

# Coverage of Child Immunization in Rural Hard-to-reach Haor Areas of Bangladesh: Acceptability of Alternative Strategies



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# Coverage of Child Immunization in Rural Hard-to-reach Haor Areas of Bangladesh: Acceptability of Alternative Strategies

Md. Jasim Uddin<sup>1</sup>, Charles P. Larson<sup>1\*</sup>, Elizabeth Oliveras<sup>1</sup>  
A.I. Khan<sup>1</sup>, M.A. Quaiyum<sup>1</sup>, Nirod Chandra Saha<sup>1</sup>  
Faaiz Ahmed<sup>1</sup>, Iqbal Ansary Khan<sup>2</sup>, and Shamsuzzaman<sup>2</sup>

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<sup>1</sup>Health Systems and Infectious Diseases Division, ICDDR,B, GPO Box 128, Dhaka 1000, Bangladesh and

<sup>2</sup>Expanded Programme on Immunization, Directorate General of Health Services,

Ministry of Health and Family Welfare, Government of Bangladesh, Dhaka, Bangladesh

\*Present address: Centre for International Child Health, All Children Matter, British Columbia Children's Hospital, Vancouver, BC, Canada

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GPO Box 128, Dhaka 1000  
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Phone : 88 02 8822467  
Fax : 88 02 8819133 or 88 02 8823116  
Email : msik@icddrb.org  
Web : <http://www.icddrb.org>

**Edited by**

M. Shamsul Islam Khan

**Administrative and Technical Assistance**

Md. Emdadul Haque  
Laila Farzana

**Cover design**

Syed Hasibul Hasan

**Page formatting**

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## Abstract

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**Background:** Immunization is essential to achieve the Millennium Development Goals (MDGs) of substantially reducing child mortality rates. Results of some studies suggest that the coverage of child immunization is low in hard-to-reach areas of Bangladesh. Alternative strategies for improving the immunization coverage in those remote areas have not been assessed.

**Objectives:** The study was conducted to assess the status of childhood vaccination coverage in rural hard-to-reach haor areas of Bangladesh and also to assess the acceptability of selected alternative strategies in those areas.

**Methods and materials:** During September–November 2006, the acceptability study was carried out in a remote hard-to-reach haor (low-lying) upazila of Sunamgonj district under Sylhet division. The World Health Organization (WHO)-recommended 30 cluster-sampling methodology was used for determining the sample size. Seven children aged 12-23 months were selected from each cluster. Data were collected through a survey, in-depth interviews, group discussions, and observations of vaccination sessions. The chi-square tests were performed to compare the coverage in the study area with the national coverage. To ascertain the status of child immunization coverage by socioeconomic status, univariate and bivariate analyses were performed. Qualitative data collected through in-depth interviews and group discussions were first transcribed and then translated into English. Data were then analyzed using content analysis.

**Results:** The complete immunization coverage among children aged 12-23 months was significantly lower in the hard-to-reach areas compared to the national coverage level. The drop-out rate was significantly higher in the hard-to-reach areas compared to the national level. The overall rate of invalid doses in the upazila was also higher (9%) compared to the national level (7%). Results of bivariate analysis showed that, as expected, children with more educated parents were more likely to have complete immunizations. The findings also showed that complete immunization was significantly higher among children of parents who had exposure to mass media than those who had not. The study identified the following reasons for low coverage of child immunization in the hard-to-reach areas: (a) irregular/cancelled EPI sessions; (b) less time spent in EPI spots by field staff; (c) absence of any alternative strategy for remote areas; (d) absence of any mechanism to involve the community with the EPI; (e) side-effects; (f) invalid doses; (g) poor knowledge of mothers about benefits of complete vaccination; (h) less/absence of supervision; (i) mothers did not get information about EPI sessions; (j) an inadequate number of field workers for the increased population; (k) the post of Health Assistant (HA) remained vacant; (l) geographical barriers; and (m) lack of money to meet necessary transportation costs. The findings indicated that the existing service-delivery strategy was not sufficient to improve the immunization coverage in the hard-to-reach areas. However, most strategies assessed, such as modified EPI service schedules, organizing EPI days, EPI support groups, use of a screening tool in health centres other than EPI spots, training of service providers on invalid doses, and elimination of geographical barriers, were considered acceptable by healthcare providers for the hard-to-reach areas.

**Discussion and conclusion:** The coverage of child immunization in the hard-to-reach haor areas was low, and a number of strategies were acceptable for implementation for improving the coverage in those areas. Before implementing the alternative strategies in the hard-to-reach areas, the feasibility and effectiveness of the acceptable strategies need to be tested to identify evidence-based strategies for scaling up in all hard-to-reach areas of Bangladesh.



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## Introduction

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Vaccine-preventable diseases remain an important cause of death among young children in many developing countries (1). Complete immunization is essential to achieve the Millennium Development Goal (MDG) of substantially reducing child mortality rates (2). Nearly 30 million of 130 million children born every year do not receive basic immunization. The great majority of unreached children, or 28 million, lives in developing countries, and 25 million of those are in the poorest countries, defined as countries that have less than U\$ 1,000 per-capita GNP (3). According to global immunization experts, 10 million additional lives could be saved through full child and maternal immunization during 2006-2015 (2).

Around the world, regional averages mask lower local coverage. In many cases, children of rural and remote areas have low coverage of immunization (4). In Africa, immunization is a mix of successes and failures, but 17 sub-Saharan African countries have immunization-coverage levels under 50% (5). The immunization coverage in Asia has increased dramatically during the past 25 years; however, 50% of children in the region remain unimmunized (4). Although infectious diseases affect poor children disproportionately, the immunization coverage is higher in wealthier households in most South Asian countries. In many cases, children in rural and remote areas in particular have less access to immunization (1). This immunization gap represents a devastating toll on the world's population. Every year, three million unnecessary premature deaths occur because a good number of children have not been given vaccines that could have saved their lives. This is not only a health issue, it is an issue of fundamental equity and human rights (3).

Immunization gap exists also within Bangladesh. Of 12-23 months old children in Bangladesh, although 71% of children aged 12 months are fully immunized, the coverage remains low in some areas. In 22 rural districts, the full immunization coverage ranges from 44% to 60%, and almost all these districts are hard-to-reach (6). The coverage of child immunization in urban slums of Bangladesh is also low (54%) (6). To improve the coverage of child immunization in urban slums, strategies have been developed and are being tested through a collaboration of International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B), Ministry of Health and Family Welfare (MoHFW), Dhaka City Corporation (DCC), and non-governmental organizations (NGOs). Hard-to-reach areas have yet to be addressed. Hard-to-reach areas are those that are difficult to reach to deliver immunization services, i.e. mainly low-lying (haor) and hilly areas. Fourteen million people live in such areas of Bangladesh (7). A study in border areas of Kurigram, Jamalpur, and Sherpur districts found that the proportion of fully-immunized children aged 12-23 months was only 42% (8). Results of a recent study by the World Health Organization (WHO) showed that the National Immunization Day (NID) coverage was low and gradually decreasing in hard-to-reach areas compared to other areas of Bangladesh, and the study concluded that "hard-to-reach areas need more attention for child immunization" (9). To protect children born everyday, health systems must have the ongoing capacity to provide effective, timely, and sustainable vaccination services (1). Results of review of literature showed that, although information on the coverage of Expanded Programme on Immunization (EPI) in hard-to-reach areas is available district-wise and in border areas and also on NIDs, information from remote rural areas is very limited.

Studies in various underdeveloped countries have identified individual components of EPI that are effective in increasing coverage. ICDDR,B has documented the effectiveness of several individual components in urban slums of Bangladesh, another area with a low coverage (54%) (6). Through a collaboration of ICDDR,B, MoHFW, DCC, and NGOs, a package of strategies is currently being

tested in urban slums. The acceptability of these same strategies among healthcare providers for hard-to-reach areas is unknown. However, studies in different countries have found evidence of the effectiveness of interventions to improve full immunization coverage.

Modification of the schedule of the EPI session to allow women more time to attend in a particular location could be an effective strategy for such areas. A study in Uganda found that the implementation of additional and more convenient outreach sites resulted in a steady increase in coverage and a distinct decline in drop-out rate (10).

Studies in different countries have found evidence of the effectiveness of interventions to improve full immunization coverage. A study in Madagascar found that the immunization coverage was improved, and drop-outs were reduced through intensified efforts at system strengthening and community mobilization (11). Results of a study in India indicated that community participation improved the vaccination coverage (12,13). Results of another study in Uganda also showed that the involvement of the community in efforts to increase the number of children fully immunized resulted in an increased immunization coverage (10). Another study in Benin found that lack of community involvement was one of the major constraints to improving the EPI coverage (14). A study conducted in Bangladesh on NID found that the community played a significant role in increasing the polio coverage. Over 46% of parents learned about the NID from community volunteers who also actively participated with health providers in child-to-child search (15). Community participation and appropriate behaviour change communication may be particularly important in low coverage areas of Bangladesh, and effective means of ensuring community involvement needs to be developed and tested.

Findings of a study revealed that the use of a screening tool in the essential services package (ESP) clinics could be effective for identifying unmet need for immunization. For every 100 clients who requested immunization services at NGO clinics, 13 other clients attending for other services were found to have a need of immunization for their children (16). A study conducted by ICDDR,B in six municipalities in Bangladesh revealed that almost one-quarter of children aged less than two years in urban areas had an unmet need for immunization (17).

A study in Indonesia found that training for providers helped improve the immunization coverage. Findings of the study revealed that the coverage of DPT1, polio3, and measles vaccines in intervention areas rose about 40% while the coverage in non-programme group remained nearly constant over a two-year period (18). In Bangladesh, current training for EPI providers includes training on valid doses but does not specially focus on it. Refresher training for EPI providers addressing the issue of valid doses could be an important strategy for low coverage areas of Bangladesh. It is, therefore, important to test a combination of strategies to improve the coverage of child immunization in hard-to-reach areas. As stated, a number of innovative strategies are currently being tested in urban slums where the coverage is also low, and assessing their acceptability among healthcare providers in hard-to-reach rural areas is equally important to design appropriate strategies for improving the coverage of child immunization in those rural remote areas.

### **Objectives of the study**

The overall aim of the study was to assess the status of child immunization coverage in hard-to-reach haor areas of Bangladesh and also to assess the acceptability of selected strategies among healthcare providers to design appropriate strategies for improving the immunization coverage in those areas.

**The specific objectives were to:**

- a. assess the status of child immunization coverage in rural hard-to-reach haor areas;
- b. assess the acceptability of implementation of the following strategies in hard-to-reach areas: (i) modified EPI service schedules, (ii) EPI days, (iii) EPI support groups, (iv) use of a screening tool in health centres other than EPI spots, and (v) training of service providers on valid doses; and
- c. formulate recommendations for designing an appropriate programme for improving the immunization coverage in the hard-to-reach areas.

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## Methods and Materials

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This acceptability study was carried out in Jamalgonj upazila of Sunamgonj district under Sylhet division. The following processes were followed in selecting the upazila: From six divisions of Bangladesh, the lowest-performing division (Sylhet) was selected purposively. From the selected division, the lowest-performing district (Sunamgonj) was selected again purposively. After the selection of the district, a list of hard-to-reach upazilas of the district was prepared. Jamalgonj upazila was randomly selected from that list.

### Sampling and sample size

The WHO-recommended 30-cluster sampling methodology was used for estimating rates of the EPI coverage. Of the 120 EPI sites in the upazila, 30 sites were randomly selected. Households of the catchment areas of the 30 selected EPI sites were the 30 clusters. Seven children aged 12-23 months were selected from each cluster. The total sample was (30x7) 210. Cluster effects were not calculated because the 30-cluster sampling method does not take into consideration such effects. The children were chosen by selecting households, and one eligible child from each household was included in the sample. If more than one eligible child lived in a household, one child was randomly selected for interview.

### Data collection

Data for the study were collected through a survey, in-depth interviews, group discussions, and observations of vaccination sessions.

### Survey

The first household of a cluster was randomly selected (by spinning a bottle in the middle of the cluster), and one eligible child in that household was sampled. After the first household was visited, the interviewer moved to the next household in the same direction, which was defined as the one whose front door was closest to the one just visited. This process was continued until seven eligible children were found. After reaching the end of the cluster, if the required number of children was not fulfilled, the interviewer moved in another direction within the cluster to complete interviews. The interviewers collected information on the status of vaccination coverage of the child from the EPI card and from the mother/guardian of the child.

### Qualitative components

**In-depth interviews with key informants:** In-depth interviews were conducted with key informants. The key informants included district and upazila-level officials and supervisors, such as Civil Surgeon (CS), Deputy Civil Surgeon (DCS), and District EPI Supervisor of Sunamgonj district. From Jamalgonj upazila, Upazila Health and Family Planning Officer (UHFPO), all Health Inspectors (HIs) and Assistant Health Inspectors (AHIs), and EPI technician were interviewed. Information was collected on the existing EPI service-delivery system in the upazila, barriers faced in providing services, the transportation system from upazila to villages, the porter system, availability of required health workers and porters, necessity of conveyance for field staff and supervisors, availability of facilities for maintaining cold-chain at the upazila and EPI spots, necessity of alternative strategies for improving EPI coverage, acceptability of implementing alternative strategies, such as use of a screening tool, modified EPI service schedule, and EPI support groups in the hard-to-reach haor areas.

**Group discussions:** Two group discussions were held with field workers (Health Assistants and Family Welfare Assistants) and one focus-group discussion (FGD) with porters. The field workers and porters were randomly selected from all the unions of the upazila. Data were collected on the frequency of organizing EPI sessions, barriers faced in organizing EPI sessions and carrying vaccines from upazila to EPI spots, communication in their working areas, costs involved in travelling to their working areas, availability of funds for conveyance, involvement of the community with the EPI, and whether they had thought of any alternative strategy for improving the coverage of child immunization. They were particularly asked if they recommend any further strategy for improving the coverage and, if so, what are these. The acceptability of implementing alternative strategies, such as use of a screening tool, a modified EPI service schedule, and EPI support groups in the hard-to-reach haor areas was also assessed.

**Observations:** The project staff observed one randomly-selected EPI site from each ward of each union of the upazila. Activities of EPI sessions, reasons for not holding sessions, physical and geographical barriers for both field workers and the community, attendance in EPI sessions, attendance in peak and non-peak hours, availability of community support, duration of the session, and attitudes of the field workers towards vaccine-recipients were observed.

### Analysis

Two types of childhood vaccination coverage—crude coverage and valid coverage—were assessed in the study. The crude coverage was assessed in terms of the dose(s) of any antigen—both valid and invalid—that a child received, regardless of whether s/he received these by or after one year of age. An invalid dose was the dose given before the recommended age or during the interval, i.e. less than four weeks from the prior dose. The valid coverage, on the other hand, was assessed in terms of valid doses(s) of any antigen administered to a child by age one year. A valid dose is a recommended dose of an antigen administered at the recommended age and during the appropriate interval. Both valid coverage and crude coverage of vaccination were assessed for each specific antigen and for all the antigens taken together. The crude coverage, shown against valid coverage, indicates how much more valid coverage could have been gained if all the antigens given to children were given at the appropriate time within the first year. In other words, the comparison between the crude coverage and the valid coverage showed how much coverage was lost due to the failure to give antigens to children at appropriate times.

Full vaccination defined as vaccination with all the recommended doses of all the antigens at the recommended age and interval by age one year was also calculated.

The coverage of childhood vaccination was assessed using the following information gathered in the survey regarding the vaccination status of each of 12-23 months old children surveyed: whether the child received any antigen; if s/he had it, the date of each antigen/each dose of antigen received; and whether or not the child received all the antigens. As stated earlier, the information was obtained from the vaccination card of the child if available. If the card was not available, information was obtained from the mother or caretaker of the child asking some questions, such as how many times the child went to an EPI centre; how many injections were pushed to the child in each visit; and how many oral drops were given to the child during whole visits to an EPI centre.

Quantitative data were entered into visual Basics/FoxPro and analyzed with the SPSS PC+ software (version 11.5). The quality of data was maintained through supervision and thorough checking to minimize errors.

The chi-square tests were performed to compare the coverage of Jamalgonj with the national level. To ascertain the status of child immunization coverage by socioeconomic status, univariate and bivariate analyses were performed.

Qualitative data collected through in-depth interviews, group discussion, and observations of vaccination sessions were first transcribed and then translated into English. Data were then analyzed using content analyses. Analysis of qualitative data began with the first field activities and lead to refinements as the study proceeded. The data-analysis processes followed a sequence of interrelated steps. The process included reading, coding, displaying, reducing, and interpreting. At first, transcripts were read carefully, and then coding of the data began. Reading and coding were initiated while data were being collected. Data display and reduction process were conducted at desk once all data have been collected. Even during data display and reduction, we looped back through earlier steps to refine codes, reread texts, and revise some aspects of the analysis.



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## Results

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### Childhood Vaccination and Determinants of Low Coverage in Hard-to-reach Haor Areas

#### Background characteristics

Table 1 shows that over half of the respondents (n=210) were aged 20-29 years. Four percent of mothers were adolescents. Fifty-two percent of children (n=210) were male, and 48% were female. The findings revealed low levels of education for parents and high-parity families. Half of the mothers had access to mass media, such as radio, television, and newspapers. The mean monthly expenditure for the families was Tk 4,282 while the mean expenditure for food during the last week of data collection was Tk 641.

#### Childhood immunization

##### Levels of crude coverage

Figure 1 shows the crude coverage among 12-23 months old children. The percentage of crude fully-immunized children in Jamalgonj was 68%. The drop-out rate was quite high (30%), although 2% of the children was never vaccinated.

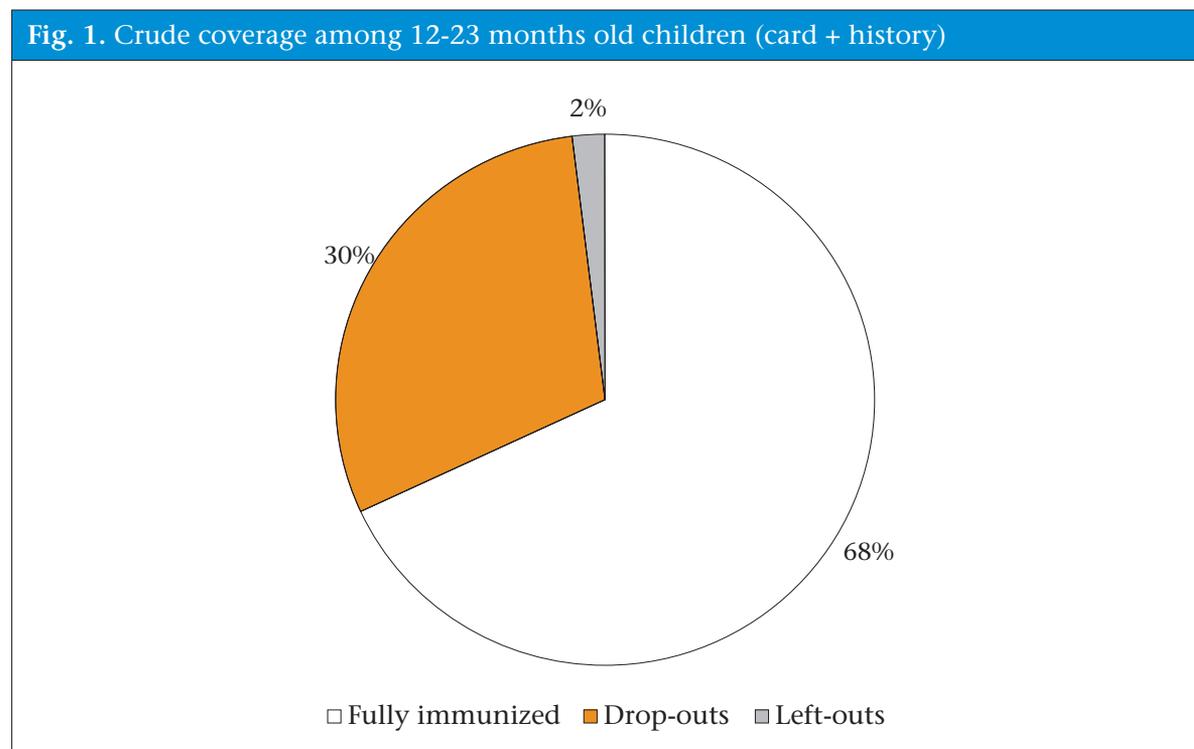


Figure 2 shows the crude coverage for each recommended specific vaccination from card and history. The rate of antigen-wise crude coverage was high (98%) for BCG and almost equally high (97%) for DPT1. However, the coverage for subsequent doses and antigens dropped markedly, with 94% of the children receiving DPT2, 87% DPT3, and 74% measles vaccines.

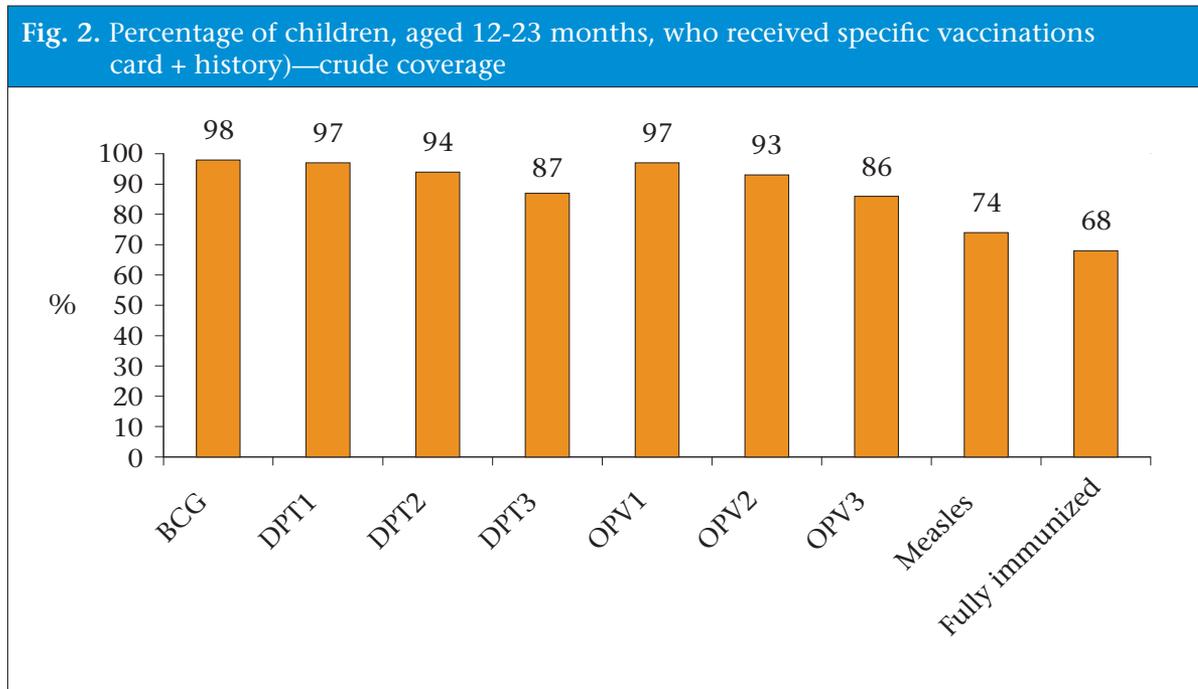
##### Levels of valid coverage

The findings revealed that 57% of the children received all the valid doses of all the recommended antigens within 12 months and were, therefore, considered fully immunized. The overall rates

of drop-outs and invalid doses were quite high (30% and 9% respectively). The vaccination drop-out rate was defined as: if a child aged 12-23 months failed to receive any dose of any antigen between EPI 1st dose and measles vaccines. A very few valid fully-immunized children received subsequent doses within the interval of four weeks. More than 80% of the children received subsequent doses after four weeks. The range of the intervals varied from 31 to 183

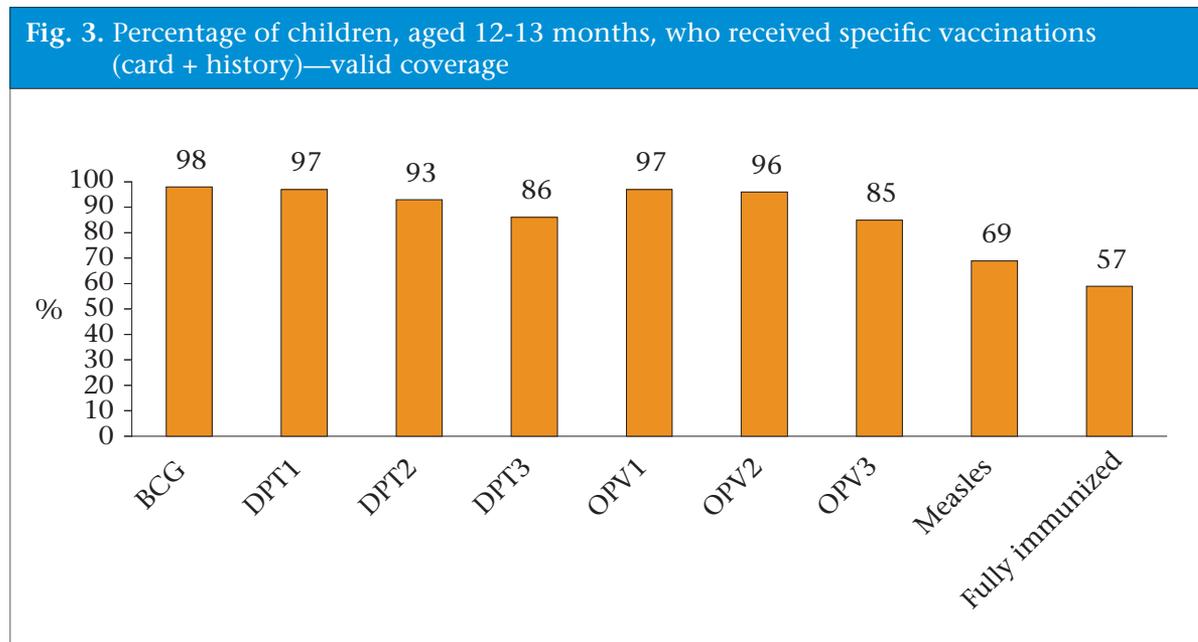
**Table 1. Characteristics of parents of children aged 12-23 months**

Characteristics	Percentage (n=210)
Age (years) of mothers	
<20	4
20-24	22
25-29	34
30-39	35
40+	5
Education of mothers	
No education	51
Primary (up to class V)	39
Secondary (up to class X)	10
Education of fathers	
No education	59
Primary (up to class V)	27
Secondary (up to class X)	12
Secondary+	2
Occupation of fathers	
Agriculturist	35
Day labourer (manual labour sells in agriculture)	19
Small businessman	18
Fisherman	13
Others (quack/homeopath doctor, boatman, tailor, rickshaw/van-puller)	15
Parity of mothers	
1	19
2	20
3	28
4	14
5 and above	19
Sex	
Male	52
Female	48
Access to mass media (radio, television, newspaper)	52
Mean monthly family expenditure (Tk)	4,282 (mode 4,000)
Mean family food expenditure of the last week (Tk)	641 (mode 500)



days, so the doses were valid but were not provided according to the standard schedule.

Figure 3 shows the valid coverage for each recommended vaccination from card and history. The valid coverage rate was high (98%) for BCG and almost equally high (97%) for DPT1. The coverage for subsequent doses and antigens dropped markedly, with 93% of the children receiving DPT2, 86% DPT3, and 69% measles vaccines. The figure shows that, although the coverage of third dose EPI was 85% and above, the problems lied with the coverage of measles vaccine which was only 69%. Therefore, the programme needs to be focused more on the increasing coverage of measles vaccines.



### Incidence of post-vaccination side-effects

The incidence of side-effects following any dose of vaccination was calculated to assess the safety of injections for children. The rate of side-effects was calculated as the proportion of recipients of vaccines (injections) who had side-effects after receiving any of the antigens. Mothers were asked if their children had any problem (abscess/infections, fever, pain) after vaccination. The findings revealed that 6% of the children had abscess and infections while 97% and 79% had fever and pain respectively (Table 2). The abscess was defined as infection after vaccination, excluding BCG scar.

Table 2. Incidence of side-effects among children, aged 12-23 months, who were vaccinated	
Type of side-effects*	Percentage (n=205)
Abscess/infections	6
Fever	97
Pain	79
*Multiple answers	

### Retention of vaccination cards

Table 3 shows that, except a few, all the vaccinated children received the EPI card. Of 205 children who received the card, 174 (85%) retained it.

Table 3. Status of retention of EPI card among children aged 12-23 months	
Retention of EPI Card	Percentage (n=205)
Received card	98
Status of card retention	
Received and had card	85
Received but did not have card (lost)	15

The immunization coverage in Jamalgonj was compared with the national coverage. The number of fully-immunized children with valid doses in Jamalgonj was significantly lower compared to the national level (Table 4). On the other hand, drop-outs were significantly higher in Jamalgonj compared to the national level. Nine percent of 16 children in Jamalgonj had invalid doses compared to 7% nationally. Interestingly, the retention of the card was significantly higher in Jamalgonj compared to the national level. Less mobility among mothers in the hard-to-reach areas may be a reason about high rates of retention of the card.

Table 4. Status of childhood vaccination in Jamalgonj compared to the national level				
Area	Status			
	Jamalgonj (%)	National (%)	p value	95% CI
Valid complete coverage	57	71	0.0000	7.2-20.2
Drop-outs	30	20	0.0004	3.7-16.3
Invalid doses	9	7	0.2638	1.9-5.9
Retention of card	85	65	0.0000	15.1-24.9
CI=Confidence interval				

Results of bivariate analysis showed that children whose parents had more education were more likely to be immunized. Exposure to mass media had a significant association with complete immunization (Table 5).

<b>Table 5. Coverage of child immunization by socioeconomic status</b>			
Characteristics	Complete immunization		
	Yes	No	RR (95% CI)
Education of mothers			
None	62	38	1.0
Primary (1-5)	71	29	1.14 (0.93-1.40)
Secondary (6+)	85	15	1.37* (1.08-1.73)
Education of fathers			
None	60	40	1.0
Primary (1-5)	75	25	1.26* (1.02-1.55)
Secondary (6+)	80	20	1.34* (1.06-1.69)
Exposure to mass media			
Not exposed	18	82	1.0
Exposed	81	19	4.46* (2.29-6.70)
Parity			
1	71	29	1.0
2	69	31	0.98 (0.74-1.29)
3+	66	34	0.94 (0.74-1.18)
*p<0.05; CI=Confidence interval; RR=Relative risk			

### Knowledge of mothers about benefits of full immunization

To assess the knowledge of mothers whose children were fully immunized, they were asked about the benefits of full immunization. About two-thirds of 143 mothers had no knowledge about the benefits of completion of all doses (Table 6). Only 32% mentioned that vaccines were given to prevent any one of the vaccine-preventable diseases. Twenty-eight percent stated that their children were given all doses of vaccines to protect them from vaccine-preventable diseases and any other diseases. Half of the mothers interviewed said that all doses of vaccines were given to their children to protect them from other than vaccine-preventable diseases, such as diarrhoea, pneumonia, fever, cold, cough, allergy, cancer, blindness, heart diseases, asthma, and weakness. Six percent reported that they gave all the vaccines to their children because a doctor advised them to do so. Although they had some interactions with doctors, they did not have any interactions with the field staff about child immunization. Because none of the respondents mentioned that they were taught about the benefits of completion of all doses by any field staff.

Qualitative data showed that a very few mothers whose children were fully vaccinated were aware of the benefits of full immunization for their children. None of them said that the vaccines could protect against seven preventable diseases. All of them, however, mentioned one or two preventable disease(s) and other diseases, such as diarrhoea, pneumonia, fever, cold, cough, allergy, cancer, blindness, heart disease, asthma, and weakness.

### Reasons for drop-outs

Mothers who missed any doses were asked about the reasons of dropping out. The main reasons mentioned by them were: they were not informed about EPI sessions, sessions were not held regularly, and they were afraid of side-effects (Table 7).

**Table 6. Knowledge of mothers (n=142) about benefits of full immunization**

Knowledge*	Percentage
Protect from any one vaccine-preventable disease	32
Protect from vaccine-preventable diseases and any other illness	28
Protect from any illness (other than vaccine-preventable diseases)	50
Doctors advised to give all doses	6
*Multiple answers	

**Table 7. Reasons for drop-outs**

Reason*	Percentage (n=63)
Mother was not informed about EPI session	63
EPI sessions were not held	19
Afraid of side-effects	11
Child was sick	10
Distance/bad communication	8
Vaccinators refused as mothers did not go to the centre on due date and lost card	7
*Multiple answers	

Qualitative data also showed that the field staff did not get time to call the mothers to the EPI centres as it required much time in travelling from the upazila headquarters to the EPI sites. Further, the field staff could not do motivational work on the days preceding the scheduled sessions because the areas are hard-to-reach. According to service statistics maintained by the Upazila Health Complex, 16% of 230 scheduled sessions in the past year were not held (July 2005 to June 2006). Observation data showed that four of the 16 sessions planned were not held during data collection. Both observation data and field staff suggested organizations of EPI sessions mainly as crash programmes instead of a routine schedule.

Mothers who did not complete all the doses of vaccines were asked whether the field staff asked them anything about subsequent doses. Fifty-seven percent of them said 'Yes'; 83% were told about the due date of the next dose, and 18% were told to preserve the card carefully. Only 3% were informed by the staff about the benefits of complete vaccination (Table 8).

**Table 8. Vaccinators provided information to mothers about child immunization**

Information	Percentage (n=63)
Informed about subsequent doses	57
Type of information provided*	
Date of next due dose	83
Preservation of EPI card	18
Benefits of complete vaccination	3
*Multiple answers	

Mothers whose children received any dose were asked about the average time they had spent at their last visit to the EPI sites for vaccination. The findings revealed that more than 90% of the mothers (n=205) had to wait for less than 30 minutes. These mothers were also asked for their suggestions about how to increase full immunization. About two-thirds suggested informing them of the session day and bringing their children to an EPI centre. Thirty-six percent suggested providing vaccines to their children at their home (Table 9).

Table 9. Suggestions of mothers for completion of all doses of vaccines for their children	
Suggestion*	Percentage (n=205)
Inform mothers on session day	59
Provide vaccines in home	36
Ensure that all EPI sessions are held	12
Find drop-outs and ensure vaccination	5
Others (provide medicine for side-effects)	3
*Multiple answers	

### Reasons for low EPI coverage

During key-informant interviews and group discussions, the study participants were asked about reasons for the low EPI coverage in the upazila. The respondents mentioned the following:

- All service providers with whom in-depth interviews and FGDs were conducted stated that, as the communication system of the upazila is bad and as most villages are hard-to-reach, it was, however, difficult for the staff to reach the villages, particularly during the monsoon and post-monsoon seasons. Four of the five unions in the upazila were hard-to-reach. The furthest village is 25 km from the upazila headquarters; the only way to reach the spot is by boat or on foot. It is very difficult in the summer season, when the only means of travel is on foot. In the rainy season, it is very costly to travel to the villages by boat. Further, during the post-monsoon season, it is not possible to go to the spots either by boat or on foot. Travel is further hampered by weather, which led to the cancellation of sessions.
- Another important reason for the low EPI coverage in the upazila was inadequate time spent by the field staff at the EPI spots. All the service providers interviewed informed that, since most villages were hard-to-reach, it took most of the time of a day for an HA to travel to the EPI sites. In most cases, if an HA starts from the Upazila Health Complex (UHC) at 8:30 am, s/he can reach the EPI spot by 12 noon. If s/he does not start at 1 pm from the site, it is not possible to return to the UHC before sunset. Therefore, the HAs had little time to provide EPI services at the villages. One HA said, “I can mention about my area. The place I work, that is ward no. 1 of my union, is far away from the headquarters. If I start at 7 or 7:30 am in the morning, it takes four hours to reach there, and if I do not start by 1 o’clock, I would be stuck in that village for that day”. Even if an HA starts from his/her own home which is supposed to be in his/her working area, s/he has to travel at least 8-10 km every day. The situation of the villages is such that, to travel from the HA’s home to his/her working spot, s/he has to come to the upazila headquarters to get a boat due to lack of transport from his/her village.

- According to the service providers, the EPI sessions were not held at post-monsoon time as there was no way to go to the EPI sites by the field staff. The other reason they mentioned about not holding the EPI sessions is natural calamities. All the service providers reported that it frequently happened that EPI sessions were not held in this upazila during bad weather days and post-monsoon season. Because it is neither possible to walk nor a boat is available at that time.
- The service providers informed that they did not have any mechanism to organize the sessions that were not held and to do nothing to organize the sessions.
- The service providers also mentioned the lack of money for meeting transportation costs. They stated that they got a nominal amount of money as transportation costs for the field staff and their supervisors. The reported amounts provided for travel allowance are:

- For Health Assistant	Tk 50 per month
- For Assistant Health Inspector	Tk 100 per month
- For Health Inspector	Tk 150 per month

However, the field workers and supervisors said, “we have spent money from our own pocket. There are places in the upazila where one has to travel by a boat. If one has to hire a boat, it costs Tk 500-600. This is something that we have to spend from our own pocket”.

- The Upazila Health and Family Planning Officer (UHFPO) reported that he had been getting extra monetary support from the Global Alliance for Vaccines and Immunization (GAVI), which helped the upazila support its EPI. But this support had been stopped.
- The district-level officials said that active supervision from first-line supervisors was rare because necessary resources were lacking. They said that, if a supervisor moves from any upazila of the district to remote villages, it requires Tk 100-150 for each day. But the supervisors get less money than this for a month.
- The vacant posts of HAs were another reported cause of the low EPI coverage mentioned by most service providers. In total, five positions of HA in the upazila were reported to be vacant. When this occurs, the HAs of the adjacent areas are assigned to provide services, resulting in additional workload for them.
- The absence of mechanisms to involve the community with the EPI was another reason given for the low coverage mentioned by most service providers interviewed. No formal mechanisms for community participation exist, except the NID programme. According to the UHFPO, *Imams* of the local mosques were occasionally involved for community mobilization but no committee, *samittee*, or group support the EPI in the upazila.
- Increasing population size was also a problem as cited by the field staff and their supervisors. Although it is estimated that 1,000 people live in each HA’s catchment area, the estimate was done more than a decade ago, and the population has increased. They believed that the population in catchment area has doubled, but the number of workers remained the same, i.e. one HA in each ward for 8 EPI spots. Given the larger population, the HAs, AHIs, and HIs reported that it takes a day to inform mothers to come to the EPI sites.
- The service providers informed that geographical barriers (khal/paddy field/scattered houses) are common in the upazila and restrict mothers from bringing their children to the EPI spot for vaccination.

- Although most field staff members were aware of valid and invalid doses, some supervisors were confused about what an invalid dose is. The HIs had a wrong idea about invalid doses, and they considered drop-outs as invalid doses. Although they did not have correct knowledge about invalid doses, they believed that invalid doses were rare in their upazila. They suggested providing refresher training to all the field staff members and supervisors to update their knowledge of valid and invalid doses and other technical issues of EPI.
- Some field staff members and their supervisors informed that the most important problem for the low coverage was the absence of updating the targets. As the areas are hard-to-reach, the field staff could not update the targets. During session observation, updated targets were not found in any sessions. The field staff visited the households of their working areas for mobilization at scheduled dates of sessions and informed the community that the vaccination session was going on. As they did not have any target, they could not find and visited the drop-outs and left-outs.
- The district-level officials pointed out that supervision by the upazila-level officials was very rare, which hampered the programme severely. Further, since most staff members and their supervisors resided in the upazila headquarters, they did not want to visit the field as and when necessary.

### Acceptability of Strategies to Improve Coverage of Child Immunization

To assess the acceptability of the strategies mentioned earlier, data were collected from the field staff and upazila and district-level managers. According to them, currently, no system exists for implementing alternative strategies in the upazila, except organizing crash programmes, as mentioned earlier. Regarding alternative strategies, the Civil Surgeon of Sunamgonj said, “the EPI outreach programme has been functioning since 1979. The outreach programme is not adequate for improving the immunization coverage in hard-to-reach areas. I personally feel that an alternative or separate strategy is needed for some special areas, particularly in the hard-to-reach areas and raised this issue several times in several forums. I am again telling that, except any kind of alternative strategy, it is not possible to improve the EPI coverage in the hard-to-reach areas”. The participants of in-depth interviews and group discussions reported that they occasionally organized crash programmes in the farthest villages where it is not possible to organize the EPI session regularly. This involves getting together a team of 3-4 persons for the hard-to-reach villages to provide vaccines. They added that organizing such crash programmes were not implemented on a regular basis.

For this study, responses about the acceptability of the strategies were scored as to whether they were: (a) highly acceptable (all the respondents recommended), (b) acceptable (>50% of the respondents recommended), and (c) not acceptable (rejected by all the respondents). Table 10 shows the status of the responses to each of the acceptable strategies.

### Modified EPI service schedules

Under this strategy, providers in hard-to-reach areas would organize EPI sessions once in two months for two or three consecutive days rather than holding monthly one-day sessions. This will lessen the time to travel to the hard-to-reach areas and extend the time of availability of providers in EPI sessions.

**Table 10. Responses to acceptability of proposed strategies**

Strategy	Status			Remarks
	Highly acceptable	Acceptable	Not acceptable	
Modified EPI service schedules	√			HAs raised concerns about accommodation
Organizing EPI days	√			
Organizing afternoon or evening sessions			√	
EPI support groups	√			
Use of a screening tool in health centres other than EPI spots	√			One union has constructed HFWC
Training of service providers on valid doses	√			
Involvement of interested volunteers in pushing vaccines and management of side-effects			√	
Elimination of geographical barriers		√		
HAs=Health Assistants; HFWC=Health and Family Welfare Centre				

Although all the participants in in-depth interviews and group discussions thought that this was highly feasible, some raised concerns about the strategy. The following are their views and comments about the strategy:

- The Civil Surgeon (CS) was very much enthusiastic about the strategy to help improve the EPI coverage in the hard-to-reach areas. He said, “We have already started this technique in 2-3 unions of Dherai and Dharmapasa upazilas.” The UHFPO strongly supported the strategy and suggested implementing this in extremely hard-to-reach and most low-performing areas, instead of all the hard-to-reach areas. The HIs and AHIs said that this must be a good option to ensure the holding of sessions. They added that, as it is difficult to travel to the hard-to-reach villages, which happens to cancel the sessions, organizing sessions once a month may be a good option. One HA opined, “there could be an increase of coverage, but I think the quality of work will degrade because the frequency of our visits to the areas will lessen. The HIs said, “the idea of staying 2-3 consecutive days in an area would work well, if it is done once in three months.
- Some HAs raised concerns about accommodations for a night stay in the remote villages. They said, “the hard-to-reach areas are really hard in all aspects. There is no such place that we can stay. The villagers are usually poor. So, they will not be able to offer us a place to stay at night. Food would be another problem. Those places are so remote that you cannot buy any food with money because there is no hotel or place where you can buy ready-made food”. In

this connection, the UHFPO informed that, although most HAs reside in the upazila headquarters (unofficially), all of them have their own houses in their working areas where they would be able to stay for those days. He added that, with the help of Upazila Nirbahi Officer (UNO), he would be able to manage accommodation for the field staff at the Union Parishad office or at the residence of chairmen/members of the unions. The CS also agreed with the proposal. He said that he would be able to manage the problem after discussion with the representatives of the local government authority. The HIs and AHIs suggested that the field staff and they themselves, if necessary, would be able to stay at night in (a) their own houses at the villages (where they are not currently staying), or (b) the local FWA's house, or (c) unused community clinics, or (d) the Union Parishad office. The participating officials and supervisors thought that incentives should be given to the field staff so that they are encouraged to stay and work continuously for 2-3 days in the remote areas.

- Regarding the supply of vaccines and maintaining cold-chain, the participants said that maintaining the cold-chain for 3-4 days is not at all a problem because there are enough cold-boxes to maintain the cold-chain for 3-4 days anywhere. The CS and UHFPO confirmed that they have sufficient cold-boxes.

### EPI day

One of the main reasons for high drop-outs in the hard-to-reach areas was that EPI sessions were not held. To address the problem, EPI days were proposed based on the successful NID for polio eradication. Initially, quarterly EPI days will be held in selected areas. Each of the EPI days will serve for the delivery of vaccines for cases missing the schedule and a campaign source for the whole community. The three doses required for DPT, polio, and hepatitis B might be better ensured through this strategy.

The UHFPO liked the idea of organizing EPI days, such as NID, and added that, instead of a crash programme which is unscheduled and irregular, special EPI days can be organized with the involvement of the concerned HA and community people. He emphasized organizing regular EPI days in the hard-to-reach areas.

The CS and DCS were also supportive of organizing EPI days in the hard-to-reach areas. They said that it has already been proved to be successful through NID; so, organizing EPI days would definitely bring in good results in the hard-to-reach areas if the community could be involved and if it could be organized regularly. The HIs commented that it would be more useful to organize regular EPI days in the farthest villages instead of a crash programme. The AHIS suggested organizing the days at an interval of a minimum of 3-6 months. One AHI said, "If the EPI day is conducted frequently, the regular EPI sessions will be hampered, and it will only add up burden to workers." The field workers also preferred the organization of regular EPI days, but thought that they would need some logistics support, including actual fares for the trawler or boat, support of the FWAs in their work, and raincoats for use in rainy days.

### Community participation/EPI support groups

This strategy is designed to involve community members with the EPI to improve the immunization coverage. Support groups might consist of community members from different groups.

The participants could not mention any mechanism of involving the community with the EPI in their areas, except NID, when community mobilization has been successful. According to the UHFPO, they sometimes involve *Imams* of the local mosques to mobilize the community

people for vaccination of their children. Although no committee, *samittee*, or group currently support the EPI in the upazila, they thought that an EPI support group could be formed in the catchments area of each EPI spot and involved to improve the immunization coverage. Suggested group members include motivated mothers, members of the village defense party (VDP), female school teachers, adolescent girls and boys, elderly women, young women sitting idle after finishing school, representatives of NGOs, and *Imams* of the mosques in the hard-to-reach villages.

The participants said that several NGOs which work in the district have a large number of staff members and volunteers at the village level. These NGOs are: (a) BRAC, (b) Association of Social Advancement, (c) Center for Natural Resources Studies (CNRS), and (d) Bangladesh Association for Rural Development. The NGOs can also be involved in mobilizing for EPI services in the villages. The NGOs have village groups for credit programmes, and some have health programmes. Existing groups meet every week for income generation and to discuss other development activities. The HIs suggested involving NGO members and BRAC's Shebikas to support the EPI. The AHIs commented, "There are NGOs working in Jamalgonj, which also have credit groups. If we can, through those NGOs, make the community members understand about the benefits of EPI, it would be facilitating the overall EPI progress because most women are members of those groups, and women are more responsible for vaccinating children".

The HAs stated that the participation of the community in the EPI is essential, and they already got support from the community, although not in a systematic way. For example, the community helps conduct the EPI by providing a place to sit and do the work (EPI sessions are generally conducted in someone's house). If the community people are asked to inform mothers, they do it voluntarily. The HAs suggested involving village *dais* (midwives) because they have a good influence on mothers and can motivate them to use EPI and family planning. They added that, to make them work, the programme has to spend some money. Voluntary work is totally not possible at this stage.

The participants stated that the groups can undertake the following activities to improve the EPI coverage in the hard-to-reach areas:

- Perform social mobilization
- Assist in updating the targets
- Work to reduce drop-outs and left-outs
- Help the service providers stay at the community if it requires
- Ensure the holding of scheduled EPI sessions regularly
- Create community awareness and advocacy about modified EPI service schedules
- Assist in the registration of newborns
- Help the service providers mobilize the community towards immunization
- Identify the drop-out children in the community and encourage/facilitate completion of all vaccines
- Inform mothers about the timing of EPI sessions and also when mothers to come to EPI sites
- Organize meetings with participation of service providers for review and monitoring of EPI activities

### Organizing afternoon or evening sessions

Organizing afternoon or evening sessions is a strategy that is being implemented in urban slums. Holding of EPI sessions outside normal hours may enable working mothers to bring their children for vaccination at a more suitable time.

During the survey, in response to a question regarding the convenient time to vaccinate their children, 84% of the mothers reported that up to 2 pm is the appropriate time to vaccinate their children (Table 11).

Appropriate time	Percentage (n=210)
Morning (8:00 am-11:59 am)	47
Noon (12:00 noon-1:59 pm)	37
Afternoon (2:00 pm-4:59 pm)	14
Evening (5:00 pm-6:59 pm)	2

The CS who was very negative about this strategy said that it is not possible to organize evening sessions in villages where there is no electricity and other necessary arrangements. The UFHPO said that the holding of afternoon sessions is not feasible in the hard-to-reach areas because there is no electricity, and the people will not come out of their home in the afternoon or evening. The field staff, AHIs, and HIs also thought that it would be impossible to organize afternoon or evening sessions because of: (a) unavailability of electricity, (b) the village people do not move in the afternoon, and it is also difficult to move, and (c) the people go to bed early.

### Involvement of local volunteers with pushing vaccines and management of side-effects

Another proposed strategy was to encourage the community to participate actively during vaccination. Interested well-recognized local service providers would be trained to inject vaccines and maintain sterilization, substituting where the position of HA is vacant. If successful, this strategy might stimulate the Government to fill up the vacant posts of HA, thereby increasing the immunization coverage in these areas.

Most respondents in in-depth interviews and FGDs thought that this approach would create problems and have negative effects on the EPI. Reasons given include the following:

- a. Side-effects might be more if the volunteers push vaccines to children, and they (volunteers) will not be able to manage side-effects, which might contribute negatively to the programme.
- b. Maintaining cold-chain at the houses of volunteers would be a problem. They said that there are no electricity, refrigerator, or any other arrangement for keeping vaccines in the villages of the upazila.

The field workers said, "Involving volunteers may not be a good idea, no matter how much you train them. Because injecting vaccines is still a technical issue. In the hard-to-reach areas, after years of hard work, we earned the trust of the people. For volunteers, it will take more time. The management of side-effects is another issue which we think the volunteer may not be able to handle properly. The competence of a regular paid worker cannot be equalled to a volunteer's work. Volunteers' work is voluntary; it cannot be replaced with the sincerity of regular workers."

However, the UHFPO and EPI supervisor of the district office felt that, despite the risks of involving volunteers with pushing of vaccines and management of side-effects, this strategy could be tested on a small scale in one or two village(s) with rigorous training and constant supervision. They suggested involving the unemployed but literate girls and boys for the activities, instead of involving quacks or village doctors.

### **Training to service providers on valid doses**

Training is an important component for service providers to update their knowledge about their job activities and responsibilities. Therefore, providing refresher training to providers and their supervisors was assessed.

The participants suggested providing refresher training to all the field staff members and supervisors to update their knowledge about valid and invalid doses and other technical issues relating to EPI. Several participants thought that, although the authority sometimes arranged refresher training for them, the focus on invalid doses and management of side-effects were very minimal.

One field staff stated, “we did not find any training about valid and invalid doses, but we know about invalid doses. In fact, we knew about it from our DCS. In our monthly meeting, our UHFPO also discussed this.” In response to a question about the type of training needed, the field staff and supervisors mentioned about basic training on EPI, valid and invalid doses, management of side-effects, BCC activities, and effective recording and reporting. The FWAs said, “surely, we need training on valid and invalid doses. We also need refresher training on EPI. At the time of joining the service, we had basic training on EPI. After that, we did not find any training on EPI. Therefore, refresher training will surely help us a lot to perform better on EPI.”

### **Eliminating official barriers**

The research team did not propose this strategy; instead, the upazila and district-level officials suggested it. According to them, some areas are hard-to-reach from the particular upazila to which they are assigned, but are easy to reach from the adjacent upazila. However, official barriers prevent the local programme managers from working with the managers of other upazilas to develop alternative options to reach the hard-to-reach areas. Therefore, a strategy could be developed and tested to work with the upazila, district and policy-level personnel of the MoHFW to reorganize the working pattern of upazilas to improve the immunization coverage at those areas.

### **Recommendations of participants for improving EPI coverage in hard-to-reach areas**

When asked recommendations for implementing alternative strategies and for improving the immunization coverage in the hard-to-reach areas, the participants of in-depth interviews and FGDs made the following recommendations:

- The existing outreach programme is not sufficient in the hard-to-reach areas. Alternative programmes are essential for improving the immunization coverage in those areas.
- NGOs working in the locality should be involved with EPI activities. Members of the credit group of the NGOs may work as local volunteers for improving the immunization coverage in the hard-to-reach areas.
- Posting of HAs should be made on a population basis, i.e. one HA should be assigned for 4,000-5,000 persons, instead of a ward.

- Staff members of the family-planning wing do not support the EPI in the upazila. To increase the immunization coverage, support of the field-level staff of the family-planning wing is essential.
- Additional financial support is needed to strengthen the EPI in the hard-to-reach areas. The support that they had been receiving from the GAVI was recently stopped, but should be continued as before.
- Providing some allowance to the field staff and their supervisors would help organize EPI days and bi-monthly (once in two months) sessions in the hard-to-reach villages.
- Posting of a District Immunization Officer (DIMO) needs to be ensured. This post has remained vacant for a long time in the hard-to-reach areas in many districts.
- A Medical Officer-EPI (MO-EPI) is needed in all the upazilas, because the UHFPO is involved with multi-purpose work.
- The upazila-level officials and supervisors should ensure that all newborn children are registered.
- The higher authority should establish a system of appreciation for good work.
- Porters in the hard-to-reach areas should get additional financial benefits as they have to do more hard work.



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## Discussion and Policy Implications

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The achievement of child immunization coverage in Bangladesh has been impressive over the past years. It is encouraging to see that 71% of children aged 12-23 months were fully immunized (19). Despite the success, some concerns still remain and are needed to be addressed. This study identified some challenges of the immunization programme and attempted to point out where the EPI needs to focus to become more effective.

Major improvements in the coverage of child immunization are needed in certain geographic areas. The findings of the study revealed that fully-vaccinated children with valid doses in the study areas was significantly lower compared to the national level. Results of a recent study showed that, the full immunization coverage in 22 rural districts ranged from 44% to 60%, and most districts were hard-to-reach. Results of studies indicated that hard-to-reach areas, particularly low-performing areas, needed more programme attention (6).

The present study identified that, despite an impressive coverage of BCG and 3rd dose of DPT and OPV, the coverage of measles vaccine was only 69%. The reason behind this might be that the mothers forgot the date of the due dose as the dose is given after a long gap after the 3rd dose of DPT. Measles campaign through the community, i.e. EPI support groups, may contribute to improving the coverage of measles vaccine. The report of the EPI coverage-evaluation survey suggested that 87% of eligible children were covered by measles vaccination under the measles catch-up campaign (19).

To improve the full immunization coverage, one must first understand the reasons for low coverage in particular areas. A study has investigated the reasons for the low coverage of child immunization in Bangladesh (20). No study has so far investigated the reasons for the low coverage of child immunization in hard-to-reach areas. The reasons for the low immunization coverage in the low-lying areas identified by the present study were: absence of any alternative strategy for the remote areas; irregular/cancelled EPI sessions; less time spent in EPI spots by the field staff; absence of any mechanism to involve the community with the EPI; invalid doses; poor knowledge of mothers about benefits of complete vaccination; mothers were not informed about EPI sessions; an inadequate number of field workers for the increased population; geographical barriers; and lack of money to meet necessary transportation costs. The findings of the study emphasized alternative strategies to remove the problems and to improve the coverage of child immunization in the hard-to-reach areas. The healthcare providers accepted most evidence-based strategies to implement as alternative strategies in the hard-to-reach areas.

The main reasons for the low EPI coverage and high drop-outs in the hard-to-reach areas were that EPI sessions were either irregularly held or were not at all held, and the field staff spent less time in EPI sessions. To ensure the regular holding of EPI sessions and to spend more time with clients, modified EPI service schedules could be organized. This strategy includes the holding of EPI sessions once in two months for two or three consecutive days rather than holding existing monthly one-day sessions. This will lessen the travel time to the hard-to-reach areas and extend the time for availability of providers in the community. Another strategy to address the problems could be organizing EPI days based on the successful NID for polio eradication. Each EPI day will serve for the delivery of vaccines for cases missing the schedule and a campaign source for the whole community with special focus on the coverage of measles vaccine. A study conducted in Uganda found that implementation of additional and more convenient outreach sites resulted in an increased coverage and distinct decline in the drop-out rate.

To ensure the community participation for improving the coverage of child immunization in the hard-to-reach areas, the study recommends the use of EPI support groups, which were found to be successful in many countries. The support group may assist in ensuring the regular holding of EPI sessions, registration of EPI target population, measles campaign, community awareness, and advocacy about modified EPI service schedule, assist in organizing EPI days, identifying incomplete vaccinated children in the community, and encouraging/facilitating completion. Currently, there is no systematic strategy for detecting unmet need for immunization in health facilities. A successful screening tool could be introduced for assessing the needs of children for immunization. The findings of the present study showed that 9% of the children had invalid doses compared to 7% nationally. To minimize the rate of invalid doses, refresher training for the vaccinators and their supervisors could be arranged. A study conducted in Indonesia found and noted the importance of training in improving the immunization coverage.

The findings of the present study showed that some areas were hard-to-reach from the particular upazila to which they are assigned, but were easy to reach from the adjacent upazila(s). However, official barriers prevented local programme managers from working with managers of other upazila to develop alternative options to reach the hard-to-reach areas. The upazila, district and policy-level personnel of the MoHFW can reorganize the working patterns of upazila to improve the immunization coverage in those areas.

The findings revealed that most strategies assessed were acceptable for implementation in the hard-to-reach areas, which have some important policy implications as follows:

- Policy-makers and stakeholders should endorse the need for alternative strategies in the hard-to-reach areas for improving the immunization coverage.
- The feasibility and effectiveness of the acceptable strategies, i.e. modified EPI service schedules, organizing EPI days, EPI support groups, use of a screening tool in health centres other than EPI sites, training of service providers on valid doses, and elimination of geographical barriers, need to be tested before scaling up in all hard-to-reach areas of Bangladesh.
- For the implementation of the strategies, some support from the policy and district levels may be required. The needed support includes: arrangement of accommodation for field workers for 2-3-night stay in the remote areas through executive officials of concerned upazila or representatives of local government authorities, involvement of local NGOs (those who are not working in the health sector) with the EPI, and providing some additional money to meet transportation cost, particularly during the monsoon season.

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