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Factors affecting acceptance of immunization among children in rural Bangladesh

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This paper used the Bangladesh Fertility Survey 1989 data to identify the factor affecting acceptance of immunization among children in rural Bangladesh. Acceptance of DPT, measles and BCG vaccinations were the dependent variables. The independent variables included proximity to health facilities, frequency of visit by health worker, respondent's mobility, media exposure, education, age, economic status of household, region of residence, and gender of child. Logistic regression analysis was performed to assess the net effects of the variables in addition to univariate analysis. Among the independent variables, proximity to health facility, frequency of health worker's visit, mother's mobility, education, age, gender of child, ownership of radio, economic condition of household, and region of residence showed statistically significant association with acceptance of immunization. The effect of frequency of health worker's visit was dependent on region of residence, possession of radio, and mother's education. The effect of mother's ability to visit health centre alone was also dependent on ownership of radio, economic condition of household, and mother's education.

Introduction

The Expanded Programme on Immunization (EPI) against 6 major childhood diseases was officially launched in Bangladesh on the World Health Organization Day in 1979. The programme received serious attention only after 1985 when the then President of Bangladesh made a commitment to reach universal child immunization by 1990. This was declared at the 40th anniversary session of the United Nations General Assembly. A phased expansion of the programme was planned: 8 thanas (administrative unit below district) out of 460 were targeted during 1985–86, and all were targeted by 1989. The programme was implemented jointly by all field-level health and family planning workers and community volunteers through clinic-based and outreach activities of the existing health service facilities (Talukdar et al. 1991), health workers being responsible for performing the immunization, and family planning workers and the others for motivation and mobilization. The programme was backed by strong social mobilization and communication activities, and multi-partner support from donor agencies, and non-government organizations (Abed et al. 1991).

The achievement of the programme, from 2% coverage in 1985 to 61% in 1991, has been a 'near miracle' but is still some way from the target of over 90% coverage (UNICEF 1992; De Silva et al. 1991). The challenge now is not only to attain the target but also to sustain the success. For both, an assessment of the impacts of various programmatic variables on acceptance of immunization and their interaction with relevant non-programmatic factors is essential for further improvement of the programme.

We attempt in this paper to identify the role of health programme-related variables in relation

to the acceptance of immunization in rural Bangladesh during 1983–88. We also examine whether the effects of these variables were different for children in various social, economic, demographic, and regional groups. The analysis was limited to a rural sample because the relevant information on access to services was only available for rural areas.

Subjects and data sources

Data for this study came from the rural sample of the Bangladesh Fertility Survey conducted nationally during 1989. A total of 8467 ever-married women aged under 50 years were interviewed from December 1988 to April 1989. A two-stage probability sample design was used to select the respondents. At the first stage a sample of 175 rural Enumeration Areas (Bangladesh Bureau of Statistics divided the country into 17 998 urban and 184 102 rural enumeration areas) were selected with probability proportional to the estimated number of households. Each selected area was then mapped and all households listed. After mapping and listing, households were selected with probability inversely proportional to the first stage selection probability. The mean number of households selected per rural Enumeration Area was 47, with a range of 27 to 107. Finally, all selected households were enumerated and all ever-married women under the age of 50 years who were resident in the household on the night prior to enumeration were listed for interview. Details of the field procedures and scope of the study have been reported elsewhere (Huq and Cleland 1990).

Information on immunization of children born to the respondents during the 6 years preceding the survey, and who were alive at the time of the survey, were gathered from mothers. Information on proximity of respondents' village to health facilities, visits of health personnel, and various sociodemographic characteristics were also collected. Our analysis was restricted to 5743 children who were aged one year or more at the time of survey.

The variables

Acceptance of immunization was assessed by asking the mother about her children in a retrospective fashion. Receipt of any one of DPT (at least one dose), measles or BCG vaccinations was the outcome measure. In multivariate analysis the outcome measure was used as a dichotomized dependent variable.

The independent variables included proximity to the health facilities, frequency of visit by health workers, respondent's mobility, media exposure, education, age, economic status of the household, region of residence, and gender of child.

Proximity to health facilities was measured by distance to the nearest health centre, such as Union Health and Family Welfare Centre, Government Health Clinic, hospital, and Maternal and Child Welfare Centre. Proximity to health worker was measured by distance to the nearest family welfare assistant (FWA), health assistant (HA), or health worker. Frequency of visit by the health worker was measured by the family welfare assistant's visits to the locality during the last year.

Mother's mobility was assessed by their reported ability to visit the health centre alone. Education was measured by grades completed in secular schools. Age of mothers referred to age at the time of birth of the child. Media exposure was measured by possession of a working radio by the respondent's household. Economic status was measured by ownership of chair, bed, and wardrobe by the household. Region of residence referred to 4 administrative divisions of the country.

Method of analysis

Both bivariate and multivariate analyses were carried out. Logistic regression analysis was performed to assess the net and interaction effects of the independent variables. In multivariate analysis a main effect model was first fitted to identify important independent variables. Secondly, the dependence of the effects of the programmatic variables, such as distance to nearest health facility, number of visits by FWA, and mother's ability to visit health centre alone, on mother's education, possession of articles, mother's age, gender of children, and region of residence was examined by adding product-terms of programmatic and sociodemographic variables to the main effect model. Finally, the

proportions of immunized children in each of the combinations of categories for the pairs of programmatic and sociodemographic variables with statistically significant interaction effects, were calculated and presented.

Results

Results of bivariate analysis of the relationship between acceptance of immunization and health programme-related and other variables are presented in Table 1 and Table 2 respectively. Tables 3 and 4 present the proportion of immunized children cross-classified by the variables with significant interaction effects. Cross-classified proportions are also plotted in Figures 1–6.

Health programme variables

Bivariate analysis revealed that distance to nearest health facility and health worker has a negative relationship, and number of visits by the FWA to the community in a year has a positive relationship, with acceptance of immunization (Table 1).

Table 1. Percentage of rural Bangladeshi children aged 1–4 years who had any one of DPT, Measles, or BCG immunization during 1985–1988 by health programme variables

Independent variables	Number of children	Per cent immunized	Remarks
Distance to nearest health facility			
<1 mile	2658	31.6	
2	2087	28.1	P <0.001
3+	935	21.1	
Distance to nearest health worker			
<1 mile	3298	28.5	
2	1721	26.6	P <0.001
3+	570	20.3	
Number of visits by family welfare assistant last year			
0	1068	17.7	
1–6	3066	26.5	P <0.01
7+	1571	35.7	

Note: Number of children may differ due to missing data

The proportion of children immunized in relation to distance to the nearest health facility implied that children residing more than three miles from any health facility had the lowest chance of immunization compared with those residing nearer to health facilities. Relatively speaking children residing within one mile had a 50% higher chance of being immunized, and those residing within 1–2 miles had a 33% higher chance, than those residing at a distance of more than three miles. A similar pattern of relationship of proportion immunized with distance to nearest health workers was also observed.

Table 2. Percentage of rural Bangladeshi children aged 1–4 years who had any one of DPT, Measles, or BCG immunization during 1985–1988 by sociodemographic, media exposure, physical mobility, and region of residence

Independent variables	Number of children	Per cent immunized	Remarks
Mother's education			
None	4077	23.7	
Lower primary	779	28.7	P <0.01
Higher	885	42.6	
Possession of chair, bed, wardrobe			
All three	808	41.7	
Any two	1542	29.5	P <0.001
Any one	1536	24.9	
None	1856	21.0	
Mother's age			
<20	1319	29.6	
20–29	2983	29.3	P <0.001
30+	1421	21.2	
Gender of children			
Male	2866	29.8	P <0.001
Female	2877	24.8	
Possession of radio			
Yes	1152	36.5	P <0.001
No	4591	24.9	
Mother can go to health centre alone			
Yes	394	40.1	P <0.001
No	5347	26.4	
Region			
Chittagong	1596	20.5	
Dhaka	1721	26.7	P <0.001
Khulna	990	36.7	
Rajshahi	1436	29.2	

Note: Number of children may differ due to missing data

Table 3. Percentage of rural Bangladeshi children aged 1–4 years who had any one of DPT, Measles, or BCG immunization during 1985–1988 by mother's education, possession of radio, region of residence and frequency of visits by health workers

Independent variables	Number of visits by FWA 0	1-6	7+
Mother's education			
None	13.3	23.2	33.3
	(803)	(2193)	(1050)
Lower primary	23.0	26.7	35.3
	(122)	(419)	(235)
Higher	37.8	42.3	45.1
	(143)	(454)	(286)
Possession of radio			
Yes	22.9	34.0	50.2
	(205)	(620)	(323)
No	16.5	24.6	32.1
	(863)	(2448)	(1248)
Region			
Chittagong	16.4	17.2	31.8
	(415)	(797)	(384)
Dhaka	20.7	29.2	28.0
	(368)	(845)	(472)
Khulna	29.6	34.9	41.3
	(108)	(524)	(358)
Rajshahi	7.3	27.2	44.8
	(177)	(902)	(357)

Note: Figures within parentheses are number of children. Number may differ due to missing data.

Table 4. Percentage of rural Bangaldeshi children aged 1–4 who had any one of DPT, Measles, or BCG immunization during 1985–1988 by mother's education, possession of articles, possession of radio, and mother's ability to visit health centres alone

Independent variables	Mother can go to health centre alone Yes	No
Mother's education		
None	22.3	23.8
	(188)	(3889)
Lower primary	45.0	27.3
	(60)	(719)
Higher	61.0	39.0
	(146)	(739)
Possession of chair, bed, wardrobe		
All three	69.0	37.3
	(113)	(695)
Any two	32.7	29.3
	(110)	(1432)
Any one	33.8	24.5
	(80)	(1456)
None	18.7	21.1
	(91)	(1765)
Possession of radio		
Yes	58.2	33.6
	(314)	(1018)
No	24.6	30.8
	(4331)	(260)

Note: Figures within parentheses are number of children. Number may differ due to missing data.

Similarly, children from localities with more than 6 visits a year from FWAs had 2.10 times (>50%) and with 1-6 visits had 1.31 times (25%), higher chances of immunization than those who were not visited at all.

Mother's mobility

A mother's ability to visit a health centre alone was found to be of significance. Children of mothers who could visit health centres alone had a 52% higher chance of being immunized than those whose mother could not.

Mother's education

Proportion of immunization was also found to be positively related with a mother's years of schooling. Children of mothers with more than lower primary level of schooling had an 80% higher chance of being immunized than those of mothers without any schooling. Children of mothers with lower primary level of education had a 21% higher chance than those of mothers with no schooling.

Economic condition of household

The economic condition of the household, as measured by ownership of chair, bed, and wardrobe, showed a positive relationship with immunization of children. Children from households with all of the above items were nearly twice as likely to be immunized than those from households with none of these items.

Mother's age

Acceptance of immunization among children also varied with mother's age. Children of younger mothers were more likely to be immunized than those of older mothers. Likelihood of immunization was 40% and 38% higher among children of mothers aged less than 20 and in the 20-29 years age group than those of 30 years and more.

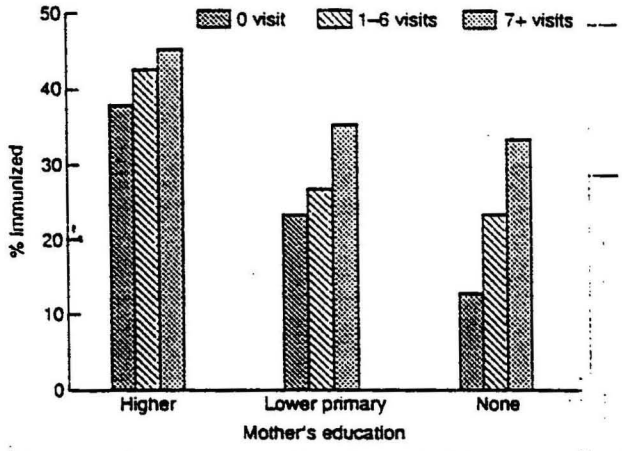

Figure 1. Percentage of children immunized by mother's education and frequency of FWA's visit

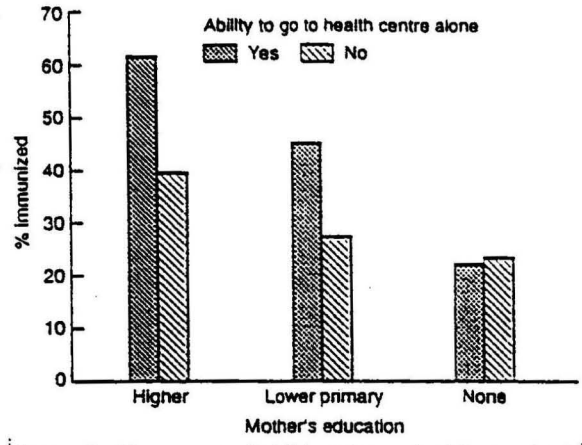

Figure 4. Percentage of children immunized by mother's education and mother's ability to go to health centre alone

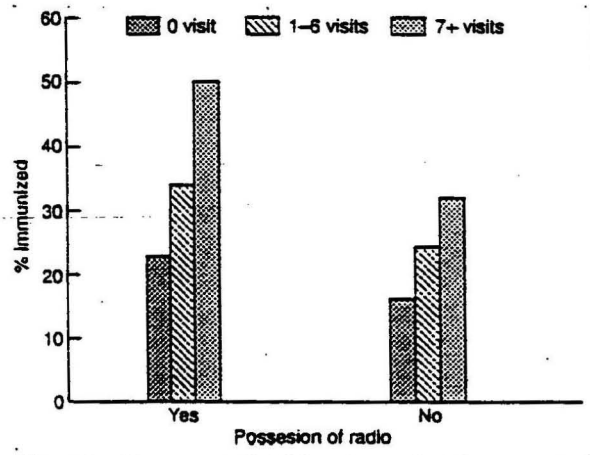

Figure 2. Percentage of children immunized by possession of radio and frequency of FWA's visit

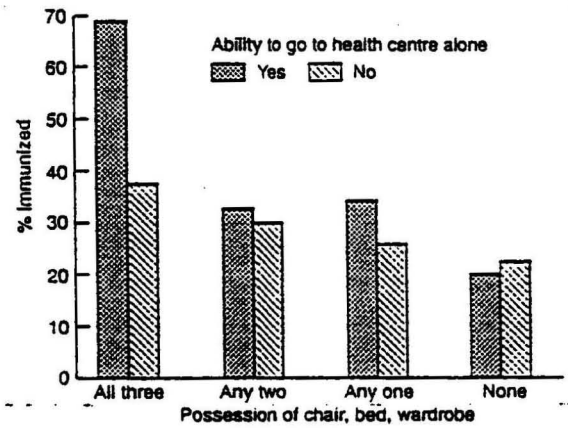

Figure 5. Percentage of children immunized by article ownership and mother's ability to go to health centre alone

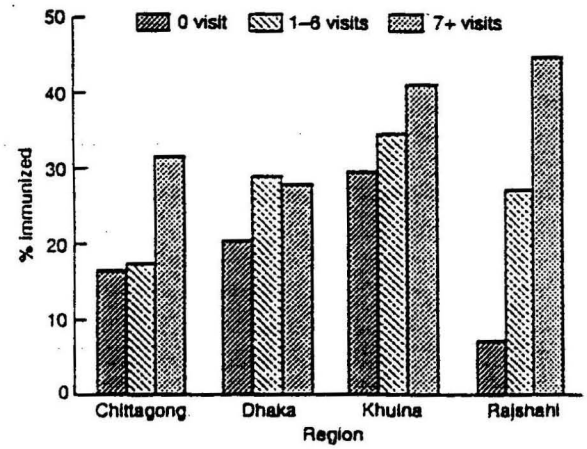

Figure 3. Percentage of children immunized by region and frequency of FWA's visit

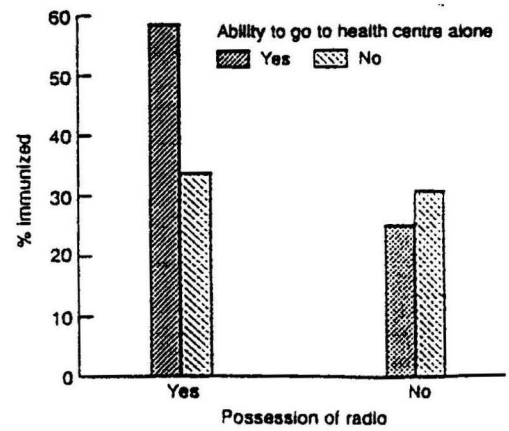

Figure 6. Percentage of children immunized by possession of radio and mother's ability to go to health centre alone

Media exposure

Exposure of the mother to radio was also found to have a positive impact on children's immunization. Children from households with a working radio had a 47% higher chance of being immunized than those from households with no working radio.

Region of residence

A significant regional variation in immunization acceptance was also marked. Children from Chittagong Division had the lowest probability of being immunized, while those of Khulna division had the highest, followed by Rajshahi and Dhaka. Chances of immunization were respectively 79%, 42%, and 30% higher for children from Khulna, Rahshahi and Dhaka respectively, compared to those from Chittagong Division.

Gender of children

Sex differentials in immunization were found to be statistically significant. Male children were 20% more likely to be immunized than female children.

Interaction effects

The logistic regression analysis revealed that all the variables included in Tables 1 and 2 also have statistically significant net influence on the probability of immunization. Analysis of first order interaction effects showed that the effects of number of visits by the FWA and mother's ability to visit the health centre alone are dependent on mother's education, economic condition of household, media exposure, and region of residence. The results of logistic regression analysis are not presented in this paper, however the observed proportions of immunized children cross-classified by the variables having statistically significant interactions are presented in Tables 3 and 4, and also plotted in Figures 1–6. An interpretation of the results obtained by combining logistic regression and stratified analyses are presented below.

Frequency of visit by FWA and mother's education

FWA visits were relatively more important in increasing the acceptance of immunization among children of mothers with no education and lower primary level of education than of mothers with a higher level of education. The ratios of proportion of immunized children with 7 or more visits and with no visit among children of mothers with no education, lower primary education and higher education were respectively 2.5, 1.5 and 1.2 times higher. Although the positive effect of mother's education was quite substantial, frequent visits by FWAs tended to diminish the difference in immunization acceptance associated with mother's education (Table 3 and Figure 1).

Frequency of visit by FWA and radio exposure

The interaction effect of frequency of worker's visit and mother's exposure to radio on immunization of children was one of degree. The effect of exposure to radio in increasing the acceptance of immunization was found to increase with an increase in the number of worker's visits (Table 3 and Figure 2).

Frequency of visit by FWA and region of residence

It can be seen in Table 3 and Figure 3 that the effects of number of visits by FWA were not similar in all the regions. The relationship was linear in all the regions except in Dhaka. The effect of worker's visit on the proportion of children immunized was strong and consistently increasing for Rajshahi and Khulna. In communities in Khulna without any worker's visit, only 30% of children were immunized, while for Rajshahi the figure was less than 10%. With intensive worker's visits the proportion rose to more than 40% in both regions.

In Dhaka, 1–6 and 7 or more visits resulted in similar proportions of immunized children, both greater than the proportion immunized with no visits. For Chittagong, on the other hand, only 7 or more visits affected the proportion immunized.

Mother's mobility alone and education

A mother's ability to visit a health centre alone was important in increasing the acceptance of immunization only in children of mothers with some years of schooling (Table 4 and Figure 4). For illiterate mothers it was immaterial whether they could visit a health centre alone or not. It can also be said that the influence of mother's education on acceptance of immunization was greater for those who could visit a health centre alone.

Mother's mobility alone and household economic status

A mother's ability to visit a health centre alone influenced the immunization of children from rich and poor households differently. The effect of mother's mobility was strongest for the children of rich households. For the poorest households, the difference between the proportion of children immunized whose mothers could visit the health centre alone and the proportion for those who could not was small. Among the children from the richest households, the mother's ability to visit the health centre alone made a large difference in the proportion of children immunized – around 1.85 times (Table 4 and Figure 5).

Mother's mobility alone and radio exposure

Possession of a working radio was found to be of more importance in the context of immunization of children if mother's were able to visit a health centre alone. For those who could not visit alone, possession of a radio made only a small difference, in the unexpected direction (Table 4 and Figure 6).

Discussion

The positive relationship of frequency of health worker visits and acceptance of immunization was quite expected. However, the visit, which was basically for the promotion of EPI along with family planning activities, did not make much difference for the children of literate mothers. The literate mothers perhaps knew about EPI from other sources or were easily motivated by the health worker's initial visits, which in effect resulted in higher immunization acceptance among their children. In fact, mother's education was found to be positively correlated with knowledge of immunization in this society and elsewhere, and better knowledge on immunization meant more acceptance (Chakravorty, 1987; Streatfield et al. 1988; 1990).

The findings that acceptance of immunization was greater for children whose community was more frequented by the field workers, and that the frequency of visits made small difference among children of mothers with higher primary level of education have important policy implications. It clearly implies that health worker's should spend more time visiting the illiterate mothers than the literate.

The importance of mass media campaigns was reflected in the positive relationship of immunization and possession of radio. The effects of health workers' visits and exposure to radio were found to be reinforced by each other. It is quite expected in a society with a low literacy level that the multidimensional approach is more effective in convincing parents to accept modern concepts such as immunization.

The regional variations in the impact of FWA visits on acceptance of immunization indicated that for Chittagong only a large number of visits improved in acceptance. This showed the backwardness of the region in embracing modern services, and is consistent with its poor performance in terms of mortality and contraceptive acceptance (Huq and Cleland 1990; Mitra and Associates 1992).

The effect of mother's mobility on acceptance of immunization and its dependence on education, household economic condition, and possession of a radio has raised some important issues. The fact that mobility did not matter for those who were either from poor households or illiterate implied that mobility has different meanings for literate and illiterate, for rich and poor. In this society rural women traditionally do not move without a companion, especially a male, for it is not considered modest. It is only very poor women who move alone to make their living. The mobility of literate and rich women alone is a very recent phenomenon in rural Bangladesh.

Thus it is quite obvious that for poor and illiterate women just the ability to visit a health centre alone has little significance for the immunization of children. They may not even be aware and convinced about the benefit of immunization. They also may not have the means to hire transport to take their children to a health centre for immunization, the opportunity cost for which may be high. Even if they visit the health centres, quite often they do not receive adequate attention from the health centre personnel (BRAC 1990). The literate and rich women, on the other hand, are more aware of the benefits of immunization. Consequently,

their ability to visit a health centre alone puts their children in an advantageous position as they then do not have to wait for a male's free time to take their children to be immunized. In addition, they are also well received and attended by the health centre personnel (BRAC 1990), which in turn may encourage them to make further visits to health facilities.

Sex discrimination against female children in medical care, as observed previously in this culture (Chen et al. 1981; Bhuiya and Streatfield 1992; Hossain and Glass 1988), is also found to exist for immunization, even if it is provided free. Lack of significant interaction of the effect of sex with education and other variables indicates that the extent of this discrimination was similar among children of all mothers, irrespective of their education and socioeconomic status. However, it can be expected that the extent of sex differentials will be reduced with universal access to immunization services.

The time period to which the present study data referred was the period when EPI in Bangladesh was starting to attract serious attention. The first phase of EPI began in 8 thanas in 1986; by 1988 it was expanded to more than 200 thanas, and by 1989 the programme covered the entire country (Talukdar et al. 1991). The coverage in 1990 was more than 60%, and the subsequent achievement, termed as 'near miracle', showed rapid increase to near universal (Huq 1991; UNICEF 1992). The success was a result of collective efforts by the government and NGOs, with strong support from the donors. While the world was impressed to see this success in Bangladesh, a concern still remains about its sustainability. It is often asked what would happen if the current level of intensity of the EPI is reduced; a question for which the answer is not yet known. The intensity of the EPI during 1983–88 was modest and perhaps was at a level which the country can manage in terms of its resources. Thus the results of the our analysis reflected, to some extent, in which segment of the population the programme was more effective at a modest level of inputs.

Since EPI has achieved near universal coverage, it is expected that the observed differentials in acceptance might have been diminished due to the intensity of the programme. However, if the intensity is reduced one may expect the patterns observed above to reappear. Therefore, before making any changes in the EPI strategy, appropriate measures should be taken to ensure adequate attention for those who are diffident in accepting EPI services and who reside far away from health facilities.

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