW 9 8	
302	Did the cough last until death?	YES ..... 1 NO ..... 2 DON'T KNOW 8	===> 310 ===> 310
303	How may days before death did the cough stop?	LESS THAN 24 HOURS . 0 0 DAYS ..... |__|__| DON'T KNOW 9 8	
310	During the two weeks before death, did (NAME) have fast or difficult breathing?	YES ..... 1 NO ..... 2 DON'T KNOW 8	 ===> 320 ===> 320
311	How many days before death did the fast or difficult breathing start?	LESS THAN 24 HOURS . 0 0 DAYS ..... |__|__| DON'T KNOW 9 8	
312	Did the fast or difficult breathing last until death?	YES ..... 1 NO ..... 2 DON'T KNOW 8	===> 320 ===> 320

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP TO
313	How many days before death did the fast or difficult breathing stop?	LESS THAN 24 HOURS . 0 0 DAYS ..... |__|__| DON'T KNOW 9 8	
320	INTERVIEWER: CHECK ANSWERS TO QUESTIONS 300 AND 310. IS THE ANSWER TO BOTH NO?	BOTH NO OR DON'T KNOW NOT BOTH NO 2	===> 400
321	During the last 48 hours before (NAME) died, did he/she have noisy breathing?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
322	During the last 48 hours before (NAME) died, did he/she have stridor (loud sound when breathing in)?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
323	During the last 48 hours before (NAME) died, did he/she have grunting?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
324	During the last 48 hours before (NAME) died, did he/she have wheezing (high-pitched sound when breathing out)?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
325	During the last 48 hours before (NAME) died, did his/her nostrills move and spread out with each breath?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
326	During the last 48 hours before (NAME) died, was the lower rib cage drawn in each time he/she breathed in?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
400	During the two weeks before (NAME) died, did he/she have a fever?	YES ..... 1 NO ..... 2 DON'T KNOW 8	 ===> 500 ===> 500
401	How many days before death did the fever start?	LESS THAN 24 HOURS . 0 0 DAYS ..... |__|__| DON'T KNOW 9 8	

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP TO
402	Did the fever continue until death?	YES ..... 1 NO ..... 2 DON'T KNOW 8	 ===> 500 ===> 500
403	How many days before death did the fever stop?	LESS THAN 24 HOURS . 0 0 DAYS ..... |__|__| DON'T KNOW 9 8	
500	During the two weeks before (NAME) died, did he/she have frequent loose or liquid stools?	YES ..... 1 NO ..... 2 DON'T KNOW 8	 ===> 600 ===> 600
501	How many days before death did the loose or liquid stools start?	LESS THAN 24 HOURS . 0 0 DAYS ..... |__|__| DON'T KNOW 9 8	
502	Did the loose or liquid stools continue until death?	YES ..... 1 NO ..... 2 DON'T KNOW 8	===> 504 ===> 504
503	How many days before death did the loose/liquid stool stop?	LESS THAN 24 HOURS . 0 0 DAYS ..... |__|__| DON'T KNOW 9 8	
504	During the two weeks before (NAME) died, he/she have blood in the stools?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
505	In the week before (NAME) died, what was the maximum number of loose or liquid stools passed during the hours of daylight (one the day with the highest stool frequency)?	NUMBER OF STOOLS ..... |__|__| DON'T KNOW 9 8	
506	In the week before (NAME) died, what was the maximum number of loose or liquid stools passed during the hours of darkness (one the day with the highest stool frequency)?	NUMBER OF STOOLS ..... |__|__| DON'T KNOW 9 8	
507	In the 24 hours before death, was (NAME) weak, limp, or drowsy?	YES ..... 1 NO ..... 2 DON'T KNOW 8	

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP TO
508	In the 24 hours before death, did (NAME) have a dry mouth and tongue?	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	
509	In the 24 hours before death, did (NAME) have sunken eyes?	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	
510	In the 24 hours before death, did (NAME) have a depression in the front part of the top of the head?	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	
511	In the 24 hours before death, did (NAME) pass urine as normal or pass less urine than normal, or pass very little urine?	NORMAL . . . . . 1 LESS THAN NORMAL . . . . . 2 VERY LITTLE OR NONE . . . 3 DON'T KNOW 8	
600	During the 3 months before (NAME) died, did he/she have a new blotchy skin rash (small reddish eruptions) mostly on the face and trunk?	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	 ===> 700 ===> 700
601	Did (NAME) have a fever at the same time as the rash?	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	
602	Was there water inside the eruptions?	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	
603	How many days before death did the rash appear?	LESS THAN 24 HOURS . 0 0 DAYS . . . . . |__|__| DON'T KNOW 9 8	
604	For how many days did the rash last?	LESS THAN 24 HOURS . 0 0 DAYS . . . . . |__|__| UNTIL DEATH . . . . . 9 7 DON'T KNOW 9 8	
605	Did (NAME) have a dry cough during the illness with the rash?	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP TO
606	Did (NAME) have red or runny eyes during the illness with the rash?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
607	Did (NAME) have a running nose during the illness with the rash?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
700	In your opinion, was (NAME) very thin, thin, normal or fat when the illness from which he/she died started?	VERY THIN ..... 1 THIN ..... 2 NORMAL ..... 3 FAT ..... 4 DON'T KNOW 8	
701	Did (NAME)'s feet swell?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
702	Did (NAME)'s hair become reddish?	YES ..... 1 NO ..... 2 DON'T KNOW 8	
800	Is a death certificate {for the death of (NAME)} available in the household?	YES ..... 1 NO 2	 ===> 810
801	INTERVIEWER: ASK TO SEE THE CERTIFICATE. RECORD THE DATE OF DEATH REGISTRATION FROM THE CERTIFICATE	DAY ..... |__|__|__| MONTH .... |__|__|__| YEAR ..... |__|__|__|	
802	RECORD THE DIRECT CAUSE OF DEATH FROM THE CERTIFICATE	..... (DIRECT CAUSE)	
803	RECORD THE UNDERLYING CAUSE(S) OF DEATH FROM THE CERTIFICATE	.... (UNDERLYING CAUSE(S)	

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP TO
804	RECORD THE CONTRIBUTING CAUSE OF DEATH FROM THE CERTIFICATE	. . . . . (CONTRIBUTING CAUSE)	= = = > 900
810	Did a health worker indicate a probable cause of (NAME)'s death?	YES . . . . . 1 NO 2	 = = = > 900
811	What was the cause of death indicated?	. . . . (INDICATED CAUSE OF DEATH)	
900	THANK THE RESPONDENT FOR TAKING PART IN THE SURVEY, AND OFFER YOUR CONDOLENCES ON THE CHILD'S DEATH. BE SURE TO REVIEW THE QUESTIONNAIRE FOR COMPLETENESS BEFORE LEAVING THE HOUSEHOLD.		

Publications List of MCH-FP Extension Project (Urban)

1. Jamil K, Baqui AH, Paljor N. "Knowledge and Practice of Contraception in Dhaka Urban Slums: A Baseline Survey" May 1993 (ICDDR,B Working Paper No 31) Urban FP/MCH Working Paper No 3). *ISBN: 984-551-006-10.*

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*

4. Baqui AH, Paljor N, Nahar Q, Silimperi DR. "Infant and Child Feeding Practices in Dhaka Slums" May 1993 (ICDDR,B Working Paper No 34)(Urban FP/MCH Working Paper No 6) *ISBN: 984-551-009-4*

5. Chaudhury N, Mohiuddin QN, Mamtaz S, Ghosh KR, Silimperi DR, Lili FB, Leena MM, "Violence in the Slums of Dhaka City" May 1993 (ICDDR,B Working Paper No 35)(Urban FP/MCH Working Paper No 7) *ISBN: 984-551-010-8.*

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7. Salway S, Jamil K, Nahar Q, (editors). "Issues for Family Planning in the Urban Slums of Dhaka, Bangladesh: Opinions and Perceptions of Field-level Workers" May 1993 (ICDDR,B Working Paper No 37) (Urban FP/MCH Working Paper No 9) *ISBN 984-551-012-4*

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13. Salway S, Jamil K, Nahar Q, Nurani S. "Perceptions of Pregnancy Risk and Contraceptive Use in the Postpartum Period Among Women in Dhaka Slums" November 1993 (ICDDR,B Working Paper No 43) (Urban FP/MCH Working Paper No 15) *ISBN: 984-551-020-5*

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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.

ICDDR,B
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