Woman-focused development programme improves child survival in rural Bangladesh

Abbas Bhuiya[1], Ph.D.
Mushtaque Chowdhury[2], Ph.D.

Correspondence to:
Abbas Bhuiya
ICDDR,B
GPO Box 128
Dhaka 1000
Bangladesh

Email: abbas@icddrb.org
Fax: 880-2-886050

[1] ICDDR,B: Centre for Health and Population Research
[2] BRAC

Abstract

This paper reports results from a prospective study of impact of a woman-focused development programme on child survival in Matlab, a rural area of Bangladesh. A total of 5,567 children born during 1993-96 in the study area were followed till the end of December 1996. Life table analysis was carried out to compare the survival curves of children of mothers who participated in the development programme with those of comparable and richer non-participants. Hazard analysis was performed to calculate the relative risk of death controlling the effects of other independent variables. The analysis revealed a positive impact of the development programmes on survival of children.

Women-focused development programme improves child survival in rural Bangladesh

Introduction

The importance of economic and social factors in the context of health improvement has recently been emphasised (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 *et al.* 1997). Some of these programmes are comprehensive and are expected to have multifarious 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 health of individuals and eventually to make a positive contribution to the overall development of the society (Rohde *et al.* 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 more 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 ICDDR,B has been a pioneer in developing an effective community-based health and family planning service delivery programme. Its unique Demographic 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 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 Sixties. 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 recorded elsewhere (Bhuiya and Chowdhury 1994; Chowdhury *et al.* 1995).

The study area

The study area is a low-lying deltaic plan situated 45 kilometres 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. The area has been the research site of ICDDR,B since early '60s. So far, a number of cholera vaccines have been field-tested in the area. The DSS has been in operation in the area for more than thirty 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 *et al.* 1998)

Over the years both the areas have been experiencing a sharp decline in infant and childhood mortality as well as fertility. Infant mortality rates in the MCH-FP and comparison areas as of 1996 were 66.2 and 67.0 per 1,000 respectively. The childhood mortality rates in the MCH-FP and comparison areas in the same year were 6.0 and 8.0 per 1,000 respectively. 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.*, 1998). 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 and 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 six months of operation the members receive social awareness education and literacy and skill development training. It is normally after six 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 2,647 (1 US $ = 46 Taka) for the first loan and Taka 4,600 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 a month to Taka 1,000 a month (Zaman *et al.* 1995). The members received technical assistance from BRAC staff in relation to running the projects, starting from identifying a feasible project, its launching, management, 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 focus. 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 input records of BRAC. DSS involved 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 sixty 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 1993-96 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. Their date of death and migration status as of 31st December 1996 was also obtained from the DSS. 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 1996. This was used as a dichotomous variable in the logit regression analysis. The independent variables included mother's education, age at birth of a 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 years completed years. BRAC membership status had three categories: member, TG (BRAC target group) non-member, and non-TG 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 deviation or effect coding scheme was used (Swafford 1980; Forthofer and Lehran1981).

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 1996. 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 48 months of life and resulted in 48 data files. Finally, all the files were added together to form a data file of 129,187 monthly exposures from a total of 5,567 live births. Logistic regression analysis was performed on the combined data file to study the relationship of the independent variables on survival status of children. The analysis was carried out by using SPSS for Windows (Norusis 1994).

Findings

A total of 9,853 women were included in the baseline survey carried out before the implementation of the development programme in 1992. These women gave a total of 5,567 live births during 1993-96. Of the births, 1,530 were among BRAC members, 2,586 were among BRAC-eligible non-members, and 1,451were among non-eligible non-members. Of these births, 239 died during the neonatal, 105 during post-neonatal, and 43 during the childhood period.

Of the 9,853 women, 1,577 were BRAC members for 35 months on an average. Fifty-five percent of them were members for more than 3 years, and 10% for less than one year. Of them 90% took loans from BRAC with an average of 3 loans per member. The average loan size was Taka 3,615 (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.

Figure 1 presents the cumulative life table survival probability of three categories of children in terms of their mothers' eligibility to be BRAC member and participation in the socioeconomic development programmes of BRAC. It can be seen that the children of mothers who joined BRAC had a higher survival probability than the comparable non-members ($p = .0002$) and statistically similar to non-TG non-members ($p = .9171$).

The results of bivariate analysis of risk of death during neonatal, post-neonatal, and childhood period are presented in Table 1. It can be seen that the children of mothers who participated in the development programmes always had a lower risk of death than the children of poor non-member mothers. The magnitude of the difference was, however, greater during the neonatal period than the post-neonatal and childhood period. Neonatal mortality rate of the TG non-member children was 55.7 per 1,000 while for TG members it was 30.1 per thousand. During the

post-neonatal period the mortality rates for TG non-members and TG members were 2.3 and 3.1 per 1,000 respectively.

Among the other independent variables, the health intervention programme of ICDDR,B showed a positive effect on child survival. The age of the mothers at the time of birth showed a curvilinear relationship with child survival. The effect of sex of children and mothers education was not statistically significant.

The results of multivariate hazard logit regression analysis are presented in Tables 2 and 3. It can be seen in Table 3 that, in a multivariate situation, participation in development programmes and residing in the ICDDR,B's family planning intervention area and age of mothers showed a statistically significant relationship with child survival when the effects of sex and mother's education were controlled.

The logit regression coefficients based on the main effect model along with the odds ratios are presented in Table 3. In a relative sense, the odds of death of children of the economically poor mothers who did not participate in the development programmes were 1.5 times that of the children of mothers who did participate. Children from the areas without ICDDR,B's family planning and health programmes had a 27% higher odds of death than those from the area with these interventions.

The statistical insignificance of the interaction terms of mothers' participation in BRAC's development programme with sex of children and area of residence in terms of ICDDR,B's health intervention programmes (Table 2, Model II and III) implied that the effect of the development programmes was statistically similar in the health intervention and non-intervention areas, and in both boys and girls.

Discussion

The study findings clearly indicated the positive impact of women's participation in development programmes on the survival of their children. It should be noted that the study was prospective in nature and was aided by a highly credible demographic surveillance system rarely that is unique for anywhere in the developing world. The pattern of relationship between the socio-demographic variables and child survival was somewhat consistent with earlier findings (D'Souza and Bhuiya 1982; Bhuiya and Streatfield 1992). However, it was interesting to note the diminishing role of mother's education and gender in the context of child survival which has been consistently improving during the last decade (ICDDR,B 1997).

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. On the other hand women's participation in VO meetings, leadership roles, social awareness programme can contribute to change one's world-view and self-confidence. The health awareness part of the programme (not a very strong component in their Matlab intervention package) might have contributed to the prevention of illnesses and better illness management practices. 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 such as Bangladesh (Mosley and Chen 1982). However, at this stage the extent and nature of the effects of BRAC's programme is not fully known. Investigation towards an explanation of the mechanisms in terms of the proximate determinants is underway (Chowdhury *et al.* 1995).

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 at the same time 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.

References

Abed, Fazle H. 1996. Health and Development: lessons learned from the grassroots. Journal of Diarrhoeal Disease, 14:119-124.

Allison, Paul. 1982. Discrete-time methods for the analysis of event histories, in Samuel Leinhardt (ed.) Sociological Methodology, pp. 61-98. San Francisco: Jossey Bass.

Bhuiya, Abbas and Mushtaque Chowdhury. 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, Abbas and Kim Streatfield. 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, Volume 1, Methods and Procedures. Dhaka: Cholera Research Laboratory.

Chowdhury, Mushtaque, Abbas Bhuiya, Patrick Vaughan, Alayne Adams, and Simeen Mahmud. 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.

D'Souza, Stan. 1984. Small-area intensive studies for understanding mortality and morbidity processes: two models from Bangladesh—the Matlab project and the Companiganj health project. *In* Data Bases for Mortality Measurement, pp. 146-164. Population Studies, No. 84. New York: United Nations.

D'Souza, Stan and Abbas Bhuiya. 1982. Socioeconomic mortality differentials in a rural area of Bangladesh. Population and Development Review, 8:753-769.

Fauveau, Vincent. 1994. Matlab: Women, Children and Health. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh.

Forthofer, Ron. N. and Robert G. Lehren. 1981. Public Program Analysis: a New Categorical Data Approach. California: Lifetime Learning Publications.

Ginneken Jeoren. van. 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.

Krishna, Anirudh, Norman Uphoff and Milton J. Esman. 1997. Reasons for Hope: Instructive Experiences in Rural Development. Connecticut: Kumarian Press.

Lovel, Catherene. H. 1992. Breaking the Cycle of Poverty: The BRAC Strategy. Connecticut: Kumarian Press.

Mosley, William. H. and Lincoln C. Chen. 1982. An analytical framework for the study of child survival in developing countries. In W. H. Mosley and L. C. Chen (eds.) Child Survival: Strategies for Research. Population and Development Review, A supplement to Volume 10, pp:25-45.

Mostafa, Golam, Mohammad. A.K. Shaikh, Jeoren. K. van Ginneken, Abdul. M. Sarder. 1998. Demographic Surveillance System-Matlab. Volume Twenty Eight. Registration of Demographic Events 1996. Dhaka: Scientific Report No. 82. ICDDR,B.

Norusis, Marija. J. 1994. SPSS Advanced Statistics 6.1. Chicago: SPSS Inc.

Rohde, Jon, Meera Chatterjee and David Morley. 1993. Reaching Health for All. Delhi: Oxford University Press.

SAARC. 1992. Report of the Independent South Asian Commission on Poverty Alleviation. Kathmandu: SAARC.

Swafford, Michael. 1980. Three parametric techniques for contingency table analysis: a nontechnical commentary. American Sociological Review. 45:664-90.

World Bank.1993. World Development Report 1993: Investing in Health. New York: Oxford University Press.

Zaman, Hassan, Saima Rahman, Shahed Hussain, Masud Rana. 1995. Profitability of BRAC-financed projects: a study of seven microenterprises in Matlab. Working Paper Number 7. Dhaka: BRAC-ICDDR,B Joint Research Project.

Cumulative life table probability of survival

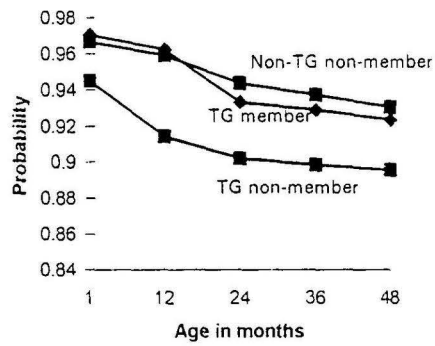

Table 1

Risk of death during neonatal, post-neonatal, and childhood period by mother's participation in socio-economic development programmes and other independent variables in Matlab, Bangladesh, 1993-96

Independent variables	Neonatal		Post-neonatal		Childhood		All	
	Number of children	Probability of death	Child-month exposure	Probability of death	Child-month exposure	Probability of death	Child-month exposure	Probability of death
BRAC membership*	$\chi^2 = 19.36$	p = .000	$\chi^2 = 3.12$	p = .210	$\chi^2 = 2.82$	p = .244	$\chi^2 = 20.32$	p = .000
TG member	1530	.0301	14429	.0022	20302	.0010	36261	.0027
TG non-member	2586	.0557	23429	.0031	33020	.0008	59035	.0041
Non-TG non-member	1451	.0338	13282	.0023	19158	.0005	33891	.0027
Residence	$\chi^2 = 6.71$	p = .009	$\chi^2 = 0.72$	p = .393	$\chi^2 = 0.67$	p = .414	$\chi^2 = 7.92$	p = .005
MCH-FP area	1974	.0334	18469	.0024	26225	.0007	46668	.0027
Comparison area	3593	.0481	32671	.0028	46255	.0009	82519	.0037
Mother's age	$\chi^2 = 11.39$	p = .009	$\chi^2 = 8.39$	p = .038	$\chi^2 = 1.33$	p = .721	$\chi^2 = 20.34$	p = .000
< 25 years	1672	.0443	15710	.0024	24701	.0008	42083	.0031
25 29	1969	.0335	18295	.0020	24912	.0007	45176	.0027
30 34	1322	.0454	11832	.0033	15585	.0010	28739	.0040
35 +	604	.0646	5303	.0040	7282	.0007	13189	.0049
Mother's education	$\chi^2 = 1.32$	p = .516	$\chi^2 = 2.36$	p = .307	$\chi^2 = 1.30$	p = .522	$\chi^2 = 4.40$	p = .110
None	3795	.0451	34912	.0029	49122	.0009	87829	.0036
1-5 years	1190	.0387	10914	.0020	15634	.0007	27738	.0028
6 +	582	.0378	5314	.0024	7724	.0005	13620	.0029
Sex of child	$\chi^2 = 0.41$	p = .521	$\chi^2 = 0.18$	p = .673	$\chi^2 = .383$	p = .536	$\chi^2 = .000$	p = .985
Male	2822	.0446	25929	.0025	36684	.0007	65435	.0033
Female	2745	.0412	25211	.0027	35796	.0009	63752	.0034

* TG- Target group for BRAC's programme (meaning very poor).

Table 2
Hazard logit analysis of association between child mortality and mother's participation in socioeconomic development programmes and other independent variables

Independent variables	Model I	Model II	Model III
BRAC membership	χ^2=15.71***	χ^2=16.28***	χ^2=16.03***
Residence	χ^2=5.09*	χ^2=6.05*	5.07*
Mother's age	χ^2=17.41***	χ^2=17.55***	17.37***
Mother's education	χ^2=1.71ns	χ^2=1.79ns	1.78ns
Sex of child	.000ns	χ^2=.000ns	0.13ns
BRAC membership X Residence	-	1.14ns	-
BRAC membership X Sex	-	-	1.54ns
Model	χ^2=45.72***	χ^2=46.89***	χ^2=47.28***

*** p<.001, ** p<.01, * p<.05, ns not significant at 5%

Table 3
Hazard logit model coefficients of the main effect model of child mortality and mother's participation in socio-economic development programmes and other independent variables

Independent variables	Coefficients	Odds ratio
BRAC membership		
Member (poor)	-.1216	1.00
Non-member (poor)	.2625	1.47
Non-member (rich)	-.1409	0.98
Residence		
MCH-FP area	-.1207	1.00
Comparison area	.1207	1.27
Mother's age		
<25 years	-.1329	0.79
25-29	-.2737	0.68
30-34	.1060	1.00
35+	.3006	1.21
Mother's education		
None	.0697	1.04
1-5 years	-.0985	0.88
6+	.0288	1.00
Sex of child		
Male	-.0004	1.00
Female	.0004	1.00
Model χ^2=45.72: p=.000		

Acknowledgements

This research was carried out under the auspices of BRAC-ICDDR.B collaborative project and was supported by the Ford Foundation and Aga Khan Foundation. The ICDDR.B: Centre for Health and Population Research is supported by the following countries, donor agencies and others which share its concern for the health and population problems of developing countries:

- The aid agencies of the Governments of Australia, Bangladesh, Belgium, Canada, European Union, Japan, the Netherlands, Norway, Saudi Arabia, Sweden, Switzerland, the United Kingdom, and the United States of America;

- UN Agencies: United Nations Development Programme (UNDP), UNICEF, and World Health Organization (WHO);

- International Organizations: International Atomic Energy Agency (IAEA), International Centre for Research on Women (ICRW), International Development Research Centre (IDRC), Population Council, Swiss Red Cross, and the World Bank;

- Foundations: Aga Khan Foundation, Child Health Foundation, Ford Foundation, George Mason Foundation, and Rockefeller Foundation;

- Medical Research Organizations: International Life Sciences Institute (ILSI), National Institutes of Health (NIH), New England Medical Centre, Northfield Laboratories, Procter and Gamble, Rhone Poulenc Rorer, and Thrasher Research Fund;

Universities: Johns Hopkins University, Karolinska Institute, Loughborough University, London School of Hygiene & Tropical Medicine, University of Alabama at Birmingham, University of Goteborg, University of Pennsylvania, and University of Virginia;

Others: American Express Bank, Helen Keller International, Lederle Praxis, NRECA, International Ltd., The Rand Corporation, Save the Children Fund-USA, Social Development Center of the Philippines, UCB Osmotics Ltd., and Wander A.G.

The authors are also grateful to the staff members of the Demographic Surveillance System of ICDDR.B for providing the necessary data and to the staff members of the BRAC-ICDDR.B collaborative project for their assistance in various ways.