

Effectiveness of an NGO primary health care programme in rural Bangladesh: evidence from the management information system

ALEC MERCER,¹ MOBARAK HOSSAIN KHAN,² MUHAMMAD DAULATUZZAMAN² AND JOANNA REID²

¹Centre for Health and Population Research, ICDDR,B, Dhaka, Bangladesh and ²Bangladesh Population and Health Consortium, Dhaka, Bangladesh

This paper considers evidence of the effectiveness of a non-governmental organization (NGO) primary health care programme in rural Bangladesh. It is based on data from the programme's management information system reported by 27 partner NGOs from 1996–2002. The data indicate relatively high coverage has been achieved for reproductive and child health services, as well as lower infant and child mortality. On the basis of a crude indicator of socio-economic status, the programme is poverty-focused. There is good service coverage among the poorest one-third and others, and the infant and child mortality differential has been eliminated over recent years. A rapid decline in infant mortality among the poorest from 1999–2002 reflects a reduction in neonatal mortality of about 50%. Allowing for some under-reporting and possible misclassification of deaths to the stillbirths category, neonatal mortality is relatively low in the NGO areas. The lower child and maternal mortality for the NGO areas combined, compared with estimates for Bangladesh in recent years, may at least in part be due to high coverage of reproductive and child health services. Other development programmes implemented by many of the NGOs could also have contributed. Despite the limited resources available, and the lower infant and child mortality already achieved, there appears to be scope for further prevention of deaths, particularly those due to birth asphyxia, acute respiratory infection, diarrhoeal disease and accidents. Maternal mortality in the NGO areas was lower in 2000–02 than the most recent estimate for Bangladesh. Further reduction is likely to depend on improved access to qualified community midwives and essential obstetric care at government referral facilities.

Key words: primary health care, effectiveness, NGO, Bangladesh, management information system, coverage, mortality, neonatal, infant, child, maternal

Introduction

In many low-income countries, non-governmental organizations (NGOs) deliver basic health services in particular areas or among certain populations. Their effectiveness in establishing sustainable primary health care (PHC) systems has been linked with promotion of community participation, having close links with the poor, being flexible and having committed staff (Gellert 1996). The comparative advantage of NGOs might be assessed in terms of efficiency, innovation, quality of services, ability to mobilize resources, contribution to the sustainability of the local health system and coverage of grass-roots communities (Gilson et al. 1994; Matthias and Green 1994; Stefanini 1995). However, the need for reliable evidence on the impact and effectiveness of NGO PHC provision has long been recognized (Edwards and Hulme 1995). This paper examines evidence of the effectiveness of a large, well-established programme in providing reproductive and child health services to the poor through small and medium-sized NGOs in rural Bangladesh.

NGOs play a significant role in PHC provision in rural Bangladesh, and they provide most of these services in urban areas. Several hundred indigenous NGOs have been active in health and development since the country's independence

in 1971. Government–NGO collaboration increased in the 1970s and 1980s on national programmes such as tuberculosis, leprosy, immunization, family planning and nutrition. However, for political reasons, and possibly competition for international donor funds, relations have undergone difficult phases (Edwards and Hulme 1995). In the 1990s, international development agencies questioned the transparency of the financial monitoring systems, accountability and integrity of successive governments in Bangladesh (Buse 1999), and have increasingly channelled funds to NGOs for health and development activities. However, at the end of the 1990s some major donors made greater financial commitments to the government to support health reforms and a sector-wide approach.

Under the Government of Bangladesh's 5-year Health and Population Sector Programme (HPSP) (which began in July 1998), the overall objective was to improve the health and population status of the least advantaged, particularly women, children and the poor. This was to be achieved through concentration of resources on client-centred provision of an Essential Services Package (ESP), consisting of reproductive and child health services, communicable disease control, limited curative care, and behaviour change communication (MOHFW 1998). The government recognized that this would require an effective sector-wide

partnership with NGOs, yet no clearly defined framework for collaboration has been developed (MOHFW 1998).

Background to the NGO programme

An agency for funding small and medium-sized, local-level NGOs to deliver maternal and child health (MCH) and family planning services in rural areas was established by the British Overseas Development Administration (ODA) in 1988, under an agreement with the Government of Bangladesh. The agency became known as the Bangladesh Population and Health Consortium (BPHC). Initially, the main objectives were to fund NGOs and develop their capacity for managing health programmes, with the aim of improving MCH outcomes. Since 1988, BPHC has supported over 100 NGOs to provide doorstep and clinic services, and promote use of higher level services provided either by the NGO or by government at upazila level (sub-district).

From 1993–97, BPHC supported NGOs with funds provided by a consortium of international development agencies. From 1998–2003, the UK Department for International Development (DFID) funded BPHC to develop government–NGO collaboration in the sector and deliver ESP services through partner NGOs in a Public–NGO Partnership (PNP). This was to be an integral part of the sectoral programme, jointly managed by DFID and the Line Director for ESP-Reproductive Health in the Ministry of Health and Family Welfare (MOHFW). BPHC consists of a team of Bangladeshi staff led by an expatriate Technical Cooperation Officer employed by DFID.

In the PNP phase, BPHC invited NGOs, including previous partners, to bid for funds to deliver ESP services in areas agreed upon with the government health managers. The MOHFW Line Director was informed of the procedures and arrangements for a transparent selection process, which was implemented by BPHC in 2000. This included visits and interviews with NGO managers, separate financial and technical proposals, and assessment and scoring of these by BPHC and external reviewers. The process resulted in the selection of 28 NGOs, 27 of which provided basic reproductive and child health services from January 2001 to June 2003 (funding now extended to December 2004). The emphasis was on BPHC supporting the NGOs to provide an expanded range of services consistent with the government ESP, developing government–NGO collaboration and demonstrating the impact of NGO service delivery. In this paper, we focus on the latter and report on evidence of coverage of reproductive and child health services, access for the poor and health outcomes.

Methods

NGO service delivery structure

BPHC does not impose a fixed model for local-level service delivery and has encouraged its partners to develop approaches to service delivery appropriate for their local context. Nevertheless, there are broad similarities, not least because NGOs are required to provide basically the same

package of services and collaborate with the government's local service delivery structure. To be contracted, NGOs had to have an agreement with the government's Upazila Health and Family Planning Officer (UHFPO) to provide ESP services in certain areas. These have no government female community health workers (Family Welfare Assistants – FWAs), although in some areas a government male community health worker (Health Assistant) works alongside the NGO fieldworkers. In many cases the NGO has been the main provider of services in the areas for some years, in agreement with the government.

At the community level, the NGOs employ female Family Health Visitors (FHV) who conduct visits to an allocated number of households (700–800) every 1–2 months. The FHV is responsible for basic health and family planning counselling, doorstep delivery of contraceptives (oral pills and condoms) and oral rehydration salts, and mobilization of women to use satellite clinics and higher level facilities. Some NGOs conduct these activities through meetings with groups of women. Satellite clinics are conducted by a paramedic at fixed sites, usually someone's house. The NGOs recruit government-trained paramedics (medical assistants or diploma nurses), who are provided with special training in reproductive and child health services by BPHC. Each paramedic is responsible for organizing about 18 satellite clinics each month in different locations. The main services provided are basic curative care, family planning (including injectable contraceptives), antenatal care (ANC) and postnatal care (PNC). Seventeen of the current partner NGOs also run a static clinic at union level (population about 25 000), otherwise women and children are referred to the government Upazila Health Complex. Under the sectoral programme (HPSP), the government built over 10 000 community clinics, which were to be the lowest level facility serving a population of about 6000. Most buildings were handed over to the local health managers for service provision in 2001–02, some in unions where NGOs were providing satellite clinic services. However, only about half the clinics provided any services in these years and continuous service delivery according to the planned schedule was not provided in many areas. The future of these facilities is uncertain under the next sectoral programme, although some BPHC partners are involved in a pilot of NGOs running them.

BPHC Management Information System

BPHC has been developing its management information system (MIS) for monitoring NGO activities since 1989. Each NGO was required to collect data on MCH and family planning, and field workers update a list of all married couples eligible for services on each household visit. The FHV's keep a register for their allocated households and record all the information that the equivalent government community health worker (FWA) is expected to collect, together with additional information for BPHC monitoring and programme purposes. The register is updated on her routine visits to a household every 1–2 months. It contains a record of the FHV's daily activities, basic demographic information about each household member, an immunization record for each child, a list of all married women of

reproductive age (15–49 years), a separate section on pregnant women and deliveries, use of ANC, PNC, tetanus toxoid vaccination, use of contraception and source of family planning, a record of users of injectables and oral contraceptives distributed by the FHV, reproductive tract infections and sexually transmitted diseases, births and deaths. The FHV reports on the data at monthly health meetings of the NGO and on visits by her Field Supervisor, who compiles the information into a quarterly report.

Each paramedic maintains a register on use of ANC, PNC and injectable contraceptives based on information from the FHV registers. She maintains a second register of patients attending her satellite clinic sessions. This contains information on the household identification number, name of attendee, village, sex, age, socio-economic status and service received. Services include family planning, immunization, tetanus toxoid vaccination, ANC, PNC and basic curative care, for which the diagnosis is also recorded. The socio-economic status of the patient's household is recorded, based on four categories (A–D) of annual per capita household expenditure reported in surveys conducted by the NGOs in 1999: (A) under Tk5000; (B) Tk5000–7999; (C) Tk8000–9999, and (D) Tk10 000 or more per year (US\$1 = approximately Tk58).

A fourth register is used to record information on community group meetings, satellite clinic meetings and health education sessions. On the basis of the four registers, data are compiled by each NGO into a monthly report, which is submitted to the government (UHFPO). NGOs submit a quarterly report to BPHC on a standardized reporting form. Data are entered into a central database, which was established when the MIS was revised in 1999. This has produced standardized quarterly reports summarizing the main performance indicators for the whole NGO programme. The reports are used by BPHC for programme monitoring and are submitted to DFID and the MOHFW. Quality of service provision is maintained through the BPHC Quality of Care Manual used by the NGOs, qualified NGO staff conducting clinical supervision of health workers, joint monitoring visits by NGOs and local government health service managers, and quarterly programme visits by BPHC.

Data quality control

As a result of external reviews, the BPHC MIS has undergone two major revisions, in 1991 and 1999. In 1991, an External Support Group¹ for BPHC reviewed the MIS, which was subsequently revised. A further independent review was commissioned from two consulting agencies in 1997–98 to validate data recorded by nine randomly selected partner NGOs (eight in rural areas). A census was conducted in each of the areas, which indicated that registration of married couples was reasonably complete in the rural areas (36 349 registered vs. 37 104 census). Interviews were conducted on sub-samples of married women of reproductive age and data were cross-checked with the NGO registers.

Although the review did not produce revised estimates of

coverage, the data indicate the level of under- and over-recording of service users for the eight rural NGOs combined. There was net over-recording of family planning users of 10.7% compared with the number of users found in the survey (2908/2627); over-recording of PNC check up of 1.4% (750/740); and under-recording of two ANC check-ups of 17.7% (1097/1333). However, there was net under-recording of deliveries occurring in the previous 2 years of 23.9% (1666/2188), which would have inflated estimates of ANC and PNC coverage. The number of children aged 12–23 months vaccinated against measles was under-recorded by 18.5% (876/1075). Births in the previous 2 years were under-recorded by 28.3% (1520/2119); and deaths among children aged 0–4 years in the previous 12 months were also under-recorded, by 29.7% (26/37; data for five NGOs only).

Following this data review in 1997–98, which included many other checks on recording and reporting of data, several recommendations for improving the MIS were implemented. BPHC provided MIS training for its NGOs, developed their capacity for data collection and analysis, and emphasized the importance of accurate and complete recording. Programme staff routinely check registers on quarterly monitoring visits to NGOs and validate a sample of data through household visits. In 2002, BPHC also introduced a data quality control process under which NGOs validate each other's MIS data using a systematic assessment protocol. NGO managers (27) participated in an exercise to validate MIS data from nine NGOs through a review of FHV registers and household surveys. Bearing in mind this was an internal review, based on smaller samples and different NGO areas from those reviewed in 1997–98, the results indicated a much lower level of recording error.

Health indicators

During the recent phase of NGO funding (2001–2003), it was decided to conduct further analysis on the quarterly data to monitor changes in service coverage and health outcome indicators more systematically. The MIS data are not client-linked, so service coverage is estimated on the basis of a ratio: users to eligible population, reported each quarter by FHV. Estimates of coverage presented here are based on the number of users in the year and an average of the eligible population reported each quarter. In view of the difficulty of interpreting trends in coverage because of improvements in the completeness of recording of numerators and denominators, we focus here on coverage in 2002, the most recent year.

The indicators of service coverage presented are: three or more ANC visits;² deliveries attended by a qualified person;³ second or booster tetanus toxoid vaccination for pregnant women; at least one PNC check-up (within 42 days of delivery); measles vaccination status of children aged 12–23 months; treatment of reported cases of acute respiratory infection (ARI) among children under 5 years;⁴ and use of modern contraception (by method). The MIS reports on the contraceptive acceptance ratio, which was found to be higher than the contraceptive prevalence rate by a factor of 1.034 in the 1997–98 data review (BPHC 1999).⁵

Indicators of health outcome are estimates of neonatal (0–28 days), post-neonatal (29–364 days) and child (1–4 years) mortality per 1000 live births, based on ratios of the number of deaths in a year \times 1000 to the number of live births in the year. To provide a longer perspective on trends in mortality, a subset of data was created for 12 NGOs that had worked in the same areas since at least 1996. Ratios have been calculated as estimates of mortality for 1996 using data available for that year from the previous MIS, while estimates of mortality for the period 1999–2002 for these NGO areas are based on data from the current MIS.⁶ The indicator of maternal mortality used by BPHC is the maternal mortality ratio (maternal deaths in a year \times 100 000 to live births in the year). As the number of maternal deaths is small and annual fluctuations preclude an assessment of trend, the maternal mortality ratio for the period 2000–02 is presented. The BPHC Quality of Care Manual provides guidelines for the NGOs on conduct of verbal autopsy and classification of maternal deaths (pregnancy-related deaths during the pregnancy or within 42 days of delivery). Since 2002, the Field Supervisors have completed a standardized verbal autopsy form for each maternal and child (0–4 years) death reported by FHV. Some results of a systematic check on the forms for January–March 2003 by a BPHC medical doctor are presented.

In this paper we report on the indicators of service coverage and mortality for all 27 NGOs combined in 2002, and indicators of mortality for 12 NGOs for 1996–2002. All these indicators are based on the registers updated through household visits by FHVs. All the indicators after 1999 have been disaggregated into ‘poorest’ (category A households) and ‘others’, on the basis of the crude indicator of socio-economic status from the household surveys (reported annual per capita household expenditure). In order to assess the performance of the NGO programme, we compare the selected health indicators with the latest estimates for Bangladesh. Most service coverage estimates are for rural Bangladesh for 1999–2000 from the Demographic and Health Survey (BDHS 2001). PNC and ANC coverage estimates are for Bangladesh as a whole for 2001 from the Bangladesh Maternal Health Services and Maternal Mortality Survey (NIPORT 2002). National coverage estimates are shown with 95% confidence intervals, while coverage in BPHC areas is based on data for the total eligible population, so there is no sampling error. Estimates of child (1–4 years) mortality for the whole of Bangladesh presented for comparison are age-specific probabilities of dying relating to a 5-year period prior to the BDHS survey (1995–99). Published estimates for rural areas separately have not been shown as they relate to a 10-year period (1990–99). However, they indicate that child mortality in the rural areas was slightly higher than for the country as a whole (BDHS 2001). The estimate of maternal mortality ratio for Bangladesh taken from the recent national survey relates to deaths in the period 1998–2001 (NIPORT 2002).

Results

Following the bidding and selection process, contracts were signed in the first quarter of 2001 between BPHC and 28

NGOs for provision of ESP services. Twenty-seven of these NGOs provided services throughout the period 2001–2002 in 254 unions in 37 upazilas spread throughout Bangladesh. All households in the NGO areas (about 340 000 with a population of about 2 million) were visited every 1–2 months by a FHV. In 2001, there were about 0.9 million service contacts for clinical, immunization, reproductive health and health education services, and about 1.1 million in 2002. There were on average 327 948 married women of reproductive age (15–49 years) registered at any one time and receiving at least a household visit. Of these, 112 471 (34.3%) were in the ‘poorest’ category (A) on the basis of reported annual per capita household expenditure.

The 12 areas where the NGOs have provided services since at least 1996 are in 85 unions in 14 upazilas in different parts of Bangladesh. There were about 105 000 households with on average 95 906 married women of reproductive age registered at any one time in 2002, of which 34 814 (36.3%) were in the ‘poorest’ category. No comparable national data on household expenditure are available. However, the poorest category is roughly comparable with the ‘extremely poor’ category (annual per capita income of <Tk4877) identified in a national survey of health service use in 2000, which contained 28% of the 25 000 households surveyed (CIET 2001).

Coverage of reproductive health services

The coverage of the poorest and other women with selected services in all 27 NGO areas in 2002 is shown in Table 1. Generally, coverage was only slightly lower for women from the poorest households. Coverage, even among the poorest, was higher than the latest estimates for rural Bangladesh (1999–2000) for pregnant women having at least two tetanus toxoid vaccinations (89.7 vs. 61.8%) and a qualified attendant at delivery (12.4 vs. 8.6%). Coverage was much higher than the latest estimates for Bangladesh as a whole in 2001 for three ANC visits (73.2 vs. 17.3%) and at least one PNC check-up (72.8 vs. 16.1%).

The contraceptive acceptance ratio for modern methods in the 27 NGO areas in 2002 was 58.1% for the poorest and 60.9% for other married couples. Applying the conversion factor (1.034), overall contraceptive prevalence was 57.9%. Even allowing for the 1997–98 level of over-recording of contraceptive use (10.7%), the contraceptive prevalence rate is considerably higher than the BDHS estimate of 43.4% for rural Bangladesh in 1999–2000 (Table 1). Data in Table 2 show there was little difference in the methods used by the poorest and other married couples in BPHC areas, although the poorest women were slightly more likely to be using longer-term methods such as injections, Norplant and tubectomy. Husbands of the poorest women were also more likely than others to have had a vasectomy, although rates were very low.

Coverage of child health services

Table 1 shows that coverage of selected child health services was very similar for the poorest and others in the 27 BPHC areas in 2002: 76.1 and 79.1%, respectively, for measles

Table 1. Coverage of eligible populations with selected services and mortality in 27 NGO areas in Bangladesh in 2002, compared with the most recent national estimates

Health indicators	27 BPHC NGO areas			Bangladesh (BDHS 2001) ^a (BMHSMS 2001) ^b Total
	Poorest	Others	Total	
Service coverage (%)	(2002)	(2002)	(2002)	(1999–2000)
Eligible women				
3 ANC check-ups	69.4	75.5	73.2	17.3 (17.1–17.5) ^b
Qualified attendant	9.2	14.4	12.4	8.6 (8.4–8.8) ^a
2 TT vaccinations	85.7	92.0	89.7	61.8 (61.1–62.5) ^a
1 PNC check-up	70.2	74.4	72.8	16.1 (15.7–16.5) ^b
Modern contraception ^c	56.2	58.9	57.9	43.4 (42.9–43.9) ^a
Eligible children				
Measles vaccination (12–23 months)	76.1	79.4	78.2	68.9 (67.5–70.3) ^a
ARI treated (0–4 years)	90.2	88.4	89.2	27.2 (24.7–29.7) ^a
Deaths per 1000 live births^d	(2002)	(2002)	(2002)	(1995–99)
Neonatal mortality	21.1	20.6	20.8	42.0 (37.3–46.7) ^e
Post-neonatal mortality	13.5	10.8	11.8	24.3 (20.7–27.9) ^e
Infant mortality	34.6	31.4	32.5	66.3 (60.5–72.1) ^e
Child (1–4 years) mortality	11.0	8.8	9.6	29.7 (25.7–33.7) ^e
<i>(Number of live births)</i>	<i>(12 699)</i>	<i>(22 722)</i>	<i>(35 421)</i>	<i>(6 971)</i>
Deaths per 100 000 live births	(2000–02)	(2000–02)	(2000–02)	(1998–01)
Maternal mortality ratio ^f	238	183	203	377 (314–440) ^g
<i>(Number of live births)</i>	<i>(36 968)</i>	<i>(67 205)</i>	<i>(104 173)</i>	<i>(39 525)</i>

^a These estimates of coverage are for rural areas of Bangladesh for 1999–2000 from the latest Demographic and Health Survey (BDHS 2001). Figures in parentheses are 95% confidence intervals, calculated on the basis of the reported sample sizes.

^b These estimates are for Bangladesh as a whole for 2001 from the Bangladesh Maternal Health Services and Maternal Mortality Survey (BMHSMS) (NIPORT 2002).

^c The contraceptive acceptance ratios for BPHC areas have been converted to contraceptive prevalence rates by dividing by the conversion factor of 1.034 found in the data validation survey of 1997–98 (BPHC 1999).

^d These are estimates of mortality based on the ratios of deaths in the year/1000s of live births in the year.

^e The child mortality estimates for Bangladesh from the BDHS are probabilities of dying (${}_4q_1$) relating to a 5-year period before the survey (1995–99). They are, therefore, more recent than the estimates published for rural areas separately, which relate to the period 1990–99. The latter indicate that child mortality in the rural areas is slightly higher than for the country as a whole.

^f The maternal mortality ratio for the BPHC areas is for the 3-year period 2000–02, since the number of annual deaths is subject to fluctuation (211 maternal deaths in 2000–02).

^g This estimate is for Bangladesh as a whole from the BMHSMS, based on cause identified at the time of death in the period 1998–2001. The 95% confidence limits are shown in parentheses.

vaccination; and 90.2 and 88.4% for treatment of ARI cases. Table 3 shows there was little difference in coverage for girls and boys, either among the poorest or others. Treatment coverage for reported ARI cases among children under 5 years was much higher for the BPHC areas than for rural Bangladesh in 1999–2000 (89.2 vs. 27.2%), and measles vaccination coverage was also higher (78.2 vs. 68.9%), allowing for 95% confidence intervals (Table 1).

Infant, child and maternal mortality

Data from the previous MIS provide an estimate of neonatal mortality in 1996 of 39.0 per 1000 live births in the 12 areas with long-term NGO service provision. This was about the same as the BDHS estimate of neonatal mortality of 42.0 per 1000 live births for Bangladesh for 1995–99. Figure 1 shows that in the 12 NGO areas, neonatal mortality declined consistently in the period 1999–2002, from 36.8 to 15.1 per 1000 live births among the poorest and from 30.6 to 16.5 per 1000 among other children.

Post-neonatal mortality in the 12 NGO areas was 25.3 per 1000 live births in 1996, about the same as the estimate of 24.3 per 1000 for Bangladesh for 1995–99. However, in these NGO areas, post-neonatal mortality among the poorest had declined to 16.0 per 1000 by 1999, and it declined further to 13.2 per 1000 by 2002. Post-neonatal mortality among other children remained around 11–12 per 1000 in the period 1999–2002.

Infant mortality in the 12 NGO areas was 64.3 per 1000 live births in 1996, about the same as the BDHS estimate of 66.3 per 1000 live births for Bangladesh for 1995–99. Between 1999–2002, infant mortality declined consistently in these NGO areas, from 52.8 to 28.3 per 1000 among the poorest, and from 41.6 to 28.2 per 1000 among other children, largely due to the decline in neonatal mortality.

Child (1–4 years) mortality was 22.4 per 1000 live births in the 12 NGO areas in 1996, compared with 29.7 per 1000 for Bangladesh in the period 1995–99. Figure 1 shows that child

Table 2. Estimated contraceptive prevalence rate^a for modern methods among married women of reproductive age in 27 NGO areas in Bangladesh in 2002

Method	% of women using		
	Poorest	Others	Total
Pill	30.0	34.0	32.7
Injections	13.6	11.9	12.5
Condom	3.3	5.4	4.7
Tubectomy	5.4	4.7	4.9
IUD	1.3	1.1	1.2
Norplant	1.6	0.9	1.2
Vasectomy	1.1	0.7	0.8
All methods ^b	56.2	58.9	57.9

^a The CPR is based on the contraceptive acceptance ratios divided by the conversion factor of 1.034 found in the validation survey of 1998.

^b The totals a slightly different from the sum of the component methods because of rounding.

Table 3. Selected health indicators for girls and boys (0–4 years) in 27 NGO areas in Bangladesh in 2002

Child health indicators	Girls	Boys
Percentage service coverage		
Measles vaccination		
Poorest	74.6	77.7
Others	80.3	78.7
Total	78.1	78.4
ARI treatment		
Poorest	89.7	90.6
Others	86.8	89.9
Total	88.1	90.2
Deaths per 1000 live births^a		
Neonatal mortality	19.4	22.0
Post-neonatal mortality	11.7	11.9
Child (1–4 years) mortality	9.5	9.7

^a These are estimates of mortality based on ratios of deaths in the year/1000s of live births in the year.

mortality in these NGO areas had declined to 12.7 per 1000 by 2000, and it declined even further among the poorest between 2000 and 2002, from 15.8 to 9.7 per 1000. By 2002, child mortality among the poorest children was much the same as child mortality among other children, which had levelled off at about 9–10 per 1000.

Among individual NGOs, there was considerable variation in infant and child (1–4 years) mortality. Bearing in mind that numbers of deaths are small and subject to annual fluctuation, infant and child mortality in 2002 for each of the 12 areas with long-term NGO service provision were below the latest estimates for Bangladesh. Neonatal mortality in 2002 for these 12 NGO areas combined was also considerably below that for the other 15 NGO areas (15.9 vs. 23.0 per 1000 live births).

For all 27 NGOs, neonatal mortality among boys was slightly

higher than among girls in 2002, while post-neonatal and child (1–4 years) mortality were about the same for girls and boys (Table 3). Annual deaths are subject to fluctuation, but the relative mortality per 1000 live births for girls and boys showed little evidence of gender inequity in the 12 NGO areas for the 4-year period 1999–2002 as a whole: 1.10 for neonatal mortality, 1.07 for post-neonatal mortality, and 0.93 for child (1–4 years) mortality.

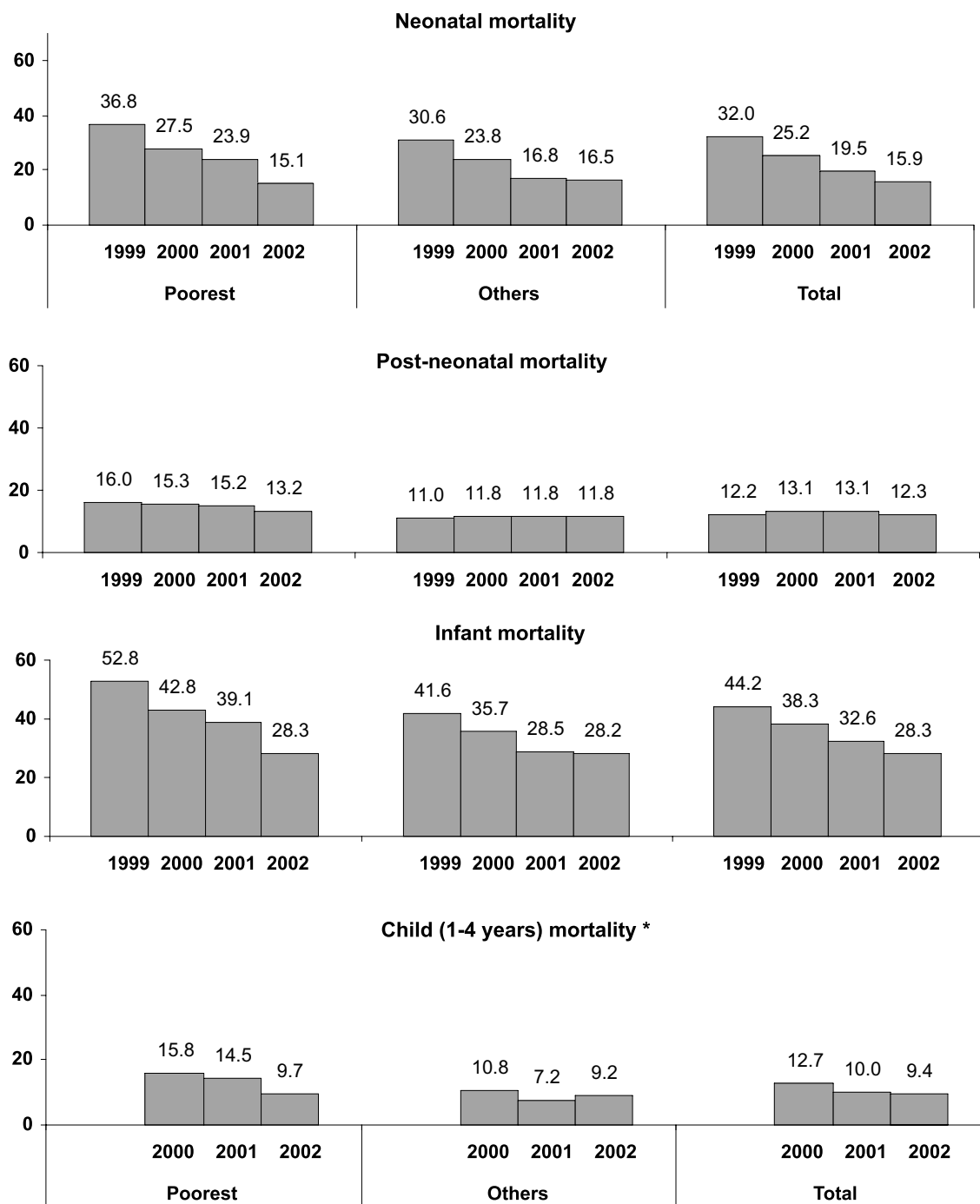
The maternal mortality ratio in the 27 NGO areas was 238 per 100 000 live births among the poorest women in 2000–2002, and 183 per 100 000 among other women. These ratios are well below the latest estimate of 377 per 100 000 for Bangladesh for 1998–2001, and below the lowest 95% confidence limit of 314 per 100 000 (Table 1).

Discussion

The MIS indicates high coverage of reproductive and child health services in the NGO areas. Together with evidence of relatively low maternal and child (0–4 years) mortality, which declined from much higher levels in 1996, this suggests an effective service delivery programme. However, several factors need to be taken into consideration before any conclusions can be drawn. It could be argued that the evidence from the MIS indicates that the NGO areas already had relatively low child mortality at the start of the period 1999–2002, compared with Bangladesh as a whole. However, the data from the previous MIS for 12 NGOs with long-term service provision indicate that infant and child mortality was much higher in 1996, when it was similar to that for Bangladesh for 1995–99 (BDHS 2001). Since then, neonatal, post-neonatal and child (1–4 years) mortality have all declined considerably. The range and quality of services the NGOs could provide has been improved through intensive technical support and supervision by BPHC, and their selection for further funding in 2001 was based in part on an assessment of capacity for service delivery.

Changes in the quality of MIS data

Clearly, errors in the data and changes in the completeness of recording over time have to be taken into account. The indicators of effectiveness of service provision are based on programme statistics, which are subject to recording and reporting errors by NGO staff, who could also deliberately manipulate the data to enhance perceived performance. However, the efforts made by BPHC to improve data recording and reporting, and the checks on data introduced, make it unlikely that this is now a major problem. A further consideration is that some households in the NGO areas may not have been registered, and these could be extremely poor, with low service coverage and higher maternal and child (0–4 years) mortality. However, the household census in 1997–98 found that NGO registration of households was reasonably complete (98%). Some women and children from outside the allocated areas may receive services from the NGOs, but coverage estimates are based on data collected by FHVVs at household level. The surveys in 1997–98 indicated that the highest level of over-recording of service users by the FHVVs was 10.7% (for family planning), and the internal data review



(* An estimate of child mortality is not available for 1999 due to a change in the method of recording)

Figure 1. Estimates of infant and child mortality per 1000 live births in 12 NGO areas in Bangladesh: 1999–2002

in 2002 suggested that accuracy of recording had improved since then.

The effect of improved recording on the trend in mortality depends on the relative improvement in recording of deaths and births. The annual number of births registered increased considerably in 1999 when efforts were made to overcome

the under-recording of births found in 1997–98 (28.3%). However, the annual number of births recorded in the 12 NGO areas remained around 11 000 over the next 3 years. This suggests that the decline in mortality in the period 1999–2002 is unlikely to be due to an increase in birth registration. Furthermore, if there had been an improvement in completeness of birth recording after 1999, it would have

affected both post-neonatal and neonatal mortality. Post-neonatal mortality declined very little from 1999–2002, in contrast with the continuing decline in neonatal mortality. However, it is possible that neonatal deaths are under-recorded in these NGO areas, despite efforts by BPHC to improve the accuracy and completeness of recording. There could have been some mis-classification of neonatal deaths to the stillbirths category, and a change in practice would affect trends. Even so, this could not explain all the decline in neonatal mortality, as the combined mortality from stillbirths and neonatal deaths declined from 55.5 per 1000 live births in 1999 to 50.5 per 1000 in 2002. For the whole period 1999–2002, there were 28.3 stillbirths per 1000 live births, about the same as the latest estimate for Bangladesh of 29.0 per 1000 for 1995–1999 from the Demographic and Health Survey.

Health services and improved child survival

A further important consideration is the extent to which relatively low child mortality might be causally linked with coverage of reproductive and child health services. At the beginning of the 1990s, a review of studies of the effectiveness of PHC activities in Bangladesh concluded that improvements in child survival could be achieved through relatively simple and cost-effective health interventions (Henry et al. 1990). Many of these have been promoted by BPHC, including oral rehydration therapy (ORT), breastfeeding and immunization, particularly against measles and tetanus toxoid. However, there is a multi-causal nexus of determinants of child survival, including both preventive and curative health services, demographic, socio-economic and educational factors (Mosley and Chen 1984).

Several studies in Bangladesh have identified factors associated with infant and child mortality. Proximate determinants such as low birthweight, prematurity, ARI, diarrhoeal diseases and malnutrition are linked with broader social and economic conditions that can affect health status independently of access to health services (Bhuiya et al. 1989; Koenig et al. 1991). Socio-economic status, current working status, years of schooling of both mothers and fathers, birth order, survival of the previous child and mother's age have been found to be significantly associated with child survival (Bhuiya and Streatfield 1992; Majumder and Islam 1993; Majumder et al. 1997). The different behavioural pathways through which educational and socio-economic factors can affect child survival include greater protection against infection, improved hygiene, reduced susceptibility to infection, reduced risk of accidents through better supervision, better nutrition, immunization and enhanced recovery through health care (Mosley and Chen 1984; Cleland and van Ginneken 1988). A study of the introduction of home and clinic-based MCH services in Matlab found that years of schooling of mothers had more effect on child survival where the more intensive services were available, and female community health workers conducting home visits empowered women to seek services (Muhuri 1995).

Household visits by FHV's play an important part in both curative and preventive child health services in the BPHC

areas. The case management strategies used by BPHC NGOs include ORT and a simple diagnostic algorithm for ARI, both of which have been found to be effective in reducing child mortality in other countries (Mulholland et al. 1992). As the estimates of post-neonatal and child (1–4 years) mortality have levelled off, it might be supposed that mortality has been reduced as far as possible with the existing services. However, a review of verbal autopsies for January–March 2003 showed that about half of the 99 deaths among children aged 1–4 years were attributed to ARI (30.3%) and diarrhoeal disease (21.2%), and many of these may have been preventable. It will be important to ascertain in future whether deaths attributed to these diseases are among children who have not received treatment. Further reduction in child mortality could also come through prevention of accidents, including drowning, which is now the biggest cause of death among children aged 1–4 years in Matlab (Ahmed MK et al. 1999; ICDDR,B 2002).

Poverty, equity and improved child survival

Although NGO health services and high coverage are likely to have played a significant part in the lower infant and child mortality in BPHC areas, the impact may have been enhanced by NGO development activities. Women participating in rural credit programmes in Bangladesh have benefited from increased physical mobility, economic security and freedom to seek services independently (Schuler and Hashemi 1994). Participation is associated with increased demand for health care and with seeking curative care for a sick child (Nanda 1999; Levin et al. 2001). Implementation of a woman-focused development programme in Matlab resulted in a substantial reduction in child mortality (Bhuiya and Chowdhury 2002). Even with relatively small NGO credit programmes, participation is associated with higher immunization coverage and lower child (0–4 years) mortality (Amin and Li 1997). On this evidence, the revolving loan funds and income-generating activities for poor women implemented by most of the BPHC NGOs could have contributed to high service coverage and lower infant and child mortality.

The estimates of infant and child mortality (based on ratios of deaths to live births) for the BPHC areas are now relatively low for a low-income country (UNDP 2002). The level of infant mortality and service coverage will be verified through an independent survey on a random sample of households conducted in all BPHC areas in 2003.⁷ The survey will also verify a further important finding from the MIS data – that women and children from the poorest households now have service coverage almost as high as the others, and that infant and child mortality have converged. The MIS data indicate that the slight decline in post-neonatal and child (1–4 years) mortality among the poorest from 1999–2002 brought them to almost the same level of child survival as other children. The rapid decline in neonatal mortality in the BPHC areas from 1999–2002 occurred among both socio-economic groups, but was more rapid among the poorest. Although the relative mortality per 1000 live births for the poorest compared with others in the 12 NGO areas was 1.20

for neonatal mortality, 1.45 for post-neonatal mortality, and 1.46 for child (1–4 years) mortality in 2000, these differentials had been virtually eliminated by 2002.

Service coverage and neonatal survival

Apart from the high service coverage and relatively low infant and child mortality for the poorest and others, the most striking feature of the analysis of the MIS data is the consistent decline in neonatal mortality. Although neonatal, post-neonatal and child (1–4 years) mortality declined from 1996 in the 12 NGO areas, neonatal mortality continued to decline after 1999 among the poorest and others when mortality at older childhood ages had levelled off. In contrast, neonatal mortality declined less than mortality among older children under 5 years in Bangladesh as a whole between 1985–99 and 1995–99 (BDHS 2001).

High coverage of ANC and PNC services, and health education could have contributed to the relatively low neonatal mortality in the BPHC areas. Health education on topics covered by the NGOs, for example, vaccination against tetanus, health and hygiene and aseptic delivery, can reduce risks for neonates (Nicolau et al. 1989). A study in rural Bangladesh found that ANC was one of the main factors associated with seeking care for sick neonates (Ahmed S et al. 2001). An earlier study found that after controlling for social, economic and demographic factors, neonatal mortality was lower in an intervention area of Matlab with more intensive health services (Bhuiya and Streatfield 1992). Strengthening of MCH–FP services led to further reduction in neonatal mortality, particularly from infectious diseases (Alam and van Ginneken 1999). These are responsible for about 30–40% of neonatal deaths in Bangladesh (Stoll 1997; Baqui et al. 1998). Tetanus toxoid vaccination coverage, particularly among poorer women, has been found to be significantly associated with availability of outreach clinics and community health workers (Jamil et al. 1999).

The role of the BPHC NGO satellite clinics and household visits by FHV's may have been particularly important for prevention of neonatal deaths. FHV's give advice to pregnant women on the danger signs for delivery and neonatal complications, and when to seek help at the satellite clinic or higher level facility. They encourage pregnant women to seek assistance at delivery from a qualified attendant, and motivate them to attend health education sessions and to have ANC and PNC check-ups. Women attending the NGO satellite clinics for ANC receive advice on neonatal care from the paramedic.

Despite the relatively low neonatal mortality achieved in the NGO areas, there is scope for further reduction. Since 2002, BPHC has become a partner in the Saving Newborn Lives Initiative of Save the Children–USA and five of its NGOs are involved in this programme (not the 12 study NGOs). Studies in India have shown considerable reduction (62%) in neonatal mortality through a package of services, including health education, diagnosis and management of birth asphyxia, identification and surveillance of premature and low birthweight babies, temperature maintenance,

promotion of breastfeeding, and treatment of infectious diseases through simple diagnostic algorithms and home-based treatment with antibiotics (Bang et al. 1999). Some advanced home-based and facility-based strategies for neonatal care are being evaluated in Bangladesh. The additional components can be implemented in the 12 BPHC areas to assess their impact where neonatal mortality is already relatively low.

Much of the residual mortality in the BPHC areas is attributed to birth asphyxia (25.4%) and low birth weight (26.0%), which is partly a function of lifelong under-nutrition of mothers. Most of the 106 deaths from January–March 2003 (85.0%) and all 27 asphyxia deaths were among children whose birth was attended by a trained traditional birth attendant (TBA).⁸ Some TBAs attend satellite clinics and have received training that includes neonatal care. However, despite training according to the government curriculum, TBAs may still not refer complicated cases. NGOs are trying to make pregnant women themselves more aware of the danger signs and to use qualified midwives. However, the lack of community midwives and fully resourced government referral facilities remain as major constraints on further reduction of neonatal and maternal mortality.

Maternal health services and mortality

Many women in BPHC areas, as elsewhere in rural Bangladesh, continue to rely on trained TBAs (55% of deliveries in the 27 BPHC areas in 2002). Professionalization of delivery care is recognized as a key measure for reducing maternal mortality (Starrs 1997; van Lerberghe and de Bouwre 2001). One study in Bangladesh found a significant association between the implementation of a home-based midwifery programme and a substantial reduction in obstetric mortality (Fauveau et al. 1991). Only a small proportion of women giving birth in the BPHC areas, as in rural Bangladesh as a whole, are attended by a qualified person. The government programme to train community midwives is likely to take many years to complete. In the absence of sufficient qualified community midwives, TBAs may have a role in referral to essential obstetric care (EOC) facilities (Bergstrom and Goodburn 2001). However, the lack of referral skills and trained staff in government EOC facilities are major constraints. Many facilities in Bangladesh are not functioning, and this has been implicated in the relatively high maternal mortality (Nessa 1995). Studies in Matlab have suggested that transport and access to a functioning referral facility will be critical for further reduction of maternal mortality in rural Bangladesh (Maine et al. 1996; Ronsmans 1997).

It is recognized that access to reproductive health services can contribute to the reduction of maternal mortality in poor countries (McDonagh and Goodburn 2001). Safe delivery and EOC are considered the key components of the World Health Organization (WHO) safe motherhood strategy (WHO 1994). They require enormous commitment by governments in terms of training community midwives and equipping and staffing EOC facilities in rural areas (Graham et al. 2001). The other two main components of the WHO

strategy are family planning and ANC services. Many ANC components address preventable causes of deaths, although there is little definitive evidence of a significant impact on maternal mortality (Graham et al. 2001). Most of the causes of maternal death occur during labour (haemorrhage, obstructed labour, complications of abortion and sepsis) and most intrapartum problems develop in women without identified risk factors prior to labour (Berg 1995). Some conditions such as hypertensive disorders of pregnancy and bleeding cannot be prevented by ANC, although early detection can lead to prevention of complications. Although ANC may have a limited role in reducing maternal mortality, it does provide opportunities for health promotion on planning for safe delivery and obstetric emergency (Rooney 1992; Berg 1995; Carroli et al. 2001). Such advice is included in the ANC and health education provided by BPHC NGOs and coverage is relatively good, for the poorest and others. This provides a good basis for developing access to safe delivery and referral.

Conclusions

NGOs can play an important role in health service delivery. BPHC has demonstrated that an NGO programme can provide ESP services effectively to a large, widely distributed rural population and achieve high coverage and relatively good health outcomes. The MIS has provided evidence to support the view that local NGOs are able to reach poor women and children whose access to government or profit-making services is restricted (Akukwe 1998). The MIS data indicate that service provision in the NGO areas has been poverty focused, with coverage among the poorest one-third of the population and others being about the same, and infant and child mortality converging in recent years. The apparent reduction in neonatal mortality by about 50% in the period 1999–2002 among the poorest and others, without any interventions specially targeting the newborn, should be investigated further. A study is planned to verify infant mortality in 2003 and to identify what programmatic and other factors might explain the relatively low neonatal mortality in the BPHC areas.

The MIS data also indicate that all the coverage and mortality indicators for this NGO programme compare favourably with the rest of Bangladesh. However, there is generally a lack of evidence concerning the relative cost and quality of NGO and public service provision. There is no unified structure for regulation or monitoring of government, NGO and private providers in Bangladesh, and regular clinical supervision is a problem for government and many smaller NGOs. Good quality service provision requires motivated staff, which is a major problem for the public sector. There is low staff morale, poor attendance, unfilled vacancies and a lack of decentralized authority to manage resources at the local level. Comparison of cost-effectiveness of government and NGO services is hampered by lack of comparable unit cost data, and differences in service delivery systems, facilities and populations served. However, the basic data from BPHC indicate that the programme has achieved cost-effective ESP service provision, albeit on a much smaller scale than the public sector. Despite any additional costs of targeting the

poor and more remote populations, the overall cost of the programme is low: US\$1.43 million in 2001 and US\$1.16 million in 2002, for provision of most ESP services to a catchment population of 2 million. This includes preventive and curative services, visits to every household every 1–2 months, village-level health promotion activities, and BPHC supervisory, technical support and administrative costs.

Cost recovery has not been a major objective for BPHC in this period, although it is exploring strategies for demand-side financing. Its partner NGOs have implemented scales of user charges based on their socio-economic classification of households. Charges for the poorest are waived and at this stage cost recovery is still low (about 10%). Provision of ESP services accessible to the poorest is likely to require subsidization for some time. Government ESP service provision was intended to be free at the point of delivery under the sectoral programme (1998–2003), and has also been heavily subsidized by international development agencies (over one-third of the costs).

The BPHC NGO programme has been innovative in developing community participation, gender equity and local accountability. The NGOs' role is not limited to 'gap filling' and provision of services in remote or under-served areas. NGOs offer an alternative for international agencies seeking to reach the poor, in Bangladesh and in other low-income countries. The degree of support they are willing to provide in different countries will depend to some extent on the capacity of the NGO sector for large-scale provision, the effectiveness of public services, the pace of government sectoral reforms, and other aspects of governance. Where there is a strong NGO sector and government lacks the capacity to provide universal coverage or to sub-contract on a large scale, it may be cost-effective for international agencies to provide direct support to NGOs. Where there are acceptable standards of governance, regulatory mechanisms, systems for monitoring quality of care, and health sector reforms, governments in low-income countries can be given financial support to contract NGOs for PHC service delivery. BPHC has demonstrated that an intermediary agency can implement a transparent selection process, provide technical support and manage NGOs contracted on behalf of government or international agencies.⁹

Endnotes

¹ Support was provided by a team from the Nuffield Institute of Health, University of Leeds, UK.

² Since the January–March quarter of 2001, the MIS has reported on three ANC visits, which is the revised standard set by the government. Previously, the indicator was two ANC visits.

³ From January–March 2001, the persons considered as qualified were medical doctors, nurses and midwives with training recognized by the government.

⁴ On household visits, the FHV's ask mothers if their children under 5 years of age have had ARI in the last month and whether treatment was received. A case of ARI is defined as fast breathing with no other signs present, which is treatable by the FHV's (pneumonia); and rapid breathing and/or chest in-drawing and/or other signs, which is referred by the FHV/paramedic (severe pneumonia). The World Health Organization/Government of Bangladesh treatment protocol for ARI is followed. The numbers of cases and cases

treated are compiled into quarterly figures, which are used to calculate the percentage of cases treated. Mothers are also asked about episodes of diarrhoeal disease. As the definition of treatment includes unsupervised home-based use of oral rehydration salts (ORS) by the mother, the data may be unreliable and have not been presented here.

⁵ The contraceptive acceptance ratio is a ratio of the number of couples who have used contraception in a quarter to the number of eligible couples registered (in hundreds). The contraceptive prevalence rate is the percentage of registered eligible couples who are using contraception at the end of each quarter.

⁶ Child (1–4 years) death rates are not available for 1999 due to a change in recording methods.

⁷ A survey on a sample of households in all BPHC areas is being conducted in 2003 by the MEASURE Evaluation Project at the University of North Carolina at Chapel Hill, as part of an evaluation of another large NGO programme in Bangladesh (NGO Service Delivery Project) funded by the United States Agency for International Development.

⁸ These data are from the verbal autopsies, which were checked by a BPHC medical doctor. About 55% of births in the NGO areas were attended by a TBA, which indicates a much higher than expected concentration of deaths among such women.

⁹ BPHC has now registered a company, Partners in Health and Development (PHD), which can bid for contracts and manage NGO programmes independently in the future.

References

- Ahmed MK, Rahman M, van Ginneken J. 1999. Epidemiology of child deaths due to drowning in Matlab, Bangladesh. *International Journal of Epidemiology* **28**: 306–11.
- Ahmed S, Sobhan F, Islam A, Barkat-e-Khuda. 2001. Neonatal morbidity and care-seeking behaviour in rural Bangladesh. *Journal of Tropical Pediatrics* **47**: 98–105.
- Akukwe C. 1998. The growing influence of non-governmental organisations (NGOs) in international health: challenges and opportunities. *Journal of Reproductive and Social Health* **118**: 107–15.
- Alam N, van Ginneken JK. 1999. Repeated neonatal deaths in families with special reference to cause of death. *Paediatric Perinatal Epidemiology* **13**: 78–88.
- Amin R, Li Y. 1997. NGO-promoted women's credit program, immunization coverage, and child mortality in rural Bangladesh. *Women's Health* **25**: 71–87.
- Bang AT, Bang RA, Baitule SB, Reddy MH, Deshmukh MD. 1999. Effect of home-based neonatal care and management of sepsis on neonatal mortality: field trial in rural India. *The Lancet* **354**: 1955–61.
- Baqui AH, Black RE, Arifeen SE et al. 1998. Causes of childhood death in Bangladesh: results of a nationwide verbal autopsy study. *Bulletin of the World Health Organization* **76**: 161–71.
- BDHS. 2001. *Bangladesh Demographic and Health Survey 1999–2000*. Dhaka: National Institute of Population Research and Training.
- Berg CJ. 1995. Prenatal care in developing countries: the World Health Organisation Technical Working Group on antenatal care. *Journal of the American Medical Women's Association* **50**: 182–6.
- Bergstrom S, Goodburn E. 2001. The role of traditional birth attendants in the reduction of maternal mortality. In: de Brouwere V, van Lerberghe W (eds). *Safe Motherhood Strategies: a review of the evidence*. Antwerp: ITGPress, Studies in Health Services Organisation and Policy, 17.
- Bhatia S. 1989. Patterns and causes of neonatal and postneonatal mortality in rural Bangladesh. *Studies in Family Planning* **20**: 136–46.
- Bhuiya A, Chowdhury M. 2002. Beneficial effects of a woman-focused development programme on child survival: evidence from rural Bangladesh. *Social Science and Medicine* **55**: 1553–60.
- Bhuiya A, Streatfield K. 1992. A hazard logit model analysis of covariates of childhood mortality in Matlab, Bangladesh. *Journal of Biosocial Science* **24**: 447–62.
- Bhuiya A, Wojtyniak B, Karim R. 1989. Malnutrition and child mortality: are socio-economic factors important? *Journal of Biosocial Science* **21**: 357–364.
- BPHC. 1999. *Health and Family Planning Management Information Systems in BPHC and Supported NGOs*. Rana, Dhaka: Bangladesh Population and Health Consortium and Interact.
- Buse K. 1999. Keeping a tight grip on the reins: donor control over aid coordination and management in Bangladesh. *Health Policy and Planning* **14**: 219–28.
- Carroli G, Rooney C, Villar J. 2001. How effective is antenatal care in preventing maternal mortality and serious morbidity? An overview of the evidence. *Paediatric Perinatal Epidemiology* **15**: 1–42.
- CIET. 2001. *Service Delivery Survey: Second Cycle, 2000. Health and Population Sector Programme, 1998–2003, Bangladesh*. Dhaka: CIET, Canada and Ministry of Health and Family Welfare.
- Cleland JG, van Ginneken JK. 1988. Maternal education and child survival in developing countries: the search for pathways of influence. *Social Science and Medicine* **27**: 1357–68.
- Edwards M, Hulme D. 1995. *Non-governmental organisations – performance and accountability*. London: Earthscan.
- Fauveau V, Stewart K, Khan SA, Chakraborty J. 1991. Effect of community-based maternity-care programme in rural Bangladesh. *The Lancet* **338**: 1183–6.
- Gellert GA. 1996. Non-governmental organizations in international health: past successes, future challenges. *International Journal of Health Planning and Management* **11**: 19–31.
- Gilson L, Sen PD, Mohammed S, Mujinja P. 1994. The potential of health sector non-governmental organizations: policy options. *Health Policy and Planning* **9**: 14–24.
- Graham WJ, Bell JS, Bullough CHW. 2001. Can skilled attendance at delivery reduce maternal mortality in developing countries? In: de Brouwere V, van Lerberghe W (eds). *Safe Motherhood Strategies: a review of the evidence*. Antwerp: ITGPress, Studies in Health Services Organisation and Policy, 17.
- Henry F, Briend AS, Fauveau V. 1990. Child survival: should the strategy be redesigned? Experience from Bangladesh. *Health Policy and Planning* **5**: 226–34.
- ICDDR,B, Centre for Health and Population Research. 2002. The emergence of drowning as a principal cause of childhood death in Bangladesh. *Health and Science Bulletin* **1**: 10–12.
- Jamil K, Bhuiya A, Streatfield K, Chakraborty N. 1999. The immunization programme in Bangladesh: impressive gains in coverage, but gaps remain. *Health Policy and Planning* **14**: 49–58.
- Koenig MA, Fauveau V, Wojtyniak B. 1991. Mortality reductions from health interventions: the case of immunization in Bangladesh. *Population and Development Review* **17**: 87–103.
- Levin A, Rahman MA, Quayyum Z, Routh S, Barkat-e-Khuda. 2001. The demand for child curative care in two rural thanas of Bangladesh: effect of income and women's employment. *International Journal of Health Planning and Management* **16**: 179–94.
- Maine D, Akalin MZ, Chakraborty J, de Francisco A, Strong M. 1996. Why did maternal mortality decline in Matlab? *Studies in Family Planning* **27**: 179–87.
- Majumder AK, Islam SM. 1993. Socioeconomic and environmental determinants of child survival in Bangladesh. *Journal of Biosocial Science* **25**: 311–8.
- Majumder AK, May M, Pant PD. 1997. Infant and child mortality determinants in Bangladesh: are they changing? *Journal of Biosocial Science* **29**: 385–99.
- Matthias AR, Green AT. 1994. The comparative advantage of NGO (non-governmental organizations) in the health sector – a look at the evidence. *World Hospital Health Services* **30**: 10–5.

- McDonagh M, Goodburn E. 2001. Maternal health and health sector reform: opportunities and challenges. *Studies in Health Services Organisation and Policy* **17**: 371–86.
- MOHFW. 1998. *Health and Population Sector Programme, 1998–2003, Programme Implementation Plan*. Dhaka: Ministry of Health and Family Welfare.
- Mosley WH, Chen LC. 1984. An analytical framework for the study of child survival in developing countries. *Population and Development Review* **10** (supplement): 25–45.
- Muhuri PK. 1995. Health programs, maternal education and differential child mortality in Matlab, Bangladesh. *Population and Development Review* **21**: 813–34.
- Mulholland EK, Simoes EA, Costales MO et al. 1992. Standardised diagnosis of pneumonia in developing countries. *Pediatric Infectious Diseases Journal* **11**: 77–81.
- Nanda P. 1999. Women's participation in rural credit programmes in Bangladesh and their demand for formal health care: is there a positive impact? *Health Economics* **8**: 415–28.
- Nessa S. 1995. Training of traditional birth attendants: success and failure in Bangladesh. *International Journal of Gynaecology and Obstetrics* **50** (supplement): S135–39.
- Nicolau S, Teodoru G, Popa I, Nicolescu S, Feldioreanu E. 1989. The role of maternal care in reducing perinatal and neonatal mortality in developing countries. *Revista de Pediatrie, Obstetrica si Ginecologie Pediatria* **38**: 185–92.
- NIPORT. 2002. *Bangladesh Maternal Health Services and Mortality Survey, 2001: Preliminary Report*. Dhaka: National Institute of Population Research and Training and ORC Macro.
- Rooney C. 1992. *Antenatal care and maternal health: how effective is it?* Geneva: World Health Organization.
- Ronsmans C, Vanneste AM, Chakraborty J, van Ginneken J. 1997. Decline in maternal mortality in Matlab, Bangladesh: a cautionary tale. *The Lancet* **350**: 1810–4.
- Schuler SR, Hashemi SM. 1994. Credit programs, women's empowerment, and contraceptive use in rural Bangladesh. *Studies in Family Planning* **25**: 65–76.
- Starrs A. 1997. *The Safe Motherhood Action Agenda: priorities for the next decade*. New York: Inter-Agency Group for Safe Motherhood and Family Care International.
- Stefanini A. 1995. Sustainability: the role of NGOs. *World Health Forum* **16**: 42–6.
- Stoll BJ. 1997. The global impact of neonatal infection. *Clinical Perinatology* **24**: 1–21.
- UNDP. 2002. *United Nations Development Report, 2002*. New York: United Nations Development Program.
- Van Lerberghe W, de Brouwere V. 2001. Reducing maternal mortality in a context of poverty. In: de Brouwere V, van Lerberghe W (eds). *Safe Motherhood Strategies: a review of the evidence*. Antwerp: ITGPress, Studies in Health Services Organisation and Policy, 17.
- WHO. 1994. *Mother-Baby Package: Implementing safe motherhood*

in countries. Practical guide. Geneva: World Health Organization, Maternal Health and Safe Motherhood Programme.

Biographies

Alec Mercer, BSc (Econ), MSc (Econ), MPhil, is a health demographer. He joined ICDDR,B Centre for Health and Population Research as an Operations Research Scientist in 2002. He has previously worked on local level health statistics in the UK National Health Service; conducted health surveillance among refugee populations in Sudan, Pakistan and (former) Zaire and health surveys in other East African countries for Médecins Sans Frontières (Netherlands); and taught at the Centre for Development Studies in Swansea, UK, including acting as an adviser to DFID. This latter position led him to join DFID and manage its NGO health programme in Bangladesh, before joining ICDDR,B.

Mobarak Hossain Khan is a medical graduate who has attended short courses on reproductive health and research at the London School of Hygiene and Tropical Medicine, epidemiological methods at ICDDR,B, and health economics at the University of Dhaka. He is currently a Technical Officer with the Bangladesh Population and Health Consortium (BPHC), where he is responsible for quality assurance and leads on two new projects: 'Saving New Born Lives' and 'HIV/STD'. Before joining BPHC he was a Field Research Manager at ICDDR,B.

Md. Daulatuzaman, BA, MA, is a Programme Officer with BPHC with responsibility for overall programme implementation and technical support for 14 local NGOs. Prior to his current post, he was responsible for development of the MIS, computerisation and data processing. Previously he managed a Computer Training Centre and was a Field Supervisor with the Aga Khan Foundation.

Joanna Reid, MBA, MSc, BVMS, is a Technical Co-operation Officer for the UK Department for International Development (DFID), working as Team Leader of BPHC and managing the Public NGO Partnership project. Although originally qualified as a veterinary surgeon, she moved into health management at an early stage (including working as a Health Service Manager in the UK NHS) and then into health and development work. Prior to her current position, she was a Programme Officer with Voluntary Service Overseas (VSO) in China.

Correspondence: Alec Mercer, c/o HSID, Centre for Health and Population Research, ICDDR,B, Mohakali, Dhaka 1000, Bangladesh. Tel: 880–2–8811751–60 (Ext 2531); 880–2–9882252 (Direct); Fax: 880–2–8823116, 880–2–8811568; Email: amercer@icddr.org