

H N P D I S C U S S I O N P A P E R

Reaching The Poor Program Paper No. 2

Bangladesh: Inequalities in Utilization of Maternal Health Care Services - Evidence from MATLAB

A.T.M. Iqbal Anwar, Japhet Killewo, Mahbub-E-Elahi K Chowdhury, and Sushil Kanta Dasgupta

October 2004



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Chowdhury, and Sushil Kanta Dasgupta**

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Bangladesh: Inequalities in Utilization of Maternal Health Care Services - Evidence from Matlab

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Paper prepared for the Program on Reaching the Poor with Effective Health, Nutrition, and Population Services, organized by the World Bank in cooperation with the William and Melinda Gates Foundation and the Governments of the Netherlands and Sweden.

Abstract: This study investigates the equity implications of introducing a facility-based maternity care strategy in rural Bangladesh. The study took place in Matlab subdistrict in Chandpur District, where the Centre for Population and Health Research (ICDDR,B) had initiated a home-based maternity care program during 1987. During 1996-2001 the home-based strategy was replaced by a facility-based strategy that featured gradual upgrading of four ICDDR,B subcentres to provide basic emergency obstetrical care (EOC). During the 1997-2001 study period 19% of births took place in ICDDR,B facilities, 4% occurred in other facilities (public & private), and 2.6% births were attended by ICDDR,B midwives at home. The remaining deliveries took place at home without trained attendants. The study examines: 1) the extent to which poorer women in the community used the EOC services introduced and 2) the factors determining the use of those services. It does so by analyzing monitoring and service data from the ICDDR,B's maternity care program. The principal findings are that: (i) Women from poorer households used ICDDR, B delivery facilities significantly less than their better-off counterparts: the ratio between the best-off and worst-off 20% of the population was nearly 3:1. (ii) While overall facility utilization increased during the study period, the economic disparities in use persisted. (iii) Factors other than economic status associated with use of maternity care were area of residence, number of antenatal visits, birth order, maternal education and age, and year of delivery.

Keywords: Bangladesh, Matlab, ICDDR,B, health service inequality, emergency obstetric care

Disclaimer: The findings, interpretations and conclusions expressed in the paper are entirely those of the authors, and do not represent the views of the World Bank, its Executive Directors, or the countries they represent.

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FOREWORD

This discussion paper is one in a series presenting the initial results of work undertaken through the Reaching the Poor Program, organized by the World Bank in cooperation with the Gates Foundation and the Governments of Sweden and the Netherlands.

The Program is an effort to begin finding ways to overcome social and economic disparities in the use of health, nutrition, and population (HNP) services. These disparities have become increasingly well documented in recent years. Thus far, however, there has been only limited effort to move beyond documentation to the action needed to alleviate the problem.

The Program seeks to start rectifying this, by taking stock of recent efforts to reach the poor with HNP services. The objective is to determine what has and has not worked in order to guide the design of future efforts. The approach taken has been quantitative, drawing upon and adapting techniques developed over the past thirty years to measure which economic groups benefit most from developing country government expenditures.

This discussion paper is one of eighteen case studies commissioned by the Program. The studies were selected by a professional peer review committee from among the approximately 150 applications received in response to an internationally-distributed request for proposals. An earlier version of the paper was presented in a February 2004 global conference organized by the Program; the present version will appear in a volume of Program papers scheduled for publication in 2005, *Reaching the Poor with Effective Health, Nutrition, and Population Services: What Works, What Doesn't, and Why*.

Further information about the Reaching the Poor Program is available at the following sites:

Program Overview:

<http://www1.worldbank.org/prem/poverty/health/rpp/overview.htm>

List of Papers Commissioned by the Program:

<http://www1.worldbank.org/prem/poverty/health/rpp/projectlist.htm>

Presentations at the Program Conference:

<http://www1.worldbank.org/prem/poverty/health/rpp/conference.htm>

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BACKGROUND

Bangladesh is one of the poorest countries in the world, with a maternal mortality ratio of 320/100,000 live births (NIPORT 2001). As part of its effort to promote safe-motherhood and to reduce maternal mortality, the government has been upgrading existing health facilities and services in order to make essential obstetric care (EOC) services available to all women. The target is to provide quality comprehensive EOC services from all 59 district hospitals, 64 (out of 90) Maternal and Child Welfare Centers (MCWCs), and selected (120 out of 403) rural *Thana* (subdistrict) Health Complexes (THCs)(MOH and FW 1998).

Questions Addressed in this Study

Some progress has been made in the number of women attending EOC services, but the question remains whether these are the women who really need such services. The rise in caesarean section rates in Bangladesh from 0.7 percent in 1994 to 2.2 percent in 1999, for example, may indicate some progress toward meeting the need for emergency obstetric care. However, the fact that half of these caesarean sections took place in private facilities may suggest better access for the urban elite than for the rural poor (Khan et al. 1999).

Although inequity is a growing concern, few systematic studies of equity have been conducted in Bangladesh, particularly in the field of maternal health care services. This study is an attempt to explore inequality in utilization of maternal health services in the Matlab ICDDR,B service area, a homogeneous rural area in Chandpur district. The following research questions are addressed:

- To what extent do women from the poorer segment of the population use the available essential obstetric care services in Matlab ICDDR,B service area?
- What other sociodemographic factors influence utilization of maternal health care services?

Setting

Matlab, a rural subdistrict of the Ganges-Meghna Delta with a population of 550,000 in 22 unions, is situated about 55 kilometers southeast of Dhaka city in Bangladesh. As in most areas of flood-prone southern Bangladesh, rural people barely subsist on rice growing and fishing, use mostly water communication, and follow a male-dominated cultural pattern such as seclusion of women in their compounds (Faveau et al. 1991). In the Matlab area since 1966, ICDDR,B has maintained a Health and Demographic Surveillance System (HDSS) covering a population of about 220,000 (in 2001). The system collects information on births, deaths, marriages, and migration in the area by community health research workers (CHRWs) through monthly house-to-house visits. In

addition, the HDSS also conducts periodic *socioeconomic censuses*, and such data are available for 1974, 1982, and 1996.

The HDSS area is divided into two parts, an ICDDR,B service area and a comparison (government service) area, each covering a population of about 110,000. The ICDDR,B service or “treatment” area is subdivided into four blocks (A, B, C, and D), and each block is served by a health subcenter that provides maternal and child health services for its catchment population. In addition, ICDDR,B has a 120-bed hospital in Matlab town (Matlab Hospital) that provides free services for the management of diarrheal diseases as well as maternal and child health care.

Maternal Health Services Delivered

In 1987, ICDDR,B initiated a *community-based maternity care program* in the northern half of the service area (Blocks C and D) covering 48,000 people living in 39 villages (Figure 1). Two nurse-midwives (government-trained) were recruited and assigned to each subcenter in the program area to conduct home deliveries. Their duties were to: work with CHRWs and traditional birth attendants and ensure that they are called in during labor; pay antenatal visits to the pregnant women identified by CHRWs; assess antenatal complication risks; attend as many home deliveries as possible; treat arising complications at onset before they become severe; organize referrals and accompany referred patients to the central clinic at Matlab, if judged necessary; and visit as many new mothers as possible within 48 hours of delivery. Details of their duties, treatment guidelines, essential drugs, equipment, and record-keeping system are described elsewhere (Fauveau and Chakraborty 1988). Midwives were supported by two other program components—development of a referral chain, including a boatman and a helper to accompany patients day or night to the referral site; and installation of a maternity clinic at Matlab, where additional trained midwives and female physicians were always available for intensive surveillance, treatment, or further referral to the Chandpur District Hospital. The Matlab maternity clinic was not equipped with surgical, radiological, or modern laboratory facilities. The only items of obstetric equipment available were a vacuum extractor, a suction machine, and obstetric forceps. The emphasis was on immediate care of admitted patients and stabilization of patients for rapid transfer to higher-level comprehensive facilities, mostly in Chandpur town. In January 1990, the maternity care intervention was expanded in the other two blocks (A and B) of the ICDDR,B service area following the same home-based strategy practiced throughout the ICDDR,B service area until November 1996 and with similar referral linkages with the Matlab Hospital clinic and comprehensive EOC facilities (public and private) in Chandpur, the district headquarters.

In 1996, the strategy for providing maternity care services in the ICDDR,B service area began to shift from home-based to facility-based delivery of services. Community-based midwives and paramedics were withdrawn from the field and assigned to health subcenters to conduct normal deliveries. The Block C subcenter was upgraded in November 1996 to provide basic EOC. Subsequently, all the other subcenters were

upgraded as basic EOC facilities, and by 2001 the home-based strategy was totally replaced by a facility-based strategy.

In addition to ICDDR,B services, maternity care services were available from the government thana health complex at Matlab, the government district hospital at Chandpur, and private clinics and hospitals located mostly in Chandpur district town for the study population.

Data and Methodology

This is a secondary data analysis study. The following existing surveillance and monitoring databases were used:

- The HDSS birth file from 1997 to 2001
- Pictorial card data from 1997 to 2001
- The 1996 socioeconomic census data conducted in the entire Matlab HDSS area.

HDSS birth file. The HDSS records all births in the ICDDR,B surveillance area including still births. During the reference period (1997–2001), there were 15,041 births in ICDDR,B service area. The limitation of birth files is that they have no variables on socioeconomic status or detailed service utilization. But HDSS assigns every individual as well as every household in the surveillance area a unique identification number, through which different surveillance and monitoring databases of ICDDR,B, including socioeconomic censuses, can be linked.

Pictorial cards. These are especially designed pregnancy-monitoring tools to follow all mothers in the ICDDR,B service area throughout pregnancy, delivery, and 42 days (six weeks) after delivery. The CHRWs provide all new pregnant mothers with relevant background information and instruct them to preserve these cards carefully and submit them to the midwives during home visits or visits to the ICDDR,B facilities for maternity care services. Six weeks after childbirth, the CHRWs collect these cards from mothers. The service providers (mostly midwives) use these cards as tools for imparting BCC to the mothers as well as tools for recording mothers' relevant service uptake information. No economic information is collected through these cards but they provide room for recording a set of unique identification numbers for the women. During the reference period, 12,080 filled-in pictorial cards were available for analysis, although the total number of births recorded by HDSS during the same period, in ICDDR,B service area was 15,041.

The 1996 socioeconomic census. In the Matlab HDSS area, socioeconomic information is collected through periodic censuses as conducted in 1974, 1982, and 1996. For this study, we used household-level socioeconomic information from the 1996 census to classify mothers into wealth quintiles.

Measurement of socioeconomic status. In this study, socioeconomic status is defined in terms of assets or wealth, rather than in terms of income or consumption. We used

principal components methods of data reduction to classify mothers into socioeconomic quintiles (Filmer and Pritchett 2001; Gwatkin et al. 2000). Calculation of socioeconomic quintiles was based on the 14,306 mothers for whom household-level information was available on assets and other socioeconomic variables from the socioeconomic census of 1996 (Appendix A).

Data linking. Birth file data were linked with socioeconomic census data using household identification numbers of the mothers. Out of 15,041 mothers in the birth-file, socioeconomic information was recorded for 14,306 (95.1 percent); 12,080 (80.3 percent) had pictorial cards; and 11,555 (76.8 percent) had both pictorial cards and socioeconomic indicators.

Our current analysis covered 12,080 mothers who had a filled in a pictorial card; but for inequality analysis we could use only 11,555 of them. Therefore the number (N) varies in different parts of the analysis.

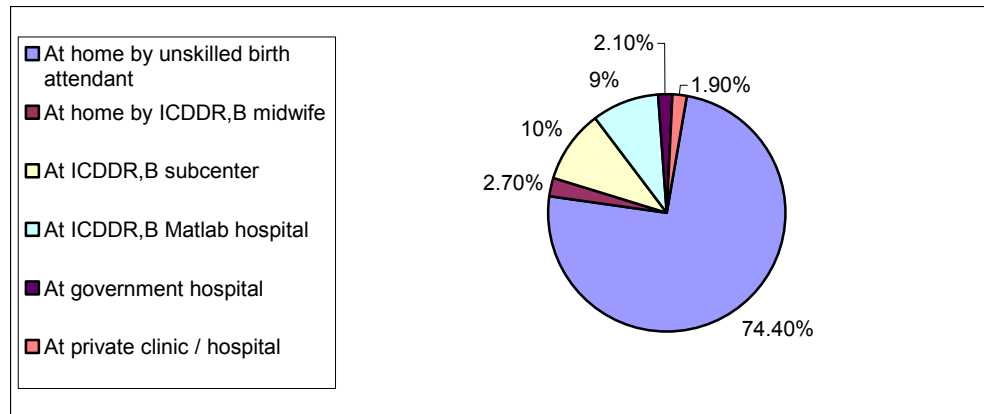
The socioeconomic status of the 11,555 mothers with both pictorial cards and socioeconomic information (and included in the inequity analysis) was quite similar to that of the 2,851 (14,306-11,555) mothers with socioeconomic information but without pictorial cards. This suggests that any bias resulting from the incomplete coverage of pictorial cards was minimal.

Tools for data analysis. Data were entered and linked in Foxpro-2.6a software. For analysis, Excel 2000 and SPSS 10 were extensively used.

FINDINGS ABOUT DISTRIBUTION

During the study period (1997–2001), out of 12,080 births monitored by pictorial cards, 19.0 percent took place in ICDDR,B facilities, 2.1 percent in government facilities, and 1.9 percent in private clinics and hospitals. An additional 2.7 percent of births were attended by ICDDR,B midwives at home, and the remaining 74.4 percent of births were conducted by unskilled attendants at home (Figure 2). So, in the ICDDR,B service area, a skilled birth attendant was present for 25.6 percent of deliveries during the reference period, which is much higher than the national average for Bangladesh. During the same period, 83 percent of the mothers in ICDDR,B service area made at least one antenatal visit and the mean number of visits for those who received antenatal care was 1.9 per pregnancy. 51 percent of the mothers received postnatal care, and 1.7 percent underwent caesarean sections.

Figure 1: Place of Delivery in ICDDR,B Service Area



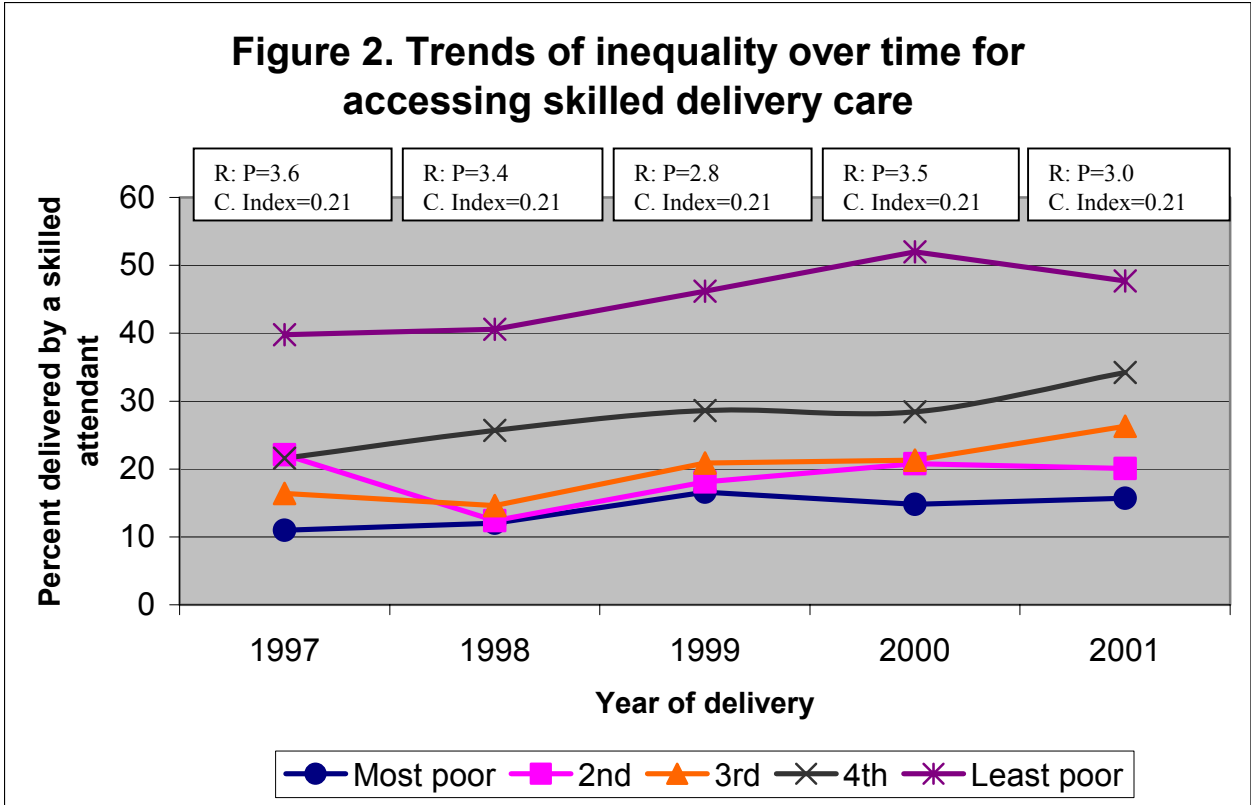
Note: N = 12,080.

Source: Pictorial cards, 1997–2001.

Bivariate Analysis

In bivariate analysis, socioeconomic status was found to be strongly associated with utilization of maternal health care services (Table 1). In the ICDDR,B service area, poorer mothers used maternity care services less than their richer counterparts. Most poor mothers had much less skilled attendants (14.2 percent) at delivery than the least poor (45.7 percent) mothers. For deliveries, inequality was highest for use of private sector facilities (Rich: Poor Ratio 12.0 and concentration index 0.46) and lowest for use of ICDDR,B resources (Rich: Poor Ratio 2.9 and concentration index 0.13 to 0.26). With respect to inequality, use of public facilities was intermediate (Rich: Poor Ratio 5.0 and concentration index 0.36). Among ICDDR,B services, facility-based care was more equitably distributed than home-based skilled delivery care. Among ICDDR,B facilities, services from centrally located Matlab ICDDR,B hospital were found less pro-poor than services from peripheral-level subcenters. Disparities were found in access to antenatal care or post-natal care services as well, but the difference was less pronounced than for skilled attendance at deliveries. Inequality increased systematically for higher numbers of antenatal care visits. Among all indicators examined, inequality was highest for caesarean sections undertaken. The C-section rate for most poor quintile mothers was 0.5 percent while that of mothers from the richest quintile was 4.6 percent (Rich: Poor Ratio 9.2 and concentration index 0.47).

Figure 2: Trends of inequality over time for accessing skilled delivery care



Note: N = 11,555.

Source Pictorial cards, 1997–2001.

An increasing trend for use of maternity care services is observed in the study area, but a similar extent of disparity was observed throughout the reporting period (Figure 3). In 1997, 18.5 percent of deliveries took place in facilities while the population-based caesarean rate was 1.5 percent. However, by 2001 the figures had increased to 28.9

Table 1: Utilization of maternal health care services, by mother's socioeconomic status

Indicator	Socioeconomic quintiles					Total (N=11555)	Rich Poor Ratio	Concentration index	Con. Index Standard Error
	Most poor (N=2335)	2nd (N=2330)	3rd (N=2306)	4th (N=2294)	Least poor (N=2290)				
Delivery care									
At home by unskilled attendant	85.7%	81.7%	79.8%	71.6%	54.2	74.7%	0.6	.0781	.0316
At home by ICDDR,B midwives	1.5%	2.1%	1.6%	2.6%	5.7%	2.7%	3.8	.2632	.0716
At ICDDR,B subcenter	6.5%	7.9%	8.9%	11.1%	12.6%	9.5%	1.9	.1312	.0237
At ICDDR,B Matlab Hospital	4.8%	6.8%	7.4%	10.1%	17.8%	9.3%	3.7	.2499	.0535
At government hospital	1.0%	0.8%	1.3%	2.0%	5.0%	2.0%	5.0	.3642	.0559
At private clinics and hospitals	0.4%	0.7%	0.9%	2.0%	4.8%	1.7%	12.0	.4599	.0599
Total	100%	100%	100%	100%	100%	100%			
Antenatal care uptake									
No ANC visit	22.4%	19.8%	17.0%	14.3%	12.8%	17.3%	0.6	-.1144	.0190
One ANC visit	38.1%	37.9%	37.5%	36.6%	28.4%	35.7%	0.7	-.0461	.0272
Two ANC visits	24.8%	26.7%	27.5%	28.9%	29.3%	27.4%	1.2	.0327	.0079
Three ANC visits	10.7%	10.7%	12.3%	13.3%	18.9%	13.2%	1.8	.1151	.0353
Four or more ANC visits	4.0%	4.8%	5.8%	6.9%	10.7%	6.4%	2.7	.1925	.0425
Total	100%	100%	100%	100%	100%	100%			
Received Postnatal care	48.9%	48.2%	49.3%	51.5%	57.2%	51.0%	1.2	.0311	.0125
Delivered by caesarean section	0.5%	0.5%	0.7%	1.7%	4.6%	1.6%	9.2	.4704	.0429

Note: N=11,555

Source: Pictorial cards, 1977-2001

percent and 2.6 percent, respectively (Appendix B). With time, the increase of antenatal and post-natal care uptake was minimal, but the mean number of antenatal care visits increased significantly from 1.66 in 1997 to 2.05 in 2001 (data not shown). In bivariate analysis, other factors found significantly associated with utilization of maternity services were the mother's education, distance to the nearest subcenters, the mother's age at delivery, religion, parity, and the year of delivery (Appendix B). Distance to the nearest subcenter and the mother's age and parity were found to have an inverse relationship with uptake of maternity services, while the relationship of other socioeconomic variables with utilization of maternity services was positive. Analysis also revealed that the higher the number of antenatal care visits, the higher was the percentage of skilled attendance at delivery, C-section rates, and post-natal care uptake among the women.

Multivariate Analysis

From the bivariate analysis of the monitoring data, it is evident that poverty is a significant factor that indicates care-seeking behavior for maternal health services. In subsequent analysis, we developed a binary logistic regression model considering presence of skilled attendant at birth (at facility or at home) as the dependent variable and socioeconomic status, mother's education, distance, age, gravida, year of delivery, number of antenatal care visits, and religion as independent variables (regressors). All the independent variables were recoded as categorical or ordinal categorical variables. For calculating the odds ratio for each category of independent variables, the first group was always taken as the reference category (Table 2).

Table 2 shows the crude and adjusted odds ratios of utilization of skilled attendants at birth for different sociodemographic characteristics. Socioeconomic status, even after adjusting for the effects of all other covariates in the model, maintained a significant relationship with the dependent variable. Mothers from the least poor quintile were 3.4 times more likely to use a skilled birth attendant than most poor quintile mothers after adjusting for the effects of other covariates.

It is also evident that, a mother with one antenatal care visit is 2.04 times more likely to be delivered by a skilled birth attendant than a mother with no antenatal check-up. And the odds ratios for skilled attendance at delivery were found to increase tremendously as the number of antenatal care visits increased. Finally, a mother with four antenatal care visits was 12.9 times more likely to be delivered by a skilled attendant than a mother with no antenatal care, after controlling for the effects of covariates.

Distance to nearest subcenter was significantly associated with use of maternity care services. The probability of delivering at facility decreases significantly with increasing distance, even after controlling for the effects of covariates. Mothers residing between 1 and 2 kilometers from subcenters were 55 percent less likely to use skilled delivery services than mothers residing less than 1 kilometer from the subcenters.

Table 2: Logistic regression result from pictorial card data for sociodemographic correlates of skilled attendance at birth in ICDDR, B service area, 1997–2001

Independent variables (Regressors)	Dependent variable <i>Baby delivered by (0 =unskilled birth attendant; 1 = skilled birth attendant)</i>			
	Crude odds ratio	95% confidence intervals for crude odds ratio	Adjusted odds ratio ^a	95% confidence intervals for adjusted odds ratio
Socioeconomic status				
Poorest	1.00	Reference category	1.00	Reference category
2 nd Quintile	1.35	1.16–1.58	1.32	1.12–1.57
3 rd Quintile	1.53	1.31–1.78	1.37	1.16–1.62
4 th Quintile	2.38	2.06–2.76	1.95	1.65–2.31
Riches	5.09	4.41–5.87	3.42	2.87–4.04
Education of mother				
No formal education	1.00	Reference category	1.00	Reference category
1–4 years of education	1.04	.91–1.19	0.92	0.79–1.07
5–9 years of education	1.42	1.28–1.58	1.04	0.92–1.18
10 years + of education	3.75	3.32–4.23	1.82	1.56–2.13
Gravida				
1 (primigravida)	1.00	Reference category	1.00	Reference category
2 nd gravida	.62	.56–.70	0.57	0.50–0.66
3 rd gravida	.49	.43–.55	0.46	0.40–0.54
4 th gravida	.48	.41–.55	0.47	0.40–.57
5 th gravida or more	.39	.32–.44	0.42	0.34–0.51
Antenatal care visits				
No visit	1.00	Reference category	1.00	Reference category
One visit	2.03	1.72–2.4	2.04	1.69–2.46
Two visits	4.39	3.72–5.18	4.14	3.44–4.99
Three visits	7.33	6.13–8.76	6.43	5.25–7.87
Four or more visits	15.04	12.25–18.48	12.94	10.24–16.36
Age group of mother				
10–19 years	1.00	Reference category	1.00	Reference category
20–34 yrs	0.80	0.71–0.91	1.10	.93–1.28
35 years or more	0.68	0.57–0.81	1.64	1.27–2.10
Distance of subcenter from home				
<= 1 km	1.00	Reference category	1.00	Reference category
1.1–2 km	0.43	0.38–0.48	0.45	0.39–0.51
2.1–3 km	0.46	0.41–0.52	0.50	0.43–0.57
3.1–4 km	0.40	0.34–0.48	0.42	0.35–0.52
>=4 km	0.20	0.15–0.28	0.18	0.12–0.25
Religion				
Muslim	1.00	Reference category	1.00	Reference category
Hindu and others	1.32	1.18–1.49	1.76	1.54–2.02
Year of delivery				
1997	1.00	Reference category	1.00	Reference category
1998	0.93	0.80–1.08	0.89	0.75–1.05
1999	1.27	1.09–1.47	1.07	0.90–1.26
2000	1.38	1.20–1.60	1.03	0.88–1.22
2001	1.49	1.29–1.71	1.08	0.92–1.27

a. After controlling for the effects all other covariates in the model.

Source Pictorial cards, 1997–2001

The mother's education is independently a significant factor for skilled attendance at delivery, after adjusting for the effects of other covariates. A mother with 10 years or more of schooling was 1.8 times more likely to be delivered by a skilled birth attendant than a mother with no formal education.

Gravidity was found to be inversely associated with uptake of services. Hence, a mother with fourth birth-order was 58 percent less likely to use a skilled birth attendant for her delivery than a primigravida.

The effect of age upon the dependent variable showed a contrasting result. In the bivariate analysis, it was observed that, with increasing age, the probability of using skilled care decreases (Appendix B). However, when the effect of gravida was controlled for in multivariate analysis, age became positively associated with skilled attendance at birth (Table 2). Mothers aged 35 years or more were found 1.64 times more likely to be delivered at health facilities than under-20 age mothers.

Mothers from minority religious groups were 1.76 times more likely to use a skilled attendant for delivering their babies than mothers from majority religious groups.

DISCUSSION

Inequalities in Service Utilization

This study is an initial attempt at an inequality analysis for utilization of maternal health care services in Bangladesh, a country with low levels and large socioeconomic differences in use of obstetric and other maternal health services. For example, the recent Bangladesh Maternal Health Services and Maternal Health Services and Maternal Mortality Survey (BMMS) 2001 showed that skilled professionals perform only 11.6 percent of all deliveries, and only 8.8 percent of deliveries take place in essential obstetric care facilities. In that study, wide urban-rural and socioeconomic differentials were observed. In urban areas, skilled medical professionals attended 26.8 percent of births, as compared to only 8.4 percent in rural areas. Only 3.4 percent of mothers from the poorest quintile households had a skilled attendant at delivery, as compared to 37.3 percent for the least poor mothers. The rich-poor ratio in this indicator was 11.6.

We examined variations in utilization of maternal health care services in rural area of Bangladesh, among a seemingly homogenous group of poor mothers by their relative socioeconomic status (wealth quintiles). In our study area, overall coverage of maternal health services was much better than the Bangladesh national averages. However, inequality in utilization, though much lower than at national level, was still high for such a seemingly homogenous population where ICDDR,B services are provided free of charge. Study findings suggest that ICDDR,B has succeeded in expanding use of maternal health care services but not to all who need them, so the equity goal has yet to be achieved.

Among different types of obstetric care providers in the study area, the disparity was highest for the for-profit private sector and lowest for ICDDR,B services, with the public sector in between. Private sector services will naturally be less pro-poor, because patients have to pay for them. Why services from public sector providers are less equitably distributed than ICDDR,B services, however, is not clear—when both are provided free of charge. One reason may be that public sector services, though officially free, actually are not. Often service recipients have to pay unofficially for these services.

However, significant poor-rich differences in use existed even for the free ICDDR,B services. Reasons for this appear likely to include indirect costs associated with use, for example, for transportation, referral, and lost time. Other factors also have to be considered: cultural barriers, lack of confidence in the health care system, ignorance, and distance to the EOC facility in rural areas. Quality of care, both perceived and technical, could be another issue, one gaining in importance among program managers and policy planners. All these barriers affect the poorer segment of the community more than the better-off.

Inequalities in caesarian sections appear particularly large. The World Health Organization and the United Nations Children's Fund have suggested that the population-based rate for caesarian section should lie between 5 percent and 15 percent of all births (Maine, McCarthy, and Ward 1992). Anything below 5 percent indicates that a substantial proportion of women do not have access to potentially life-saving surgical obstetric care and probably die as a result. By this indicator, the maternal health situation in Matlab is still poor, because the estimated overall C-section rate is only 1.7 percent, slightly above the national average of 1.6 percent (NIPORT 2001). The rich-poor disparity for C-sections was highest (9.6 percent) in the ICDDR, B service area, as expected, since the intervention is costly, and ICDDR, B does not provide it. Women requiring C-sections are referred to district-level facilities (public or private), which often charge far more than the poorer segments of the community can pay.

Role of Other Sociodemographic Factors

Distance. According to the study findings, services from peripheral-level subcenters are more equitably distributed (rich-poor ratio 1.9 and concentration index 0.13) than services from the centrally located Matlab Hospital (rich-poor ratio 3.7 and concentration index 0.25). Distance to nearest facility (subcenter) was also shown to curtail service use. Therefore, to ensure efficiency as well as equity, the decentralization of emergency obstetric care services, the approach chosen by the government of Bangladesh, should be strengthened.

Antenatal care. The low predictability of antenatal markers for adverse maternal outcomes has led some observers to rule out antenatal care as an efficient strategy in the fight against maternal and perinatal mortality. Few studies, however, have assessed the predictability of antenatal care screening for adverse maternal outcomes other than dystocia or perinatal death, and most of the studies have been hospital based (Vanneste et al. 2000). However, our study showed that the number of antenatal care visits is strongly

associated with utilization of other maternal health care services like skilled attendance at birth and post-natal care. Thus, antenatal care may not be an efficient strategy for identifying the women most in need of obstetric service delivery. If promoted in conjunction with effective emergency obstetric care, however, it may become an effective instrument for improving use of those services.

Mothers' education. The mother's education, even after controlling for the confounding effects of covariates, positively influences use of emergency obstetric services. To reduce maternal mortality, female education should therefore be strengthened.

Parity and maternal age. Parity and maternal age are mutually correlated, but parity affects utilization negatively and the mother's age affects it positively, after controlling for the effects of covariates in logistic regression. Higher parity mothers should therefore be targeted to improve indicator status for maternity services.

CONCLUSIONS

The higher and rising overall utilization rates of maternal health care services in Matlab, compared to other areas of Bangladesh and the persistent rich-poor gap, indicate that ICDDR,B interventions through a program approach, have managed to increase utilization but have not adequately addressed equity. Although maternity services are free in Matlab, inequality in utilization of EOC services is still unacceptably high. The reason may be that other indirect costs such as transportation cost, cost of referrals, and attendants' lost time might adversely affect utilization. Quality of care, both perceived and technical, is gaining in importance among program managers and policy planners. The literature suggests that other factors like cultural barriers, lack of confidence upon the health care system, and ignorance in rural areas need to be taken into account. All these barriers affect mostly the poorer segment of the community. As a result, the overall utilization of maternal health care is improving within ICDDR,B service area but the socioeconomic disparities in the use of the services persist. Study results suggest that providing free services does not ensure equity. To reduce maternal mortality rates to an acceptable level, we need to focus on programs that are efficient, and effective. But persistent inequity at an unacceptable level in this sector is a growing concern. Program managers and policy planners should make sure—at the project planning and implementation phases—that services are client focused and need based, of high quality and within the reach of the neediest. Other access barriers also need to be explored and addressed to make maternal health care services equitable, efficient, and effective.

APPENDIX A: ASSETS AND FACTOR SCORES

Table A.1 Assets and factor scores

<i>Asst variable</i>	<i>Unweighted</i>		<i>Asset factor score</i>	<i>Household asset score, if</i>	
	<i>Mean</i>	<i>Standard deviation</i>		<i>Has asset</i>	<i>Do not have</i>
Has khat	0.27	0.44	0.10	0.18	-0.06
Has quilt	0.65	0.48	0.11	0.09	-0.15
Has mattress	0.51	0.50	0.12	0.13	-0.12
Has lamp	0.87	0.33	0.06	0.02	-0.16
Has watch/clock	0.60	0.49	0.11	0.10	-0.12
Has chair/table	0.61	0.49	0.11	0.10	-0.13
Has wardrobe	0.37	0.48	0.09	0.12	-0.06
Has radio	0.48	0.50	0.11	0.12	0.10
Has TV	0.06	0.24	0.07	0.28	-0.02
Has bicycle	0.04	0.20	0.04	0.22	-0.01
Has boat	0.30	0.46	0.01	0.01	-0.01
Has cattle	0.34	0.48	0.04	0.06	-0.03
Has electricity	0.16	0.37	0.07	0.16	-0.03
Wall, solid	0.02	0.15	0.05	0.30	-0.01
Wall, tin	0.30	0.46	0.10	0.15	-0.06
Wall, tin & bamboo	0.13	0.34	0.02	0.04	-0.01
Wall, tin & others	0.06	0.24	-0.00	-0.01	0.00
Wall, bamboo	0.30	0.46	-0.05	-0.08	0.03
Wall, others	0.18	0.39	-0.08	-0.15	0.04
Roof, solid	0.01	0.07	0.02	0.33	0.00
Roof, tin	0.96	0.21	0.04	0.01	-0.18
Roof, tin & bamboo	0.00	0.04	-0.00	-0.07	0.00
Roof, tin & others	0.01	0.07	-0.02	-0.23	0.00
Roof, bamboo	0.00	0.05	-0.01	-0.20	0.00
Roof, others	0.03	0.17	-0.05	-0.25	0.01
If females use septic tank	0.05	0.21	0.05	0.23	-0.01
If females use water-seal latrine	0.19	0.39	0.07	0.14	-0.03
If females use open latrine (solid/tin)	0.15	0.36	0.04	0.08	-0.01
If females use open latrine	0.60	0.49	-0.09	-0.07	0.12
If female use open place	0.00	0.06	-0.01	-0.09	0.00
If female use other latrine	0.01	0.10	-0.01	-0.09	0.00
If female use no latrine	0.00	0.06	-0.01	-0.13	0.00
If drink tube well water	0.96	0.20	0.03	0.01	-0.01
If drink tank water	0.01	0.11	-0.01	-0.10	0.00
If drink river water	0.02	0.15	-0.03	-0.16	0.00
If drink canal water	0.00	0.06	-0.01	-0.16	0.00
If drink from other sources	0.00	0.03	-0.00	-0.03	0.00
Total land possessed by HH in decimals	85.23	177.40	0.07	--	--
Total floor space in sq. feet	309.86	199.60	0.11	--	--

Source: Socioeconomic Census 1996

Table A.2 Cut-off points for wealth quintiles

<i>Wealth quintiles</i>	<i>Asset index value</i>	
	<i>Lowest</i>	<i>Highest</i>
Most poor quintile	Lowest	-. 92556267
2 nd quintile	-.92556268	-.32050018
3 rd quintile	-.32050019	.362016503
4 th quintile	.36201650	1.0477274
Least poor quintiles	1.0477275	Highest

APPENDIX B. DELIVERY, ANTENATAL AND POST-NATAL CARE

<i>Background characteristic</i>	<i>Delivery by skilled attendant (at home or at facility)(%)</i>	<i>Received at least one antenatal care visit(%)</i>	<i>Received post-natal care (%)</i>	<i>Population-based caesarian section (%)</i>	<i>Total number of births (N)</i>
Education of mother					
No formal education	21.0	80.6	48.7	1.3	6718
1-4 years of education	21.6	83.7	52.6	1.0	1548
5-9 years of education	27.4	85.3	53.0	1.2	2472
10 years + of education	49.9	86.0	55.6	4.8	1342
Total	25.6	82.6	50.9	1.7	12,080
Religion of mother					
Muslim	24.2	82.7	52.4	1.4	9989
Hindu and others	29.7	82.4	42.1	2.4	1655
Total	24.9	82.6	50.9	1.6	11644
Year of delivery					
1997	22.0	81.0	52.5	1.5	1661
1998	20.8	75.9	47.8	1.4	2680
1999	26.3	83.7	50.7	1.3	2444
2000	28.0	84.7	53.1	1.4	2533
2001	29.5	87.1	51.1	2.6	2762
Total	25.6	82.6	50.9	1.7	12,080
Distance to subcenter					
<= 1 km	41.0	91.0	69.6	1.8	1685
1.1-2 km	23.0	84.8	56.6	1.3	4282
2.1-3 km	24.3	78.8	44.7	2.1	4624
3.1-4 km	22.0	77.6	38.9	1.3	1072
>=4 km	12.3	81.1	15.5	0.7	413
Total	25.6	82.6	50.9	1.7	12,076
Birth order					
1 st birth	35.3	85.3	54.4	2.3	3428
2 nd birth	25.4	84.0	52.3	1.9	3051
3 rd birth	21.0	84.6	50.3	1.3	2435
4 th birth	20.7	80.8	49.7	1.2	1488
5+ births	17.0	73.5	43.2	0.8	1651
Total	25.6	82.7	50.9	1.7	12,053
No. of antenatal care visits					
No visit	9.2	00.0	24.9	0.8	2104
One visit	17.0	100.0	42.7	1.0	4294
Two visits	30.7	100.0	61.1	1.2	3297
Three visits	42.5	100.0	71.1	3.3	1599
Four or more visits	60.3	100.0	80.9	6.4	786
Total	25.6	82.6	50.9	1.7	12,080
Age at birth of child					
10-19	29.8	84.0	51.4	1.1	1442
20-34	25.3	83.1	51.1	1.7	9485
35+	22.4	76.4	48.1	1.6	1153
Total	25.6	82.6	50.9	1.7	12080

Note: Percent distribution of mothers by presence of skilled birth attendant at delivery, antenatal care and post-natal care uptake and caesarean sections undertaken, by background characteristics. *Source:* Pictorial cards, 1997–2000.

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