IOCH

Immunization and Other Child Health Project

Vaccination Coverage Survey of selected unions along the North -Western border of Bangladesh

February 2000

Survey Report No 2

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Acronyms

BCC	Behaviour Change Communication
BCG	Bacillus of Calmette and Guerin
CES	Coverage Evaluation Survey
COSAS	Coverage Survey Analysis System
DMA	Data Management Aid
DPT	Diphtheria, Pertussis and Tetanus
EPI	Expanded Program on Immunization
IOCH	Immunization and Other Child Health
MSH	Management Sciences for Health
NGO	Non Governmental Organisation
NID	National Immunization Day
OPV	Oral Polio Vaccine
TT	Tetanus Toxoid
Upazila	Sub district (previously known as Thana)
WHO	World Health Organisation

Terminology

This provides the meaning of some of the more technical terms used in this report and a brief explanation of their use.

By card: An immunization given to a child is termed as by card if the date of the dose is entered on an immunization card. Only doses recorded by card are treated as valid data in this survey.

By history: Immunization history collected from a parent's recall is termed as by history. Often no date will be mentioned. This information is only included in crude data.

Crude coverage rate is calculated from the doses recorded by card and/or by history. It is not ascertained whether the doses were given at the correct age and/or following the correct interval (where applicable). Crude data however, helps us to understand how much additional coverage could be achieved if all vaccines were given at the optimum age for the child and following the optimum interval. It also provides useful information on access to the EPI program and on the operational aspects of the provision of health services.

Valid coverage rate is calculated from the vaccinations recorded by card. Valid data includes only the doses of vaccines that were given after the minimum date of eligibility and/or after the minimum interval necessary to be effective and to protect the child. There is no maximum interval for a dose and therefore a dose administered after 52 weeks is still regarded as valid. By comparing crude coverage with valid coverage data of any particular antigen, one can determine how much coverage was lost due to the inability to give vaccine at the appropriate time.

Invalid doses are those administered at the wrong age and/or at the wrong interval. Doses administered before the minimum age in the case of DPT/Polio 1st doses and Measles vaccine or with less than four weeks interval in the case of DPT or Polio vaccines are classified as "invalid" doses.

Program access is measured by the percentage of children surveyed who received DPT 1st dose (crude data – by card and history) in the routine immunization session.

The **criteria for a valid dose** used in this survey is the criteria recognised by the Bangladesh EPI program: minimum age for DPT/Polio 1st dose - 6 weeks old; minimum DPT/Polio interval - 4 weeks; minimum age for Measles vaccine - 38 weeks old.

Fully immunized means the child has received all the doses it requires (BCG, OPV 1-3, DPT 1-3 and Measles).

Missed Opportunity refers to a visit of a child to a vaccination centre for a dose that he received but was also eligible for another dose of antigen that he did not receive. If the missed dose was provided at a later date, it is a *corrected missed opportunity*. If not, it is an *uncorrected missed opportunity.*

Executive Summary

Background

Between February 10 – 16, 2000 a coverage evaluation survey was conducted by IOCH in selected unions along the North-Western border areas of Bangladesh. These unions are considered hard-to-reach areas and having high-risk populations, because the health services are scarce in many places due to geographical constraints. In 1999 wild poliovirus cases were detected in adjacent areas of India (see map).

Objectives

The principal objectives were to assess:

a) the levels of immunization coverage of children (12 – 23 months);
b) the levels of TT immunization coverage in women of child bearing age; and
c) the OPV and Vitamin A coverage levels achieved during the sixth round of NIDs conducted in Nov-Dec 1999.

Coverage Levels for the Routine Immunization of Children

Access: 97% of the children received at least one dose of antigen (DPT 1st dose in this case) from routine immunization sessions based on crude data (card plus history). 2% of the children did not receive any immunization.

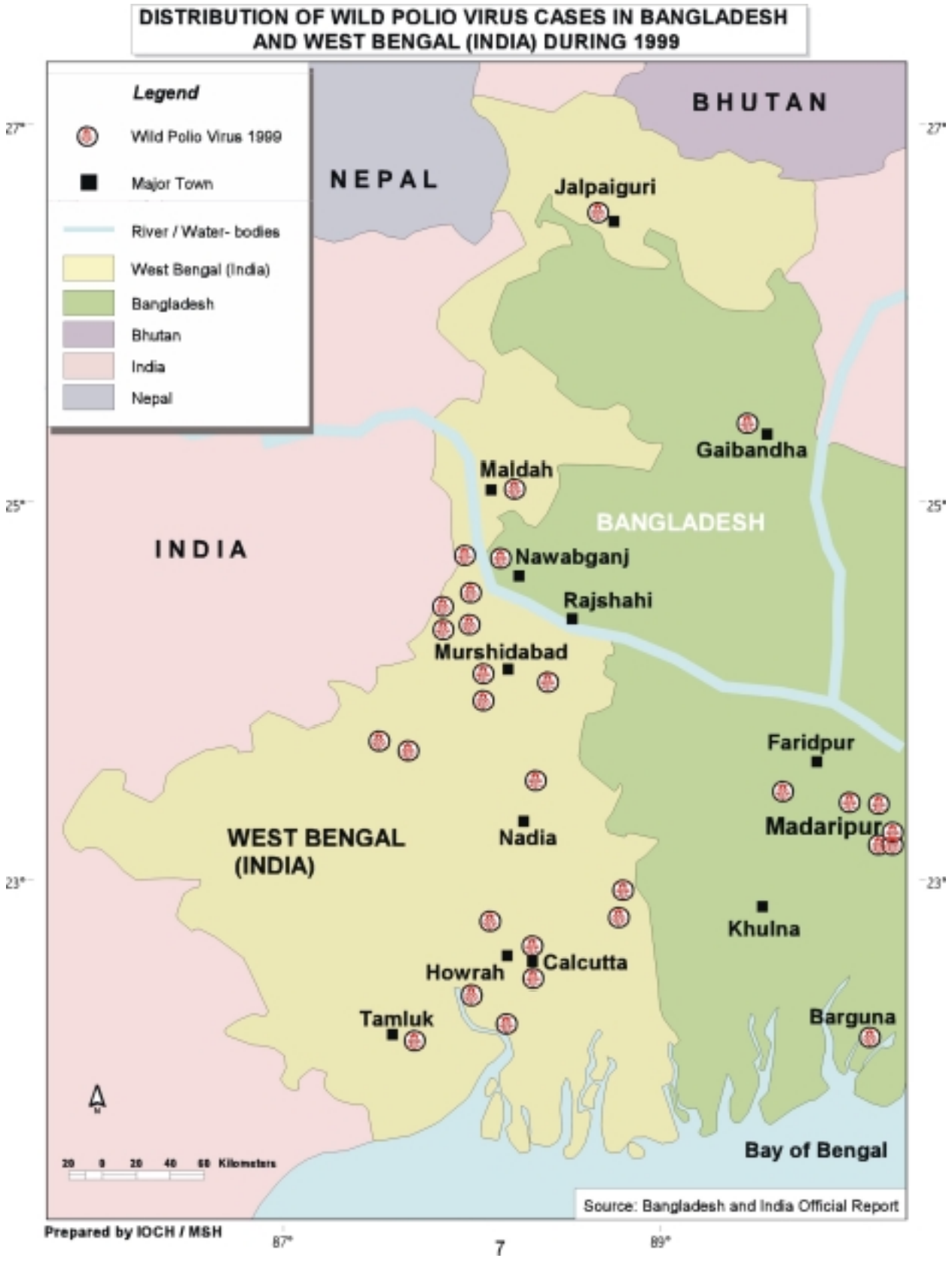
Crude coverage between 12-23 months: 98% children received BCG, 76% received three doses of OPV, 71% received three doses of DPT and 70% received measles vaccine.

Valid coverage between 12-23 months: 98% children received BCG, 65% received three doses of OPV, 61% received three doses of DPT and 67% received measles vaccine.

Valid coverage by 12 months: 98% children received BCG, 63% received three doses of OPV, 61% received three doses of DPT and 61% received measles vaccine.

Reasons for non-immunization and partial immunization of children: The main reasons for non-immunization and partial immunization were lack of knowledge about the importance of immunization and in particular the need to return for subsequent doses.

Problems detected: although access to immunization was fairly high, there was very high drop out rate (26% from DPT1 to DPT3 and 28% from DPT1 to Measles) and a number of invalid doses due to early immunization (12% for DPT1 and 4% for Measles). A small percentage of missed opportunities occurred at the immunization sessions (range 0-4% for different antigens). Childhood immunization cards were preserved in only 50% cases and lost in another 19% cases.


DISTRIBUTION OF WILD POLIO VIRUS CASES IN BANGLADESH AND WEST BENGAL (INDIA) DURING 1999
Legend
Wild Polio Virus 1999
Major Town
River / Water- bodies
West Bengal (India)
Bangladesh
Bhutan
India
Nepal
BHUTAN
NEPAL
Jalpaiguri
Gaibandha
Maldah
BANGLADESH
INDIA
Nawabganj
Rajshahi
Murshidabad
Faridpur
Madaripur
WEST BENGAL (INDIA)
Nadia
Khulna
Howrah
Calcutta
Tamluk
Barguna
Bay of Bengal
20 0 20 40 60 Kilometers
Source: Bangladesh and India Official Report
Prepared by IOCH / MSH
27°
25°
23°
87°
89°

Coverage Levels for the Routine TT Immunization of women

78% of women of childbearing age (15-49 years) had received a first dose of TT. Only 21% women had received the five doses of TT. 22% of the women had not received any immunization.

*Reasons for non-immunization and partial immunization of women: The m*ajor reasons cited for non-immunization were unawareness of the need for immunization and fear of side reactions. Whereas the main cause cited for partial immunization was unawareness of the need to return for second or third doses.

Coverage Levels for the sixth NID Campaign

In the north-western border areas of Bangladesh, the NID coverage figures were good. 95% children received a dose of OPV during the first round and 98% during the second round. It still means however, that there were children who received only one dose of OPV or no OPV during the sixth NID campaign. This occurred at a time when every child under five years old should receive a dose of OPV on each round of NID in order for Bangladesh to achieve its goal of being a "Polio free country".

Vitamin A capsules were given to 78% of the eligible children on the second NID of the campaign.

Reasons for non-immunization in the sixth NID campaign: For the small percentage of non-immunized children, lack of knowledge of the NID campaign and preoccupation with other works were cited as the major reasons for not being vaccinated.

Suggested solutions

The survey indicates a need for better information being given to parents / caretakers about the importance of each child being fully immunized (preferably before 12 months) and about how to achieve full immunization (the time and place of the immunization sessions and the number of doses required) and promoting the details of the NID Campaigns. Women of childbearing age require more education about how to prevent neonatal tetanus with 5 doses of TT vaccination. There is also a need for training to be given to the service providers to help them keep up to date with EPI policies and guidelines and increase their capacity for counselling parents about EPI.

Introduction

In these rural border areas, routine EPI is carried out by Government Health and Family Planning staff at fixed and outreach sites. The doses provided are supposed to be reported to the Upazila Health and Family Planning Officer at the end of each vaccination session. After compilation, the data is submitted on a monthly basis to the Civil Surgeon's office that aggregates it with other district results and sends it on to the EPI HQ in Dhaka. For many reasons routine EPI data is generally unreliable and does not provide specific information for the areas surveyed.

Border areas between Bangladesh, India and Myanmar are considered high risk for epidemiological reasons: high traffic of people involved in business and difficult terrain. Outbreaks of diseases ignore political boundaries. Because of the number of wild polio-virus cases reported on the Indian side of the border in 1999, IOCH decided to carry out a survey to obtain data on the status of the immunization coverage of children and women as well as on the operational profile of the provision of immunization services. In February 2000, this survey was conducted in the unions of selected parts of the north-western border areas of Bangladesh with the objectives mentioned below.

Objectives

The overall objective of the survey was to assess the level of immunization coverage in the unions in the north-western border areas of Bangladesh. The specific objectives were to:

a) assess the level of immunization coverage of children (12-23 months) and find out the reasons for non-immunization and partial immunization
b) assess TT immunization coverage among women of 15-49 years of age irrespective of their marital status and find out the reasons for non-immunization and partial immunization
c) assess the coverage levels of OPV and Vitamin A during the sixth round of NIDs

Methodology and its Limitations

The survey followed the WHO recommended 30-cluster survey method, which has been widely used in many developing countries to assess immunization coverage. It is relatively simple and can be done at low cost. (The detailed survey methodology and its limitations are presented in **Annex A**). Briefly, the immunization information is collected on a randomly selected group of 210 children from 30 clusters (7 children per cluster) in a given community. It gives an estimate of immunization coverage to within +/- 10 percentage points of the true population proportion with 95% statistical confidence, assuming a design effect of 2.

In this survey 7 children between 12-23 months (children born between February 8, 1998 to February 7, 1999) were selected from each cluster to ascertain their routine vaccination status. **Annex B** describes how the dates of eligibility of different antigens in routine immunization were determined. Seven women (between 15-49 years of age, irrespective of their marital status) were selected to ascertain their tetanus toxoid vaccination status. Another 7 children of 0-59 months of age (children born between November 2, 1994 and November 1, 1999) were selected for information about the OPV vaccinations and Vitamin A they received during the sixth NID Campaign.

The 30 clusters were chosen randomly from census data of the populations living in the unions in the North-Western border areas of Bangladesh. These are listed in **Annex C** and their location is shown in the map on the following page. The WHO standard questionnaire was used in this survey for documenting the child and women immunization status. A separate questionnaire was used for collecting data for the NIDs Campaign.

"Data Management Aid" (DMA) a local consulting firm with proven experience in conducting similar surveys was hired through a competitive bidding process to collect the information. DMA recruited the surveyors and supervisors. It also provided two days orientation (one day in the office and another day in the field - actually doing a test survey in a slum area in Dhaka City) for the surveyors and supervisors. IOCH/MSH provided technical support for their orientation. In the field there was a team of two surveyors (male/female) of DMA assigned to one cluster per day. They collected information by checking vaccination cards and also by interviewing parents/care takers. One supervisor was assigned to two teams of surveyors. IOCH had its own team in the field for quality control. At the end of each day the quality control team collected all the forms from the surveyors and they then randomly identified two sample respondents from each of the target groups in each cluster and re-interviewed them on the following day to check the quality of data collected. On that evening, discussions took place with the concerned interview team to resolve any inconsistencies.

All checked and completed questionnaires were handed over to IOCH. Data entry and analysis was done by IOCH using COSAS 4.3 and "EPI Info" programs. The final report was prepared by the Monitoring and Evaluation Unit, IOCH/MSH Project.


EPI Coverage Survey in the West Border Areas of Bangladesh
Gomastapur
Daipukhuria
Shahbajpur
Binodpur
Manakasa
Sibganj
NAWABGANJ
Panka
Uzirpur
Nawabganj
Godagari
Shajahanpur
Char Asharidaha
Matikata
Deopara
RAJSHAHI
Paba
Isabpur
Sardah
Charghat
Charghat
Mahigram
Pakuria
Bagha
Legend
Sample Cluster
District HQ
Thana HQ
Union HQ
Water-bodies
Paurasava
International Boundary
District Boundary
Thana Boundary
Union Boundary
Road
Rail Line
10 0 10
Kilometers
Bangladesh
11
Prepared by IOCH / MSH

Limitations of the 30-cluster survey method

Although the 30-cluster survey method is relatively simple, it has several limitations that can be grouped into two types:

Linked to the sampling method:

- As an inherent bias in the sampling technique in 30 clusters, bigger villages are more likely to be selected as a cluster. The survey leaves out scattered small villages usually with poor access to services. It also does not reflect the lack of uniformity in service availability or the behavior of particular populations in some villages.
- There is a wide confidence interval (+/- 10%). It means that if the result shows for example, 61% of children received a valid dose of measles before 12 months of age, then the "true" figure of measles immunization of children could be anywhere between (61-10) = 51% and (61+10) = 71%. This type of survey is useful when the coverage is low but is less relevant to assess higher coverage or to compare surveys – unless there is a big difference between two surveys.
- To be relevant, the analysis of valid data must apply to a relatively high percentage of available cards.

Linked to the implementation:

- The selection of the index house is key. Too often the proper method is not followed because the surveyors do not make the effort to number all the houses from their location at the centre of the village to the end of the village along the direction indicated by the bottle or by the pencil.
- If a household includes an eligible child who is not at home for a few hours, the surveyor too often does not return later on but skips the house and substitutes another child. This is, of course, an incorrect procedure that introduces a bias.

It is also important to remember that this survey coverage data gives little information about the current program as it documents the activities of a year earlier.

Results

A. Routine Immunization coverage of children

Coverage Levels (card plus history data of COSAS analysis)

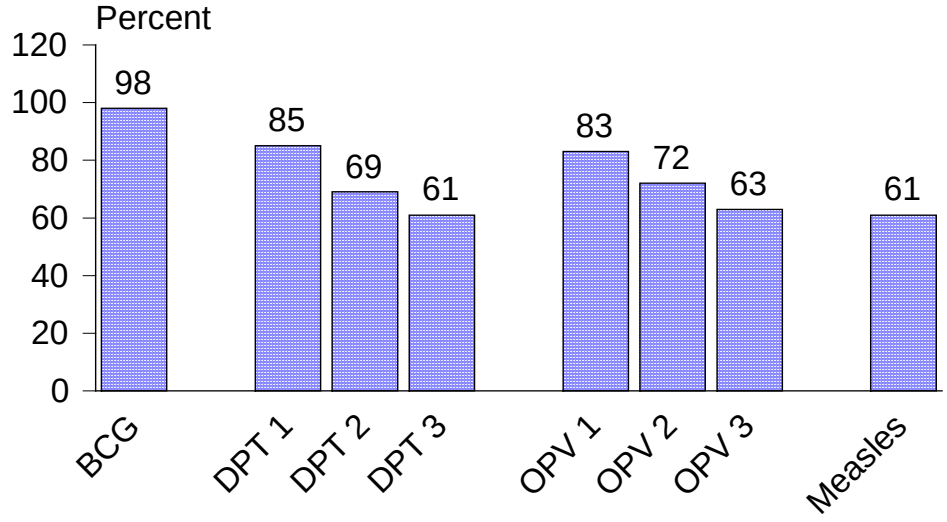
Table 1 shows the coverage levels of children between 12 and 23 months and their vaccination status at 12 months of age. The crude data figures for the 12-23 month age group indicate that 76% of the 12-23 month age group received three doses of OPV, 71% received three doses of DPT and 70% were vaccinated against measles. The valid coverage levels are however considerably lower, only 65% of children received three doses of OPV, 61% received three doses of DPT and 67% were vaccinated against measles. The reasons for this and other comments are given below. Only four children (2%) out of 210 children surveyed had not been immunized at all and were therefore not reached by the EPI program.

Table 1: Routine immunization coverage levels of children (card plus history data)

	Coverage (%) Immunization of 12- 23 month age group		Coverage (%) Immunized by 12 months Valid data
	Crude data (Access)	Valid data	
BCG	98%	98%	98%
Polio 1	94%	84%	83%
Polio 2	86%	73%	72%
Polio 3	76%	65%	63%
DPT 1	97%	85%	85%
DPT 2	82%	69%	69%
DPT 3	71%	61%	61%
Measles	70%	67%	61%
Zero dose	2%		

Table 1 shows little difference between the valid data of immunization of the 12-23 months age group and the valid data by 12 months except for measles coverage (67% versus 61%). **Chart 1** shows the actual coverage for children of less than 12 months.

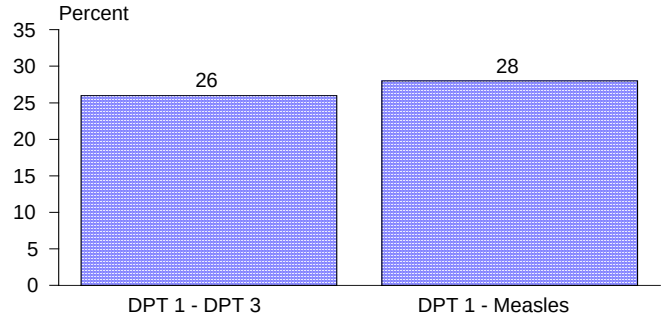
Chart 1: Immunization coverage among children less than 12 months old (card plus history data)



Program access [(percent of children surveyed who received DPT 1st dose (crude data - by card or history)].
Access to immunization is good as 97% of children received a 1st dose of DPT.

Program continuity (dropout rate)
Crude data for antigens received by 12-23 months of age is used for calculating the dropout rate. In this survey, the DPT1 to DPT3 dropout rate is 26% and DPT 1 to measles drop out rate is 28% (**Chart 2**).

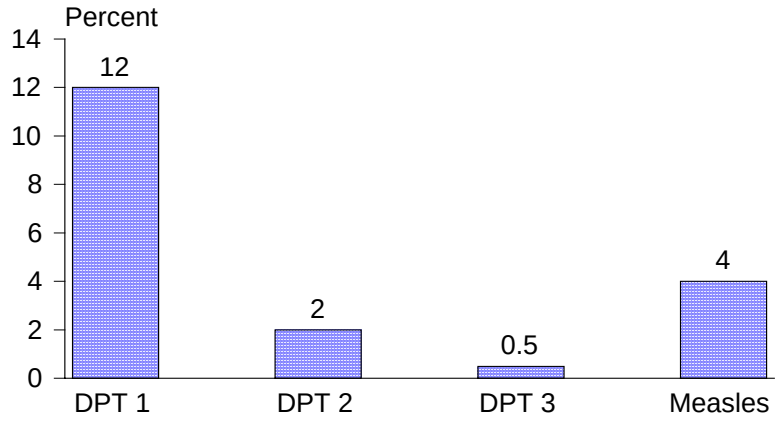
Chart 2: Drop out rate for childhood immunization



Program quality

Adherence to the immunization schedule – invalid doses
Adherence to the immunization schedule is generally considered to be the major indicator of program quality. The data indicates that the provider's performances reduced the coverage of DPT1 from an initial access of 97% measured by crude data to a coverage of 85% (valid data) for children between 12-23 months of age. A similar trend is seen for the other antigens (except BCG). 12% of children received invalid DPT 1st doses and 4% received invalid measles vaccine. 4 children (2%) received a DPT second dose less than 4 weeks after the first dose of DPT and only one child (0.5%) received DPT third dose less than 4 weeks after the second dose of DPT (**Chart 3**).

Chart 3: Invalid doses of immunization provided to children



BCG vaccination
98% children surveyed received BCG vaccine based on card plus history data. 96% of the children were found with a BCG scar but 2% did not produce a visible scar.

Missed opportunities of immunization
The prevalence of uncorrected missed opportunities is low (range 0% BCG – 4% OPV1). The overall DPT1 coverage would be 3% higher than the survey finding if there had been no missed opportunities.

Availability of documentation of immunization
Only 50% of child immunization cards were available. Immunization cards were issued to another 19% children, which were subsequently lost.

Reasons for non-immunization and partial immunization of children
Only four children out of 210 children had not been immunized. Parents of two of them were not aware of the need for immunization, another one feared side reactions and the other did not know the time and place of immunization. **Table 2** shows the reasons given for partial immunization. The major reasons cited by parents/care takers for partial immunization are: a) unaware of need of return for second and third dose (51%), b) child ill and not brought to immunization session (12%), c) cultural and religious reasons (8%) and d) fear of side reactions (8%).

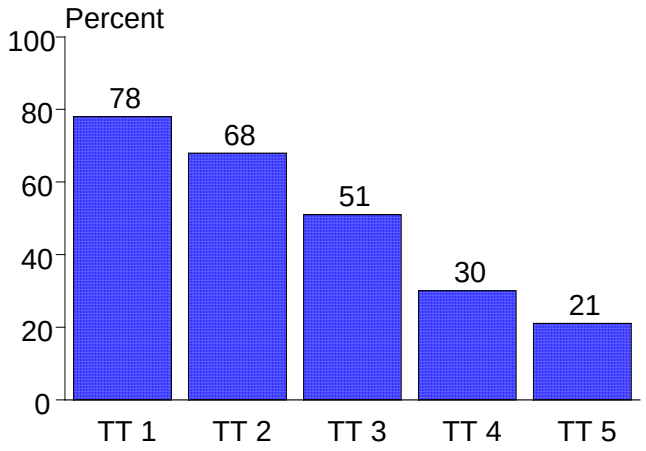
Table 2: Reasons for partial immunization of the children

Reasons	Partially immunized
Don't feel need for immunization	5%
Unaware of need to return for 2nd or 3rd dose	51%
Child ill, not brought	12%
Fear of side reactions	8%
Wrong ideas about contraindications	1%
Child ill, brought but not given immunization	5%
Vaccinator absent	3%
Mother too busy with household work	4%
Cultural / religious reasons	8%
Family problem, including illness of mother	2%
Other reasons related to lack of motivation	1%

B. Routine TT immunization coverage of women

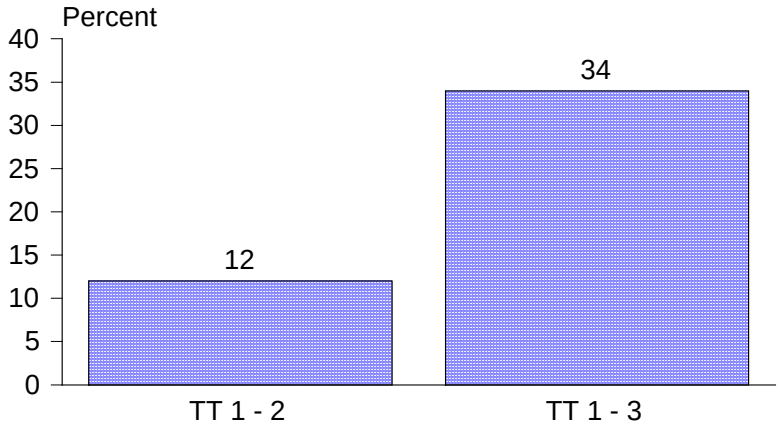
78% (based on crude data) of the women had access to a first dose of TT. 68% of women received two or more doses of TT vaccine. Only 21% had received all the 5 required doses (**Chart 4**). 22% women surveyed had not received any doses of TT vaccine.

Chart 4: Routine immunization coverage levels for TT of the women (15 – 49 years)



The dropout rate from TT first dose to TT second dose is 12% and the dropout rate from TT first dose to TT third dose is 34% (**Chart 5**). Survey findings indicate that no woman missed an opportunity for TT (first dose) immunization during an antenatal check-up.

Chart 5: Drop out rate for TT immunization



Reasons for non-immunization and partial immunization for TT of the women

Table 3 indicates the major reasons cited for non-immunization: a) unaware of the need for immunization (85%), b) fear of side reactions (9%) and c) Cultural / religious reasons (4%). Whereas the major reasons cited for partial immunization were as follows: a) unaware of the need to return for second or third dose (55%), b) next dose is not yet due (12%), c) did not feel need of immunization (12%) and d) health worker did not specify the date to return for the next dose (5%).

Table 3: Reasons for non-immunization and partial immunization for TT of the women

Reasons	Not Immunized	Partially Immunized
Unaware of the need for immunization	85%	12%
Unaware of need to return for 2nd or 3rd dose	-	55%
Health worker did not specify the date to return for the next dose	-	5%
Place and/or time of immunization unknown	-	2%
Fear of side reactions	9%	-
Next dose is not yet due	-	12%
Too busy with household work	-	2%
Family problem	2%	3%
Cultural / religious reasons	4%	4%
Other obstacles	-	5%

C. Coverage Levels in the sixth NID Campaign

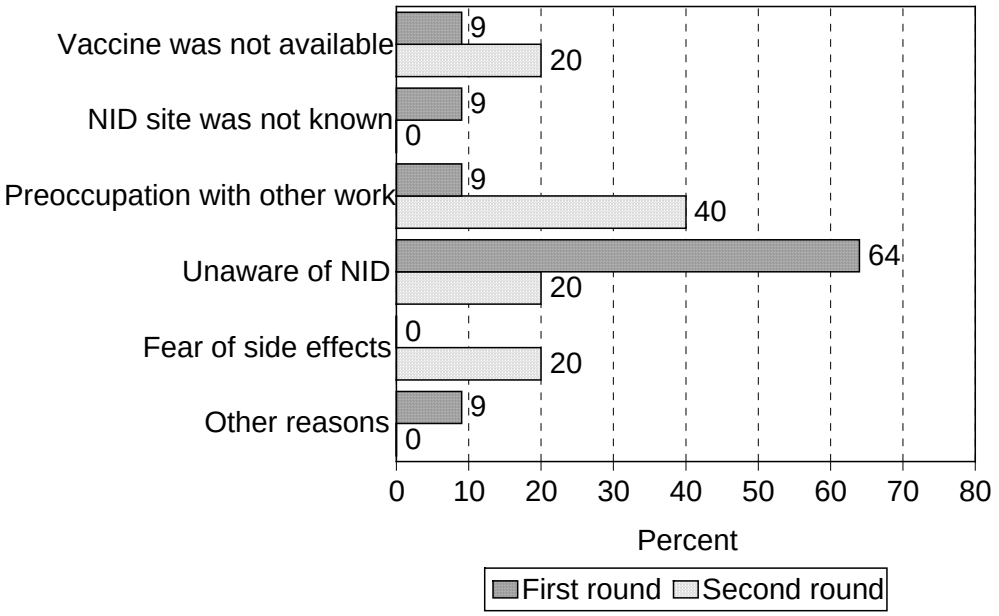
OPV coverage

95% of children below 5 years of age received OPV during the first round and 98% during the second round of the sixth NID campaign.

Reasons for non-immunization of OPV

The main reasons invoked for not being immunized at the sixth NIDs (first and second round) were the lack of knowledge of the campaign and preoccupied with other work. These together with the other reasons are shown in **Chart 6**.

Chart 6: Reasons for non-immunization during the sixth NIDs



High potency Vitamin A coverage

During the second round of the sixth NID campaign, high potency vitamin A capsules were also administered to 78% of the children between one and five years.

Reasons for not receiving Vitamin A

Table 4 indicates the major reasons given by parents for their child not having the vitamin A capsule a) the capsule was not needed (79%), b) preoccupation with other work (4%) and c) Vitamin A capsule was not available (4%).

Table 4: Reasons for not accepting the Vitamin A capsule during the sixth NIDs

Reasons	Percent
Not needed	79%
Fear of side effects	2%
Vitamin A capsule was not available	4%
Preoccupation with other work	4%
Others	11%

Places of vaccination during the sixth NIDs

Almost all of the children received OPV and Vitamin A capsule from the NID vaccination sites (**table 5)**.

Table 5: Places of vaccination during the sixth NIDs

		NID site	Home	Bus stand
OPV	1st round	98.5%	1%	0.5%
	2nd round	99%	1%	-
Vitamin A capsule	2nd round	100%	-	-

Discussion

The survey showed that 97% of the children surveyed had access to routine immunization, a significant achievement for an area thought to be poorly covered by health services. 16% had received a valid BCG vaccination before 6 weeks of age that is a testimony of some parent's awareness of the need for vaccinating their children at the earliest opportunity. But the promising start was eroded by the high dropout rate (e.g. 26% between DPT1 – DPT3 and 28% between DPT1 – Measles) and by the number of invalid doses (12% for DPT1 and 4% for measles given too early). This is indicative of the poor quality of the EPI services. 50% of the children had a vaccination card and another 19% had lost them. Only 23% of the women had a vaccination card. The absence of cards has got serious implications as it may mean that when a child comes to the immunization session for the second or subsequent doses, the vaccinators will have to immunize without accurately knowing the date of birth of the child and the date of previous immunization. It is another factor likely to increase the number of invalid doses given.

It is an achievement that 95% of the children between 0 – 5 years surveyed received a dose of OPV during the first round and 98% received one dose of OPV on the second round of the sixth NID Campaign. But these figures still mean that there were children who did not receive any or only one dose and that this occurred at a time when the goal of each of the NID Campaigns is to vaccinate each and every child under five years with two doses of OPV.

Conclusions and Recommendations

Coverage levels for routine immunization of children

Access to routine immunization

This survey found that the access to routine immunization for children in the unions in the north-western border areas of Bangladesh was good with 97% receiving a first dose of DPT but this coverage rate was not maintained for subsequent immunizations. This important shortcoming can be mainly attributed to the lack of knowledge on the importance of full immunization leading to the high drop out rates and to a lesser extent to the number of invalid doses and missed opportunities.

The dropout rates

The dropout rates could be reduced by:

- providing better counseling to parents/caretakers about the importance of each child receiving all the required antigens before 12 months. They also require advice about when and where they should take their child for the next dose. Most children will need to attend 4 immunization sessions. The majority of the children (51%) dropped out simply because their parents/care takers did not know that they were required to return to the EPI center/site for subsequent doses. Another 12% of the children were not taken for immunization because the child was ill. It should be remembered that minor illness is not a contraindication to vaccination.
- undertaking appropriate Behavior Change Communication (BCC) activities through the mass media and service providers to increase awareness of the need for children to receive all the doses of each of the antigens.
- providing refresher training and orientation to the service providers for counseling parents and women of child bearing age about immunization. It is apparent from the results of the survey that the service providers lack the relevant technical skills and/or motivation for counseling. Some parents reported that they had never received any immunization information from a health worker and others complained that they had not been talked to at all.

Invalid doses

A number of the children received invalid doses of vaccine because they received them before the minimum age recommended for each of the antigens or before the minimum interval that should occur between the doses. This indicates the poor quality of screening, inadequate technical knowledge and/ or lack of motivation of the service providers. This situation could be improved by:

- providing appropriate refresher training to the service providers to emphasize proper screening and filling of vaccination cards and to remind them about the correct ages and intervals for immunizations.
- introducing/strengthening the support given to the service providers through supervision;
- emphasizing the need to retain vaccination cards by parents

Missed Opportunities

The rate of uncorrected missed opportunity at EPI centers/sites was low (range varied from none for BCG to 4% for OPV). The missed opportunities could still be further reduced by:

- checking children's immunization records at each immunization session and immunizing them for doses if eligible
- providing appropriate training in screening to the service providers

Coverage levels for TT vaccination

Access to TT vaccine (TT1) was reasonable but the rate of drop out after the second dose was very high. The coverage of 78% for TT1 reduced to 21% for TT5 and 22% had not been immunized at all. (A woman of reproductive age needs to receive 5 doses of TT at appropriate intervals to acquire immunity for rest of her reproductive life).

Coverage is likely to be improved by:

- checking the TT status of all women between 15-49 years at antenatal check ups and at routine child immunization sessions to see whether the mother or female caretaker is eligible for any dose of TT and giving a dose of TT if it is required
- undertaking appropriate BCC activities to increase awareness of the women of childbearing age of the need for 5 doses of TT vaccinations
- providing refresher training to the service providers of the TT vaccination requirements

Coverage levels for the sixth round of NIDs

The coverage levels of the sixth NID campaign were at a commendable level (95% receiving a dose on first round and 98% on second round); but it still means that there were children who received only one dose of OPV or zero dose. This occurred at a time when every child under five years old should receive a dose of OPV on each NID in order for Bangladesh to achieve its goal of being a "polio free country". Improvements might be made by:

- increasing and improving the BCC activities to ensure that each parent/caretaker is aware that each and every child must receive polio vaccine during both rounds of each NID campaign planned in 2000;
- paying particular attention to immunization in the hard to reach areas and among high-risk populations.

Reference and Resource materials

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Annex - A

The following are extracts from **Anthony G Turner, Robert J Magnani and Muhammad Shuaib's** article entitled ***"A not quick as quick but much cleaner alternative to the Expanded Program on Immunization (EPI) cluster survey design"*** *published in the International Journal of Epidemiology in 1996, volume 25, Issue No. 1, pages 198-203.*

The standard EPI Cluster Survey Design

"The sample design for the EPI Cluster Survey is a two stage design involving the selection of 30 primary sampling units or 'clusters' (usually village or other area units), from which 210 children with a target age range (usually 12-23 months) are chosen, seven children per cluster. The sample size of 210 children (per domain or stratum) is mandated by the desire to estimate the level of immunization coverage to within +/- 10 percentage points of the true population proportion with 95% statistical confidence, assuming a design effect (i.e. *deff*) of 2.0. Based upon prior experience with immunization coverage surveys (primarily in the US), 30 clusters are generally thought to be necessary to yield sufficiently reliable estimate."

"In the standard design, clusters are chosen from a list of primary sampling units (i.e. villages, urban communities, census enumeration areas etc.) through systematic random sampling with probability proportional to estimated size (*ppes*). The latest estimates of cluster population sizes, which are assumed to be proportional to the number of children in the target age group in each cluster, are typically used as measures of size. The 30 clusters so chosen are then visited by survey field staff who carry out the second stage of sample selection and conduct the household interviews. "

"The original EPI design called for sample children to be chosen randomly from a list of all eligible children in each sample cluster. However, because the creation of lists of households and children tends to be time consuming, costly, and unfeasible in some settings, this procedure is only infrequently used in actual practice. Instead, one of several simplified second stage sampling procedures is commonly used. In one variant, children are selected by first choosing a random direction from a central location in a village or community (e.g. by spinning a bottle). The number of households in that direction to the edge of the community is then counted, and one household is randomly chosen to be the first sample household. Subsequent households are chosen by visiting the nearest neighbouring households until information has been gathered on seven children. In a yet simpler variant, a direction from a central starting point is randomly chosen as described above and households are contacted as the interviewer moves in the chosen direction until the required information has been gathered for seven children."

"The second stage sampling methods described above are 'quota sampling procedures' and some of the problems resulting from the use of this approach have been noted over the years."

"First, quota sampling does not ensure that every eligible member of the target population has a known, non-zero chance of being selected. Hence, the standard EPI design, as it is usually applied, is not a true probability sample design. ……."

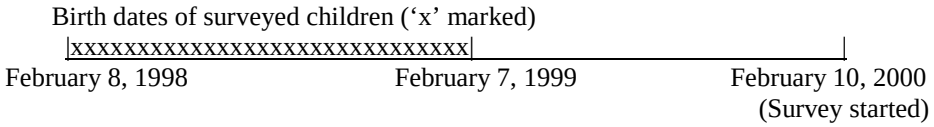
"A second problem concern sampling weights. …….. However, since measures of size in sampling frames are often inaccurate due to census errors and changes in population since the census was taken, application of the standard EPI Cluster Survey method does not automatically result in a self weighting sample. The survey data must be weighed in order to yield unbiased estimates. …… However, since selection probabilities are not known in most EPI Cluster Survey applications, sampling weights can not be calculated."

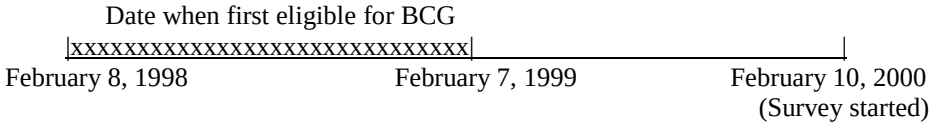
"Thirdly, a computer simulation study demonstrates that the EPI Cluster Survey based upon quota sampling at the second stage of sample selection is considerably more prone to sampling bias than conventional cluster sampling, particularly where immunized children are 'pocketed' within clusters. "

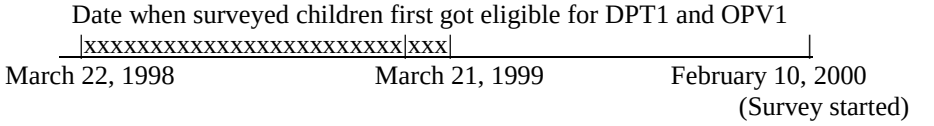
"Finally, there is the issue of how second stage sample selection should proceed in surveys with multiple measurement objectives."

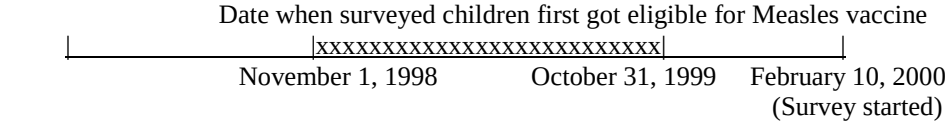
Annex B

The following illustration describes when children surveyed first became eligible for different vaccines:









Annex C

Immunization and other Child Health Project / Management Sciences for Health
EPI Coverage Survey in North-western border areas of Bangladesh
List of clusters identified for survey

District	Upazila	Union	Mauza	Village	Village population	Cluster number
Rajshahi	Bagha	Manigram	Hilalbaria	Hilalbaria	1392	1
			Tulsipur	Tulsipur	2869	2
		Pakuria	Kadirpur	Kadirpur	2482	3
	Charghat	Charghat	Anupampur	Anupampur	3238	4
			Mangli	Mangli	2405	5
		Yusufpur	Baduria	Pasondia	792	6
			Isubpur	Tangon	1692	7
		Sardah	Balidanga	Balidanga	1126	8
			Moktarpur	Moktarpur	7258	9
			Sardah	Sardah	6441	10
	Godagari	Char Ashariadaha	Nowsera Khashmahal	Nowsera Khashmahal	1864	11
		Deopara	Deopara	Fakirpara	490	12
			Palpur	Palpur	1607	13
		Godagari	Madarpur	Madarpur	3433	14
			Sreemantapur	Sreemantapur	1948	15
		Matikata	Harishakarpur	Harishankarpur	2800	16
			Pirijpur	Pirijpur	4076	17
Nawabganj	Nawabganj	Shahjahanpur	Shakhalipur	Marendrapur	7170	18
	Shibganj	Binodpur	Bishwanathpur	Chhaygharia	333	19
			Kaliganj	Lazibtala	379	20
		Daipukuria	Chakla	Chakla	2811	21
			Mirzapur	Mirzapur	3288	22
		Manakosha	Chauka	Chauka Manakosha	725	23
			Saha para	Munshipara	523	24
		Panka	Babupur	Babupur	2797	25
		Shahbajpur	Azmatpur	Namo chakpara	2436	26
			Dilalpur	Hazar Bighi	1714	27
			Shahbajpur	Shahbajpur	1126	28
		Uzirpur	Radhakantapur	Radhakantapur	5613	29
			Uzirpur	Dakshin Uzirpru	3016	30

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