Technical Study 56e

Mortality and Morbidity: The Matlab Experience

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Abstract

The increased interest in mortality studies in recent years has seen the proliferation of frameworks and models to study the factors underlying mortality. However, insufficient attention has been focused on the fact that in developing countries appropriate data rarely exist to test the validity of such models. Accurate vital registration systems are practically nonexistent, and developing countries have relied on surveys for estimates, developed usually on indirect procedures. Unfortunately, although these approaches have provided reliable levels of mortality, differentials such as those due to sex, have been masked because of cultural factors involved in sex-selective omissions in remembrance and responses regarding children that have died.

The Matlab field station in Bangladesh has acquired international recognition because of the availability of longitudinal data of reliable quality since its inception in 1966. Scientific results based on Matlab data, and specially designed studies in the area, have been published in various medical and demographic journals. This paper is intended to present examples of studies showing how mortality and morbidity can be studied within a "small area." Recent efforts to ensure timely processing and linkage of data, through the use of an appropriate numbering system and new approaches in data base technology, have been provided. The possibility of grafting small studies at relatively little cost onto an ongoing longitudinal system is described. The study of correlates stressed in mortality frameworks is thus facilitated. The paper attempts to establish that although cost considerations prevent population laboratories like that of Matlab being replicated in every developing country, regional centres particularly in Africa could be usefully considered.

Résumé

L'intérêt accru qui entoure depuis peu les études de la mortalité explique la prolifération de cadres et de modèles applicables à ce genre d'étude. Cependant, on a négligé le fait que les pays en développement possèdent rarement les données voulues pour vérifier la validité de ces modèles. Ces pays n'ont pour ainsi dire pas de bureaux de l'état civil et leurs estimations se fondent sur des enquêtes habituellement faites indirectement. Bien que ces méthodes aient permis d'établir assez justement les niveaux de la mortalité, elles masquent les causes de différences statistiques, comme celles attribuables au sexe, en raison des facteurs culturels qui interviennent au moment de la déclaration du nombre ou du sexe des enfants décédés.

La station de Matlab au Bangladesh s'est acquis une réputation internationale parce qu'elle fournit des données longitudinales de bonne qualité depuis sa création en 1966. Des études scientifiques fondées sur des données de Matlab et des études conçues pour la région ont été publiées dans divers périodiques médicaux et démographiques. Dans cet ouvrage, l'auteur donne des exemples d'études montrant que la mortalité et la morbidité peuvent être étudiées dans de petities régions. Il aborde aussi les récents efforts faits pour traiter et lier les données à l'aide d'un système de numérotation et les nouvelles démarches appliquées à la technologie des bases de données. Il décrit la possibilité de greffer, sans grands frais, de petities études sur le système longitudinal; l'étude de corrélats, sur laquelle les cadres proposés pour l'étude de la mortalité mettent l'accent, se trouve ainsi facilitée. L'auteur essaie de montrer que, même si les coûts interdisent la création de laboratoires démographiques comme celui de Matlab dans chaque pays en développement, il vaudrait la peine de songer à établir des centres régionaux, particulièrement en Afrique.

Resumen

Ultimamente el creciente interés en los estudios de mortalidad ha visto proliferar marcos de referencia y modelos para estudiar los factores subyacentes a esta. Sin embargo, se ha prestado poca atención al hecho de que en los países en desarrollo rara vez existe información adecuada para probar la validez de tales modelos. En estos países, prácticamente no existen sistemas confiables de registro vital por lo cual han tenido que valerse de encuestas para los estimativos, que generalmenet desarrollan mediante procedimientos indirectos. Desafortunadamente, aunque estos enfoques han ofrecido niveles confiables de mortalidad, hay diferenciales, como el sexo, que quedan ocultas en razón de los factores culturales involucrados en las omisiones relacionadas con el sexo los recuentos y respuestas en torno a los decesos infantiles.

Desde su creación en 1966, la estación de campo Matlab en Bangladesh ha adquirido renombre internacional gracias a la disponibilidad de información longitudinal confiable. Resultados científicos, basados en esta información, así como estudios de diseño especial en el área, han aparecido en revistas médicas y de demografía. Este trabajo presenta ejemplos de estudios que demuestran cómo la mortalidad y la morbilidad pueden ser estudiadas dentro de una "pequeña área". Se ilustran esfuerzos recientes para asegurar el procesamiento y la vinculación oportuna de datos, mediante el uso de un sistema apropiado de numeración y nuevos enfoques en tecnología de base de datos. Se describe la posibilidad de insertar pequeños estudios, a un costo relativamente bajo, en un sistema longitudinal en curso. Con ello se facilita el estudio de correlacionadas, tan importantes en el marco de la mortalidad. El trabajo intenta establecer que, aunque las consideraciones de costo impiden replicar laboratorios de demografía como el de Matlab en todos los países en desarrollo, se puede considerar la posibilidad de centros regionales, particularmente en Africa.

CONTENTS

FOREWORD

The Population, Health and Development (PHD) project of the Social Sciences Division of IDRC was created in 1983 as a temporary mechanism to support and to strengthen the capacity of developing-country researchers in carrying out interdisciplinary investigations of the persistent problems of high levels of infant and child mortality and poor health. To this end and with the active involvement of the Health Sciences Division, the project has organized a number of activities. These include a series of interdisciplinary regional workshops in Latin America and Africa of health scientists and social scientists, the preparation of two research bibliographies, and the sponsoring of several researchers to international conferences. In addition, the PHD project has commissioned a series of technical research papers on widely recognized problems or gaps in infant mortality research. These papers were reviewed by peers and published in the International Development Research Centre (IDRC) Infant Mortality and Health Studies series. They are intended to address specific methodological and conceptual issues in the research, data sources, data collection, and analysis of data.

It should be noted that the Infant Mortality and Health Studies series is not intended to be based exclusively on original or primary data. Rather the series of monographs is intended to examine and update researchers whose work successfully integrates conceptual and methodological approaches from both the health science and the social science research traditions. Where appropriate, a field manual approach and style was encouraged. Otherwise, an operational and illustrative approach was used in preparing the papers for publication.

"Mortality and Morbidity: The Matlab Experience" illustrates the relative strengths and utility of using the "population laboratory" approach for the monitoring of mortality-morbidity processes and is an important reference document for investigators considering this approach. The authors, Stan D'Souza, Abbas Bhuiya, Susan Zimicki, and Kashem Sheikh have had extended affiliation with the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) where the Matlab research was carried out. Stan D'Souza, the principal author, is currently the Senior Demographer/Analyst for the United Nations Development Programme (UNDP) in Benin.

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INTRODUCTION

In recent years, there has been an increased interest in mortality studies, and efforts have been made to develop frameworks within which to examine factors underlying mortality. Socioeconomic and biological correlates are usually studied, although models of increasing complexity are proposed to cover, for instance, structural and environmental variables (Mosley and Chen 1984). The problem with these models for the developing-country situation is that appropriate data are not available. In fact, vital registration systems of reliable quality rarely exist, and recourse has been made to indirect estimation procedures to assess levels and trends of mortality. These estimates, although useful, often mask underlying problems that could arise from cultural and other biases that exist in the responses based on retrospective approaches.

The purpose of this paper is to present examples from a field station set up by the International Centre for Diarrhoeal Diseases Research, Bangladesh (ICDDR,B) (originally called the Cholera Research Laboratory) showing how mortality and morbidity processes can be studied within the context of "small area" studies. Several papers have documented the Matlab experience (D'Souza 1981a). This paper presents an updated and abbreviated version of existing documentation and aims at illustration rather than presentation of research results. Thus, figures are provided, without the underlying tables, so that the researcher interested in applications of health and mortality research can rapidly get a grasp of the flexibility and power of an integrated data base. New advances in the field of microcomputers have also made available to the researcher in the Third World setting techniques of data base linkage that initially could only be done on large computers usually based in developed countries. This paper stresses the need for appropriate numbering systems to ensure that linkage is efficiently executed even on micros. The negative aspects of the earlier situation can easily be imagined. Research analysis was done away from the practitioners in the field who collected the data. Thus, studies on famine are published years after the famine has decimated the local population and reliable data are not available at the time when the practitioners can make an impact on the morbidity and mortality situation of the area in which they are working.

In the case of Matlab, data processing was done at the Johns Hopkins University in the United States. Matlab was used as a field station for mainly expatriate researchers, and the need to have computerized data analysis in Bangladesh was not felt. In fact, it was only after internationalization of the centre in 1979 that an IBM S34 minicomputer was acquired for the DSS in Dakha under a UNFPA grant.

To indicate that variations of the Matlab experience are in fact replicable, data from another field study in Bangladesh is presented briefly as comparison in terms of costs and registration coverage, etc., in the study of mortality and morbidity within the Third World (D'Souza 1981b).

THE MATLAB DEMOGRAPHIC SURVEILLANCE SYSTEM

Brief History

The Matlab Demographic Surveillance System (DSS) is a unique demographic resource in Asia. Beginning in 1963, ICDDR,B initiated a DSS in selected villages within an area adjacent to Matlab Thana, Comilla District, Bangladesh. The DSS combined periodic censuses of the study population with continuous registration of vital events: births, deaths, and migrations. In 1966, a census was conducted in the Matlab Demographic Surveillance Area (DSA), covering a population of 110,000 people residing in 132 villages referred to as the Old Trial Area (OTA). The DSA was doubled in 1968 with the addition of 101 adjacent villages, referred to as the New Trial Area (NTA). At the 1974 census, the population of the total DSA was 254,000 residing in 233 villages. In October 1978, the study area was reduced to 149 villages containing an estimated 1974 population of 160,000. All these retained villages are within Matlab Thana (Becker et al. 1982). In 1982, a new census update was undertaken. The 1982 population total was about 180,000.

According to the 1974 census, the study area population is 88% Muslim and 12% Hindu. The average household consists of six persons. Households of patrilineally related families are grouped in clusters called "baris," having a common courtyard. Landholding is skewed, with 18% of the households owning 47% of the land. About 40% of the males and 16% of the females over age 15 have completed 4 years of schooling. About 70% of the males and 6% of the females are classified as "economically active." Over the past decade, the Matlab DSS has generated an enormous volume of unusually reliable data. Population censuses are available for 1966 (OTA), 1968 (NTA), 1970 (OTA), 1974 (DSA), and 1982 (reduced DSA and present DSS coverage). Vital events have been registered since 1966 in the OTA and since 1968 in the NTA. Beginning in January 1975, continuous registration of marital unions and dissolutions was introduced. Depending upon the census, selected socioeconomic information is available for all households. During the past few years, census books updated to 1982 have been prepared. A 1982 socioeconomic survey of individual households also has been undertaken. The data have been computerized and indicate little change in socioeconomic status (SES) of the population since the 1974 socioeconomic survey (D'Souza et al. 1983).

Numbering System of the 1982 Census Update

The importance of an appropriate numbering system must be stressed. The value of a data base can be seriously undermined if linkage problems exist when attempts are made to link mortality, for instance, with other variables. Furthermore, field retrieval of individuals in longitudinal studies becomes difficult if a numbering system is set up that cannot cope with movement of the population.

Each person in the Matlab system was assigned a registration number at the time of a census. This number, however, originally intended to provide identification in the field of households and individuals, tended to become quickly out of date because of population movement, split households, etc. For the 1982 census update, a dual numbering system was introduced. A current identification number (current ID) was set to designate present residence and would change with change of address. A permanent registration number was also designated. This number, in cases present at the 1974 census, would be the 1974 census number. For individuals entering after that date, the registration number assigned at the time of entry was designated as the permanent registration number. Forms would cease to carry earlier census numbers. Also, a new ID corresponding to actual location would be designated. Thus, an individual living in village V47 and having family residence number 0044 and being the head of the household would have current ID V47-0044-01. The last two digits, -01, constitute his or her individual number and were assigned by the computer, based on relation to the head of the household. A check code (1 or 2) was also inserted on the file to indicate if the person entered before or after the 1982 census. This was to avoid possible duplication of registration numbers for new entries. The registration number of this individual would be his 1974 census number: V47-0036-01 (see Appendix).

It was decided that the resident population of the 149 villages in the DSS area retained in October 1978 would constitute the target population of the 1982 census update. In the de-jure census a resident was defined as (a) a person resident in the DSS area on a regular basis including persons who return to the area at least once a month and stay at least 1 night; and (b) a person resident in the DSS for at least 6 months a year (usually migratory workers). Temporary visitors and guests who were present at the time of the census were excluded from the count. The mid-year population of 1982 was the target.

To increase the analytic utility of the census update an SES update was also planned. The last SES data for the area had been collected in 1974 and, because of the various crises caused by floods and famine as well as political instability that had ravaged Bangladesh since that year, it was felt that a new SES baseline was necessary.

It was decided to collect SES information at the same time as the field visits for the census update. This decision was based on efforts to economize on transport costs as well as to reduce inconvenience to Matlab inhabitants caused by renewed visits for sociological inquiry purposes. As a complement to the SES survey of households, a village survey was first undertaken during which information on a few structural variables, such as the existence of a market, a school, a post office, etc., was sought.

Data Collection and Processing Procedures

The scientific "support" work of the ICDDR,B is undertaken by "branches," each branch having a specific technical role. The DSS Dhaka, the Demographic Surveillance Program of the Matlab Field Station, headed by a Senior Field Research Officer, is responsible for the field operation and collection of the surveillance data. The Dhaka Data Management Branch is responsible for editing, processing, and initial tabulations of the demographic field data. The Computer Branch is responsible for the computerization of data. The following is an operational diagram of the DSS activities.

Field Station Matlab	Data Management Branch, Dhaka	Computer Branch Dhaka
Field operation and data collection --------▶	Editing, coding ---▶	Data entry, preliminary tabulations
Verification -----------▶	Verification ------▶	Verification
	Preparation of annual reports ----▶	Final tabulations

The current data collection system is a three-tier system. Detection of vital events is primarily the responsibility of the 110 female community health workers (CHWs). Eighty CHWs undertake primary detection of the vital events in half of the surveillance area as part of their work in providing village-based maternal child health-family planning (MCH-FP) services. Each CHW covers about 200 households and visits each family fortnightly. In the remaining half of the Matlab study area, 30 CHWs, covering about 500 households each, do only demographic surveillance work, visiting each household fortnightly. All CHWs have at least a 7th grade education. They inquire about births, deaths, migrations, and marriages and divorces, and record these events in register books. The work of CHWs is checked by 12-16 male health assistants (HAs) who, accompanied by the CHWs, visit each household monthly to review the completeness of the registration and to record the vital events on standard registration forms (see Appendix). The area covered by an HA is called a "field unit," and contains about 16,000 people (2800 households). The work of HAs is checked by 3 or 4 senior health assistants (SHAs), who visit each household at least three times annually. All these workers are supervised by the DSS Senior Field Research Officer who, along with two assistant supervisors, randomly checks on the quality and completeness of the fieldwork.

MORTALITY LEVELS, TRENDS, AND DIFFERENTIALS

The existence of a continuous data base with reliable vital registration from 1966 is unique in the developing world. The data provide valuable insight into the movement of mortality parameters at moments of stress. Postneonatal mortality and child mortality register noticeable rises. The long period also indicates that earlier optimism about a steady mortality decline attainable in developing countries is premature. In fact, mortality levels fluctuate around a fairly high plateau. The lower level in particular years is often due to fortuitous circumstances of good harvests and sustained health inputs. The fragile equilibrium of such levels is manifest as soon as stress conditions appear. The situation in several African countries recently ravaged by drought and war corroborate this point.

Mortality rates for the Matlab area for the period 1966-82 are provided in Fig. 1. Conventional rates are presented except when specifically indicated for some results in 1975 and 1976. Even though

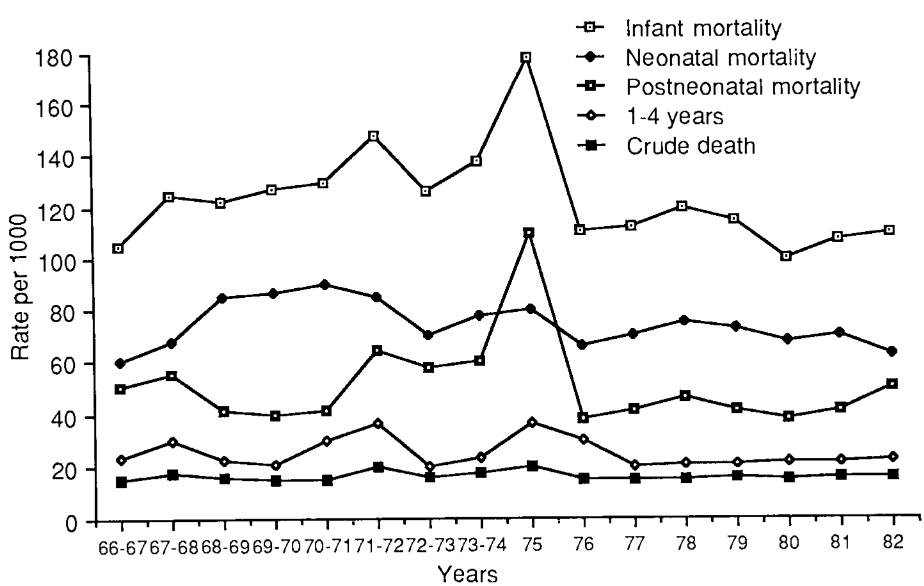

Fig. 1. Infant (neonatal and postneonatal) mortality rate, 1-4 year child death rate, and crude death rate in Matlab, Bangladesh (1966-82).

the base populations are different for the period 1966-82, the size of the study area has been large enough to ensure against random fluctuations. Variations in death rates reflect the conditions in the country. For the period 1966-71, the crude death rate (CDR) per thousand was about 15. From 1971 to 1975 the CDR fluctuated substantially, reaching about 21/1000 during the liberation struggle (1971) and the famine period (1975). In 1976 the CDR was back to normal (14.8). It remained around the same level in subsequent years until 1982. Fertility variables are also under study in the Matlab area. The crude rate of natural increase (RNI) has varied from about 2.5 to 3.3%.

Differentials in Mortality

The study of differentials is extremely important in the understanding of mortality and morbidity processes. Such studies when based uniquely on indirect methods can be misleading. The Bangladesh Retrospective Survey on Fertility and Mortality showed consistently that male mortality was higher than female mortality. This error arose from the cultural biases that ensure that the recollection of male child deaths is more accurate than that of female child deaths. Because of close surveillance and supervision, the Matlab area has been able to detect deaths of children in the first few months of life that could have been missed if retrospective procedures had been used.

Sex Differentials

The results in this section are based on DSS data for 1974-77 (D'Souza and Chen 1980). Table 1 shows that occasionally male infant mortality rates appear to be higher than female rates. However, a review of the neonatal and postneonatal rates indicates that, although it is true that neonatal male rates are in fact higher than the corresponding female rates, the situation is reversed if one considers postneonatal rates. The higher female mortality rates are maintained for child mortality rates of 1-4 years (Table 2). Results from Matlab show that the higher female mortality persists into older age groups.

Figure 2 depicts the direction and magnitude of sex differentials in mortality for children under 5 years of age for 1974-77. The ratios of female to male (F/M) mortality at specific ages are plotted. Male mortality exceeds female mortality only during the neonatal period. Thereafter, female mortality exceeds male mortality by increasing amounts up to 3 years of age, when female death rates are 46-53% higher than the corresponding male rate.

The consequences of extreme privation for sex differentials in mortality can be examined during times of crisis. This is attempted in Fig. 3 where the percentage of "excess" female death rates in comparison to male rates is shown during the food shortage of 1974-75 and during the normal years 1976-77. For three critical age groups (1-12 months, 1-4 years, and 5-14 years) "excess" female mortality was consistently higher during the food-shortage years. This would indicate that female children experience disaster disproportionately. Scarce resources are allocated more readily to boys than girls. A food allocation study in the Matlab area brought this fact to the surface (Chen et al. 1981).

Table 1. **Infant mortality rates (per 1000 live births) by year and sex in Matlab, Bangladesh, 1974-77.**

Mortality measure	1974	1975	1976	1977	1974-77
Infant mortality rate (all infants)					
Both sexes	137.9	191.8	102.9	113.7	131.2
Male	142.5	165.1	113.6	113.3	130.9
Female	132.9	184.1	110.3	114.2	131.5
Neonatal mortality rate (infants less than 1 month)					
Both sexes	78.1	79.9	65.3	71.3	73.0
Male	87.9	81.6	72.0	73.1	78.2
Female	67.8	78.1	58.1	69.4	67.6
Postneonatal mortality rate (infants 1-11 months)					
Both sexes	59.8	111.9	37.6	42.4	58.2
Male	54.6	98.4	33.3	40.2	52.6
Female	65.1	126.3	42.1	44.8	63.9

Source: D'Souza and Chen 1980.

Table 2. **Early childhood mortality rates (per 1000 population) by year and sex in Matlab, Bangladesh, 1975-77.**

Age (years)	Sex	1974	1975	1976	1977	1975-77[a]
1	Both sexes	31.6	47.4	48.2	29.9	43.10
	Male	22.9	38.4	40.9	23.8	35.23
	Female	40.6	56.8	55.9	36.6	51.28
2	Both sexes	34.8	38.6	33.0	23.8	32.53
	Male	25.7	31.4	29.5	16.1	26.59
	Female	44.4	46.1	36.6	32.2	38.80
3	Both sexes	22.5	31.7	24.1	18.2	24.36
	Male	16.0	26.0	20.4	12.6	19.37
	Female	29.2	37.7	28.1	24.0	29.65
4	Both sexes	11.6	18.8	15.2	10.5	14.83
	Male	7.7	17.2	13.0	8.4	12.86
	Female	15.8	20.6	17.5	12.7	16.94
1-4	Both sexes	25.4	34.9	29.6	19.6	28.43
	Male	18.3	28.8	25.5	14.5	23.27
	Female	32.9	41.3	33.9	25.2	33.89

Source: D'Souza and Chen 1980.
[a]1974 not included because of different coverage.

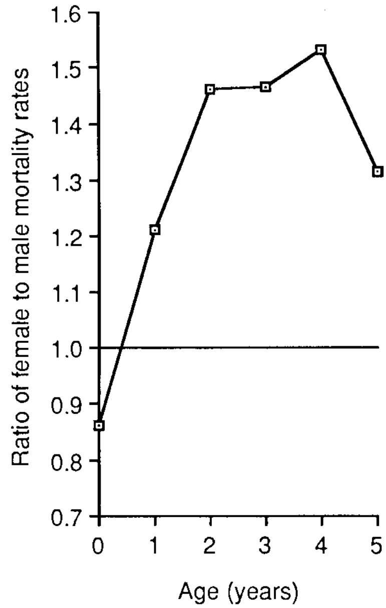

Fig. 2. Ratio of female to male mortality rates for children under 5 years of age in Matlab, Bangladesh, 1974-77 (source: D'Souza and Chen 1980).

The data presented so far have been obtained by cross-sectional approaches. The Matlab data base provides a unique opportunity for longitudinal studies. Thus, a cohort of 11,454 children born during the period of 1 May 1973 to 30 April 1974 were followed up to April 1978. Figure 4 shows the estimated cumulative proportion of children dying by sex for the cohort. A cross-over takes place toward the end of the first year, and, thereafter, proportionately more girls than boys die. This study thus confirms the earlier cross-sectional study approach (Koenig and D'Souza 1986). The availability of longitudinal data has also allowed the use of recently developed analytic techniques, such as hazard models, to study the determinants of child mortality (Koenig et al. 1984).

Education and Child Mortality Differentials

Table 3 presents mortality rates in early childhood by education level of the household head. Three levels of education have been considered: persons with no schooling or with religious education only, those who have completed 1-6 years of schooling, and persons completing 7 or more years of schooling. At all three educational levels, there is a peak in mortality rates for 1975, whereas 1977 rates are fairly similar to those of 1974. Considering mortality for particular years, one notices markedly lower death rates with

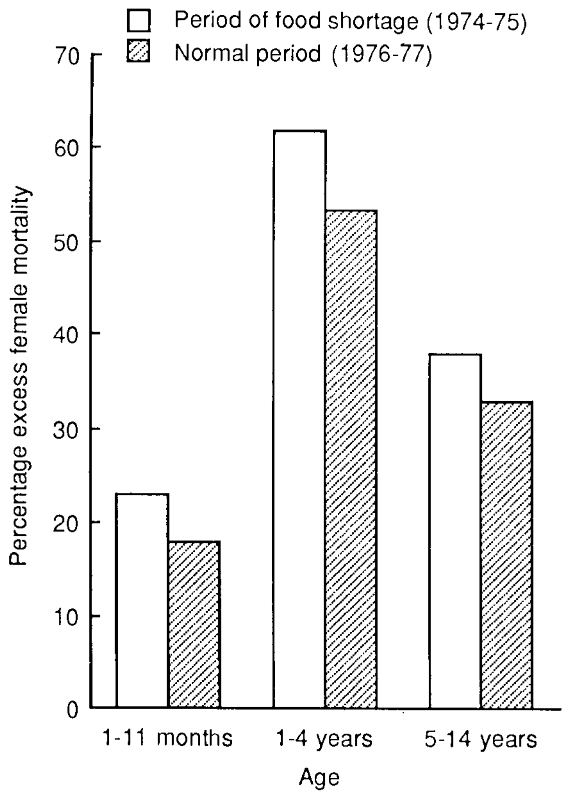

Fig. 3. Percentage by which female mortality rates exceeded male mortality rates in infancy and childhood during a period of food shortage (1974-75) and during normalcy (1976-77) Matlab, Bangladesh (source: D'Souza and Chen 1980).

increasing education. The ratio of mortality rates at the lowest education level to the highest (I:III) exceeds 1.70 in each of the 4 years, although a slight decline in this ratio is noticed with time. Of note, too, is the fact that during the crisis year of 1975 the mortality rate at the lowest educational level was 44.6.

The education of mothers has generally been shown to be an important predictor of mortality levels. Because of limited data, matching of deaths with levels of education of mothers, obtained in the 1974 census, can be done only for children who died between the ages of 1 and 3 and only for the years 1975-77. These results are presented in Table 4. As in Table 3, an inverse relationship between increasing education and mortality levels is evident, although the ratio I:III is now as high as 5.3. The conclusion one may draw at this stage is that education levels are important to understanding differential mortality. Although for practical purposes the education of the household head is sufficient to identify the group more susceptible to death, mothers' education may, in fact, be a more sensitive indicator and should be used, especially when young children are concerned.

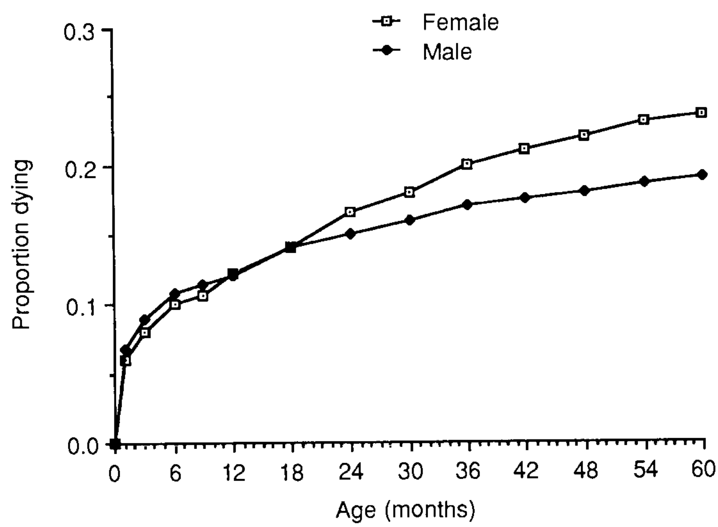

Fig. 4. Estimated cumulative proportion of children dying by sex for the cohort born between 1973 and 1974, Matlab, Bangladesh (source: Koenig and D'Souza 1986).

Number of years of education of the household head or mother is relatively easy to measure. But a problem exists regarding the type of school attended. Religious schools (Maktab) may not have the same type of modernizing influence on health practices as secular schools. Hence, it is important that allowance be made for the type of school attended.

Table 3. Mortality rates[a] (per 1000) at ages 1-4 for both sexes by education (years of completed schooling) of household head, Matlab, Bangladesh 1974-77.

Education of household head (years of schooling)	Number of persons in 1974	1974	1975	1976	1977	1974-77
I 0 (no schooling)[b]	15406	27.3	44.6	37.3	26.0	34.5
II 1-6	9854	21.2	33.9	27.9	19.0	25.8
III 7+	3569	12.0	23.3	21.4	15.4	18.1
All	28829	23.3	38.3	32.1	22.2	29.4
Ratio I:III		2.23	1.91	1.74	1.72	

Source: D'Souza and Bhuiya 1982.

[a]Under usual statistical assumptions, the differences in mortality rates at educational levels I and III are highly significant ($t = 7.437$, $p<0.01$, d.f. = 3).

[b]Or religious (Maktab) schooling only.

Table 4. **Mortality rates (per 1000) at ages 1-3 for both sexes by education (years of schooling) of mother for the 1974 birth cohort followed through 1977, Matlab, Bangladesh.**

Education of mother (years of schooling)	Number of mothers	1975-77
I 0 (no schooling)[a]	21278	33.3
II 1-6	7439	20.2
III 7+	853	6.3
All	29480	29.2
Ratio I:III		5.29

Source: D'Souza and Bhuiya 1982.
[a]Or religious (Maktab) schooling only.

Socioeconomic and Biologic Differentials

The results from Matlab show a clear inverse relationship between various levels of mortality and socioeconomic status (D'Souza and Bhuiya 1982). This inverse relationship persists for all age groups considered: 1-4, 5-14, and 15-44 years. The criteria used for assessing socioeconomic status - years of education of head of household or mother, occupation, size of dwelling, ownership of cows, and health practices - were all effective for demonstrating higher mortality rates for the lower socioeconomic groups (see Fig. 5).

Clearly, the variables mentioned are correlated. Persons of higher education are likely to belong to families having more possessions, larger houses, etc. To assess whether education would still be important after controlling for the various other parameters

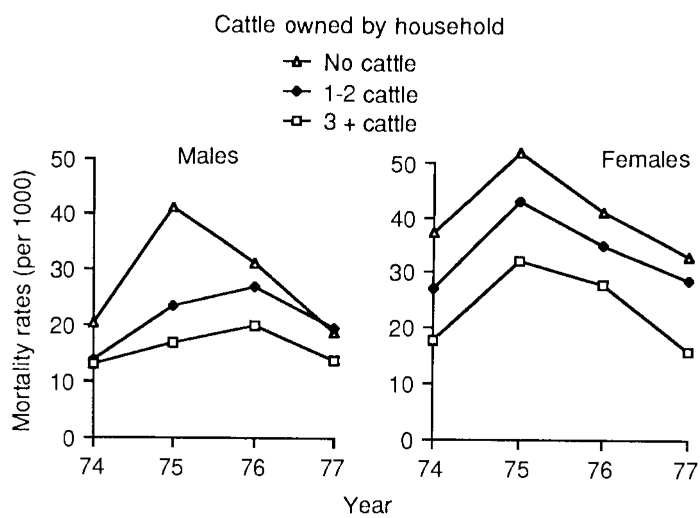

Fig. 5. Mortality rates (1974-77) of children aged 1-4 years by number of cows owned by the household (source: D'Souza and Bhuiya 1982).

Table 5. **Mortality rates (per 1000) for children of both sexes aged 1-4 years by education of household head and other socioeconomic variables, Matlab, Bangladesh 1974-77.**

Education of household head (years of schooling)	Number of persons in 1974	Occupation			
		Agricultural laborer	Owner/worker	Landowner	All
0 (no schooling)[a]	128772	32.8	23.0	20.4	25.2
1-6	83066	26.9	18.5	8.9	19.1
7+	30021	9.5	13.5	10.4	13.1
All	241859	31.2	19.9	13.5	21.7
		Area of dwelling in ft^2			
		169	170-242	243+	All
0 (no schooling)[a]	142350	31.4	26.7	18.3	25.3
1-6	90324	24.8	19.6	16.2	18.8
7+	32596	17.0	19.6	11.5	12.9
All	265270	28.9	23.5	16.2	21.5
		Number of cows owned			
		0	1-2	3+	All
0 (no schooling)[a]	142250	29.2	22.6	16.9	25.3
1-6	90324	22.0	17.6	14.0	18.9
7+	32596	14.3	13.1	10.3	13.0
All	265270	25.3	19.6	14.8	21.5
		Use of fixed latrine			
			Yes	No	All
0 (no schooling)[a]	142350		22.3	28.7	25.3
1-6	90324		18.7	19.6	18.8
7+	32596		12.6	16.0	12.9
All	265270		20.6	26.0	21.5

Source: D'Souza and Bhuiya 1982.

[a]Or religious (Maktab) schooling only.

Table 6. Number of children under age 5, number of deaths and death rates by height for age, weight for height, and weight for age, 1981-82 (source: D'Souza et al. 1983).

	Number	Deaths	Rate/1000
Height for age			
Severe (85%)	312	17	54.5
Moderate (85-89%)	618	14	22.7
Mild (90-94%)	581	7	12.1
Normal (95%)	211	4	19.0
Total	1722	42	24.4
Weight for height			
Severe (70%)	32	5	156.3
Moderate (70-79%)	325	17	52.3
Mild (80-89%)	919	17	18.5
Normal (90%)	446	3	6.7
Total	1722	42	24.4
Weight for age			
Severe (60%)	233	24	103.0
Moderate (60-74%)	996	13	13.1
Normal (75%)	493	5	10.1
Total	1722	42	24.4

- occupation, area of dwelling, number of cows owned, use of a fixed latrine - three-way tabulations were prepared (Table 5). The inverse relationship of mortality rates with education, even controlling for other socioeconomic characteristics, is quite clear from the table. Using data from the Bangladesh Fertility Study (BFS), Mitra in 1979 constructed a simple index of economic status - poor, middle, and rich - depending on the possession of such items as a radio or watch. With this definition of controlling for economic status, he found a similar inverse relationship between parents' literacy and mortality.

Apart from the development of methodological tools for mortality studies, the major importance of the results from the Matlab investigations is that serious differentials in mortality levels have been documented for various socioeconomic strata in a rural area of Bangladesh - the lowest strata having the highest mortality levels. The vulnerability of the lowest socioeconomic status groups to the very high mortality rates during times of crisis also has been shown. Higher SES groups appear to have a higher capacity to withstand the hardships arising from floods and subsequent shortage of food.

Differentials in infant mortality rates by SES are linked to such biological factors as month of gestation, height of mother, or weight of infant (Chowdhury 1982). Preterm deliveries were common among mothers with no education. Higher neonatal death rates are found among children of mothers with no education. More studies on infant mortality need to be undertaken to separate the various confounding social and biological variables. Further studies relating birth weights and infant mortality can be undertaken in the rural setting of Matlab.

An IDRC-funded study (D'Souza et al. 1983) has confirmed the continued existence of mortality differentials. The plan was to study in depth some of the underlying reasons for mortality differentials, particularly nutrition. More intensive data were collected in five villages and were used as a pilot study for the 1982 census and SES survey in the Matlab area. Of interest are the tables linking mortality rates and anthropometric measures. "Weight for height" and "weight for age" measures discriminate quite clearly between the groups that are most likely to be at mortality risk (Table 6). These simple measures can thus be utilized for programs related to special nutrition for high-risk children. It must be remembered, however, that such programs, in isolation, have only a limited value. A deeper understanding of the "cause of death" process including social and economic linkages is necessary to reduce infant and child mortality in developing countries.

MATLAB DSS CAUSE OF DEATH REPORTING

The ICDDR,B has been using a lay reporting system for cause of death since 1966. Some of the problems encountered and the potential for improvement will be discussed briefly here. Preliminary trials of new approaches tried both in Bangladesh and in Niakhar, near Dakar, Senegal, are reported in detail elsewhere (Garenne and Fontaine 1986; Zimicki 1986).

The death reporting system in the Matlab field trial area has been operating since 1966, in a population that in 1982 numbered about 180,000. Twelve field and two office staff of the demographic surveillance system are responsible for death reporting. The field-workers, who are responsible for reporting all vital events, interview families about the cause of death and complete a "death report" form. Beginning in 1974, the number of categories was extended to 27, and a new report form was gradually introduced with boxes for fieldworkers to tick for some specific and "other" classifications and space to write a description of symptoms leading to death (see Appendix). In the office, this information is used to check the field coding and to categorize death marked "other" by the fieldworker. The final coded forms are key-punched and maintained in files for each year. Recently, a new precoded form has been introduced (death registration form, Appendix), which incorporates the dual numbering system but, for reasons not quite clear, sex of the dead person has not been included as a question on the form. Basic tabulations are available (DSS annual yearbooks and Zimicki et al. 1985). Figure 6 provides "cause of death" of child mortality for some diseases in Matlab for 1975-81. Apart from the higher mortality rates during the difficult period of 1975, it is worth noting the consistently higher female mortality in most categories (D'Souza 1984).

There are problems with the procedures used for reporting "cause of death," leading to a lack of assurance about the validity of the coded causes of death (Zimicki et al. 1985). Circumstances of death are determined from the retrospective open-ended interview with relatives, carried out by experienced but nonmedically trained interviewers, and classified by office workers. There is no documentation of decision rules that have been used in such cases. In fact, for both elicitation of information about circumstances of death and classification of cause, the system has relied greatly on the common sense of the workers. The potential for respondent, interviewer, and classifier bias is obvious.

Furthermore, one of the most important reasons for misclassification is the lack of fit between local and medical notions of why people die. A good example of this discrepancy can be seen by evaluating deaths attributed to neonatal tetanus. Although tetanus is the coded cause for about half the neonatal deaths, examination of the

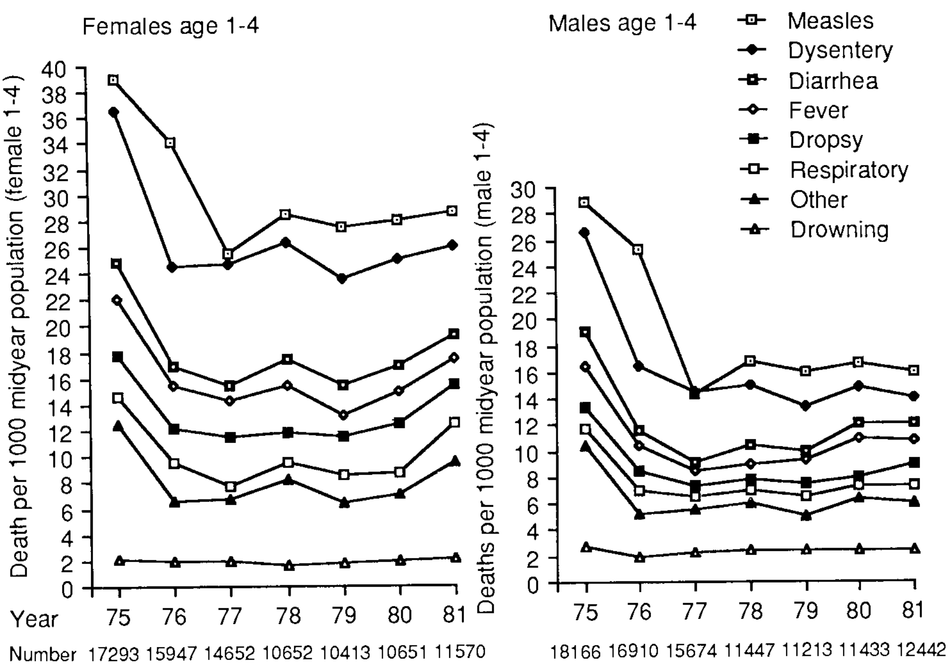

Fig. 6. Selected death rates by sex and cause of children aged 1-4 years in Matlab, Bangladesh (1975-81) (source: D'Souza 1984).

day of death and the sex ratios of deaths suggests that many "tetanus" deaths may be a result of other causes.

Zimicki (1986) has proposed and tested a new approach. As a partial experimental solution to the problems of the reporting system for "cause of death," a comprehensive questionnaire has been substituted for the open-ended interview. Most symptoms that are important to distinguish between various causes of death are described fairly easily and unambiguously by people in Matlab (rash and convulsions are two exceptions). In the system being tried, fieldworkers ask a set of questions to ascertain the presence or absence of symptoms or conditions during the period before death and their time of onset and duration. Using this information and decision rules, such as those suggested by WHO (1978), deaths can be categorized. Physicians independently determine cause of death for a sample of deaths to calibrate the system.

The new system attempts to standardize reporting by fieldworkers. It also provides more exact knowledge of the absence as well as the presence of conditions that might contribute to death. Documentation of decision rules clarifies the meaning of various categories and the use of rules improves consistency of classifications. Because information is coded and permanently retrievable, different sets of decision rules can be applied, as we learn more about epidemiology, clinical manifestations, and cultural perceptions of diseases through small, intensive studies. The potential for multiple classification is also useful, because interest in various categories may change with time or point of view. The International Classification of Disease (WHO 1967) and systems derived from it are based on a medical (patho-physiological) model of disease (rather than, say, a nutritional deficiency model) and are most useful for evaluating the effect of medical interventions, such as immunization programs or the use of penicillin by community health workers. Even as a basis for decisions about medical interventions, the classification systems currently used may be problematic, because they only allow deaths to be classified by a single cause. Death often is multicausal and, in situations where mortality might be reduced by intervening against an antecedent cause or contributory condition (say, malnutrition or measles in the measles-viral pneumonia progression), knowledge about these contributory causes may be more important than about direct causes for which no intervention is feasible.

ASSESSMENT OF HEALTH INTERVENTIONS

The Matlab data base is highly suited to assess the impact of health interventions according to specified designs. Since the introduction of a health intervention program in 1978, the DSA has been divided roughly into two areas - treatment and comparison areas (Bhatia et al. 1980). Both areas had a population of about 80,000, and both could receive treatment for diarrhea at the Matlab field hospital. In addition, in the treatment area, various health interventions including family planning were gradually introduced. The evaluation of particular health interventions such as oral therapy has, thus, been possible.

An oral therapy field trial was conducted in the Matlab area from January 1979 through to December 1980. The entire DSA "treatment" area was divided into subpopulations of 40,000, both being earmarked as "oral therapy treatment" areas. In these two subpopulations, two different oral rehydration solutions (ORS) were made available in homes: a WHO-approved packet solution and a salt/sugar (labon/gur) solution made from local ingredients. A subpopulation of 40,000, about half the DSA "comparison" area, was earmarked as an "oral therapy reference" area. A decline in clinic attendance because of ORS treatment at home was expected in the treatment area.

The smoothed curves (3-month moving averages) of crude population-based monthly clinic attendance rates show the seasonal component and illustrate the decline that occurred during the 4-year period 1977-80 (Fig. 7) in the treatment and reference areas. There are two peaks each year; the first, in March-May, is associated mainly with Escherichia coli, and the second, in August-October, with both E. coli and V. cholera. The pattern of decline and the component attributable to cholera are similar for the packet and lobon/gur areas. Attendance rates due to cholera diminished somewhat in 1979 and 1980, possibly because of the absence of a large-scale cholera epidemic. This absence is particularly evident in the reference area attendance rates for cholera. However, the major reduction in treatment area attendance occurred for patients with diarrheas other than cholera. In particular, the March-May peaks were greatly reduced - in 1980, they almost disappeared - in the two treatment areas, although they persisted in the reference area.

Comparison of the crude clinic attendance rates for the 2 years preceding the study and the 2 study years indicates a similar significant reduction in both treatment areas. This decline is 30% greater than that observed for the reference area, which was also significant (Zimicki et al. 1984).

Figure 8 represents the number of cases of measles occurring per month in the Matlab area over the period November 1979 to December

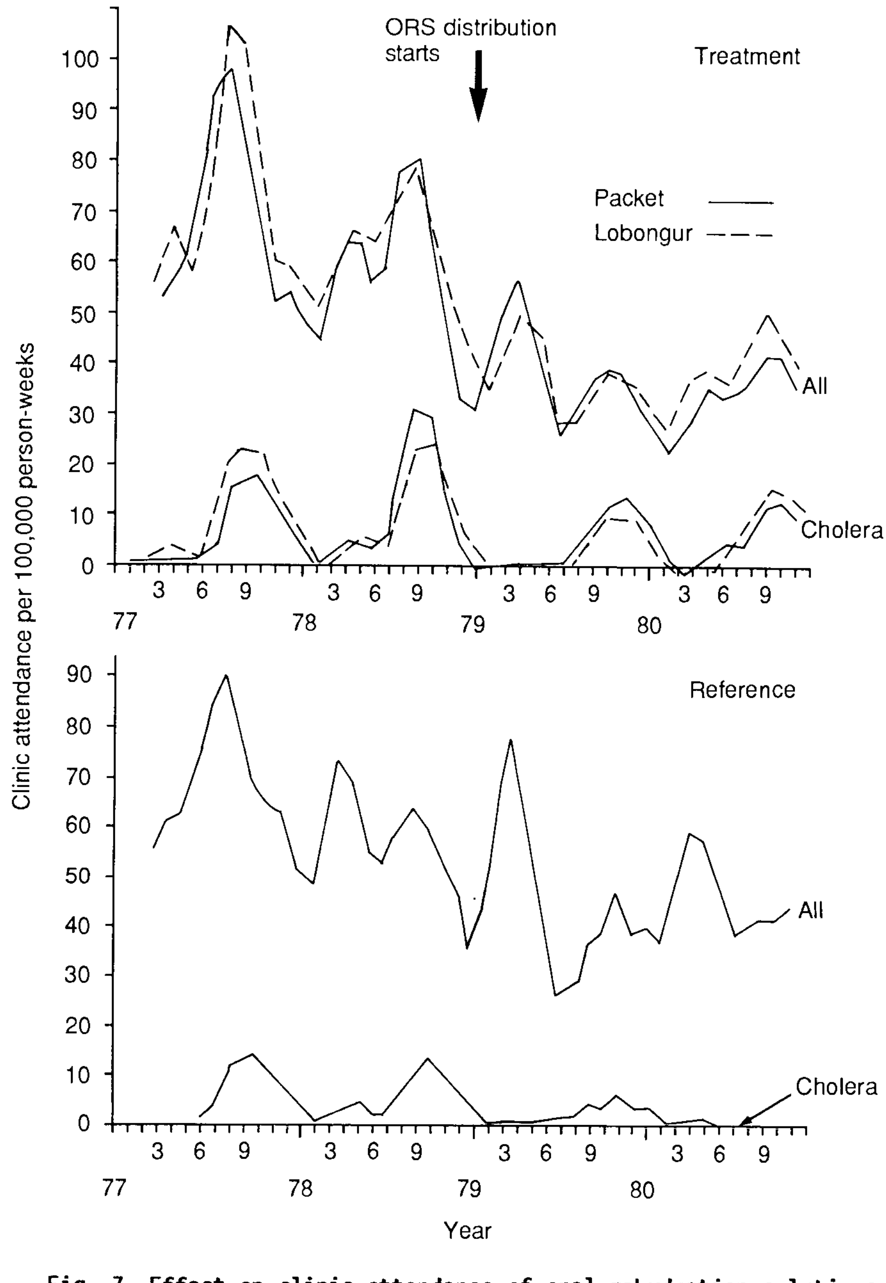

Fig. 7. Effect on clinic attendance of oral rehydration solutions (ORS) distribution (1977-80), Matlab, Bangladesh (source: Zimicki et al. 1984).

1983. From a fairly low 200 cases/month in November 1975, the outbreak of measles gradually peaked until more than 1500 cases were reported in March 1980. Lower peaks were noted in 1981 and 1982. In 1983, measles cases were substantially lower, possibly because of the

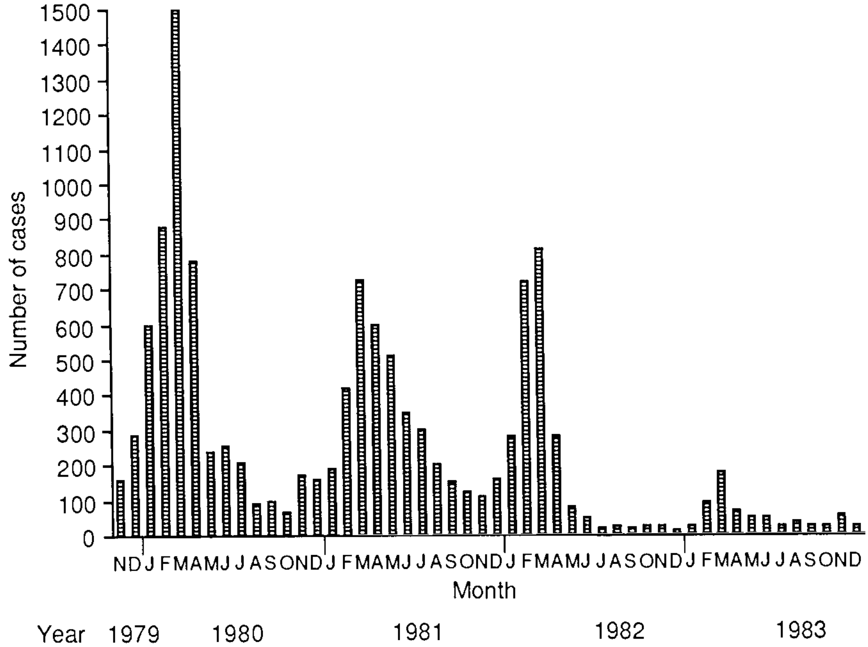

Fig. 8. Number of measles cases by month (1979-83), Matlab, Bangladesh.

introduction of measles vaccine in some areas. Measles is an important cause of death in a developing country, and programs of maternal and child health tend to include a measles vaccine where feasible. An inhibiting factor is that an expensive "cold chain" to maintain measles vaccine is necessary. Data on measles cases were obtained by an additional set of questions asked during the usual visits of CHWs. The eventual monitoring of morbidity as well as mortality is one of the goals of the DSS.

The data base provided by the DSS has been shown to be indispensable in terms of evaluation of health intervention programs. An extremely important component of the DSS system consists of accurate information on the whereabouts of particular individuals within a rural setting. This element makes it possible to set up studies where "follow-up" methods are part of the investigation. On a worldwide basis, in the case of cholera vaccine trials conducted in 1974 and again in 1984 when WHO support was obtained, the DSS Matlab has been the major reason for site selection.

SOME COST CONSIDERATIONS

In this section, some data related to the cost of the DSS and the diarrhea treatment centre in Matlab are presented. The collection of mortality data on the DSS is a costly, intensive affair, which cannot easily be replicated elsewhere. The 1982 DSS census update, however, has provided an opportunity to show that an update operation can be done relatively inexpensively once a system has been set in place. An IDRC-funded project at a level of 50,000 Canadian dollars (CAD) enabled the ICDDR,B to update both the census figures as well as SES data (D'Souza et al. 1983). A comparison of the costs involved in the DSS with other projects that monitor vital events in "small areas" can provide important elements for policy decisions regarding vital registrations. Design and costs of data collection from the Companiganj health project are briefly compared with the DSS to point out some strengths and weaknesses of the two systems. With regard to the treatment of diarrhea, the cost per patient utilizing the Matlab treatment centre and a small decentralized unit at Shotaki village in the Matlab area are compared. Results attempting to quantify the "cost per death averted" are shown.

Comparative Vital Registration Costs

A detailed description of the DSS was presented at the beginning of this report. The Companiganj Health Project (CHP) started a joint venture of the Government of Bangladesh and a voluntary agency. It was designed to establish a model of the National Integrated and Family Planning Program of 1973 in a single "thana." In this model, it was proposed that various features of the government's program would be tested and evaluated and that there would be experimentation with certain modifications, particularly local recruitment of women to work in their own unions (a subunit of a thana) and the development of a maternal child care program.

In September 1974, a separate Evaluation Unit was established that carried out a 10% enumeration survey and began monthly vital registration to record all births, deaths, and migrations in a 10% sample of households. The objective was to observe changes in vital rates that might occur as a result of project interventions and to provide basic information on demographic and health variables in a defined population (Ashraf et al. 1980).

Table 7 presents a comparison of some of the main items distinguishing the Matlab and Companiganj health projects. One striking element is clearly the difference in cost. The DSS has cost around $300,000/year, in comparison with $20,000/year for the CHP. On a per capita survey basis, however, the costs are not very different.

Table 7. **Items of comparison between the Matlab and the Companiganj Health Project (source: D'Souza 1981b).**

Item	Matlab	Companiganj
Population (1974)	160000	114000
Cost ($/year)	300,000	20,000
Type	Longitudinal	Longitudinal
Sample	100%	10% systematic
Lowest level data collection personnel	Educated female workers	Uneducated female workers
Purpose	Research oriented with special reference to diarrheal diseases	Program evaluation oriented with reference to integrated and family planning programs
Studies undertaken	Vital rates/several in-depth studies	Vital rates/causes of death
Time period	1966 to present	1975-80
Scope	Related to national and international programs	Related to national programs
International staff	Presence continuing	Present for first few years

Twenty percent of the budget has been allocated to transport costs. Personnel costs are high, accounting for nearly half of the overall budget. Cheaper surveillance systems are clearly necessary. The question remains whether the type of intensive field checkups, both in terms of vital registration and in terms of in-depth studies, that can be done in Matlab are feasible using cheaper surveillance systems.

The Companiganj project has been conducted on a sample basis. The evaluation unit costs about $20,000/year. Some of the advantages of the Matlab project are shared by the CHP. However, intensive field case-control studies have not been carried out in the CHP because the orientation of the two projects is quite different. Of interest in the Companiganj project is the fact that an evaluation unit can be attached to a health intervention program without much additional cost as reported by Chowdhury et al. in 1978. If one needed vital rates and changes only, evaluation units of the Companiganj type would be sufficient. Similar inverse relations between mortality and socioeconomic status were recorded within Matlab and Companiganj. However, even in Companiganj, because of the size of the effects of the famine, it has not been possible to separate the effects of the program from those caused by the famine.

Limitations of the Matlab project also would apply to the Companiganj health project. For instance, if long-term use of the same sample areas were envisaged, a "contamination" effect would set in. To avoid this, some sort of sample rotation would be necessary. In fact, the Companiganj evaluation unit has been closed for lack of funding. As in the case of Matlab, the Companiganj project also suffered from inadequate data reporting; the first full-scale reports covering the 5-year period were issued in 1980. The need for timely data reporting is overlooked in many projects in developing countries. The time lag between data collection and publication of reports often is as long as 3-5 years, making the results less useful (D'Souza 1981a,b).

Cost-Effectiveness Studies

The Matlab treatment centre was opened in 1963 to treat diarrheal diseases in the area, particularly cholera. Although services were provided, the focus of work was mainly for research, and speedboats were used as ambulances to prevent any deaths in the study area. One study showed that the treatment centre was more effective than a cholera vaccine campaign (Mosley et al. 1972). During the cholera epidemic, it was estimated that the treatment centre averted 159 deaths of the 318 cases treated. The assumption was that 50% of the severely dehydrated cases would have died. Innoculation against cholera would have averted fewer than 143 of the hospital cases and, thus, fewer deaths. In 1980 prices, using a World Bank price index, the cost of treatment per patient would have been $14.91 and the cost per death averted, $603.48. Mosley's cost estimates for the treatment centre and an immunization program suggest that the former would have been more cost-effective. A later study (Oberle et al. 1980) showed that the cost per patient in the hospital was between $38 and $81. Translated into 1980 prices, costs would have been $13.83/patient treated and $48-120/death averted. The cost of an immunization campaign was not calculated but was indicated to be higher. A more recent study compares the cost-effectiveness of the Matlab treatment centre with its speedboat ambulance service and an alternative decentralized unit in Shotaki village in the Matlab area. When an ambulance boat was withdrawn from Shotaki, the unit was set up with community participation for diarrheal treatment. The ICDDR,B supplies the necessary medical and office supplies and has trained six volunteers to give oral and I.V. fluids as well as certain drugs.

Table 8 presents a summary of cost-effectiveness figures for the Matlab treatment centre and for the Shotaki clinic. The term "long-run average cost" includes both user-dependent costs (drugs, food, gasoline) and user-independent costs (wages, etc.), as well as equipment and depreciation costs. In the determination of costs, the concept of "economic resource" costs was utilized. Even for a resource that is available free to the centre, such as the building of the Matlab treatment centre, a cost was imputed equivalent to the cost that would have been necessary to rent the facility. Furthermore, because the treatment centre has a research function, some joint costs had to be allocated partially as a service cost. Various estimates have been provided in the working paper. The maximum variant has been shown in the table.

Table 8. Summary of cost-effectiveness figures.

	Matlab Treatment Centre	Shotaki
Long-run average cost (USD)[a]		
Per patient	16.77	3.36
Per severe patient[b]	676.21	93.59
Per "death averted"[c]	1352.40	187.19
User numbers	10618	891
Number severely dehydrated	263	32

Source: Horton 1982.
[a]United States dollar (USD) = 1.33 Canadian dollars (CAD).
[b]Patients for whom severe dehydration was recorded on admission.
[c]It is assumed 50% of severely dehydrated patients would have died in the absence of treatment.

The cost "per death averted" by the treatment centre is more than twice that estimated by Mosley and more than 12 times that of Oberle. Clearly, there are differences of methodology and assumptions. The Oberle study, for instance, takes no account of expatriate supervision. The estimates of "cost per patient treated" are closer in the various studies if the rising costs of gasoline are reviewed separately. If one compares the table data for the Matlab treatment centre and Shotaki, a first assessment would be that decentralization is cost-effective, even when the high ambulance costs are separated out. However, there are serious problems of comparability. For example, the classification of dehydration status by the volunteers of Shotaki and the staff at the Matlab treatment centre could be different. The economic resource cost of Shotaki could have been underestimated. The efficacy of Shotaki depends to a large extent on the continuing logistic and technical support of the Matlab treatment centre. Estimation of the cost of each support only in terms of supplies delivery would be inadequate. A fairer comparison would estimate the costs of servicing the whole study area by a set of decentralized units completely independent of the Matlab treatment centre. The ability to handle epidemic situations that occur seasonally also should be compared. The working paper provides interesting results and highlights the complexity of cost-effectiveness studies, particularly when the confounding effects of both research and services are present and must be separated.

This brief section on cost considerations points to the need for further research and standardization of methodology. Questions related to effectiveness, cost, and availability must be studied. Clearly, immunization such as that administered to pregnant mothers against neonatal tetanus affecting their future children is both effective and cost effective. Measles vaccine still is costly, although quite effective. Both these immunization approaches require a cold chain, which is difficult to maintain in rural areas without electricity. A vaccine for cholera that is effective still must be developed. Savings in costs for diarrhea treatment by the use of oral rehydration rather than I.V. fluid are considerable. Decentralization of treatment to the village or home also could be a future avenue for cost savings, as well as assuring availability. Studies of costs for introducing preventive measures - water and sanitation and health education especially of the mother - should be undertaken.

SOME CONCLUSIONS

As mentioned in the introduction, this paper has not presented new results. Rather it has provided updated documentation on the Matlab experience. It has attempted to illustrate the utility of a longitudinal data base for the study of mortality and morbidity processes. Even within the context of the limited examples provided, the scope of the type of studies that have been and can be conducted in the area is quite large.

Few countries of the developing world have functional and accurate vital registration systems. In Senegal, the data base in Niakhar has proved quite useful (Garenne and Fontaine 1986). In some African countries, such as Benin, through recent surveys in the context of the World Fertility and Enquêtes ã passages rêpetêes programs, some data on mortality has been obtained. Although indirect and survey methods have proved useful, they cannot provide a substitute for careful vital registration in developing countries. Longitudinal studies are known to suffer from follow-up problems. In the case of Matlab, because of the fairly sedentary nature of the population and the frequent visits by CHWs, who are well known to the village population, these problems have not been important. More important has been the timeliness and accuracy of data processing particularly when available computing facilities were mainly in the U.S.

The five-village study shows how, with relatively little extra cost and logistic difficulty, it is possible to graft important studies, relating to mortality and morbidity, onto an ongoing longitudinal vital registration system. Some of these studies, particularly those related to vaccine trials and oral rehydration, have been of worldwide interest. The documentation of sex biases in mortality reporting through retrospective methods has also been significant.

The paper has provided some details of the census update to highlight areas where an appropriate numbering system and new approaches in the use of data base technology can ensure linkage and shed more light on the correlates stressed in mortality frameworks. Serious backlogs in data processing and the publication of reports that had plagued the Matlab experience can also thus be avoided. Microprocessors are now more readily available and their increasing sophistication with respect to memory and speed of operation make their use more important and feasible each year. In fact, in view of relatively lower costs of maintenance than mainframe computers, serious efforts should be made to develop microprocessor technology in various developing countries. The availability of software packages for demographic analysis using micros also facilitates the task of researchers in the Third World setting.

Cost considerations prevent population laboratories like that of Matlab being replicated in every developing country, but regional centres could be usefully considered. The profound insights that the Matlab centre has provided for the understanding of mortality and morbidity processes in the South Asian area would indicate that regions of Africa, with similar disease and cultural patterns, could pool resources to maintain a longitudinal data base coupled with a research and training centre.

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APPENDIX

Matlab DSS 1982 census update (village pop. totals) by area

Treatment area (pop. total, 94795)			
Village code	Population[a]	Village code	Population[a]
D	1436	V59	795
W	2445	V60	862
V10	1361	V61	634
V11	1248	V62	708
V31	7882	V72	4947
V32	2244		
H	1197	V26	2299
V12	441	V56	1293
V13	704	V82	1214
V19	3117	V83	429
V20	927	V85	374
V21	446	V87	513
V22	598	VB12	3555
V23	573	VB13	4021
V24	2338		
K	850	V40	680
L	410	V41	1246
M	137	V42	643
N	1858	V43	833
O	1180	V44	535
P	1767	V64	4308
Q	336	V86	667
V27	818	V88	429
V28	1179	VB11	2229
V30	493	D100	2993
V39	322	D101	1177
R	1292	V34	778
S	1071	V52	237
T	1397	V54	540
V15	540	V55	510
V16	715	V57	1030
V17	1045	V63	1948
V18	3322	V67	542
V25	1228	V81	508
V29	580	V84	1938
V33	628	V89	1255

Comparison area (pop. total, 92779)			
Village code	Population[a]	Village code	Population[a]
A	2316	V78	231
B	1683	V79	305
C	3116	V80	942
F	1163	V90	1032
G	2239	V95	916
J	409	V96	469
U	6980	V97	407
V01	687	V98	203
V02	437	V99	654
V03	631	VB1	1109
V04	223	VB2	835
V05	2940	VB3	2496
V06	2173	VB4	2559
V07	369	VB5	782
V08	1148	VB6	381
V09	1023	VB7	184
V14	926	VB8	945
V35	3184	VB9	144
V36	4537	VB10	1491
V37	367	D28	1112
V38	1463	D29	168
V45	853	D30	700
V46	313	D31	1031
V47	1655	D32	543
V48	603	D33	933
V49	1126	D34	1262
V50	733	D35	648
V51	1380	D88	1797
V53	2906	D89	579
V58	1216	D90	2513
V65	614	D91	953
V66	852	D92	527
V68	763	D93	725
V69	1126	D94	912
V70	660	D95	334
V71	358	D96	208
V73	699	D97	598
V74	1130	D98	2605
V75	336	D99	1835
V76	1374		

[a]As of July 1, 1982.

UPDATE DATE 31/05/82

INTERNATIONAL CENTRE FOR DIARRHOEAL DISEASE RESEARCH, BANGLADESH
DEMOGRAPHIC SURVEILLANCE SYSTEM: MATLAB
FAMILY REGISTRATION BOOK

VILLAGE: V47 NAME: TULATALI BARI: 007 NAME: MIZI BARI FAM.RES.NO: 0044 SIZE: 06 RELGN: MUSLIM

IND NO.	NAME	SEX	RELN MMM	MOTHER'S REGN.NO.	MAP STA	SPOUSE'S REGN.NO.	ENT YER	MEMBER'S REGN.NO.	DATE OF BIRTH	DATE OF DEATH	DATE OF MIGR.IN	DATE OF MIGR.OUT	INTER-VIL MIGR.	REM ARK
01	SHAIZUDDIN	M	HEAD		M	1V47003602	74	1V47003601	0/00/20					
02	HALEMA KHA	F	WIFE		M	1V47003601	74	1V47003602	0/00/35					
03	ANNA	F	DAUG	1V47003602	S		75	1V47003640	20/09/75					
04	TAZMAHAL	F	DAUG	1V47003602	S		74	1V47003607	23/10/71					
05	HELENA	F	DAUG	1V47003602	S		74	1V47003604	0/00/64					
06	RASHID	M	SON	1V47003602	S		74	1V47003605	6/07/66					

INTERNATIONAL CENTRE FOR DIARRHOEAL DISEASE RESEARCH, BANGLADESH
DEMOGRAPHIC SURVEILLANCE SYSTEM: MATLAB
FAMILY REGISTER

DATE: 31/08/82

VILLAGE CODE: V47 NAME: TULATALI BARI CODE: 007

BARI NAME: MIZI BARI FAM.RES.NO: 0044 UPDATE DATE: 31/05/82

IND NO.	NAME	MO NO.	SP NO.	DATE OF BIRTH	SEX	MEMBER'S REGN.NO.	REPORT SERIAL NO.	REMARK
01	SHAIZUDDIN		02	0/00/20	M	1V47003601		
02	HALEMA KHA		01	0/00/35	F	1V47003602		
03	ANNA	02		20/09/75	F	1V47003640		
04	TAZMAHAL	02		23/10/71	F	1V47003607		
05	HELENA	02		0/00/64	F	1V47003604		
06	RASHID	02		6/07/66	M	1V47003605		

DEATH REGISTRATION FORM

ICDDR, B-MATLAB

Serial No, ____________________ Village Code: ____________________ Date of death: ____________________
1-3 4-6 DD MM YY 7-12

Name of deceased: ____________________ Date of birth: ____________________ Sex: [1] M [2] F [3] UNK
DD MM YY 13-18

Current id. No. ____________________ Registration No. ____________________
20-29 30-39

Mother's current id. No. ____________________ Registration No. ____________________
40-49 50-59

Marital Status at the time of death:

Never Married [1] Married [2] Widowed [3] Separated [4] Divorced [5] [ ] 60

Education at death; ____________________ Occupation at death: ____________________
61-62 63-64

Events and symptoms leading up to death:

Measles	02	Diarrhoea: Acute	07	Chronic	08
Tetanus	03	Dysentery: Acute	09	Chronic	10
Drowning	04	Childbirth	11		
Murder	05	Jaundice	12		
Suicide	06	Other not covered above	13		

Symptoms leading up to death: ____________________
____________________ [ ] 65-66
____
____

Place of death: Village ____________________ P.S. ____________________ Diat. ____________________ Code [ ] 67

Type of Doctor Consulted:

Licenced Allopath [1] Allopath quack [2] Homeopath [3] Kabiraj [4] Other [5] Doctor not consulted [6] [ ] 6-8

Reported by: ____________________ Entered by;____________________

Date: ____________________ Date: ____________________

Date entered: Field Vol. [ ] Matlab Vol. [ ]

Remarks: ____________________ ____________________

DEATH REGISTRATION FORM

DSS-MATLAB, ICDDR, B

1. St. No. [ ][ ][ ] 2. Village (Code) ______________ 3. Date of death [ ][ ][ ][ ][ ][ ] D D M M Y Y

4. Place of death: Village ______________ Upazila ______________ [ ]

	Name	Current Id No.	Registration No.	Date of birth (D D M M Y Y)
5.	______ Deceased	[ ][ ][ ][ ][ ][ ][ ][ ][ ]	[ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]	[ ][ ][ ][ ][ ][ ]
6.	______ Mother's	[ ][ ][ ][ ][ ][ ][ ][ ][ ]	[ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]	[ ][ ][ ][ ][ ][ ]

7. Marital status at the time of death:

Code		
1	[ ]	Never married
2	[ ]	Married
3	[ ]	Widowed
4	[ ]	Separated
5	[ ]	*Divorced*

8. Type of doctor consulted

Code		
1	[ ]	Allopath
2	[ ]	Allopath *quack*
4	[ ]	Homeopath
8	[ ]	Kabiraj
16	[ ]	Others
32	[ ]	Doctor not consulted

9. Education at death ______________ [ ][ ]

10. Occupation at death ______________ [ ][ ]

11. Detailed description of events and symptoms leading up to death:

____

____

____

____

____

____

____

____

____

____

12. Specific causes of death (HA's report);

Code		
02	[ ]	Measles
03	[ ]	Tetanus
04	[ ]	Drowning
05	[ ]	Murder
06	[ ]	Suicide
07	[ ]	Diarrhoea acute
08	[ ]	Diarrhoea chronic
09	[ ]	*Dysentery acute*
10	[ ]	Dysentery chronic
11	[ ]	Child birth
12	[ ]	Jaundice
13	[ ]	Others not covered above

13. Reported by: ______________ (Code) [ ][ ]

14. Date entered into:

Field Vol. ______________

Matlab Vol. ______________

15. Date of reporting [ ][ ][ ][ ][ ][ ] D D M M Y Y

16. Remarks: ____

Card No. 2 (1), Study No. ____ (2 4), Village: ____ ____ (5 7), Bari: ____ ____ (8 10), Family No. ____ (11 14), Religion: ____ (15)

20. Individual Information:

Sl. No.	Year of reg.	Registration No.	Name	Sex	Relation to Head	Marital Status	Sl.No.of Spouse	Date of birth	Sl.No.of Mother	Education: Type	Education: Years of schooling	Occupation: Primary	Occupation: Secondary
16-17	18 19	20 - 28		29	30-31	32	33-34	35 - 40	41-42	43	44 - 45	46 - 47	48 - 49
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													

Name of the interviewer:

Time taken (in minutes):

PREGNANCY HISTORY FOR EVER MARRIED WOMEN:

Ind.	No.	Name	Total no. of pregnancies		No. of living children		No. of children born alive, now dead		Total no. of miscarriages and stillbirths
					Son	Daughter	Son	Daughter	

BIRTH REGISTRATION FORM

DSS-MATLAB, ICDDR,B

1. Serial No. [ ][ ]   2. Mother's residence village (code): ________

3. Place of birth: Village ________ Upazila ________ [ ]

	Name	Current Id. No.	Registration No.	Date of Birth
4.	________ Mother	[ ][ ][ ][ ][ ][ ][ ][ ][ ]	[ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]	D D M M Y Y
5.	________ Father	[ ][ ][ ][ ][ ][ ][ ][ ][ ]	[ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]	D D M M Y Y

6. Size:
- 1 Single
- 2 Twin*
- 3 Triplet*

7. Name of newborn: [ ]

8. Registration No. [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]

9. Sex:
- 1 Male
- 2 Female
- 3 Unk.

10. Relation to head: ________ [ ][ ]

11. Date of birth: [ ][ ][ ][ ][ ][ ] D D M M Y Y

12. Result:
- 1 Miscarriage induced (<7 m)
- 2 Miscarriage spontaneous (<7 m)
- 3 Stillbirth (≥7.m)
- 4 Live birth

13. Duration of pregnancy (months): [ ]

14. The delivery was:
- 1 Normal
- 2 Difficult or Unusual

15. If difficult or unusual: Was there excessive maternal bleeding?
- 1 No
- 2 Yes

16. Any other complications related to pregnancy, specify: ________ [ ]

17. The presentation of the baby was:
- 1 Head
- 2 Breech
- 3 Face
- 4 Limb

18. Duration of labour:
- 1 More than 24 h
- 2 Less than 24 h

19. The baby cried:
- 1 Immediately after birth
- 2 After some time

20. Anything done to make the baby cry?
- 1 No
- 2 Yes

If yes, specify ________ [ ]

21. Delivery was attended by:
- 1 Govt. Dai
- 2 Village trained Dai
- 3 Experienced regular Dai
- Other

Specify: ________

22. Umbilical cord was cut by:
- 1 New blade
- 2 Old blade
- 3 Bamboo split
- Other

Specify: ________

23. Materials used for dressing of the cord:
- 1 Burnt ashes
- 2 Burnt cow dung
- 3 Medicated powder
- 4 Catechu
- Other

Specify: ________

(continued)

BIRTH REGISTRATION FORM (concluded)

DSS-MATLAB, ICDDR,B

24. MOTHER'S PREGNANCY HISTORY (Excluding this birth)

- No. of living sons	[ ]	- No. of living daughters	[ ]
- No. of sons born alive now dead	[ ]	- No. of daughters born alive now dead	[ ]
- No. of miscarriages and stillbirths	[ ]	- Total number of pregnancies	[ ]

25. Any kinship between father and mother? 1 [ ] No 2 [ ] Yes If yes, specify:________________ [ ]

26. Reported by: ______________ Code [ ][ ] 27. Date of reporting: [ ][ ][ ][ ][ ][ ] D D M M Y Y

28. Date entered into: Field Vol. ______________ Matlab Vol. ______________

*For multiple births fill in the reverse side of this form.

Information on pregnancy outcome for the 2nd of multiple births

Results:

1 [ ] Miscarriage induced (<7 m)
2 [ ] Miscarriage spontaneous (<7 m)
3 [ ] Stillbirth (≥7 m)
4 [ ] Live birth

Name of newborn: ____________

Registration No. [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]

Sex:

1 [ ] Male
2 [ ] Female
3 [ ] Unk.

The presentation of the baby was:

1 [ ] Head
2 [ ] Breech
3 [ ] Face
4 [ ] Other

The baby cried:

1 [ ] Immediately after birth
2 [ ] After some time

Anything done to make the baby cry?

1 [ ] No
2 [ ] Yes

If yes, specify: ____________ [ ]

Information on pregnancy outcome for the 3rd of multiple births

Results:

1 [ ] Miscarriage induced (<7 m)
2 [ ] Miscarriage spontaneous (<7 m)
3 [ ] Stillbirth (>7 m)
4 [ ] Live birth

Name of newborn: ____________

Registration No. [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]

Sex:

1 [ ] Male
2 [ ] Female
3 [ ] Unk.

The presentation of the baby was:

1 [ ] Head
2 [ ] Breech
3 [ ] Face
4 [ ] Other

The baby cried:

1 [ ] Immediately after birth
2 [ ] After some time

Anything done to make the baby cry?

1 [ ] No
2 [ ] Yes

If yes, specify: ____________ [ ]

IN-MIGRATION REGISTRATION FORM

DSS-MATLAB, ICDDR,B

1. Serial No. [ ][ ][ ]

2. Village (Code) ______

3. Type of movement
   - [1] Single
   - [2] Partial family
   - [3] Whole family

4. Date of movement [ ][ ][ ][ ][ ][ ] D D M M Y Y

5. Religion
   - [1] Islam
   - [2] Hinduism
   - [3] Other

6. Where from: Village ______ Upazila ______
   Town ______ Dist. ______
   Country ______

7. [1] Rural ______
   [2] Urban ______
   [3] Abroad ______

8. Whether creating a new family [1] No [2] Yes

   Family No. (new or in which joined) ______ Bari name ______ Bari No. [ ][ ][ ] N.H.F. ______

9. [ ][ ][ ][ ][ ][ ][ ]
   Village Family

10.

Ind. No.	Name	Sex	Relation to head	Mother's Ind. No.	Marital Status	Spouse Ind.No	Registration Number	Date of Birth D D M M Y Y	Education	Occupation	Cause of movement

11. Reported by: ______ Code [ ][ ]

    Date of report [ ][ ][ ][ ][ ][ ] D D M M Y Y

12. Date entered: Field Vol. ______ Matlab Vol. ______

13. Remarks ______

* For ever married women fill in the reverse side of this form.

OUT-MIGRATION REGISTRATION FORM

DSS-MATLAB, ICDDR,B

1. Serial No. [ ][ ][ ]
2. Village (Code) ________
3. Type of movement
   - 1 [ ] Single
   - 2 [ ] Partial family
   - 3 [ ] Whole family
4. Date of movement [ ][ ][ ][ ][ ][ ] D D M M Y Y

5. Where to: Village ______________ Upazila ______________
   Town ______________ Dist. ______________
   Country ______________
6.
   - 1 [ ] Rural
   - 2 [ ] Urban
   - 3 [ ] Abroad

7. [ ][ ][ ][ ][ ][ ][ ]
   Village Family

8.

Ind. No.	Name	Sex	Registration Number	Cause of movement

9. Reported by: ______________ Code [ ][ ]

10. Date entered: Field Vol. ______________ Matlab Vol. ______________

10. Date of report [ ][ ][ ][ ][ ][ ] D D M M Y Y

12. Remarks: ______________________________

MARITAL STATUS REGISTRATION FORM
DSS-MATLAB, ICDDR,B

1. Serial No. ☐☐☐ 2. Village (Code) ______ 3. Date of event ☐☐☐☐☐☐ (D D M M Y Y)

4. Event
- 1 ☐ Marriage
- 2 ☐ Divorce

		Male Partner	Female Partner
5.	Name	: ______________	______________
6.	Current Id. No.	: ☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐
7.	Registration No.	: ☐☐☐☐☐☐☐☐☐☐	☐☐☐☐☐☐☐☐☐☐
8.	Date of birth	: ☐☐☐☐☐☐ D D M M Y Y	☐☐☐☐☐☐ D D M M Y Y
9.	Usual residence	: Vill.____ UZ____ ☐	Vill.____ UZ____ ☐
10.	Marital status prior to this event	: __________ ☐	__________ ☐
11.	Duration of prior status in months (excepting never married)	: __________ ☐☐	__________ ☐☐
12.	No. of previous events	: Marr. ☐ Wid. ☐ Div. ☐	Marr. ☐ Wid. ☐ Div. ☐
13.	Education	: __________ ☐☐	__________ ☐☐
14.	Occupation	: __________ ☐☐	__________ ☐☐

15. Marriage initiated by :
- 1 ☐ Partners
- 2 ☐ Guardians
- 3 ☐ Other

If other, specify: __________

16. Kinship between partners:
- 1 ☐ No
- 2 ☐ Yes

If yes, specify: ________

17. Partners from the same :
- 1 ☐ Bari
- 2 ☐ Village
- 3 ☐ Union
- 4 ☐ Upazila
- 5 ☐ Other

18. Event registered by Quazi:
- 1 ☐ No
- 2 ☐ Yes

19. Reported by: ______________________ Code ☐

20. Date ☐☐☐☐☐☐ (D D M M Y Y) 21. Date entered: Field Vol.______ Matlab Vol.______

Remarks: ____

INTERNAL MOVEMENT REGISTRATION FORM

DSS-MATLAB, ICDDR,B

1. Serial No. [| |]   2. Village (Code) ________   3. Type of movement

1		Single
2		Partial family
3		Whole family

4. Date of movement [| | | | |] D D M M Y Y

5. Whether creating a new family

1		No
2		Yes

6. Family No. ______ (new or in which joined)   Bari name ______________   Bari No. [| |]   N.H.F. __________

7. [| | | | | |] Village Family

8.

Ind. No.	Name	Sex	Relation to head	Mother's Ind. No.	Marital Status	Previous Id. No.	Spouse Ind.No.	Registration Number	Date of Birth D D M M Y Y	Cause of movement

9. From: Village ______________ Bari ______________
Reported by ______________ Code [|] Date [| | | | |] D D M M Y Y

10. To: Village ______________ Bari ______________
Reported by ______________ Code [|] Date [| | | | |] D D M M Y Y

11. Date entered: Field Vol. ______________ Matlab Vol. ______________

12. Remarks: ____

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SES 1982
ICDDR,B

1. Card No. 1 (1), 2. Study No. ____ (2-4), 3. Village: ____________ ____ (5-7), 4. Bari: ____________ ____ (8-10)

5. Family No. ____ (11-14), 6. (74/) Family registration No. ____ (15-18), 7. Religion: ______ ____ (19), 8. Date of interview: ____ (20-25)

9. Main sources of water during season (from to):

Drinking: ________ ____ (26), Cooking: ________ ____ (27), Bathe: ________ ____ (28), Washing: ________ ____ (29)

Codes: Tube well (1), Tank (2), River (3), Ditch/Canal (4), Other (5)

10. Structure of the largest room: Wall: ____________, Roof: ____________ ____ (30)

Codes: Wall tin + Roof tin (1), Wall pucca + Roof tin (2), Wall tin + Roof others, Wall others + Roof tin (3), Other (4)

11. Items owned : Lep (01), Hurricane (02), Bicycle (04), Any watch (08), Radio (16), Remittance (32) ________ (31-32)

12. No. of cows owned: ____ (33), 13. No. of boats owned: ____ (34)

14. Total land owned (excluding homestead) in decimals: ____________ ____ (35-38)

If own land: Self cultivated (1)
Renting out (2)
Share cropping (4)
____ (39)

If no land: Takes rent (1)
Shares crop (2)
Other (specify) (4)
____ (40)

15. Use of fixed latrine: Male Yes/No
Female Yes/No ____ (41), Within 15 yards from used water sources: Yes/No ____ (42)

16. Highest education of former member now outside DSS/Abroad: ____ (43), Type: ____ (44), Years of schooling: ____ (45-46)

17. Highest education in the family:Type ____ (47), Years of schooling: ____ (48-49)

18. Occupation of household Head: ____ (50-51), 19. Family size: ____ (52-53)

Instructions for the Field Workers - SES '82

1.	Card No.	: Leave blank.
2.	Study No.	: Leave blank.
3.	Current Id. No.	: To be copied from census update form. It will consist of current village code and current family No.
4.	Bari (code)	: To be copied from census update form.
5.	Date of interview	: Please write date of interview.
6.	(74/) family registration	: 1974 number will be written down if it exists; otherwise, the number that the family first had on inclusion to DSS.
7.	Religion	: To be copied from census update form.
8.	Education of household	: To be copied from census update form.
9.	Occupation of household head	: To be copied from census update form.
10.	Highest education in the family	: To be copied from census update form.
11.	Highest education of former member now outside DSS/abroad	: If a former member of the family is now living outside DSS, then his type of education, years of schooling, and place of present residence will be noted. For more than one such member, information on the individual with the highest education will be taken.
12.	Family size	: To be copied from census update form.
13.	Items owned	: Every item owned by the family should be ticked. Remittance: if the family receives cash or money order more than once a year from former member(s) of the family, it will be considered to have remittance.

14.	No. of cows owned	:	Exact no. of cows owned by the family.
15.	No. of boats owned	:	Exact no. of boats owned by the family.
16.	Total land owned in decimals	:	Total land owned by family excluding homestead. Ownership will include (a) land for which proper documentation exists and (b) land owned through inheritance, although proper documentation does not exist.
	If own land	:	Tick the appropriate entries.
	If no land	:	Tick the appropriate entries.
17.	Main sources of water	:	Main sources used during major period of the specified season by majority of members of the family against every purpose as mentioned.
18.	Structure of the largest room	:	Materials used in most of wall and roof of the largest dwelling. Nonexistence of dwelling should be mentioned.
19.	Area of dwelling	:	Please write length and breadth of the rooms used by the household members (write in descending order).
20.	Use of fixed latrine	:	Whether fixed latrine is used by the majority of male and female members (more than 7 years of age) of the family. Whether it is within 15 yards of used water source. Tick the appropriate entries.

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Please direct requests for information about IDRC and its activities to the IDRC office in your region.