

Mortality and Fertility: Impact Evaluation of BRAC Reproductive Health and Disease Control Programme

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June 2001 /

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Summary findings

This study assessed the impact of BRAC's RHDC programme on fertility and mortality compared to the baseline status as well as the comparison area. Subsequently, a number of variables such as total fertility rate (TFR), age-specific fertility rates (ASFR), crude birth rate (CBR), crude death rate (CDR), infant mortality rate (IMR), child mortality rate (CMR), under-five mortality rate (U5MR) and age-specific death rates (ASDR) were chosen for analysis. These variables are measurable and widely accepted to reveal the impact of any reproductive health programme. Moreover, we have baseline data on these variables for comparison.

In the baseline study (1992) fertility and mortality data were collected from 12,073 households (programme 8,072 and comparison 4,001) representing a total of 261 villages (programme 184 and comparison 77). But, in the follow-up study done in 2000, 103 villages (programme 80 and comparison 23) were revisited. Using the cluster survey method, data were collected from 8,033 households (programme 4,003 and comparison 4,030) in the follow-up study. Each married woman was asked to provide information on the number of children she had given birth during the 12 months recall period. Information on all the live births were collected, such as name, sex, date and place of birth, age, father's name and occupation, and birth order of the child. Similarly, data on death that occurred during the last 12 months along with name, sex, month and year of death, age at death, marital status and causes of death, were also collected.

The study found that the reduction of TFR from the baseline to the follow-up study was sharper in the programme area than in the comparison (21% versus 13%). The present TFR for both the areas was identical (programme 2.7 and comparison 2.6/1,000 women). It is to be noted that the benchmark TFR was higher in the programme area than in the comparison area (3.4 versus 3.0).

In the programme area, the neonatal, infant, child and U5 mortality declined from the baseline to the follow-up study by 25%, 6%, 29% and 14% respectively, in contrast with an increase in post neonatal mortality by 49%. In the comparison area, the neonatal, post neonatal and infant mortality increased by 5%, 7% and 6% while child and U5 mortality decreased by 48% and 3% respectively. A noticeable finding was that

compared to the baseline period the crude death rate (CDR) increased significantly in the programme than in the comparison area, though, the rate was lower than that of the national average of 9 per 1,000 populations in 2000.

Compared to the comparison area, a substantial decline in TFR and IMR was observed in the programme area. In the programme area, age-specific fertility reduction amongst the teenage mothers was much sharper than the comparison area that may help reduce maternity related risks in this potentially risk groups. The decline of fertility and mortality was higher amongst the poor than the non-poor in both the study areas.

Introduction

During the past decades the fertility and mortality have substantially declined in Bangladesh (Population Growth Estimate, 1962-65; BBS, 1996; Mitra SN et. al., 1997). Despite a considerable success, the population growth is still considered to be the number one problem in Bangladesh (Bairagi et al., 1999). The World Population Data Sheet (1999) revealed that Bangladesh still lagged behind in most demographic indicators. It shows that except the crude death rate (11 per 1,000 population), the level of fertility and mortality in Bangladesh is the highest among all Southeast Asian, East Asian, American, European and Oceanic countries (CBR-27/1,000 population, TFR-3.3/woman, CDR-8/1,000 population, IMR-82/1,000 live births).

Two major categories of factors such as biological and social, determine the fertility. While the biological component is necessary but not the sufficient condition for fertility, the social environment largely determines whether couples will actually have children, and if so, how many, and with what length of birth interval. It is believed that a high level of childhood mortality keeps fertility at a high level (Rahman, 1998; Preston, 1978).

However, BRAC Reproductive Health and Disease Control (RHDC) programme, addresses the issues of improved child survival and reduced fertility. To this end, RHDC provides a wide range of services to people in its intervention areas.

The RHDC, indeed, is the successor to BRAC's defunct Women's Health and Development Programme (WHDP). With the primary thrust to improve health and nutritional status of the most vulnerable segment of the population (i.e., women and children) the WHDP operated during 1991-1995. It had five interconnected projects: i) Comprehensive Health Development Project (CHDP), ii) Facilitation of the Expanded Programme on Immunisation (FEPI), iii) Primary Health Care in BRAC Development Programme (PHC-BDP), iv) BRAC Education Programme (BEP), and v) Health Resource Centre (HRC). The CHDP, a cornerstone of the programme, was implemented in 10 *upazilas* of Dinajpur, Bogra and Mymensingh regions covering a population of about 1.7 million; half of whom were poor. Through CHDP BRAC directly implemented antenatal care (ANC), growth monitoring (GM) for children, tuberculosis (TB) control, family planning (FP), training of traditional birth attendants (TBA), and development of

village women's forum (WF), and facilitated expanded programme on immunisation (EPI), and vitamin A capsule (VAC) distribution.

Besides the above components, some supplementary elements such as establishment of maternity waiting home (MWH), facilitation to the government district hospitals for managing emergency obstetric cases were piloted for maternal mortality reduction (MMR) in the Bogra and Dinajpur sadar *upazilas*. In these *upazilas*, special inputs were given for safe motherhood and pneumonia control. All the services in the pilot *upazilas* were open for all, regardless of their socioeconomic background. While in other *upazilas* the WHDP services were targeted primarily to the poor (Karim et al, 1995). However, BRAC carried out a comprehensive baseline study covering a wide range of issues of WHDP to enable the management to evaluate the impact of the programme (Ali et al. 1992).

Nonetheless, BRAC consolidated, reinforced and augmented the core of the WHDP activities under the banner of the present RHDC in 1996. This helped make the RHDC consistent and compatible with the concept of reproductive health ratified in the 1994 International Conference on Population and Development in Cairo. Consequently, the goal of RHDC is to reduce infant, child and maternal mortality and morbidity, fertility, and the improvement in the nutritional status of children, adolescents, and women. In fact, this goal is consistent with that of the WHDP. However, the RHDC provides a package of essential reproductive health services viz. adolescent family life education, contraception, pregnancy related care including safe delivery and referral of complicated cases to the tertiary level of care, treatment and control of reproductive tract infections (RTI), sexually transmitted diseases (STD) and HIV/AIDS awareness, control of TB and acute respiratory infection (ARI), and basic curative care. Moreover, the RHDC offers possible backup and secondary referral services for the above services through BRAC's fixed Health Centres or *shushasthos* (Table 1). In addition, the RHDC facilitates the use of a number of government services including satellite clinics, immunisation, family planning, vitamin A capsule distribution, and water and sanitation programme. Originally BRAC health services were open to all, but in August 1997 BRAC shifted its approach to focus on the pressing health needs of the poor, particularly

Table 1 A comparative picture of health services under WHDP and RHDC

WHDP		RHDC
Facilitation	Supplementation	
Satellite clinics, EPI and referral, Family planning, Vitamin. A Capsule, Water and Sanitation	Antenatal care where satellite clinic is not held, Iron supplementation and TBA training, Health, Nutrition, Family planning, Growth monitoring and selective supplementation, ARI control, TB control, Hygiene education and <i>Shebika</i> training, Maternity waiting home	Reproductive health: Pregnancy care, FP, RTI/STD, HIV/AIDS awareness, Adolescent reproductive health education, Supplementation to pregnant women and children. Disease control: Community based ARI and TB control, <i>EPI</i>, <i>VAC</i> and De-worming. BRAC Health Centre – <i>shushastho</i>: All primary and secondary clinical support

those involved in NGO (including BRAC) micro-finance activities, because the poor do not have easy access to the existing health services, and their incomes are eroded due to ill-health.

BRAC trained community health workers (CHW) known as *Shastho shebikas* (SS) and traditional birth attendants (TBA) are the key resources used to mobilise people at the community level for RHDC services (BRAC 1999). The RHDC staffs regularly liaise with these community volunteers and supervise their activities.

RHDC has a coverage of over 9.7 million people across the country including the areas under the former WHDP, and provides comprehensive reproductive and disease control services. The educative, preventive and promotive care at the grassroots level is supplemented by secondary level of care through *shushasthos* located mostly at *upazila* towns. By now there are 90 *shushasthos* functioning throughout the country. Each *shushastho* has a physician, 2 paramedics or nurses or family welfare visitors, one ayah, one lab technician and one service staff. The available facilities in each *shushastho* include indoor, and outdoor services, maternity care, family planning, RTI/STD, basic pathological services and counselling.

But, to what extent the level of fertility and mortality was changed as a result of RHDC programme? This study explored the answer to this question.

Methods and Materials

Four years have elapsed since the WHDP activities have been amalgamated with that of the RHDC programme. If the WHDP period is taken into account the life span of the programme activities exceeds 8 years in 2000. At this stage, BRAC intended to evaluate the impact of RHDC on mortality and fertility compared to the benchmark information collected in March 1992 (Ali et al, 1993) and comparison area.

Study area

The study areas were categorised into 'pilot' and 'intervention' *upazilas* in the baseline study. The pilot programme was implemented in the Bogra and Dinajpur sadar *upazilas* where special inputs were given to reduce maternal mortality and ARI. While such inputs were not given in intervention *upazilas* including Kahalu in Bogra district, Gobindaganj sadar in Gobindaganj district, Parbotipur and Fulbari in Dinajpur district and Mymensingh sadar, Muktagachha, Trishal and Phulpur in Mymensingh district. However, the baseline study was implemented in the Bogra and Dinajpur sadar *upazilas* (pilot area), and in Kahalu, Gobindaganj, Parbotipur and Fulbari *upazilas* (intervention area) in March 1992. The Jaipurhat sadar and Khetlal *upazilas* of the adjacent Jaipurhat district were studied as 'comparison area'. This study revisited the villages covered by the baseline study in Jaipurhat as well as the Bogra and Dinajpur sadar *upazilas* excluding the 'intervention' *upazilas*. The reason for exclusion of the 'intervention' villages was that the baseline study did not reveal much difference in many indicator values between the 'pilot' and 'intervention' villages. Secondly, concentration on 'pilot' villages helped substantially minimise costs and operational difficulties of the present study without affecting the sample size and study quality. It is to be noted that in the follow up study 2000 the 'pilot' area was referred to as 'Programme' area.

Sample size

The baseline study (1992), on aggregate, covered 12,073 households (pilot 4,083, intervention 3,989 and comparison 4,001) from 261 villages (pilot 81, intervention 103 and comparison 77). This huge number of households was required for data collection on

maternal mortality through “sisterhood method”¹, fertility and childhood mortality. The impact study 2000, however, revisited 103 villages (programme 80 and comparison 23) and interviewed 8,033 households (programme 4,003 and comparison 4,030) following the same methods embraced in the baseline study.

Sampling procedures

All the study villages were selected using the multistage sampling methods. Using the cluster survey methods, a total of 8,033 households were visited for collecting data on fertility and mortality in the follow-up study.

Tools and techniques of data collection

A pre-tested standard questionnaire containing structured and unstructured questions was used to collect data. Primarily responsible and competent mothers were interviewed by visiting the households. Alongside the mothers other competent members (such as household heads or elders) of the households were also consulted on information concerning sensitive variables such as landholding, etc.

Data collection

A number of variables such as total fertility rate (TFR), age-specific fertility rates (ASFR), crude birth rate (CBR), crude death rate (CDR), infant mortality rate (IMR), child mortality rate (CMR), under-five mortality rate (U5MR) and age-specific death rates (ASDR) were chosen for analysis. These variables are measurable and widely accepted to reveal the impact of any reproductive health programme. Moreover, we have baseline data on these variables for comparison.

Each married woman was asked to provide information on the number of children she had given birth during the 12 months recall period. Information on all the live births were collected, such as name, sex, date and place of birth, age, father’s name and last 12 occupation, and birth order of the child. Similarly, data on death that occurred during the

¹ An indirect technique for deriving population-based estimates of maternal mortality. It uses the proportions of adult sisters dying during pregnancy, childbirth, or the puerperium reported by adults during a census or survey, to derive a variety of indicators of maternal mortality. But the method gives a status of 10-12 years back.

months along with name, sex, month and year of death, age at death, marital status and causes of death, were also collected.

Twenty trained field investigators worked in 4 teams to collect data. Each team had a supervisor for guiding and monitoring the fieldwork. Five percent of the households covered by the interviewers were spot-checked or re-interviewed for consistency and completeness of data.

Quality control

Measures were taken for quality control at different levels of data collection and analysis. The questionnaire was pre-tested. Besides, the team supervisors acted as the primary quality control officers at field level. They spot-checked and re-interviewed 5% of the households covered by the interviewers. On return from fieldwork everyday the field supervisors checked the filled-in questionnaires for consistency and completeness of data.

The principal investigators also regularly visited and supervised the fieldwork. At the Head Office, the questionnaires were strictly scrutinised and edited under the close supervision of the principal researchers. Besides, the baseline data stored in the computer dBase software package were also retrieved and meticulously checked for quality and analysis.

Operational definition of variables/indicators

Live birth (United Nations 1959): The complete compulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy, which, after such separation, breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached; each product of such a birth is considered live birth.

Land ownership: The amount of land possessed by a household/person with valid government documents of ownership. In this analysis, the households were classified into four groups depending on land ownership in decimals (0, 1-10, 11-50 and 51 or more decimals of landholding).

Occupation of household heads:

Agriculture- Household head engaged in agricultural production or cultivation in his/her own or rented land.

Day labourer- Household head who involves in daily paid work which is based on “no work no pay”, in any sector.

Business- Household head who involves in any kind of business.

Service- Household head who is employed by the government or any other agency/institute (private, NGO, etc.).

Other occupation- Household head who lives on begging or housework or unemployed.

Age-specific fertility rates (ASFR): The Ratios of the number of live births by age of mother to women in each age interval- usually in 5-year, is expressed as a rate age-specific fertility per 1,000 women.

Total fertility rate (TFR): The average number of children that would be born live per woman if she were to live to the end of her child bearing years and bear children at each age in accordance with prevailing age-specific fertility rates. Adding the current age-specific fertility rates and multiplying by 5 if five-year age groups of women are used can calculate it.

Crude birth rate (CBR): Ratio of the number of births to the total mid-year population, expressed as a rate per 1,000 populations.

Neonatal mortality rate (NMR): Ratio of the total number of live-born infants who die before reaching four weeks or a month of age to the total number of live births in the same year, and converted to a rate per 1,000 live births.

Infant mortality rate (IMR): Ratio of the total number of live-born children who die before the first birthday to the total number of live births in the same year, and converted to a rate per 1,000 live births.

Post neonatal mortality rate (PNMR): The difference between infant and neonatal mortality rate and converted to a rate per 1,000 live births.

Child mortality rate (CMR): Ratio of the number of deaths between the 1 to 4 years of age group to the total number of children of that age group and converted to a rate per 1,000 population.

Under-five mortality rate: Probability of dying between birth and fifth birthday, expressed as a rate per 1,000 live births and the formula for under-five mortality rate is given below:

$$\text{Probability of dying, } {}_nq_x = {}_nm_x / [1/n + {}_nm_x \{ 1/2 + n/12 ({}_nm_x - \ln C) \}],$$

Where x = age at birth, n = age interval, ${}_nm_x = {}_nD_x / {}_nP_x$, $\ln C = 0.095$

Crude death rate (CDR): Ratio of the number of deaths to the mid-year population and converted to a rate per 1,000 populations.

Age-specific death rates (ASDR): Ratios of the number of deaths of a given age group to the mid-year population of that age group, expressed as a rate per 1,000 populations.

Natural rate of increase (NRI): The difference between crude birth rate and crude death rate, expressed as a rate percent.

“TG” (Target group): Refers to the households owning 0-50 decimals of land (except the homestead), and any member aged 12 or more years sells manual labour for at least 100 days per annum for survival.

“NTG” (Non-target group): Refers to the households, which do not fall under the above criteria of TG.

Analytical strategy

Multi-dimensional comparisons were carried out for assessing the impact of BRAC's RHDC programme on fertility and mortality. Firstly, the results along with relative changes across different variable/indicator values were compared between the baseline and the follow-up data for both the programme and comparison areas. Secondly, the results of the follow-up survey were compared between programme and comparison areas. In case of any important result, comparisons between the target groups (TG) and non-target groups (NTG) were also attempted. Thirdly, associations between fertility/mortality and key socioeconomic variables were examined.

Relative change from baseline period to follow-up period was measured by the following formula:

$$\text{Relative change} = \frac{\text{Follow-up status} - \text{Baseline status}}{\text{Baseline status}} \times 100.$$

Limitations

- i) Some baseline data in computer were lost due to long time storage. It was apprehended that such an event might delimit the dimensions of data analysis. To prevent this, all the data were extensively checked, and missing variables were dropped from the analysis.
- ii) The spread of the study villages in the programme area was relatively wider than those in the comparison area. This was likely to shade the results of the programme area in some cases.

Results

Fertility levels

Tables 2 and 3 in Annex reveal that in the programme area the age-specific fertility rate (ASFR) reduced from the baseline period among the women of 15-19, 20-24, 25-29, 40-44 and 45-49 years of age groups, but increased among 30-34 and 35-39 years of age groups. In the comparison area, compared to the baseline survey, the ASFR reduced among the women of 15-19, 20-24, 25-29, 30-34 and 45-49 years of age groups, but increased among 35-39 and 40-44 years age groups. It was observed that the reduction in ASFR from the baseline to the follow-up study in the programme area was significantly higher among the women of 15-19 and 20-24 years of age groups ($p<0.05$, $p<0.005$). The follow-up study data revealed that the ASFR among the women of 15-19, 25-29, and 45-49 years of age groups were lower in the programme area than in the comparison area, but it was reverse for the remaining age groups.

Table 4 shows that the level of TFR reduced to 2.7 in the follow-up from the benchmark status of 3.4 in the programme area while it reduced from 3.0 to 2.6 in the comparison area. Likewise the CBR reduced in both the areas (programme 30.3 to 25.4 and comparison 29.3 to 26.7).

Table 4 Total fertility rates per 1000 women and crude birth rates per 1000 population

Indicators	Baseline 1992						Follow-up 2000					
	Programme			Comparison			Programme			Comparison		
	TG	NTG	Total	TG	NTG	Total	TG	NTG	Total	TG	NTG	Total
TFR	3.5	3.4	3.4	3.5	2.7	3.0	3.4	2.4	2.7	2.8	2.4	2.6
CBR	32.9	28.0	30.3	38.2	24.4	29.3	33.7	21.9	25.4	33.1	24.6	26.7

Table 5 shows the relative change in age-specific fertility, TFR and CBR. The reduction of age-specific fertility among the teenage women was higher in the programme area than in the comparison (26 versus 17 percent). The data reveal that the reduction of TFR from the baseline to the follow-up study was sharper in the programme area than in the comparison area (21 versus 13 percent). The follow-up study data revealed almost an identical TFR for both the areas (programme 2.7 and comparison 2.6).

Table 5 Relative change in age-specific and total fertility rates and crude birth rates by study areas (%)

Age (Years)	Relative change in rates (%)	
	Programme	Comparison
	Baseline vs. Follow up	Baseline vs. Follow up
15-19	-26.3 ^a	-17
20-24	-27 ^c	-16
25-29	-24	-7
30-34	+8	-44
35-39	+2	+32
40-44	-39	+433
45-49	-100	-60
TFR	-21	-13
CBR	-16 ^b	-9

Note: Minus (-) and plus (+) signs indicate the decrease and increase respectively,

^a p<0.05, ^b p<0.01, ^c p<0.005

The CBR reduced from the baseline status to the follow-up in both the study areas (programme 16 and comparison 9 percent respectively). But the degree of reduction in CBR was significantly higher in the programme area than in the comparison area (p<0.01).

Association between fertility and key socioeconomic variables

Table 6 shows the change in fertility by different key socioeconomic backgrounds during 1992-2000. TFR across all groups of households by land ownership reduced from the baseline to the follow-up survey in both the study areas. But the reduction followed a non-linear pattern across the study areas. The level of reduction in TFR was highest (40%) for the 51 or more decimals of landholding group in the programme area, and for 11-50 decimals of landholder group in the comparison area (36%). The 1-10 decimals landholding group in both the areas had lowest reduction in TFR (programme 0% and comparison 3%).

With the exception in few cases, the TFR declined from the baseline status among all categories of women by occupation of household heads. In the programme area, the TFR increased among the women whose household heads were day labourers (40%) indicating an adverse effect for this group. But the decline from the baseline to follow-up study was higher among the women whose household heads were agriculture workers and other² occupations in the programme area than in the comparison area. In contrast with the programme area, the reduction in TFR from the baseline status to follow-up study was higher (33%) among the women whose household heads were businessmen in the comparison area.

Table 6 Total fertility rates by key socioeconomic variables

Socioeconomic characteristics	Baseline 1992		Follow-up 2000		Relative change in rates (%)	
Land (decimal)	Programme	Comparison	Programme	Comparison	Programme B vs. FU	Comparison B vs. FU
0	3.6 (2307)	3.3 (1695)	3.2 (2330)	2.8 (1635)	-11	-15
1-10	2.7 (127)	3.5 (105)	2.7 (216)	3.4 (145)	0	-3
11-50	2.6 (574)	3.3 (689)	2.4 (659)	2.1 (620)	-8	-36
51+	3.5 (1877)	2.8 (2287)	2.1 (1676)	2.4 (2008)	-40	-14
Household head's occupation						
Agriculture	3.4 (2168)	2.8 (2523)	2.0 (1343)	2.4 (1717)	-41	-14
Day labourer	2.5 (1193)	3.4 (962)	3.5 (1344)	2.9 (1090)	+40	-14
Business	3.6 (519)	3.6 (496)	2.6 (746)	2.4 (655)	-28	-33
Service	3.4 (885)	3.3 (725)	2.7 (988)	2.6 (662)	-21	-21
Other	3.4 (120)	0.6 (70)	2.3 (460)	1.5 (284)	-32	+150

Note: Figures in the parentheses indicate the mid-year population,
Minus (-) and plus (+) signs indicate the decrease and increase respectively,
B= Baseline, FU= Follow-up.

Mortality levels

Table 7 shows that the level of neonatal, post-neonatal, infant, child and U5 mortality. Except the post neonatal, mortality levels among other groups decreased in the programme area. But in the comparison area, except the child and U5, mortality levels among other groups increased.

Table 8 presents the relative change in infant and child mortality by study areas during 1992-2000. In the programme area, the neonatal, infant, child and U5 mortality declined from the baseline to follow-up survey by 25%, 6%, 29% and 14% respectively,

² beggar, unemployed, and housewife

Table 7 Infant and child mortality by study areas

Child mortality types	Baseline 1992						Follow-up 2000					
	Program			Comparison			Program			Comparison		
	TG	NTG	Total	TG	NTG	Total	TG	NTG	Total	TG	NTG	Total
1	2	3	4	5	6	7	8	9	10	11	12	13
Neonatal	56.0	43.3	49.8	73.1	31.5	51.3	45.2	32.4	37.4	88.7	38.6	53.8
Post neonatal	21.7	13.3	17.7	23.1	24.5	23.8	28.2	25.2	26.3	24.2	25.7	25.4
Infant	77.6	56.7	67.5	96.2	55.9	75.1	73.4	57.6	63.7	112.9	64.3	79.2
Child	7.7	2.0	5.1	3.5	7.7	5.8	5.1	2.8	3.6	5.2	2.1	3.0
Under-5	111.6	74.2	93.6	121.8	88.1	105.4	101.6	68.9	80.8	151.5	81.2	102.3

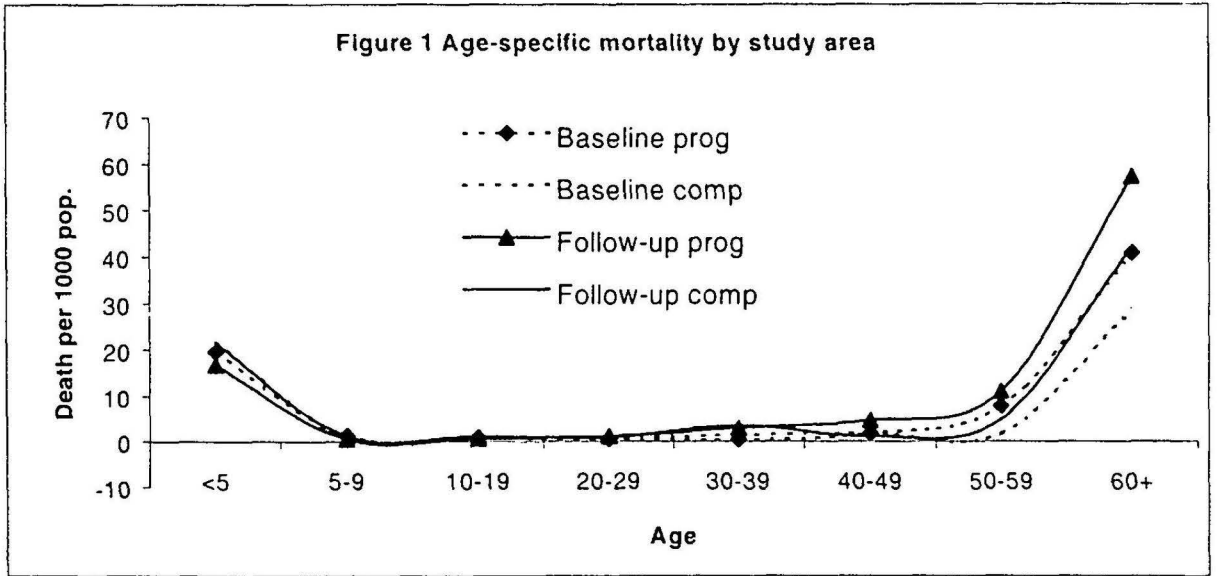
Table 8 Relative change in infant and child mortality by study areas (%)

Child mortality types	Programme	Comparison
	Baseline vs. Follow up	Baseline vs. Follow up
Neonatal	-25	+5
Post neonatal	+49	+7
Infant	-6	+6
Child	-29	-48
Under-5	-14	-3

Note: Minus (-) and plus (+) signs indicate the decrement and increment respectively

in contrast with an increase in post-neonatal mortality by 49%. In the comparison area, the neonatal, post-neonatal and infant mortality increased by 5%, 7% and 6% while child and U5 mortality decreased by 48% and 3% respectively.

Table 9 (Baseline 1992) and Table 10 (Follow-up 2000) in Annex show that almost in both the areas, age-specific death rates (ASDR) decreased in the teenage group and then gradually started to increase for 20-29 years of age group. The follow-up data also indicated that the CDR was higher in the programme (7.3/1,000 population) than that of the comparison area (6.3). Compared to the baseline, the reduction of the ASDR



among 5 or less years of age group was higher in the programme area than in the comparison area. Figure 1 shows the U-shaped curve of age-specific death rates.

Table 11 shows that compared to the baseline, the crude death rate increased significantly by 28% in the programme area ($p<0.05$), while in the comparison area such increase was lower by 17%.

Table 11 Relative change in age-specific mortality and crude death rates (%)

Age (Years)	Programme	Comparison
	Baseline vs. Follow up	Baseline vs. Follow up
<5	-14	-1
5-9	-62	0
10-19	-22	0
20-29	+140	+13
30-39	+650	+133
40-49	+161	-37
50-59	+42	+178
≥60	+40	+48
CDR	+28 ^a	+17

Note: Minus (-) and plus (+) signs indicate the decrease and increase respectively. ^a $p<0.05$

Association between mortality and key socioeconomic variables

Tables 12 (Baseline 1992) and 13 (Follow-up 2000) in Annex show the mortality status by household land ownership and occupation of household head.

Table 14 presents that the neonatal mortality rates (NMR) among the landless increased by 5% from the baseline in the programme area, in contrast with a decrease by 9% in the comparison area. Compared to the baseline status, the reduction of NMR was higher among the 1-10, 11-50 and 51 or more decimals of landholding groups in the programme area. In the comparison area, the reduction was higher amongst 1-10 decimals of landholding groups followed by landless and 11-50 decimals landholders, but it increased amongst the 51+ landholder group.

Compared to the baseline, the post neonatal mortality rates (PNMR) increased across all landholding categories in the programme area. But in the comparison area it decreased among 1-10 and 51 or more decimals of landholding groups, in contrast with an increase among the landless and 11-50 decimals of landholding groups.

The increase in the IMR from the baseline status was higher among the landless of the programme area than the comparison (11% versus 6%). On the contrary, the increase in the IMR among the 11-50 decimals of landholding group of the programme area was lower than the comparison area (4% versus 24%). The decrease in the IMR from the baseline status among the 1-10 decimals of landholding of the programme area was lower than the comparison area (69% versus 78%) but when the 51 or more decimals of landholding group was considered it was higher in the programme area than in the comparison (42% versus 1%).

The child mortality rates (CMR) among the landless of the programme area and among the 1-10 decimals of landholding group of the comparison area increased from the baseline to follow-up status by 26% and 3% respectively. The CMR from the baseline to follow-up status declined among the remaining groups. But the decline was higher among the 11-50 and 51 or more decimals of landholding groups in both the programme and comparison areas.

The under-five mortality rate from the baseline to follow-up study increased among the landless, and reduced among the rest of the groups in both the study areas. The

Table 14 Relative change in infant and child mortality by household landholding (%)

Indicators	Land (decimal)	Programme Baseline vs. Follow up	Comparison Baseline vs. Follow up
Neonatal	0	+5	-9
	1-10	-100	-68
	11-50	-22	-7
	51+	-63	+23
Postneonatal	0	+22	+42
	1-10	+∞	-100
	11-50	+∞	+86
	51+	+36	-45
Infant	0	+11	+6
	1-10	-69	-78
	11-50	+4	+24
	51+	-42	-1
Child	0	+26	-2
	1-10	0	+3
	11-50	-100	-100
	51+	-100	-69
Under-five	0	+14	+18
	1-10	-59	-46
	11-50	-31	-43
	51+	-59	-13

Note: Minus (-) & plus (+) signs indicate the decrease and increase respectively

reduction was higher among the 11-50 and 51 or more decimals of landholding groups in the programme area than in the comparison.

Table 15 shows that the NMR reduced sharply compared to the baseline among the households whose heads were involved in agricultural work in the programme by 55% as opposed to 48% in the comparison area. The increase in the NMR from the baseline status among the households whose heads were day labourers and businessmen was lower in the programme area than in the comparison area. The decrease in the PNMR from the baseline status was lower among the households whose heads were agriculture workers in the programme area (52%) than in the comparison (71%). The reduction of IMR from the baseline status was identical among the households whose heads were agriculture workers in both the programme and comparison areas. The reduction in CMR from the baseline status among the households where the heads were agriculture workers was higher in the programme area (100%) than in the comparison area (34%). The

Table 15 Relative change in infant and child mortality by household head's occupation (%)

Indicators	HHH occupation	Programme Baseline vs. Follow up	Comparison Baseline vs. Follow up
Neonatal	Agriculture	-55	-48
	Day labour	+21	+153
	Business	+2	+141
	Service	+29	-57
	Others	-61	+∞
Postneonatal	Agriculture	-52	-71
	Day labour	+88	-21
	Business	+52	+∞
	Service	+288	+21
	Others	+∞	0
Infant	Agriculture	-54	-54
	Day labour	+36	+76
	Business	+35	+383
	Service	+94	-14
	Others	-25	+∞
Child	Agriculture	-100	-34
	Day labour	+8	-30
	Business	0	0
	Service	+37	-141
	Others	+∞	0
Under-five	Agriculture	-69	-43
	Day labour	+36	+77
	Business	+20	+116
	Service	+73	+62
	Others	-19	+72

Note: Minus (-) & plus (+) signs indicate the decrease and increase respectively

reduction in U5MR from the baseline status among the households whose heads were agriculture workers was higher in the programme (69%) than in the comparison area (43%).

Discussion

The analyses showed that in the programme area, age-specific fertility significantly reduced from the baseline period among the women of 15-19 and 20-24 years age group than the other age groups, while in the comparison area where ASFR reduced more among the 20-24 and 30-34 years age groups.

High fertility among the teenage group is viewed to be risky for safe motherhood. In that sense, reduction of fertility among the teenage groups in the programme area (Table 16) is a good indication for fertility control, and this possibly happened due to BRAC intervention. Besides, the reduction of TFR during the inter survey period was sharper in the programme area than in the comparison area, which may be attributed to

Table 16 Relative change in major indicator values from baseline status to follow-up study by study area (%)

Indicators	Baseline versus follow-up study status	
	Programme	Comparison
Age-specific fertility rate among teenage group	-26	-17
TFR	-21	-13
Neonatal mortality	-25	+5
Post-neonatal mortality	+49	+7
Infant mortality	-6	+6
Child mortality	-29	-48
Under-five mortality	-14	-3

Note: Minus (-) and plus (+) signs indicate increase and decrease in indicator values

the effect of BRAC programme. However, the overall TFR was lower in both the study areas (programme 2.7 and comparison 2.6) than that of the national average of 3.3 (BDHS 1999-2000). The CBR significantly reduced to 25.4 from the baseline period of 30.3 in the programme area, which was lower than what was found in a study (29.4 per

1,000 population) done by Mitra SN et. al. (1997) for the whole of Bangladesh. This finding supports the subsequent decline in TFR in the programme area.

Critical awareness coupled with relatively higher use of contraceptives (programme 57% and comparison 73%) might have contributed to reduce TFR in the region. In the programme area, TFR substantially decreased among the people belonging to households with 51 or more decimals of land, households whose heads were agriculture workers and others (the 'others' category include beggars, unemployed and housework), contrary to the increase among the households whose heads were day labourers. In fact, reduction in TFR among the households whose heads were involved in 'other' activities (beggars, unemployed, and housework) and increase among the day labourers seem to be conflicting. But the reason cannot be explained with the present study data requiring further study on the issue.

A noticeable finding was that compared to the baseline status the crude death rate increased significantly in the programme than in the comparison area. Indeed, the main thrust of the programme was to reduce the infant mortality, which is one of the more sensitive development indicators than that of the crude death rate. However, the CDR was lower than the national average of 9 per 1,000 population (UNICEF 2001). The neonatal mortality rate (NMR) reduced considerably in the programme area, which was lower than that of the national average of 42 per 1,000 live births (BDHS 1999-2000). This may be attributed to the increased use of TT vaccine and antenatal care during pregnancy in the programme. On the contrary, there was no impact of RHDC programme with regard to the post neonatal mortality. Although we have no hard data to explain the reasons for this divergence, but it seemed that there was a deficiency in ensuring infant care by the programme during the post-neonatal period. However, the IMR decreased in RHDC area, in contrast to an increase in the comparison area. More access and availability of child survival technologies such as antenatal care, immunisation, etc. in the programme compared to the comparison might have had contributed to the reduction in IMR.

It should be noted that the impact of the programme was investigated after about 8 years of the baseline survey (1992 versus 2000). This means that the follow-up survey was done only once in 2000 to compare the changes. In fact, the fertility and mortality

situation may fluctuate over time, which is difficult to capture unless periodical survey is conducted. There might be external forces in the year of the follow-up study that might obscure the effect of any intervention. Thus, periodical survey was needed to capture the trends in changes in the study areas. But in this case that did not happen. Thus, one may argue that the status of two points of time with a long gap is not suitable for a valid comparison.

Conclusion

Compared to the comparison area, a substantial decline in TFR and IMR was observed in the programme area. Teenage mothers are high-risk group for any deadly consequences of maternity. In the programme area, age-specific fertility reduction amongst the teenage mothers was much sharper than it was in the comparison area. The decline of fertility and mortality was higher amongst the poor than the non-poor in both the study areas.

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Annex

Table 2 Age-specific fertility rates per 1000 population of baseline survey

Age (Years)	Programme			Comparison		
	TG	NTG	Total	TG	NTG	Total
15-19	176 (421)	106 (531)	137 (952)	188 (335)	99 (595)	131 (930)
20-24	240 (628)	243 (489)	242 (1117)	185 (513)	205 (600)	196 (1113)
25-29	118 (465)	167 (462)	142 (927)	169 (396)	110 (527)	135 (923)
30-34	74 (311)	69 (303)	72 (614)	125 (224)	72 (374)	92 (598)
35-39	34 (239)	49 (325)	43 (564)	22 (179)	30 (331)	28 (510)
40-44	47 (149)	36 (195)	41 (344)	0 (106)	4 (250)	3 (356)
45-49	13 (151)	5 (203)	9 (354)	12 (82)	23 (264)	20 (346)

Note: Figures in the parentheses indicate the mid-year population

Table 3 Age-specific fertility rates per 1000 population of follow up survey

Age (Years)	Programme			Comparison		
	TG	NTG	Total	TG	NTG	Total
15-19	167 (318)	74 (747)	101 (1065)	145 (248)	94 (636)	109 (884)
20-24	218 (289)	157 (629)	177 (918)	181 (260)	158 (703)	164 (963)
25-29	102 (284)	111 (624)	108 (908)	122 (213)	125 (590)	125 (803)
30-34	102 (197)	68 (458)	78 (655)	74 (135)	44 (387)	52 (522)
35-39	67 (149)	36 (440)	44 (589)	44 (114)	34 (351)	37 (465)
40-44	16 (124)	29 (275)	25 (399)	0 (96)	21 (289)	16 (385)
45-49	0 (104)	0 (243)	0 (347)	0 (93)	10 (293)	8 (386)

Note: Figures in the parentheses indicate the mid-year population

Table 9 Age-specific mortality and crude death rates per 1000 population of baseline survey

Age (Years)	Programme			Comparison		
	TG	NTG	Total	TG	NTG	Total
1	2	3	4	5	6	7
<5	23.6 (1443)	15.0 (1263)	19.6 (2706)	25.9 (1083)	18.4 (1306)	21.8 (2389)
5-9	2.0 (1530)	0.6 (1548)	1.3 (3078)	1.1 (908)	1.3 (1507)	1.2 (2415)
10-19	1.0 (1924)	0.7 (2762)	0.9 (4686)	0.8 (1268)	1.4 (2843)	1.2 (4111)
20-29	0 (1993)	1.0 (2022)	0.5 (4015)	0 (1567)	1.3 (2369)	0.8 (3936)
30-39	0.7 (1346)	0 (1399)	0.4 (2745)	0.9 (1111)	1.8 (1642)	1.5 (2753)
40-49	1.4 (736)	2.2 (907)	1.8 (1643)	2.1 (479)	1.9 (1061)	1.9 (1540)
50-59	6.5 (461)	8.7 (691)	7.8 (1152)	3.9 (257)	1.2 (825)	1.8 (1082)
≥60	36.4 (385)	43.4 (715)	40.8 (1100)	37.3 (241)	26.0 (883)	28.5 (1124)
CDR	5.9 (9818)	5.6 (11307)	5.7 (21125)	6.1 (6914)	5.0 (12436)	5.4 (19350)

Note: Figures in the parentheses indicate the mid-year population

Table 10 Age-specific mortality and crude death rates per 1000 population of follow up survey

Age (Years)	Programme			Comparison		
	TG	NTG	Total	TG	NTG	Total
1	2	3	4	5	6	7
<5	21.3 (750)	14.3 (1333)	16.8 (2083)	32.7 (490)	16.9 (1185)	21.5 (1675)
5-9	0 (639)	0.7 (1393)	0.5 (2032)	2.3 (433)	0.8 (1261)	1.2 (1694)
10-19	0.9 (1176)	0.7 (3072)	0.7 (4248)	0 (777)	1.5 (2603)	1.2 (3380)
20-29	0.9 (1057)	1.3 (2313)	1.2 (3370)	1.2 (860)	0.9 (2348)	0.9 (3208)
30-39	3.9 (775)	2.6 (1904)	3.0 (2679)	0 (579)	4.6 (1737)	3.5 (2316)
40-49	2.1 (483)	5.7 (1222)	4.7 (1705)	2.5 (394)	0.8 (1217)	1.2 (1611)
50-59	15.9 (251)	9.5 (739)	11.1 (990)	9.1 (219)	3.8 (784)	5.0 (1003)
≥60	84.1 (214)	50.7 (888)	57.2 (1102)	53.7 (149)	40.0 (800)	42.1(949)
CDR	8.2 (5345)	6.9 (12864)	7.3 (18209)	7.4 (3901)	5.9 (11935)	6.3 (15836)

Note: Figures in the parentheses indicate the mid-year population

Table 12 Infant and child mortality by socioeconomic characteristics of baseline survey

Mortality indicators	Socioeconomic characteristics	Baseline 1992	
	Land (decimal)	Programme	Comparison
Neonatal	0	42.9 (326)	70.5 (227)
	1-10	153.9 (13)	181.8 (11)
	11-50	67.8 (59)	22.0 (91)
	51+	49.1 (224)	41.5 (217)
Post-neonatal	0	24.5 (326)	26.4 (227)
	1-10	0 (13)	90.9 (11)
	11-50	0 (59)	11.0 (91)
	51+	13.4 (224)	23.0 (217)
Infant	0	67.5 (326)	96.9 (227)
	1-10	153.9 (13)	272.7 (11)
	11-50	67.8 (59)	33.0 (91)
	51+	62.5 (224)	64.5 (217)
Child	0	5.3 (1136)	3.7 (807)
	1-10	0 (67)	18.9 (53)
	11-50	10.5 (285)	7.4 (269)
	51+	2.9 (700)	6.5 (767)
Under-five	0	94.7 (1413)	116.9 (1010)
	1-10	119.5 (79)	275.0 (63)
	11-50	98.5 (339)	67.8 (357)
	51+	86.5 (887)	94.7 (959)
HHH occupation			
Neonatal	Agriculture	72.5 (262)	68.8 (247)
	Day labour	43.8 (160)	37.9 (132)
	Business	14.9 (67)	14.3 (70)
	Service	25.2 (119)	63.2 (95)
	Others	71.4 (14)	0 (2)
Postneonatal	Agriculture	22.9 (262)	24.3 (247)
	Day labour	12.5 (160)	30.3 (132)
	Business	29.9 (67)	0 (70)
	Service	8.4 (119)	31.6 (95)
	Others	0 (14)	0 (2)
Infant	Agriculture	95.4 (262)	93.1 (247)
	Day labour	56.3 (160)	68.2 (132)
	Business	44.8 (67)	14.3 (70)
	Service	33.6 (119)	94.7 (95)
	Others	74.4 (14)	0 (2)
Child	Agriculture	6.8 (889)	6.7 (889)
	Day labour	5.0 (595)	6.8 (442)
	Business	0 (240)	0 (231)
	Service	4.6 (435)	6.5 (309)
	Others	0 (29)	0 (25)
Under-five	Agriculture	131.4 (1106)	123.2 (1109)
	Day labour	79.3 (729)	100.8 (567)
	Business	48.6 (302)	16.7 (297)
	Service	54.3 (539)	132.5 (389)
	Others	112.7 (42)	0 (27)

Note: Figures in the parentheses indicate the mid-year population

Table 13 Infant and child mortality by socioeconomic characteristics of follow up survey

Mortality indicators	Socioeconomic characteristics	Follow-up 2000	
	Land (decimal)	Programme	Comparison
Neonatal	0	44.9 (267)	64.5 (186)
	1-10	0 (21)	58.8 (17)
	11-50	52.6 (57)	20.4 (49)
	51+	18.2 (110)	51.0 (157)
Postneonatal	0	30.0 (267)	37.6 (186)
	1-10	47.6 (21)	0 (17)
	11-50	17.5 (57)	20.4 (49)
	51+	18.2 (110)	12.7 (157)
Infant	0	74.9 (267)	102.2 (186)
	1-10	47.6 (21)	58.8 (17)
	11-50	70.2 (57)	40.8 (49)
	51+	36.4 (110)	63.7 (157)
Child	0	6.7 (902)	3.6 (557)
	1-10	0 (81)	20.4 (49)
	11-50	0 (226)	0 (209)
	51+	0 (437)	2.0 (509)
Under-five	0	107.6 (1147)	137.7 (713)
	1-10	49.3 (99)	147.6 (63)
	11-50	68.2 (284)	38.5 (255)
	51+	35.6 (553)	82.1 (644)
	HHH occupation		
Neonatal	Agriculture	33.0 (91)	35.7 (140)
	Day labour	52.9 (170)	96.0 (125)
	Business	15.2 (66)	34.5 (58)
	Service	32.6 (92)	27.0 (74)
	Others	27.8 (36)	83.3 (12)
Postneonatal	Agriculture	11.0 (91)	7.1 (140)
	Day labour	23.5 (170)	24.0 (125)
	Business	45.5 (66)	34.5 (58)
	Service	32.6 (92)	54.1 (74)
	Others	27.8 (36)	0 (12)
Infant	Agriculture	44.0 (91)	42.9 (140)
	Day labour	76.5 (170)	120.0 (125)
	Business	60.6 (66)	69.0 (58)
	Service	65.2 (92)	81.1 (74)
	Others	55.6 (36)	83.3 (12)
Child	Agriculture	0 (380)	4.4 (455)
	Day labour	5.4 (555)	5.3 (381)
	Business	0 (274)	0 (210)
	Service	6.3 (315)	0 (228)
	Others	8.2 (122)	0 (50)
Under-five	Agriculture	41.0 (479)	66.9 (579)
	Day labour	107.6 (706)	161.5 (486)
	Business	58.4 (333)	73.2 (264)
	Service	94.0 (407)	166.2 (287)
	Others	90.9 (158)	81.5 (59)