



Beneficial effects of a woman-focused development programme on child survival: evidence from rural Bangladesh

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Abstract

This paper reports results from a prospective study of the impact of a woman-focused development programme on child survival in Matlab, a rural area of Bangladesh. The programme was targeted to households owning less than 50 decimals of land and members selling more than 100 days of labour for living in a year. Programme components included formation of women's groups for saving and credit, training on skill development, functional literacy including legal and social awareness, and technical and marketing support to projects undertaken with the loan money from the organization. A total of 13,549 children born alive during 1988–97 in the study area were included in the study. Hazards of mortality during pre- and post-intervention periods were compared among the programme participants and non-participants controlling the effects of other relevant variables. There has been a substantial reduction in mortality during the post-intervention period; however, the reduction was much greater for infants whose mothers participated in the development programme compared to infants of non-participant mothers from similar socioeconomic background. In a relative sense, there has been a 52% reduction of the pre-intervention level hazard of death of children during infancy of participant mothers compared to 31% reduction for the infants of non-participant mothers from similar socioeconomic background. There had also been a substantial reduction in hazard of death during childhood (1–4 year age group), however, the reduction was statistically similar for all groups of children irrespective of their mothers' participation in the development programmes. © 2002 Elsevier Science Ltd. All rights reserved.

Keywords: Bangladesh; Women's development; Micro-credit; Mortality

Introduction

The importance of economic and social factors in the context of health improvement has been emphasized recently (World Bank, 1993; Abed, 1996). In the recent past women-focused poverty alleviation programmes with money lending facilities have been the major focus of development initiatives in the developing world (SAARC, 1992; Krishna, Uphoff, & Esman, 1997). Some of these programmes are comprehensive and are expected to have diverse positive effects, specifically on women's lives and the family, and also on the society at large. Health programmes alone, on the other hand, also have been in place to reduce mortality and improve the

health of individuals, and eventually make a positive contribution to the overall development of the society (Rohde, Chatterjee, & Morley, 1993). Despite the widespread presence of both development and health programmes in developing nations, any clear-cut evidence of their impact on mortality, health and other well-being indicators has been scanty. This is true for development programmes than for health programmes, perhaps due to the lack of a proper experimental set-up to study such an impact.

Bangladesh has been the birthplace of both innovative community-based health and women-focused poverty alleviation programmes. The Matlab experiment of the International Centre for Diarrhoeal Research, Bangladesh (ICDDR,B, 1996) has been a pioneer in developing an effective community-based health and family planning service delivery programme. Its unique Demo-

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graphic Surveillance System (DSS) with fortnightly house-to-house visits to record births, deaths, marriage, and migration among household members has made it possible to study the impact of the health and family planning programme on demographic outcomes, especially on mortality in a developing country setting. In the field of development, perhaps the two most discussed woman-focused development programmes in the world are those of Bangladesh Rural Advancement Committee (BRAC) and the Grameen Bank, both of which were also developed in Bangladesh. However, they were not implemented in a manner to study the impact until the BRAC-ICDDR,B joint project in Matlab was initiated in 1992. Together with DSS, the study design provided an opportunity to study the joint and independent impact of MCH-FP and BRAC programmes on various demographic factors. This paper presents findings about the impact of BRAC's Rural Development Programme (RDP) on child survival.

Materials and methods

The study is an outcome of a joint research project of BRAC, a Bangladeshi non-governmental organization, and the International Centre for Diarrhoeal Disease Research, Bangladesh. The project was launched in 1992 when BRAC decided to extend its women-focused development programmes to Matlab, a field research site of ICDDR,B since the early 1960s. One of the major objectives of the project is to study the joint and independent effects of health and socioeconomic development programmes on health and human well-being. Detailed documentation on the project has been reported elsewhere (Bhuiya & Chowdhury, 1994; Chowdhury, Bhuiya, Vaughan, Adms, Mahmud, 1995).

The study area

The study area is a low-lying deltaic plain situated 45 km southeast of the capital city. Farming is the major means of livelihood in the area. Nearly half of the males and two-thirds of the females in the study area are illiterate. As the research site of ICDDR,B since the early 1960s, a number of cholera vaccines have been field-tested in the area. The DSS has been in operation in the area for more than 30 years. Half of the villages in the study area, with around 100,000 population, have also been receiving ICDDR,B's maternal child health and family planning (MCH-FP) services since 1978; the other half (comparison area) has been receiving government services. The major components of the MCH-FP services included immunization, community-based maternity care, control of acute respiratory infections, and provision of family planning methods through female community health workers. In addition, ICDDR,B has a

free 60-bed diarrhoea treatment centre in Matlab town and the Government runs a 30-bed free general hospital. More about the DSS and Matlab has been documented elsewhere (Cholera Research Laboratory, 1978; D'Souza, 1984; Fauveau, 1994; Ginneken, Bairagi, Francisco, Sader, & Vaughan, 1998).

Over the years both the areas have been experiencing a sharp decline in infant and childhood mortality as well as fertility. Infant mortality rate in the MCH-FP area came down to 49.5 per 1000 in 1997 from 80.8 in 1988. The extent of decline was, however, smaller in the comparison area than the MCH-FP area, with infant mortality rates of 96.6 and 78.6 in 1988 and 1996, respectively. The childhood mortality rate in 1997 in the MCH-FP area was 4.5 per 1000, reflecting a decline of 54.5% from 9.9 in 1987. The child mortality rate in the comparison area in 1997 was 7.0 per 1000, a reduction of 51.4 from the 1988 rate. The total fertility rates in the MCH-FP and comparison areas in the same year were 2.7 and 3.5, respectively (Mostafa et al., 1999). Details of the ICDDR,B activities in the area can be found elsewhere (Fauveau, 1994).

Since the latter half of 1992 a number of villages in the MCH-FP and comparison areas have been receiving inputs from BRAC. The programme is targeted at women from very poor households. BRAC's programme first identifies very poor households as those with less than 50 decimals of land and with household members selling at least 100 days of menial labour in a year for a livelihood. Once the target group (TG) is identified, women from the TG are invited to form small groups and start savings with BRAC on a weekly basis. Members thus identified form a village organization (VO) with 25–50 members. All the activities are centred on the VOs, which are run by an elected leader and all the members meet weekly. During the weekly meeting members deposit their savings with BRAC staff and process loan applications, discuss issues of interest, and recite 17 resolutions. Two of the resolutions are about control of birth and maintenance of domestic cleanliness. During the first 6 months of operation the members receive social awareness education and literacy and skill development training. It is normally after 6 months that the members start receiving loans from BRAC to carry out income generation activities. As of 1995, 80% of the members took at least one loan from BRAC. The maximum number of loans was 7. The amount of loan money increased with number of loans with an average size of Taka 2647 (1 US\$ = 46 Taka) for the first loan and Taka 4600 for the seventh. The most common types of income generation activities included cultivation, small trade, rural transportation, poultry, handicrafts, and cattle fattening. The average income from these projects varied between Taka 100 to Taka 1000 a month (Zaman, Rahman, Hussain, & Rana, 1995). The members received technical assistance from

BRAC staff in relation to running the projects, starting from identifying a feasible project, its launching, management, and procurement of inputs and marketing of the products. The members repay the loans taken from BRAC in weekly instalments with 15% interest rates. The process brings woman into the focus of social and economic development. Details of BRAC's rural development programme can be seen elsewhere (Lovel, 1992; BRAC, 1995).

Data sources, respondents and methods of collection

Data from a number of sources were used in this analysis. The sources were the Demographic Surveillance System (DSS) of ICDDR,B, baseline survey of the BRAC-ICDDR,B project and the membership records of BRAC. The DSS included fortnightly visits to every household by a crew of 110 female community health workers to record births, deaths, marriage, and migration. Every villager in the DSS area has a unique and permanent identification number. This operation has been in place since 1966. Detailed methods of DSS data collection can be found elsewhere (Cholera Research Laboratory, 1978; D'Souza, 1984; Fauveau, 1994). The baseline survey was carried out during the latter half of 1992 in 60 villages, before implementation of BRAC's Rural Development Programme. Nearly 12,000 households (all BRAC eligible and fifty percent of the non-eligible households) were included in the survey. Results, along with the method of data collection, were reported earlier (BRAC-ICDDR,B, 1994). RDP input records of BRAC were used to identify the BRAC members, their date of joining, and other RDP-related information.

Study subjects

All the children born during 1988–92 and 1993–97 to the women who were included in the BRAC-ICDDR,B baseline survey were the study subjects. The birth records of the children were obtained from the computer files maintained by the DSS. The date of death and migration status for the first and second group of children as of 31st December 1992 and 31st December 1997, respectively, was also obtained from the DSS. Households' eligibility for BRAC membership was ascertained by land ownership and selling of manual labour by household members, and was done through household visits immediately before the baseline survey in 1992. Mothers of children born during 1988–92 were categorized as BRAC eligible or ineligible depending on the household eligibility status in 1992. The information on BRAC membership was collected from the field records maintained by BRAC. All the members were visited at their household to confirm their membership status and to get their DSS identification numbers. Subsequently, all the data files were matched by using

the unique identification numbers assigned to the women and children.

Definition of variables

The dependent variable is the survival status of children on 31st December 1992 and 97 for the first and second group of children, respectively. This was used as a dichotomous variable in the discrete hazard logit regression analysis. The independent variables included mother's education, mother's age at birth of the child, area of residence, sex of children, and BRAC membership status. The residence of the mother was defined in terms of ICDDR,B's MCH-FP programme area and was divided into two categories—'MCH-FP' if the mother was a resident of the intervention area, and 'comparison' if the mother was from outside the intervention area. Mother's education was measured by years of schooling completed in secular schools and was grouped into three categories. Age of mother at the time of birth of the child was measured in completed years. BRAC membership status had three categories: poor member, poor non-member, and non-poor non-member. BRAC eligibles were poor enough to be BRAC target and the non-eligibles were relatively richer and did not qualify to be a BRAC member. All the independent variables were used as categorical variables in the logistic regression analysis and a dummy coding scheme was used (Swafford, 1980; Forthofer & Lehan, 1981).

Methods of analysis

The children were followed prospectively for their survival, migration and their mothers' BRAC membership status. The follow-up was terminated on 31st December 1992 and 97 for the first and second group, respectively. The analysis was carried out by following the discrete time hazard logit regression analysis (Allison, 1982). The technique involved a division of the follow-up period or age of children in monthly segments, and creating data files, one for each of the segments with information on mother's membership status and survival status of children. The exercise started with all the live-born children in the data file, after excluding those who migrated out during the first month of life. If a child died during the first month of life, this was recorded as a death in the first data file and was excluded from all the subsequent files. If the child's mother had joined BRAC before its birth, the mother was recorded as a BRAC member in the first and all subsequent data files. The file for the second month of life was created by excluding children who died during the first month of life and those who migrated out during the second month of life. Mothers who joined BRAC during the second month of the child's life were designated as a member of BRAC for the second and all subsequent files. In case of mothers of children who died during the second month of life, mothers' membership

status at the time of child's death was recorded. The above process continued for 60 months of life and resulted in 60 data files for each of the pre- and post-intervention groups. The first group of children was coded as 1 to represent pre-intervention group and the rest as 2 to represent post-intervention group. Finally, all the files were added together to form a data file of 395,255 monthly exposures from a total of 13,549 live births. Logistic regression analysis was performed on the combined data file to study the relationship of the independent variables on survival during infancy and childhood. In addition to the main effect models, an interaction term involving the BRAC-membership status and the variable indicating pre- and post-intervention group was included to assess the impact of the BRAC programme on the change in mortality risk during pre- and post-intervention periods, controlling the effects of the other variables. Mean predicted hazards were cross-tabulated and plotted by pre- and post-intervention groups and BRAC-membership status of the household in case of statistically significant effects. The analysis was carried out using SPSS for Windows (Norusis, 1994).

Findings

A total of 9853 women were included in the baseline survey carried out before the implementation of the development programme in 1992. These women gave a total of 6887 and 6662 live births during 1988–92 and 1993–97, respectively. Of the births during 1988–92, 720 died during infancy and 149 during childhood. Number of infant and child deaths of the 1993–97 births were 431 and 87, respectively.

Of the women, 1893 were BRAC members by December 1997. Ninety per cent of the members were members for more than 3 years and the remaining were members for more than two years. Of them 90% took loans from BRAC with an average of 3 loans per member. The average loan size was Taka 3615 (US\$ 80). The loan money was utilized for various income generation activities. The five most common activities were agriculture, small business, transport industry (mostly rickshaws and menial cart), cottage industry, and goat/cattle rearing.

The results of the bivariate analysis of hazard of death during infancy and childhood period are presented in Table 1. There was a statistically significant reduction in the risk of death during infancy and childhood in 1993–97 compared to 1988–92. The children of economically poor mothers who participated in the development programmes always had a lower risk of death than the children of poor non-member mothers during both infancy and childhood.

Among the other independent variables, the health intervention programme of ICDDR,B, the age of the mothers at the time of birth, and mother's education showed a statistically significant relationship with mortality during infancy. The gender differential in mortality during infancy was statistically significant at the 10% level. In relation to childhood mortality, only mother's education was among the variables other than time period and BRAC membership status showed a statistically significant relationship.

The results of multivariate hazard logit regression analysis are presented in Tables 2 and 3. Table 2 shows that, in a multivariate situation, participation in development programmes and residing in the ICDDR,B's health and family planning intervention area, age of mothers at the time of birth, and time period showed a statistically significant relationship with risk of death during infancy. For risk of death during childhood, only BRAC membership status, residing in the ICDDR,B's health and family planning intervention area, and time period showed statistically significant relationship.

The logit regression coefficients based on the main effect model along with the odd ratios are presented in Table 3. In a relative sense, the odds of death during infancy of the children of economically poor mothers who did not participate in the development programmes were 1.28 times that of the children of mothers who did participate. Children from areas without ICDDR,B's family planning and health programmes had a 25% higher odds of death than those from the area with these interventions. Risk of death during infancy was highest among children of mothers aged less than 20 years at birth, followed by children of mothers aged 30 years or more, 25–29 years, and 25–29 years of age. Children born to mothers with no education and with 1–5 years of schooling had a similar risk of death during infancy, which was 29% higher than children of mothers with more than 6 years of schooling. The risk of infant death during 1993–97 was 62% of the risk observed during 1988–92.

The statistical significance of the interaction term of BRAC membership and time period in case of risk of death during infancy implied that the decline in risk of death during the post-intervention period over the pre-intervention period was dependent on the mother's BRAC membership status. Fig. 1 presents the predicted risk of death of children during infancy for pre and post intervention periods by mothers' BRAC membership status. It is evident that the decline in the risk of death over time during infancy was largest (53%) for children of mothers who joined BRAC followed by children of rich non-members (41%), and poor non-members (31%). Thus, the difference between the gains among the children of BRAC member mothers and that of poor non-members (22%) may be attributed to the beneficial effect of the BRAC's programme.

Table 1

Hazard of death during infancy and childhood period by mother's participation in socioeconomic development programmes and other independent variables in Matlab, Bangladesh, 1988–97^a

Independent variables	Infancy		Childhood	
	Child-month exposure	Risk of death	Child-month exposure	Risk of death
<i>BRAC membership status</i>	$\chi^2 = 32.64^{***}$		$\chi^2 = 15.99^{***}$	
Poor member	36,230	0.0079	76,008	0.0009
Poor non-member	60,498	0.0105	123,264	0.0011
Rich non-member	32,354	0.0072	66,901	0.0005
<i>Residence</i>	$\chi^2 = 19.73^{***}$		$\chi^2 = 2.63^{ns}$	
MCH-FP area	51,631	0.0075	107,238	0.0008
Comparison area	77,451	0.0099	158,935	0.0010
<i>Mother's age (years)</i>	$\chi^2 = 31.61^{***}$		$\chi^2 = 4.70^{ns}$	
< 20	11,960	0.0131	27,603	0.0006
20–24	44,010	0.0091	97,183	0.0009
25–29	41,419	0.0077	80,854	0.0010
30 +	31,693	0.0088	60,533	0.0010
<i>Mother's education</i>	$\chi^2 = 10.60^{**}$		$\chi^2 = 8.74^*$	
None	89,732	0.0093	186,024	0.0010
1–5 years	27,496	0.0088	55,691	0.0008
6 +	11,854	0.0063	24,455	0.0004
<i>Sex of child</i>	$\chi^2 = 2.95^{@}$		$\chi^2 = 3.01^{@}$	
Male	63,864	0.0094	131,862	0.0008
Female	65,218	0.0085	134,311	0.0010
<i>Time period</i>	$\chi^2 = 72.41^{***}$		$\chi^2 = 10.91^{**}$	
Pre-intervention (1988–92)	64,666	0.0112	135,298	0.0011
Post-intervention (1993–97)	64,416	0.0067	130,875	0.0007

^a Notes: *** $p < 0.000$, ** $p < 0.01$, * $p < 0.05$, @ $p < 0.10$, ^{ns} not significant at 10%.

Table 2

Results of hazard logit analysis of association between infant mortality and mother's participation in socioeconomic development programmes and other independent variables^a

Independent variables	Infancy		Childhood	
	Main effect	Interaction	Main effect	Interaction
BRAC membership	$\chi^2 = 21.87^{***}$	$\chi^2 = 7.13^*$	$\chi^2 = 9.68^{**}$	$\chi^2 = 12.52^{**}$
Residence	$\chi^2 = 12.35^{***}$	$\chi^2 = 12.29^{***}$	$\chi^2 = 1.27^{ns}$	$\chi^2 = 1.26^{ns}$
Mother's age	$\chi^2 = 19.82^{***}$	$\chi^2 = 19.99^{***}$	$\chi^2 = 7.48^{@}$	$\chi^2 = 7.21^{@}$
Mother's education	$\chi^2 = 4.30^{ns}$	$\chi^2 = 4.37^{ns}$	$\chi^2 = 2.33^{ns}$	$\chi^2 = 2.33^{ns}$
Sex of child	$\chi^2 = 3.09^{@}$	$\chi^2 = 3.05^{@}$	$\chi^2 = 2.66^{ns}$	$\chi^2 = 2.67^{ns}$
Time period	$\chi^2 = 53.47^{***}$	$\chi^2 = 32.48^{***}$	$\chi^2 = 13.38^{***}$	$\chi^2 = 0.94^{ns}$
BRAC membership $\times$ time period		$\chi^2 = 6.40^*$		$\chi^2 = 4.29^{ns}$
Constant	$\chi^2 = 864.04^{***}$	$\chi^2 = 796.54^{***}$	$\chi^2 = 347.11^{***}$	$\chi^2 = 341.04^{***}$
Model	$\chi^2 = 143.39^{***}$	$\chi^2 = 149.90^{***}$	$\chi^2 = 43.99^{***}$	$\chi^2 = 48.32^{***}$

^a Notes: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, @ $p < 0.10$, ^{ns} not significant at 10%.

Only BRAC membership status, mother's age at birth, and time period showed a statistically significant relationship with risk of death during childhood (1–4 years) period. The risk of death during 1993–97 was

58% of the risk observed during 1988–92. Children of poor mothers who did not join BRAC had a 23% higher risk of death than the poor mothers who joined BRAC. Age of mothers at childbirth showed a negative linear

Table 3

Hazard logit model coefficients of the main effect model of infant and child mortality and mother's participation in socioeconomic development programmes and other independent variables^a

Independent variables	Infancy		Childhood	
	Coefficients	Odds ratio (95% C.I.)	Coefficients	Odds ratio ((95% C.I.)
<i>BRAC membership</i>	***		**	
Poor member	Reference	1.00	Reference	1.00
Poor non-member	0.2507	1.28 (1.11–1.48)	0.2065	1.23 (0.91–1.66)
Non-poor non-member	–0.0693	0.93 (0.78–1.12)	–0.3889	0.64 (0.44–1.04)
<i>Residence</i>	***		ns	
MCH-FP area	Reference	1.00	Reference	1.00
Comparison area	0.2236	1.25 (1.10–1.42)	0.1563	1.17 (0.89–1.53)
<i>Mother's age</i>	***		*	
< 20 years	Reference	1.00	Reference	1.00
20–24	–0.3239	0.72 (0.60–0.87)	0.3770	1.46 (0.85–2.49)
25–29	–0.4193	0.66 (0.54–0.80)	0.5995	1.82 (1.06–3.14)
30 +	–0.2192	0.80 (0.65–0.99)	0.6864	2.00 (1.13–3.49)
<i>Mother's education</i>	ns		ns	
None	0.2589	1.30 (1.01–1.66)	0.5114	1.67 (0.86–3.23)
1–5 years	0.2602	1.30 (0.99–1.69)	0.4419	1.56 (0.78–3.11)
6 +	Reference	1.00	Reference	1.00
<i>Sex of child</i>	(a)		ns	
Male	Reference	1.00	Reference	1.00
Female	–0.1041	0.90 (0.80–1.01)	0.2128	1.24 (0.96–1.60)
<i>Time period</i>	***		***	
Pre-intervention (1988–92)	Reference	1.00	Reference	1.00
Post-intervention (1993–97)	–0.4756	0.62 (0.55–0.71)	–0.5108	0.60 (0.45–0.79)
<i>Constant</i>	–4.6517***		–7.9873***	

^a Note: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, $p < 0.10$, ns = not significant at 10%.

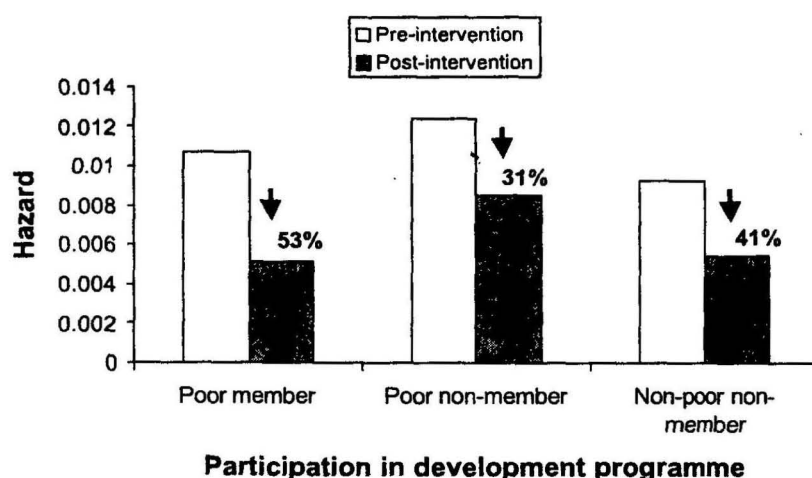


Fig. 1. Predicted hazards of infant death during pre- and post intervention period by mothers participation in development programme, Matlab, 1988–97.

relationship with the risk of death during childhood. An absence of the statistically significant interaction term involving BRAC membership status and time period indicated that the decline in the risk of death during childhood over time was statistically similar in all the categories of mothers in terms of BRAC membership status. This implied that the participation in BRAC's programme is yet to have a statistically significant impact on the risk of death during 1–4 years of life.

Discussion

The study was prospective in nature and was aided by a highly credible demographic surveillance system that is unique in the developing world. The patterns of relationship between the sociodemographic variables and child survival as observed in this study were somewhat consistent with earlier findings (D'Souza & Bhuiya, 1982; Bhuiya & Streatfield, 1992). The findings also clearly indicated that the reduction in mortality over a period of ten years was greater for infants whose mothers participated in the development programmes compared to those of non-participant mothers of similar socioeconomic background. Another important point is that a study of this kind is always faced with the challenge of selectivity bias in terms of programme participation (Rafi, Evans, & Adams, 1999; Zaman, 1996). In fact the observed higher risk of death among infants of poor non-participant mothers than those of poor participant mothers during the pre-intervention period was an indication of the presence of this phenomenon (Fig. 1). However, the comparison of the post-intervention mortality figures of infants of poor non-members and poor members with their respective pre-intervention figures allowed an estimation of the effect which is free from the possibility of selectivity bias, even if the programme participation was somewhat selective.

One may wonder which particular element of the BRAC development programmes may have contributed to the enhanced survival of children of member women, and how it happened. As described earlier, BRAC programme inputs have three broad aspects. Inputs such as savings, credit, and skill development training can contribute directly to raise household income and savings (Zaman et al., 1995; Chowdhury & Bhuiya, 2001). On the other hand, women's participation in VO meetings, leadership roles, and social awareness programmes can contribute to change their world-view, self-confidence (Khatun, Wadud, Bhuiya, & Chowdhury, 1998), and the ability to make the best of the available resources. The health awareness part of the programme might have contributed to the prevention of illnesses and better illness management practices (Ahmed, Adams, Chowdhury, & Bhuiya, 2001), resulting in improved

nutritional status of children (Chowdhury & Bhuiya, 2001). Thus, it is conceivable that the participation of mothers in BRAC programmes might have contributed positively in almost all the proximate determinants of child survival as outlined for developing countries such as Bangladesh (Mosley & Chen, 1982). However, at this stage the extent and nature of the effects of BRAC's programme are not fully known. The lack of impact after the first year of life is somewhat surprising and needs further investigation.

It was impressive to see that whatever economic and social advantage is being derived by the poor households through participation in development programmes, it is being translated into improved survival of children. Since, in this instance, it is likely that health improvement is preceded by an improvement in economic and social conditions, and life skills, it is probable that the improvement will last. This is an edge that the socioeconomic development programmes may have over vertical health programmes, which can achieve short-term health improvement without any guaranteed improvement in other aspects of life.

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References

- Abed, F. H. (1996). Health and development: Lessons learned from the grassroots. *Journal of Diarrhoeal Disease*, 14, 119–124.
- Ahmed, S. M., Adams, A., Chowdhury, M., & Bhuiya, A. (2000). Gender socioeconomic development and health-seeking behaviour in Bangladesh. *Social Science and Medicine*, 51, 361–371.
- Allison, P. (1982). Discrete-time methods for the analysis of event histories. In L. Samuel (Ed.), *Sociological Methodology* (pp. 61–98). San Francisco: Jossey Bass.
- Bhuiya, A., & Chowdhury, M. (1994). *The impact of social and economic development programme on health and well-being: A BRAC-ICDDR,B collaborative project in Matlab*. Working Paper Number 1. Dhaka: BRAC-ICDDR,B Joint Research Project.

- Bhuiya, A., & Streatfield, K. (1992). A hazard logit model analysis of covariates of childhood mortality in Matlab, Bangladesh. *Journal of Biosocial Science*, 24, 447–462.
- BRAC. (1995). *Rural Development Programme IV: Project Proposal for 1996–2000*. Dhaka: BRAC.
- BRAC-ICDDR,B. (1994). *Socio-economic development and health: A joint BRAC-ICDDR,B research project-baseline survey, Matlab 1992*. Dhaka: BRAC-ICDDR,B Joint Research Project.
- Cholera Research Laboratory. (1978). *Demographic Surveillance System Matlab, Vol. 1. Methods and procedures*. Dhaka: Cholera Research Laboratory.
- Chowdhury, M., Bhuiya, A., Vaughan, P., Adams, A., & Mahmud, S. (1995). *Effects of socio-economic development on health status and human well-being: Determining impact and exploring pathways of change. Proposals for phase II of the BRAC-ICDDR,B Matlab Joint Project 1996–2000 AD*. Working Paper Number 6. Dhaka: BRAC-ICDDR,B Joint Research Project.
- Chowdhury, A.M.R., & Bhuiya, A. (2001). Do poverty alleviation programmes reduce inequalities in health? The Bangladesh experience. In D. Leon & G. Watt (Eds.), *Poverty inequality and health: An International Perspective*.
- D'Souza, S. (1984). Small-area intensive studies for understanding mortality and morbidity processes: Two models from Bangladesh—the Matlab project and the Comaniganj health project. *Data Bases for Mortality Measurement. Population studies*, No. 84 (pp. 146–164). New York: United Nations.
- D'Souza, S., & Bhuiya, A. (1982). Socioeconomic mortality differentials in a rural area of Bangladesh. *Population and Development Review*, 8, 753–769.
- Fauveau, V. (1994). *Matlab: Women, children and health*. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh.
- Forthofer, R. N., & Lehren, R. G. (1981). *Public program analysis: A new categorical data approach*. California: Lifetime Learning Publications.
- Ginncken, J. V., Bairagi, R., Francisco, A., Sarder, A. M., & Vaughan, P. (1998). *Health and demographic surveillance in Matlab: Past, present and future*. Special Publication No. 72. Dhaka: ICDDR,B.
- ICDDR,B (International Centre for Diarrhoeal Disease Research, Bangladesh). (1997). 1996 Annual Report. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh.
- Khatun, M., Wadud, N., Bhuiya, A., & Chowdhury, M. (1998). *Psychological well-being of rural women: Developing measurement tools*. Working Paper Number 23. Dhaka: BRAC-ICDDR,B Joint Research Project.
- Krishna, A., Uphoff, N., & Esmen, M. J. (1997). *Reasons for hope: Instructive experiences in rural development*. Connecticut: Kumarian Press.
- Lovel, C. H. (1992). *Breaking the cycle of poverty: The BRAC strategy*. Connecticut: Kumarian Press.
- Mosley, W. H., & Chen, L. C. (1982). An analytical framework for the study of child survival in developing countries. In W. H. Mosley, L. C. Chen (Eds.), *Child survival: Strategies for research*. Population and Development Review, Vol. 10 (pp. 25–45).
- Mostafa, G., Razzaque, A., Sarder, A. M., Saha, S. K., Ginneken, J. V., & Bairagi, R. (1999). *Demographic surveillance system-Matlab*. Vol. 30, Registration of Demographic Events 1997. Dhaka: Scientific Report No. 84. ICDDR,B.
- Norusis, M. J. (1994). *SPSS advanced statistics 6.1*. Chicago: SPSS Inc.
- Rafi, M., Evans, T., & Adams, A. (1999). Demystifying on participation in microcredit. *World Development*, 27, 419–430.
- Rohde, J., Chatterjee, M., & Morley, D. (1993). *Reaching health for all*. Delhi: Oxford University Press.
- SAARC. (1992). Report of the independent South Asian commission on poverty alleviation. Kathmandu: SAARC.
- Swafford, M. (1980). Three parametric techniques for contingency table analysis: A nontechnical commentary. *American Sociological Review*, 45, 664–690.
- World Bank. (1993). *World Development Report 1993: Investing in Health*. New York: Oxford University Press.
- Zaman, H. (1996). *Microcredit programmes: who participates and to what extent?* Working Paper Number 12. Dhaka: BRAC-ICDDR,B Joint Research Project.
- Zaman, H., Rahman, S., Hussain, S., & Rana, M. (1995). *Profitability of BRAC-financed projects: A study of seven microenterprises in Matlab*. Working Paper Number 7. Dhaka: BRAC-ICDDR,B Joint Research Project.