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# An evaluation of the 1993–94 Bangladesh Demographic and Health Survey within the Matlab area

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*The 1993–94 Bangladesh Demographic Health Survey (DHS) reported substantial declines in birth and infant mortality rates, including fertility levels that some demographers considered implausible. To validate the survey's findings, a DHS survey was conducted in the rural subdistrict (thana) of Matlab in 1994. Its results were compared with vital rates collected by the Demographic Surveillance System of the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B), whose main field station is located in Matlab. Information from the Matlab DHS about current contraceptive use was also compared with data on pregnancy status and contraceptive use routinely collected from women of child-bearing age by ICDDR,B's Record-keeping System in half of the surveillance area, known as the treatment area. Survey and ICDDR,B records of 2,628 women were matched for the comparisons.*

*The results suggest that the Matlab DHS accurately estimated fertility in both the treatment and comparison areas, lending confidence to the reliability of fertility estimates obtained from the national DHS. The results also indicate that Matlab DHS infant mortality rates for the five years prior to the survey are reasonably consistent with estimates derived from the Demographic Surveillance System. For periods more than five years before the survey, however, the Matlab DHS underreported infant deaths. The Matlab DHS also appears to have underestimated current contraceptive use, especially of modern temporary methods. Although the findings increase confidence in the DHS estimates of vital rates, some caution is still advised in drawing inferences about national data quality in Bangladesh based on the results of the Matlab validation study.*



Vital statistics registration systems in developing countries can be inadequate for demographic estimation because vital events are often seriously underreported (United Nations 1985). Yet reliable estimates of fertility and mortality are needed by national and international health and population organizations that monitor vital-rate trends in relation to health and family planning interventions (see, e.g., Gadomski, Black, and Mosley 1990). In the absence of accurate vital registration systems, governments have come to rely on national demographic surveys for up-to-date estimates of fertility and mortality.

During the 1970s more than 40 developing countries took part in the World Fertility Survey (WFS), which conducted nationally representative surveys of women in the childbearing age span (Cleland and Scott 1987). In the 1980s and 1990s a series of Demographic and Health Surveys (DHS), using a WFS-inspired questionnaire that includes questions on maternal and child health, has continued to collect information from nationally representative samples of childbearing-age women in developing countries. Technical support for the DHS surveys has come from Macro International with financial support from the United States Agency for International Development. Many nations have now conducted a second or even a third DHS survey.

Although data from DHS surveys are generally acknowledged to provide the best estimates of fertility and mortality available, there is still considerable concern about data quality. Of particular concern is the possibility of omitting vital events. For example, responses to questions about births and child deaths that occurred more than a few years before the survey interview date may be unreliable because respondents' ability to recall events can deteriorate over time (Som 1973). This problem is generally

greatest in nations where literacy levels are low (United Nations 1983a).

In cross-sectional surveys, estimates of fertility and mortality are commonly derived from two sets of questions. The first set consists of questions (often referred to as Brass questions) on the number of children ever born, the number of children born 12 months prior to the survey date (current fertility), and the number of children who have died. Indirect techniques are used to estimate fertility and mortality from responses to these questions and other commonly collected information (United Nations 1983b). However, in the presence of rapid fertility and mortality changes, these estimates can be inaccurate (Arthur and Stoto 1983). Responses to the second set of questions make up the birth-history or pregnancy-history table. Such tables include detailed information—e.g., on pregnancy outcomes, date of birth, child's sex, living status, and date or age of death if deceased—about each live birth or pregnancy that a woman has experienced. A birth history includes only questions about live births, whereas a pregnancy history includes questions about all pregnancy outcomes. With data from responses to such questions, it is possible to estimate fertility and child mortality directly for specific periods prior to a survey (Verma 1980).

Recent DHS surveys in countries with high contraceptive prevalence (above 25 or 30 percent of married couples) have used another method to obtain recent fertility and family planning information: the month-by-month calendar (DHS 1990b). In this approach, each respondent is asked to recall reproductive events over a period of time preceding the survey and to identify the month in which each of those events occurred. The calendar has also been used to record information on marriage, migration, and employment. Experiments with the calendar have shown it to be somewhat preferable to the

traditional questionnaire for recording fertility and family planning events (Becker and Sosa 1992; Goldman, Lorenzo, and Westoff 1989). The calendar makes it easy for the interviewer to record a woman's reproductive history and to correct inconsistencies that otherwise might not be caught. For example, in the traditional questionnaire the questions on pregnancy and contraception appear on separate pages, making it more difficult to check the responses for consistency. As a result, an experimental study found that when the traditional questionnaire was used, women reported much higher rates of contraceptive use for the entire duration of a pregnancy than when the calendar was used (Becker and Sosa 1992).

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## EVALUATING THE QUALITY OF DHS SURVEY DATA ON FERTILITY AND MORTALITY

The quality of data from DHS surveys can be assessed by external and internal checks. (Recent studies evaluating DHS data quality include Arnold 1990; Rutstein and Bicego 1990; Sullivan, Bicego, and Rutstein 1990; and Bicego and Boerma 1992.) External checks include (a) comparing levels of fertility and mortality over the same length of time from two or more surveys conducted at different periods within the same country; (b) inspecting demographic parameters, such as the reporting of age and the sex ratio at birth, that are known to be relatively fixed; and (c) comparing demographic estimates with those from nonsurvey data sources (e.g., a census question on the number of children a woman has ever borne or sample vital statistics registration). In a comparison of fertility estimates from two surveys in East Pakistan, Potter (1977) showed



that respondents displaced birth events in time, tending to report recent births as having occurred earlier than they actually did, with the result that fertility estimates from the two surveys for the same calendar period were quite disparate. Studies of age reporting have found a similar overestimation of young children's ages (Bairagi et al. 1982; Caldwell 1966). In more recent comparisons of birth-history estimates from WFS and later DHS surveys, Arnold (1990) found fertility levels to be comparable. Similar comparisons of the mortality of children under age 5 have shown considerable differences between WFS and DHS estimates for the same time period, indicating the omission of child deaths in the period 10–15 years before the DHS surveys.

The standard internal checks for the quality of birth-history data include calculating the proportion of birth events reported without complete dates, checking for the "heaping" of reported ages of children (e.g., at 12, 24, and 36 months), and tabulating the number of births over time to detect the displacement of events. Compared with other surveys, DHS surveys have had a low percentage of birth events reported with unknown dates, and age heaping has not generally been a major issue (Arnold 1990). However, the displacement of birth events remains a problem of concern. In DHS questionnaires, if a woman has a child below a certain age (usually below 4 or 6 years of age), she is asked a series of health-related questions. Apparently some interviewers have learned to avoid having to record respondents' answers to those questions by overstating the children's ages (Arnold 1990). Checks have also revealed substantial heaping of children's ages at death at 12 months (1 year) in most DHS surveys (Sullivan, Bicego, and Rutstein 1990, table 4.3).

Reinterviews provide a useful means of checking data quality. Reinterviews were done in some of the WFS and DHS

surveys to determine the reliability of responses. For example, after the main WFS survey in Peru, 1,200 reinterviews were conducted. The amount of agreement between the two surveys in the reported number of children born was found to be 88 percent, and for the year of the last birth it was 75 percent (O'Muircheartaigh 1984). For the Pakistan Reinterview Survey after the DHS survey of 1990–91, the corresponding levels of agreement for children ever born and the year of the last birth were 75 percent and 51 percent, respectively (Curtis and Arnold 1994).

*The Matlab Demographic Surveillance System provides a rare opportunity to validate a national Demographic and Health Survey.*

Although internal and external checks and reinterview surveys give an indication of a survey's data quality, only a validation study using prospectively registered data can provide precise estimates of the accuracy of birth-history events. Such studies are rare in developing countries precisely because vital registration systems are so often inadequate. The Matlab Demographic Surveillance System therefore provides a rare opportunity for such a validation study.

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## THE MATLAB DEMOGRAPHIC SURVEILLANCE SYSTEM AND RECORD-KEEPING SYSTEM

Matlab, a rural subdistrict (*thana*) located about 40 kilometers southeast of Dhaka, the nation's capital, is situated in an isolated area crisscrossed by rivers and canals. This rural area,

which is characteristic of much of Bangladesh, is accessible only by river transport and has only one small town of significance. Subsistence agriculture and fishing are the main economic activities. In part because of its representativeness of the country as a whole, Matlab was chosen as the principal field research station of the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B).

In 1966 the ICDDR,B introduced the Demographic Surveillance System in 132 Matlab villages. Another 101 villages were added in 1968 when a new Matlab-area census was taken, but in 1978 the number of villages under surveillance was reduced to 149. Project-area censuses were conducted in 1970, 1974, 1978, 1982, and 1993, primarily for the purpose of checking and updating the household listings. The Demographic Surveillance System area is divided into the Maternal and Child Health–Family Planning Area (more commonly known as the treatment area), where the ICDDR,B has undertaken intensive health and family planning interventions since 1978, and the comparison area, where only government programs are operating.

The registration of marriages (since 1975), pregnancy outcomes (including live births, stillbirths, and late fetal losses), deaths, and migration is done at the village level by community health workers, who visit all households in the Matlab area every two weeks. Male health assistants visit households each month with the community health workers and record vital events on standard registration forms. The data are entered on microcomputers in Matlab and transferred to Dhaka for editing, tabulation, and analysis. Unique identification numbers provide the means of linking birth records for individual women. Although the completeness of the Demographic Surveillance System data has not been independently verified,



the data are presumed to be virtually complete for births and deaths.

During their fortnightly visits to the treatment area, the community health workers provide selected health services to villagers and record information about the services rendered and the current reproductive status of each woman of reproductive age, including whether she is pregnant, amenorrheic, menstruating, using contraception, or breast-feeding. The data from these forms are entered into microcomputers and the information is maintained in a Record-keeping System data base, which is separate from the Demographic Surveillance System data base. The Record-keeping System data are assumed to be quite complete because the community health workers are in regular contact with women in the villages under surveillance. In the treatment area, contraceptive use is higher and fertility and child mortality lower than in the comparison area (ICDDR,B 1994). As of 1990, more than 100 demographic and family planning studies using these data had been published (ICDDR,B 1990).

For our evaluation of the Bangladesh DHS, we assume that Record-keeping System data are accurate. That is probably a reasonable assumption for information on breast-feeding and amenorrhea. However, for the analysis of contraceptive events, the data may be less accurate: it is possible that women may deliberately misreport their contraceptive practice to the community health workers. For example, if a disapproving husband, neighbor, or relative is within earshot at the time of the interview, the respondent may say she is not using contraception, when in fact she is. On the other hand, she may report that she is using contraception, when she is not, to gain the approval of the community health worker. However, since community health workers deliver almost all contraceptive supplies and some methods have known dates of ef-

fectiveness (e.g., three-month Depo Provera injections), the assumption of accuracy is reasonably tenable.

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## PREVIOUS VALIDATION STUDY

In 1980 a validation study of a pregnancy-history questionnaire was conducted in the Demographic Surveillance System area (Becker, Mahmud, and Sarder 1982; Becker and Mahmud 1984). The study compared backward and forward pregnancy histories. A forward history starts with questions about a woman's first pregnancy and progresses to the most recent pregnancy, whereas a backward history reverses this order. In addition, the study validated earlier responses to questions about the number of children the respondents had ever borne and the number of children who had died. The study documented events and the displacement of events missed by the vital registration system over the 13-year period of 1966–79.

Overall, 7 percent of birth events were missed with the forward-history questionnaire and 4 per cent were missed with the backward-history questionnaire. For matched events, about half of the reported dates were correct. Among those that were incorrect, there was a greater tendency for births to be pushed back rather than advanced in time in both types of history. The validation of responses to the Brass questions showed that 3.2 percent of women misstated the number of children they had ever borne and 3.6 per cent misstated the number of children who had died (Mahmud and Becker 1987). As only 13 years of vital registration data were available at the time of the study, however, the survey data on early births to older women could not be validated.

A criticism made of the 1980 validation study when it was proposed was that the results could not be generalized because the Matlab population was "contaminated" by the presence of the vital registration system (the Demographic Surveillance System) itself; that is, because Matlab families had registered vital events, the women would recall such events more accurately than would women in the general population. To assess the validity of this criticism, the ICDDR,B carried out interviews using WFS selection criteria for women both in the Demographic Surveillance System villages and in neighboring villages outside the surveillance area. Comparison tests of the data quality did not show any better reporting among women in the Demographic Surveillance System area. In fact, for one measure—the tendency of respondents to round the ages of children to whole years (i.e., age heaping)—reports from women in the Demographic Surveillance System area actually had less accuracy.

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## CURRENT VALIDATION STUDY OF THE BANGLADESH DHS

Between November 1993 and March 1994, Bangladesh undertook a nationally representative DHS survey of 9,640 women of reproductive age.<sup>1</sup> The survey followed standard DHS procedures (DHS 1990a, 1990b). The survey instrument included a household schedule and questions about the respondent's background,

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<sup>1</sup> The survey was conducted by Mitra and Associates for the National Institute for Population Research and Training under contract from the Demographic and Health Surveys, with funding from the Office of Population and Health, United States Agency for International Development, Dhaka.

reproduction, contraception, antenatal care and delivery, breast-feeding, immunization and health, marriage, and fertility preferences. In addition, it included a husband's questionnaire. From the women's birth-history data, the total fertility rate—that is, the number of children a woman would bear throughout her reproductive years at current age-specific fertility rates—was estimated as 3.4 for the three years before the survey. Contraceptive prevalence was estimated as 44.6 percent, and the infant mortality rate for the five years before the survey was reported as 87.4 deaths per 1,000 live births.

In April and May 1994, immediately after the fieldwork for the national DHS was completed, Mitra and Associates conducted a second DHS in the Demographic Surveillance System area of Matlab and in several neighboring villages outside the surveillance area. For this Matlab DHS, the same household and individual questionnaires were used as in the national DHS, except that for half of the women's sample a pregnancy-history questionnaire was used instead of a birth-history questionnaire. The format of the pregnancy-history questionnaire followed closely that of the national DHS birth-history questionnaire.

## SAMPLE SELECTION AND FIELDWORK

The sample design was a stratified random sample with proportional allocation. The household listing from the Demographic Surveillance System's Matlab census for 1993 was used as the sampling frame. Each village was considered to be a stratum. The sampling fraction in the surveillance area was 22/300. Thus, for example, if a village had 150 households, 11 households were selected from that village by means of random selection. Pregnancy-history and birth-history questionnaires were ad-

ministered by random assignment within each village. The number of selected households was 3,225, including 250 households from 12 villages outside the surveillance area. The selection of these villages was done in consultation with the ICDDR,B's Matlab staff, who know the area well and chose adjacent villages with comparable social, economic, geographic, and religious characteristics to villages in the surveillance area.

The selection of women within households was identical to the procedure followed in the national DHS. An eligible woman was any woman between the ages of 10 and 49 who had ever married. However, as in the national DHS, vital rates are based on women of ages 15–49. Although ever-married women were interviewed whether they were usual residents or visitors who had spent the previous night in the household, we analyzed the data on a *de facto* basis.<sup>2</sup>

Thirty-two of the 48 interviewers who had done fieldwork for the national DHS worked on the Matlab DHS. They were selected from among those who were interested in continuing work. All 32 interviewers were given an additional day of training on how to locate specific households in the Demographic Surveillance System area, how to administer the pregnancy-history questionnaire, and how to modify the national DHS calendar to include events in April and May 1994. A small pilot test of the pregnancy-history questionnaire was made.

<sup>2</sup> In contrast, the Demographic Surveillance System follows a *de jure* rule for eligibility. This rule is that newborns and in-migrants enter the Demographic Surveillance System data base if they (or the mothers) reside for six months in the surveillance area or if they (or the mothers) visit the surveillance area at least once a month. Similarly, records of out-migrants are removed from the Demographic Surveillance System data base after the migrants are absent for six months.

The interviewers worked in six teams of seven comprising a male and female supervisor, a logistics assistant/cook, and four female interviewers. In a deviation from the national DHS procedure, the interview teams were not instructed to make repeated callbacks in the case of respondents absent from households. Demographic Surveillance System and Record-keeping System records, which are normally kept in households, were removed by ICDDR,B staff before the interviewers visited each village to avoid their being consulted and thereby directly contaminating the responses. The interviews were conducted in private to the extent possible.

Two limitations of the study need to be mentioned. First, because the Matlab DHS data came from women routinely interviewed in the Demographic Surveillance System, the respondents may have been more knowledgeable about their demographic status and reproductive health, and therefore better able to respond to DHS survey questions, than other women in Bangladesh. Thus the small differences between Demographic Surveillance System values and Matlab DHS estimates noted in this study might not be so readily apparent in areas outside the Demographic Surveillance System. Our inability to report information on possible "contamination effects" suggests a note of caution in extrapolating the results of this validation exercise to the national level.<sup>3</sup> As noted previously, however, comparisons carried out after a similar validation study in Matlab in 1980 found little or no

<sup>3</sup> A possible contamination of the Matlab DHS data, due to frequent exposure of Matlab women to the Record-keeping System of the ICDDR,B, could be investigated by analyzing 250 cases collected from neighboring villages in areas outside the Demographic Surveillance System as part of this study. Unfortunately, owing to funding limitations, it was not possible to undertake this additional analysis.

evidence of a contamination effect due to the presence of the registration system. Second, although the workers and supervisors who collected data for the Matlab DHS were involved in collecting national Bangladesh DHS data, they were not selected randomly from among all workers and supervisors, but rather on the basis of availability. Moreover, they knew that the Matlab DHS was a validation study. The level of effort and supervision in the Matlab DHS may therefore have been greater than in the national DHS.

## DATA PROCESSING

Data entry and editing were done by means of a commercially available data-entry program. Later the data were converted to an Integrated Systems for Survey Analysis (ISSA) data set, and ISSA checking and editing programs were run to implement the same range, consistency, and date-imputation checks that had been made in the national DHS (ISSA 1995; Cushing and Cantor 1986). For the calculation of fertility rates, the ISSA programs that had been developed for the national DHS were modified to produce additional tables for the treatment and comparison areas. Fertility rates were calculated from the Demographic Surveillance System by applying the same methodology and rules as were used in the national DHS and the Matlab DHS.<sup>4</sup>

<sup>4</sup> In particular, tabulations were done for the 12-month period prior to the Matlab DHS. Linear interpolation was used to find the population of women aged 15–49 on 1 November of each year (the middle of the 12-month period before the Matlab DHS). Because the Demographic Surveillance System registers all births regardless of a mother's age, births to mothers under age 15 were recorded in the 15–19 age group and records of births to mothers over age 49 were deleted to replicate the Matlab DHS procedures.

## RESULTS

Table 1 shows the sample sizes and completeness rates of the 1994 Matlab DHS as compared with the 1993–94 national DHS. Among individual women the nonresponse rate of 12.7 percent in the Matlab DHS is considerably higher than the 2.6 percent rate in the national DHS because, as noted above, callbacks were not done systematically in the Matlab DHS. The proportions of absent households and vacant dwellings were also higher in the Matlab DHS than in the national DHS (6.7 percent versus 4.4 percent).

A comparison of the age distributions of the interviewed women (Table

2) shows some differences between the Demographic Surveillance System and the Matlab DHS in both the treatment and the comparison areas. The inconsistencies are most pronounced in the comparison area, where the Matlab DHS recorded too many women in the 15–19 age group and apparently recorded too few women in the 30–34 and 45–49 age groups. These results suggest that the Matlab DHS may have had a tendency to underreport the ages of younger women. However, given the potential for age misreporting in both the Matlab DHS and the Demographic Surveillance System, it is difficult to draw definitive conclusions concerning the accuracy of age reporting in either data set.

**Table 1. Sampling results for households and individual women: 1994 Matlab Demographic and Health Survey (Matlab DHS) and 1993–94 Bangladesh DHS**

Sample unit	Matlab DHS		Bangladesh DHS (%)
	Number	%	
Homes selected	3,225	100.0	100.0
Households absent	70	2.2	1.2
Dwellings vacant/unoccupied	148	4.5	3.2
Households present	3,037	93.3	95.6
Households not interviewed	28	0.9	0.8
Households interviewed	3,009	92.4	94.8
Eligible women in households	3,480	100.0	100.0
Women not interviewed	441	12.7	2.6
Women interviewed	3,039	87.3	97.4

**Table 2. Percentage age distribution of women of reproductive age in the treatment and comparison areas of Matlab as of November 1993: Demographic Surveillance System (DSS) and Matlab DHS**

Age group	Treatment area		Comparison area	
	DSS	DHS	DSS	DHS
15–19	23.2	24.0	22.9	28.9
20–24	19.0	19.2	19.3	18.8
25–29	15.0	18.1	15.6	16.6
30–34	15.0	13.5	15.2	10.1
35–39	11.0	11.3	11.3	10.7
40–44	8.0	8.9	8.1	8.0
45–49	7.6	5.1	7.6	6.9
Number	26,018	1,937	23,044	1,880

Note: Age distributions are for the mid-year point of the 12-month period preceding the April–May 1994 survey interviews.



## FERTILITY

The Demographic Surveillance System and Matlab DHS total fertility rates for the three years prior to the survey interviews are very similar in both treatment and comparison areas, despite a rather large overestimation in the age-specific fertility rate for the age group 15–19 in the Matlab DHS, especially in the treatment area (Table 3). In the treatment area the total fertility rates are 2.98 children per woman (Demographic Surveillance System) and 3.02 children per woman (Matlab DHS), and in the comparison area they are 4.02 (Demographic Surveillance System) and 3.95 (Matlab DHS). These results constitute remarkably close correspondence in the estimation of fertility, strengthening our confidence in the

*Total fertility rates obtained by the surveillance system and the Matlab DHS are remarkably close, strengthening confidence in the national DHS fertility data.*

reliability of the fertility data obtained from the Matlab DHS.

As noted previously, there continues to be concern that DHS birth and pregnancy histories may be producing underestimates of fertility in some settings. Such underestimates may be caused by interviewers who overstate children's ages because they wish to shorten interviews by not asking an extensive array of health questions that apply to younger children (see, e.g., Cleland 1996).

The total fertility rates for progressively longer time periods are given in Table 4. In the treatment area, for the 12 months before the survey, the Matlab DHS underestimated the total fertility rate by 0.38 children, but for all other time periods the estimates are virtually identical. In the comparison area the Matlab DHS estimates tend to be slightly lower than the Demographic Surveillance System values. These discrepancies are never more than 0.51 children for any time period prior to the survey interview. We find no evidence of a displacement of births in the Matlab DHS when we compare total fertility rates for 0–35 and 0–47 months prior to the interview—that is, rates based upon births occurring three and four years prior to the survey.

Table 5 presents the Demographic Surveillance System fertility of households whose homes were found vacant by the Matlab DHS interviewers, of women in visited households who did not respond to the Matlab DHS, and of the matched individual women. Among matched individuals (i.e., women identified in both the Demographic Surveillance System and the Matlab DHS), fertility for the last three years (April/May 1991 to April/May 1994) was nearly identical. Women not interviewed in the Matlab DHS (12.7 percent of eligible women identified in the Matlab DHS household listing) and women residing in homes that were found vacant by survey interviewers had slightly higher fertility than women successfully interviewed. However, these differences were not great enough to have a significant effect on overall fertility levels.

**Table 3. Average age-specific and total fertility rates (TFRs) in the treatment and comparison areas of Matlab for the three-year period prior to the survey interviews: DSS and Matlab DHS**

Age group	Treatment area		Comparison area	
	DSS	DHS	DSS	DHS
15–19	0.056	0.133	0.072	0.094
20–24	0.180	0.176	0.233	0.227
25–29	0.182	0.164	0.234	0.193
30–34	0.109	0.099	0.147	0.167
35–39	0.049	0.031	0.084	0.067
40–44	0.019	0.020	0.030	0.038
45–49	0.003	0.000	0.005	0.004
TFR	2.98	3.02	4.02	3.95
Number	26,018	1,937	23,044	1,880

Note: Fertility rates for the mid-point of the 36-month period preceding the April–May 1994 survey interviews.

**Table 4. Average age-specific and total fertility rates (TFRs) in the treatment and comparison areas of Matlab, by number of months prior to the survey interviews: DSS and Matlab DHS**

Months prior to interviews*	Treatment area		Comparison area	
	DSS	DHS	DSS	DHS
0–11	3.09	2.71	3.95	3.83
0–23	3.02	3.01	3.98	3.79
0–35	2.98	3.02	4.02	3.95
0–47	3.07	3.08	4.62	4.11
0–59	3.15	3.18	4.37	4.40

\*Survey interviews took place in April–May 1994.

## INFANT MORTALITY

The infant mortality rates recorded by the Demographic Surveillance System and the Matlab DHS for 0–4 years and 5–9

years prior to April–May 1994, shown in Table 6, indicate closer agreement during the more recent period than earlier. In the treatment and comparison areas over the period 0–4 years before the survey, the infant mortality rates are not notably different. However, for the period 5–9 years prior to interview, Matlab DHS estimates are 20 percent too low in both areas, which is symptomatic of recall lapses in the reporting of dead children. This finding has been noted in many other South Asian demographic

surveys and indicates that the Matlab DHS does not provide reliable estimates of longer-term trends in infant mortality.

### CONTRACEPTIVE USE

A somewhat surprising finding from this validation exercise was the apparent underreporting of contraceptive use in the Matlab DHS. For all methods (modern and traditional combined), the Matlab Record-keeping

System reported that 64.0 percent of all currently married women were using contraception as of April–May 1994, compared with 57.3 percent reported in the Matlab DHS. All modern methods were underreported by the Matlab DHS, with the greatest disagreement in total use occurring for pills and injectables. It is not clear why the Matlab DHS underreported use to the extent noted in Table 7. It may be that women were more comfortable discussing their reproductive health and contraceptive use with local community health workers than with Matlab DHS interviewers, who were strangers. Of course, one cannot totally discount the possibility that the Record-keeping System overstated use to some degree.

**Table 5. Births in Matlab during the three years prior to the interview dates, by household status at the time of the survey and women's interview status: DDS and Matlab DHS**

Household status/ Women's interview status	All women	Matched women (DSS vs. DHS)	Births		Fertility per 100 women <sup>a</sup>	
			DSS	DHS	DSS	DHS
Eligible women						
in visited households	3,480	2,945	1,224	—	13.85	—
Women interviewed	3,039	2,628	1,089	1,085	13.81	13.76
Women not interviewed	441	317	135	—	14.19	—
Dwellings vacant	231	—	97	—	14.00	—

Note: Survey interviews took place in April–May 1994.

<sup>a</sup>Total number of births in 3 years per 100 women.

**Table 6. Average infant mortality rates for two periods in the treatment and comparison areas of Matlab: DSS and Matlab DHS**

Years prior to interviews	Treatment area		Comparison area	
	DSS	DHS	DSS	DHS
0–4	74.5	75.8	90.1	82.6
5–9	89.6	71.1	105.0	84.0

**Table 7. Contraceptive prevalence rates in the treatment area of Matlab as of April–May 1994, by method: Record-keeping System (RKS) and Matlab DHS**

Methods	RKS	DHS
Modern methods	61.7	52.8
Pill	16.5	13.6
IUD	2.5	1.8
Injectable	31.9	27.5
Vasectomy	0.2	0.1
Tubectomy	8.8	8.5
Condom	1.9	1.4
Traditional methods	3.7	4.5
All methods	64.0	57.3

## DISCUSSION

The Matlab validation study is unique for its data, field setting, and design: it was possible only in the Matlab area with the data base of the ICDDR,B. The results from this inquiry are therefore of interest not only to demographers and policy-makers concerned with Bangladesh, but also to all analysts interested in the reliability of demographic data from DHS and DHS-type surveys around the world.

The estimated total fertility rate for Bangladesh in 1991–93 of 3.4 children per women, based on the national DHS data of 1993–94, is far below the previous national estimate, from the 1991 Contraceptive Prevalence Survey, of 4.2 children per woman. Some demographers suspect that a total fertility rate of 3.4 is implausibly low. While there has been less concern about the reliability of infant and child mortality data from the Bangladesh DHS, these findings also suggest that a significant improvement in health is under way. Given the importance of accurate vital-



rate estimates for policymaking, a validation study for the Bangladesh DHS was thought to be crucial.

Our validation study found that the Matlab DHS appears to have estimated fertility accurately in both the treatment and the comparison areas. This result tends to strengthen our confidence in the reliability of national fertility estimates from the 1993–94 Bangladesh DHS. Results from this validation study also indicate that Matlab DHS infant mortality rates for the five-year period prior to the interviews are reasonably consistent with estimates derived from the Demographic Surveillance System. However, for periods more than five years prior to interview, the Matlab DHS infant mortality data show clear evidence of omission. This misreporting may be due to respondents' failure to recall infant deaths, to their misreporting of children's ages at death (e.g., heaping at month 12), or both.

The Matlab DHS also appears to have underestimated current contraceptive use. This underestimate was negligible for permanent methods but substantial for modern temporary methods. Inconsistencies in the reporting of contraceptive use were also found in the national DHS, with husbands more likely than wives to report such use (Mitra et al. 1994). It could be argued that the contraceptive prevalence rate based on the Record-keeping System of the ICDDR,B is an overestimate. However, given that a community health worker visits each woman every 15 days and a supervisor visits monthly, it is unlikely that a woman would repeatedly report use to these workers when she was not actually using contraception.

In addition, if one considers the linear relationship between the total fertility rate and contraceptive prevalence as derived by Bongaarts and Potter (1983, 119), then the national DHS contraceptive prevalence rate appears to be too low.<sup>5</sup> Applying the Bongaarts model

(Bongaarts 1982) and more recent regression estimates derived from international comparisons of the total fertility rate and the contraceptive prevalence rate (Ross and Frankenberg 1993) leads to the same conclusion—namely, that

*If, as suggested by the Matlab DHS, contraceptive use at the national level is higher than reported in the national DHS, a total fertility rate for Bangladesh of 3.4 children per woman may be quite plausible.*

the national DHS contraceptive prevalence rate appears to be too low if the total fertility rate of 3.4 is assumed to be accurate. The results from the Matlab validation exercise clearly suggest that fertility and recent infant mortality estimates are reasonably accurate, whereas the reporting of modern contraceptive use (especially of pills and injectables) may be too low. This conclusion is somewhat surprising in that demographers often assume that surveys provide more reliable estimates of current contraceptive use than of vital rates. If, as suggested by the Matlab DHS, contraceptive use at the national level is actually higher than reported in the national DHS, a total fertility rate for Bangladesh of 3.4 children per woman may be quite plausible.

The message that emerges clearly from the Matlab DHS validation study is that DHS birth histories appear to be

generating reliable estimates of current fertility and infant mortality. The fertility results suggest that women of rural Bangladesh can give quite accurate accounts of their births. For example, the displacement of dates of birth is apparently negligible in the Matlab DHS data. However, inaccurate reporting of the respondents' own ages may be a problem, as is the omission of infants who died more than five years prior to the survey date.

While the findings of the validation study give us greater confidence in the vital rates estimated from the 1993–94 Bangladesh DHS, one must guard against placing too much confidence in them. It is quite possible that women in Matlab were unusually proficient at giving high-quality information on births and deaths to Matlab DHS interviewers, whereas their counterparts in other regions of the country may have been less adept in giving accurate responses. One should therefore not be overly sanguine about the quality of national-level demographic data in Bangladesh based on the encouraging results obtained from the Matlab validation study.

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<sup>5</sup> Using the equation  $TFR = 7.3 - .064 (CPR)$ , and substituting CPR of 57.3 from the Matlab DHS, yields an estimated TFR of 3.63, versus the actual rate of 2.98. On the other hand, using the CPR of 64.0 from the Record-keeping System yields an estimated TFR of 3.20, which is more consistent with the observed TFR.



## REFERENCES

- Arnold, Fred. 1990. Assessment of the quality of birth history data in the Demographic and Health Surveys. In *An Assessment of DHS-1 Data Quality*, pp. 81–111. Demographic and Health Surveys Methodological Reports, No. 1. Columbia, Maryland: Institute for Resource Development/Macro Systems, Inc.
- Arthur, W. Brian, and Michael A. Stoto. 1983. An analysis of indirect mortality estimation. *Population Studies* 37(2): 301–14.
- Bairagi, Radheshyam, M. A. Aziz, M. K. Chowdhury, and Barry J. Edmonston. 1982. Age mis-statement for young children in rural Bangladesh. *Demography* 19(4): 447–58.
- Becker, Stan, and S. Mahmud. 1984. *A validation study of backward and forward pregnancy histories in Matlab, Bangladesh*. World Fertility Survey Scientific Reports, No. 51. Voorburg, Netherlands: International Statistical Institute.
- Becker, Stan, S. Mahmud, and A. M. Sarder. 1982. *Validation study of pregnancy histories and indirect techniques of fertility and mortality estimation in Matlab, Bangladesh*. Vol. 1, *Methods and study of possible contamination*. Working Paper 25. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh.
- Becker, Stan, and D. Sosa. 1992. An experiment using a month-by-month calendar in a family survey in Costa Rica. *Studies in Family Planning* 23(6): 386–91.
- Bicego, G., and J. T. Boerma. 1992. Demographic aspects of the quality of data on births in the last five years in the DHS surveys. In *Assessment of the Quality of Health Data in DHS-1 Surveys*. DHS Methodological Reports, No. 2 (draft).
- Bongaarts, John P. 1982. The fertility-inhibiting effects of the intermediate fertility variables. *Studies in Family Planning* 13(6/7): 179–89.
- Bongaarts, John P., and R. G. Potter. 1983. *Fertility, biology, and behavior*. New York: Academic Press.
- Caldwell, John C. 1966. Study of age misstatement among young children in Ghana. *Demography* 3:477–90.
- Cleland, John. 1996. Demographic data collection in less developed countries, 1946–1996. *Population Studies* 50(3): 433–50.
- Cleland, John, and C. Scott. 1987. *The World Fertility Survey: An assessment*. Oxford: Oxford University Press.
- Curtis, Sian, and Fred Arnold. 1994. *An evaluation of the Pakistan DHS survey based on the reinterview survey*. Calverton, Maryland: Macro International, Demographic and Health Surveys.
- Cushing, Jeanne F., and David Cantor. 1986. *Software documentation for Integrated System for Survey Analysis (ISSA)*. Columbia, Maryland: Institute for Resource Development.
- DHS (Demographic and Health Surveys). 1990a. *Interviewer's manual: For use with Model "A" Questionnaire for high contraceptive prevalence countries*. DHS-II Basic Documentation, No. 3. Columbia, Maryland: Institute for Resource Development.
- . 1990b. *Model "A" Questionnaire*. DHS-II Basic Documentation, No. 1. Columbia, Maryland: Institute for Resource Development.
- Gadomski, A., R. E. Black, and W. H. Mosley. 1990. Constraints to the potential impact of child survival in developing countries. *Health Policy and Planning* 5(3): 235–45.
- Goldman, Noreen, M. Lorenzo, and Charles F. Westoff. 1989. Collection of survey data on contraception: An evaluation of an experiment in Peru. *Studies in Family Planning* 20(3): 147–57.
- ICDDR,B (International Centre for Diarrhoeal Disease Research, Bangladesh). 1990. *Annotated bibliography of ICDDR,B studies in Matlab, Bangladesh*. Specialized Bibliography Series, No. 14. Dhaka. ———. 1994. *Early indicators from the Matlab Demographic Surveillance System*. Dhaka: Demographic Surveillance System Project, ICDDR,B.
- ISSA (Integrated System for Survey Analysis). 1995. *Integrated System for Survey Analysis, Version 2.28*. Calverton, Maryland: Macro International.
- Mahmud, S., and Stan Becker. 1987. *A validation of retrospective survey data used in the indirect estimation of fertility and mortality*. Bangladesh Institute of Development Studies (BIDS) Research Report 64. Dhaka: Bangladesh Institute of Development Studies.
- Mitra, S. N., M. N. Ali, S. Islam, A. R. Cross, and T. Saha. 1994. *Bangladesh Demographic and Health Survey: 1993–94*. Calverton, Maryland: Macro International.
- O'Muircheartaigh, C. A. 1984. *The magnitude and pattern of response variance in the Peru Fertility Survey*. World Fertility Survey Scientific Reports, No. 45. Voorburg, Netherlands: International Statistical Institute.
- Potter, Joseph E. 1977. Problems in using birth-history analysis to estimate trends in fertility. *Population Studies* 32(2): 335–64.
- Ross, John A., and Elizabeth Frankenberg. 1993. *Findings from two decades of family planning research*. New York: The Population Council.
- Rutstein, Shea O., and G. T. Bicego. 1990. Assessment of the quality of data used to ascertain eligibility and age in the Demographic and Health Surveys. In *An Assessment of DHS-1 Data Quality*, pp. 3–37. Demographic and Health Surveys Methodological Reports, No. 1. Columbia, Maryland: Institute for Resource Development/Macro Systems, Inc.
- Som, R. K. 1973. *Recall lapse in demographic enquiries*. Bombay (Mumbai): Asia Publishing House.
- Sullivan, J. M., G. T. Bicego, and Shea O. Rutstein. 1990. Assessment of the



quality of data used for the direct estimation of infant and child mortality in the Demographic and Health Surveys. In *An assessment of DHS-I data quality*, pp. 113-37. DHS Methodological Reports, No. 1. Columbia, Maryland: Institute for Resource Development/Macro Systems, Inc.

United Nations. 1983a. *Fertility levels and trends as assessed from twenty World Fertility Surveys*. New York.

———. 1983b. *Manual X: Indirect techniques for demographic estimation*. Population Studies, No. 81. New York.

———. 1985. *Handbook of vital statistics systems and methods*. Vol. II,

*Review of national practices*. Statistical Office Series F, No. 35. New York.

Verma, V. 1980. *Basic fertility measures from retrospective birth histories*. World Fertility Survey Technical Bulletin 4. London: World Fertility Survey.

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