



IOCH

Immunization and Other Child Health Project

Vaccination Coverage Survey in the Slums of Dhaka City Corporation

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Survey Report No. 62

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Acronyms

BCC	Behavior Change Communication
BCG	Bacillus of Calmette and Guerin
BINP	Bangladesh Integrated Nutrition Project
CES	Coverage Evaluation Survey
COSAS	Coverage Survey Analysis System
DPT	Diphtheria, Pertussis and Tetanus
EPI	Expanded Programme on Immunization
FIC	Fully Immunized Children
FWC	Family Welfare Center
IOCH	Immunization and Other Child Health
MNT	Measles, Neonatal and Tetanus
Mahallah	Smaller localities (smaller than a village, the urban equivalent of a para)
MOHFW	Ministry of Health and Family Welfare
Mouza	Smallest administrative locality in an Upazila
MSH	Management Sciences for Health
NGO	Non Governmental Organization
NID	National Immunization Day
OPV	Oral Polio Vaccine
TT	Tetanus Toxoid
WHO	World Health Organization

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 plus history. In the calculation process, first the rate of validity is calculated based on cards only, then this rate is applied to history cases too. 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.

The **criteria for a valid dose** used in this survey is the criteria recognized 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.

Dropout cases refer to the children/women who have initially received at least one dose of any antigen and then failed to receive the subsequent doses to get fully immunized. Dropout rate implies the inability of the EPI to follow-up and protect the cohort of children initially reached out.

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.

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 center for a dose that he received. However at that time he 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

To improve routine EPI and polio eradication activities, the Expanded Program on Immunization (EPI), Directorate General of Health Services (DGHS), Government of Bangladesh, decided to conduct district and city corporation wise coverage evaluation surveys (CES) in early 2002. UNICEF supported this initiative by contracting out 75 coverage evaluation surveys- one for each of the 64 districts, one for each of the 4 city corporations and 7 surveys for the Bangladesh Integrated Nutrition Project (BINP) upazilas, to two local consulting firms. To supplement these surveys, the Government and the partners requested IOCH to conduct additional 7 coverage evaluation surveys in urban areas. Accordingly, IOCH conducted a coverage evaluation survey in the slums of Dhaka City Corporation in March 2002.

Objectives

The overall objective of the survey was to assess the level of immunization coverage in the slums of Dhaka City Corporation. The specific objectives were to:

- a) assess the level of routine immunization coverage of the children (12-23 months) and find out the reasons for non-immunization and partial immunization;
- b) assess the level of TT immunization coverage among mothers who had live births in the previous year, and find out the reasons for non-immunization and partial immunization;
- c) assess the coverage levels of OPV and Vitamin A administered during the 10th NID campaign;
- d) investigate antenatal and delivery practices, and decision making process for immunization; and
- e) understand importance of education on selected health care practices.

Coverage levels for the routine immunization of children

Access: Based on crude data (card plus history), 93% of the children 12-23 months received at least one dose of antigen (DPT 1st dose in this case) from routine immunization sessions. 6% children did not receive a dose of any antigen.

Crude coverage between 12-23 months: 94% of the children received BCG, 78% received three doses of OPV, 78% received three doses of DPT and 70% received measles vaccine. 69% children were fully immunized.

Valid coverage between 12-23 months: 94% children received BCG, 61% received three doses of OPV, 61% received three doses of DPT and 64% received measles vaccine. 51% children were fully immunized.

Valid coverage by 12 months: 93% children received BCG, 59% received three doses of OPV, 59% received three doses of DPT and 57% received measles vaccine. 48% were fully immunized.

Dropout rates: Although access to child immunization was fairly high (93% for DPT1), the dropout rates for different antigens were high too. There was 16% dropout from DPT1 to DPT2 and 25% from DPT1 to measles.

Invalid doses: There were a number of invalid doses due to early immunization and/or inadequate interval between the doses. As high as 14% of the DPT1 doses were administered before 6 weeks, and 9% measles doses before 38 weeks of age of the children. In addition, 3% of both the DPT2 and DPT3 doses were invalid as they were given before the 4 weeks interval between the doses.

Missed opportunities: Total missed opportunities (uncorrected plus corrected) for different antigens ranged from 6 to 8 cases out of 210. However, the prevalence of uncorrected missed opportunities for different antigens was low, ranging from 0 to 2%. The composite index for missed opportunities was as high as 27, reflecting poor quality of screening during vaccination sessions.

Immunization coverage by sex: Male children had more access to immunization than the female children. Boys' access to immunization as measured by coverage of DPT1 was 6 percentage points higher than that of the girls. However, the dropout rate for DPT1 to measles of the boys was higher than that of the girls (29% for boys vs. 20% for girls), leading to lower crude full immunization coverage for boys (68% crude FIC for boys vs. 71% crude FIC for girls) than that of the girls.

EPI Card retention: 92% of the children interviewed were ever given EPI cards; however, EPI cards were available in 44% of the cases at the time of interview. EPI card retention rate was 48% only, which means that 52% of the EPI cards were lost.

Sources of immunization services: Child immunization services in the slums of DCC were mostly provided by the NGO clinics (61%), followed by GOB/CC outreach centers/ EPI centers (30%). GBO hospitals and clinics provided immunization to 5% and 3% children respectively. Private clinic, however, provided immunization to 1% cases only.

Reasons for non-immunization and partial immunization of the children: The primary reasons for non-immunization of the children, as reported by the parents, included lack of faith in immunization (50%) and lack of awareness of need and importance of immunization (18%). The main reasons for partial immunization or dropouts were: sickness of the children (24%), mothers' preoccupation with other work (21%), did not know when to return for 2nd and 3rd dose of DPT/OPV or for measles (12%), and fear of adverse reaction (8%).

Coverage levels for the routine TT immunization of mothers

TT coverage: Access to TT immunization for the mothers who had live births in the last year was fairly high. About 89% of the mothers received TT1. The corresponding figures for TT2, TT3 and TT4 were 84%, 59% and 43% respectively. Only 23% of the mothers received TT5, which provide lifelong protection against tetanus. About 11% of the mothers never received any TT vaccine. Age distribution of the mothers who never received any dose of TT shows that over half of the mothers (57%) of age group 35 years and above did not receive a single

dose of TT; while the corresponding figures for mothers of the age groups below 35 years were much lower, ranging from 7% to 20%.

Invalid TT doses: A considerable proportion of TT doses were invalid as they were administered before the minimum required interval between the doses. About one quarter of TT3 doses (25%) were given before 6 months interval between TT2 and TT3, and as such were invalid. About 61% of the TT4 doses were invalid, since they were given before one year interval between TT3 and TT4; similarly about half of TT5 doses were invalid for the same reason.

TT immunization dropout rates: TT immunization dropout rates were high. The dropout rate for TT2 to TT3 was 30 percent. The corresponding rates for TT3 to TT4 and TT4 to TT5 were 27% and 47% respectively. The dropout rate for TT1 to TT5 was as high as 74%, indicating that 74% of the mothers who received first dose of TT did not complete 5 doses TT immunization schedule.

TT card retention: 79% of the mothers (who had live births in the last year) were ever given TT cards; however, TT cards were available in 36% of the cases at the time of interview. TT card retention rate was 46% only, which means that 54% of the TT cards were lost.

Protection against tetanus at birth: Of the mothers who had live births in the previous year, 82% of newborn babies were found protected against tetanus, indicating that 18% of the newborn babies were not protected against tetanus at birth.

Sources of TT immunization services: Over half of the TT immunization services were provided by the NGO clinics (55%), followed by GOB outreach centers (38%). GOB hospitals and clinics provided immunization to 6% of the cases only.

Coverage levels for the 10th National Immunization Campaign

OPV and Vitamin A coverage: During the 10th NIDs, 90% of the children < 5 years received OPV in both the rounds. The coverage of OPV was 95% in the 1st round and 93% in the 2nd round. Vitamin A capsules were given to 89% of the eligible children aged 12 – 59 months.

Sources of OPV during the 10th NIDs: Most of the children received OPV from NID sites during both the rounds of the 10th NIDs. Coverage of mobile team on the day of NID improved in the 2nd Round from 1% in the 1st Round to 3% in the 2nd Round. Similarly, more children received OPV during child-to-child search of the 2nd Round compared to that of the 1st Round (6% in 1st Round vs. 10% in 2nd Round).

Reasons for not receiving vaccines from the NID sites of the 10th NIDs: The most important reasons for not receiving OPV from the NID sites of the 10th NIDs were: lack of information about NID campaign (8% for 1st Round and 15% for 2nd Round) and the parents were too busy to take their children to NID sites (27% for 1st Round and 26% for 2nd Round). Besides, a significant proportion of the children (13% in 1st Round and 25% in 2nd Round) who were not taken to the NID sites for OPV waited at their homes to receive OPV during child-to-child search of the health workers.

Sources of information of the 10th NID Campaign: In the slums of the Dhaka City Corporation, television was major source of information about the 10th NID Campaign (40%), followed by NGO workers (34%). The other sources of information included relatives/neighbors (26%), mosque miking (24%), mobile miking (11%), and IPC by the volunteers during home visits (14%).

Antenatal checkup: Only 57% of the mother received at least one antenatal check-up during their last pregnancies. Mother's education seems to have positive association with antenatal checkup. All the women with SSC or more education received at least one antenatal checkup; while nearly half of the uneducated women (46%) did not receive a single antenatal checkup during their last pregnancies

Delivery Practices: Most of the deliveries (71%) were attended by untrained traditional birth attendants (UTBA) or neighbors and relatives. Only 13% of the deliveries were attended by graduate doctors or midwives/nurses; while another 16% of the deliveries were attended by trained traditional birth attendants (TTBA). Uneducated women were less likely to have their delivery attended by qualified doctors or midwives and nurses. In 92% of the cases, new blades or sterilized blades were used in cutting the umbilical cords of the newborn babies. The qualified doctors, midwives/nurses and trained TBAs were found more likely to use sterilized blade (for cutting umbilical cords) than the untrained TBAs and neighbors and relatives. Similarly all the women with education of SSC or above had their children's umbilical cords cut by sterilized blades; while the corresponding figure for uneducated women was 60%. Majority of the mothers (39%) did not use anything at the cut of umbilical cord of their newborn babies. Unhygienic practices, i.e. using soil/soil with oil, ash or oil at the cut of the umbilical cord were reported by about 20% mothers. Data suggest that a level of education, i.e. SSC or more leads to hygienic practices regarding treatment of the cut of the umbilical cord of newborn babies.

Decision making process for child immunization: Decision regarding immunization of children was taken jointly by mother and father in 54% of the cases; while for one-fourth of the cases, the mother alone took decision for immunization of their children. However, grant parents still accounted for 10% of the decisions. Data suggest that a certain level of education, i.e. SSC or above increases mother's role in decision making process for child immunization.

Immunization status and mother's education: Mother's education was found to be associated with immunization status of their children.

Problems detected

Access to child immunization in the slums of DCC was good (93% for DPT1); but this high access dropped to 69% for fully immunized children mainly because of high dropout rates of different antigens. (Dropout rate for DPT1 to DPT3 was 16% and DPT1 to measles was 25%). There were also high invalid doses (14% for DPT1 and 9% for measles), which further reduced the crude full immunization coverage of 69% to 51% when validity of doses was taken into account. Missed opportunities for different antigens were also considerably high

(8% for BCG and 7% for measles). These high rates of dropouts, invalid doses and missed opportunities reflect poor quality of immunization services.

Male children had more access to immunization than the female children. Boy's access to immunization as measured by coverage of DPT1 was 6 percentage points higher than that of the girls. Although 92% of the children were ever given EPI, the retention rate of EPI cards was only 48%. Such a low retention rate of EPI cards plays a negative role in the quality of EPI services provided by the health workers. Level of knowledge of the mothers with regard to full immunization was not satisfactory. Over half of the mothers could not mention how many times their children were required to be taken to EPI center to get fully immunized.

Lack of faith in immunization and lack of awareness of need and importance of immunization were the main reasons for non-immunization of children; while lack of knowledge as to when to return for subsequent doses, fear of adverse reaction and sickness of the child were reported as prime causes for dropouts.

Of the women who had live births in the previous year, 11% did not receive any dose of TT (although each of the women was supposed to receive at least two doses of TT prior to her last delivery). 18% of the newborn babies were found unprotected against tetanus at birth. The dropout rate for TT was also high (74% for TT1 to TT5), resulting in very low coverage of TT5 (23%), which provides lifelong protection against tetanus. A very high proportion of TT doses were invalid (25% for TT3, 61% for TT4 and 52% for TT5). Mother's knowledge about full TT immunization was found to be very low. 83% mothers did not know that a woman is required to receive 5 doses of TT for lifelong protection against tetanus. The rate of retention of TT cards was also very low (46%).

10% of the children < 5 years did not receive OPV in both the rounds of the 10th NID campaign. The coverage of OPV in the 2nd round (93%) was 2 percentage points lower than that of the 1st round. In spite of intensive communication activities during NIDs, lack of information of NID campaign as a reason for not receiving OPV from NID site was still reported by 8% parents in 1st round and 15% in 2nd round.

11% of the children of 12 – 59 months did not receive Vitamin A during the 10th NIDs. Besides, Vitamin A capsules were also administered wrongly to 10 ineligible children (out of 210) who were <1 year of age.

Suggested solutions

1. Programmatic strategies must be undertaken to reduce the existing high dropout rates in both child immunization and TT immunization. The program should focus on quality of counseling of mothers/women (on immunization) by the service providers. The service providers at the first contact must counsel the mothers/women properly to motivate her to return and to get herself and/or her child fully immunized.
2. Program managers and field supervisors should ensure that EPI sessions are held as per plan, and at a regular and adequate interval (more than 28 days).
3. The service providers should be given refresher training to improve their technical skills on counseling of mother/women on immunization.

4. In order to reduce existing high rate of invalid doses and missed opportunities, emphasis should be given on screening of clients for both child and TT immunization. The service providers should be given refresher training to improve their technical skills on screening of clients for immunization
5. The pregnant mothers should be motivated (by the service providers and/or by the BCC activities through mass media) to receive the required number of TT doses necessary to protect their newborn babies.
6. Mothers should be explained (by the service providers) the benefits and importance of EPI cards/ TT cards for immunization of themselves and their children.
7. Mothers should be asked to preserve the EPI card safely until their children are 5 years old, and to bring the cards with them whenever they comes to the clinic/ EPI center for immunization of their children. They should also be asked to carefully preserve their TT cards, and to bring the cards with them whenever they come to clinic/ EPI center for TT immunization.
8. In the case of loss of EPI card/TT card, it should be provided over and over, and the history of the earlier vaccinations accurately recorded again and again, if necessary.
9. During IPC between the mothers and the service providers and/or at the first contact, the mothers should be clearly explained the importance of full immunization of children and women, and of the immunization schedule for full immunization for both children and women.
10. The program should strengthen BCC activities to inform the community of importance of immunization in general, and to motivate the mothers to get themselves and their children fully immunized. Very selective and focused mass media campaign may also be conducted to achieve this end.
11. Area specific innovative strategies suitable to local situation have to be undertaken during the next NIDs to reach to the left out children.
12. More attention should be given to high risk areas and traveling population during next NIDs.
13. Communication activities need to be strengthened through mass media, such as television, as well as through IPC by the health workers, to inform the communities of the next NID campaign.
14. Parents should be encouraged to attend the fixed NID sites/centers and discouraged to wait for home visits by the service providers during child-to-child search.
15. For distribution of Vitamin A Capsules during NID, special attention should be given to the exact age group to limit shortage (through better screening for age) and no Vitamin A capsule should be given to the parents to administer them to their children either at NID site or in their homes.

Introduction

To improve routine EPI and polio eradication activities, the Expanded Program on Immunization (EPI), Directorate General of Health Services (DGHS), Government of Bangladesh, decided to conduct district and city corporation wise coverage evaluation surveys (CES) in early 2002. UNICEF supported this initiative by contracting out 75 coverage evaluation surveys- one for each of the 64 districts, one for each of the 4 city corporations and 7 surveys for the Bangladesh Integrated Nutrition Project (BINP) upazilas, to two local consulting firms. To supplement these surveys, the Government and the partners requested IOCH to conduct additional 7 coverage evaluation surveys in urban areas as follows:

- i) one coverage evaluation survey for the slums of Dhaka City Corporation;
- ii) one coverage evaluation survey for homeless and street children of Dhaka City Corporation;
- iii) one coverage evaluation survey for the slums of Chittagong City Corporation;
- iv) one coverage evaluation survey for the slums of Khulna and Rajshahi City Corporations;
- v) one coverage evaluation survey for the major municipalities (IOCH supported 91 municipalities); and
- vi) two coverage evaluation surveys for the peri-urban areas (Tejgaon Circle) of Dhaka City Corporation.

Accordingly, IOCH conducted a coverage evaluation survey in the slums of Dhaka City Corporation in March 2002.

Objectives

The overall objective of the survey was to assess the level of immunization coverage in the slums of Dhaka City Corporation. The specific objectives were to:

- a) assess the level of routine immunization coverage of the children (12-23 months) and find out the reasons for non-immunization and partial immunization;
- b) assess the level of TT immunization coverage among mothers who had live births in the previous year, and find out the reasons for non-immunization and partial immunization;
- c) assess the coverage levels of OPV and Vitamin A administered during the 10th NID campaign;
- d) investigate antenatal and delivery practices, and decision making process for immunization; and
- e) understand importance of education on selected health care practices.

Methodology

The survey employed the WHO recommended 30-cluster survey method¹, 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 survey methodology and its limitations are presented in Annex- A). Briefly, the immunization information is collected on a randomly selected

group of 210 children/women from 30 clusters (seven children/women 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. Based upon prior experience with immunization coverage surveys, 30 clusters are generally thought to be necessary to yield sufficiently reliable estimate.

In this survey, seven children between 12-23 months born between March 23, 2000 and March 23, 2001 were selected from each cluster to ascertain their routine vaccination status. The 10th NID campaign was conducted on 27 January 2002 (first round) and 10 March, 2002 (second round) throughout the country, including the urban areas. Seven children born between 15 March 1997 and 26 January 2002 were selected from each cluster for collecting information on NIDs. Also, seven women who had live births between 23 March 2001 and 23 March 2002 were selected from each cluster to ascertain their tetanus toxoid vaccination status for routine immunization. In addition to the information on immunization and NIDs, information on several social, antenatal and delivery indicators was collected from the mothers interviewed.

Thirty clusters (mahallahs/blocks/sub-blocks) were chosen randomly from a list of the slum populations in Dhaka City Corporation. The list of the selected clusters is given in **Annex C** and their location is shown on the following map. The WHO recommended standard coverage evaluation questionnaires were used in this survey for documenting the routine immunization status of children and women. Separate questionnaires were used for collecting the data on the NID campaign, as well as social and health care indicators.

The data for the survey were collected by the experienced Field Investigators of the Survey Team and selected Polio Eradication Facilitators of the IOCH. All the surveyors were trained and were adequately supervised in the field during data collection to ensure quality and completeness of the data. The data were collected over a week, between March 27, 2002 and March 31, 2002. Data processing and analysis were done by the Monitoring and Evaluation Unit of the IOCH using COSAS 4.41¹ and EpiInfo. The final report was produced by the Monitoring and Evaluation Unit of the IOCH/MSH.

Limitations

Limitations of the 30-cluster survey method

Although the 30-cluster survey method is relatively simple, it has several limitations² that can be grouped into two types:

Linked to the sampling method:

- As an inherent bias in the sampling technique in 30 clusters, bigger mouzas are more likely to be selected as a cluster. The survey leaves out scattered small mouzas with poor access to services. It also does not reflect the lack of uniformity in service availability or the behavior of particular populations.

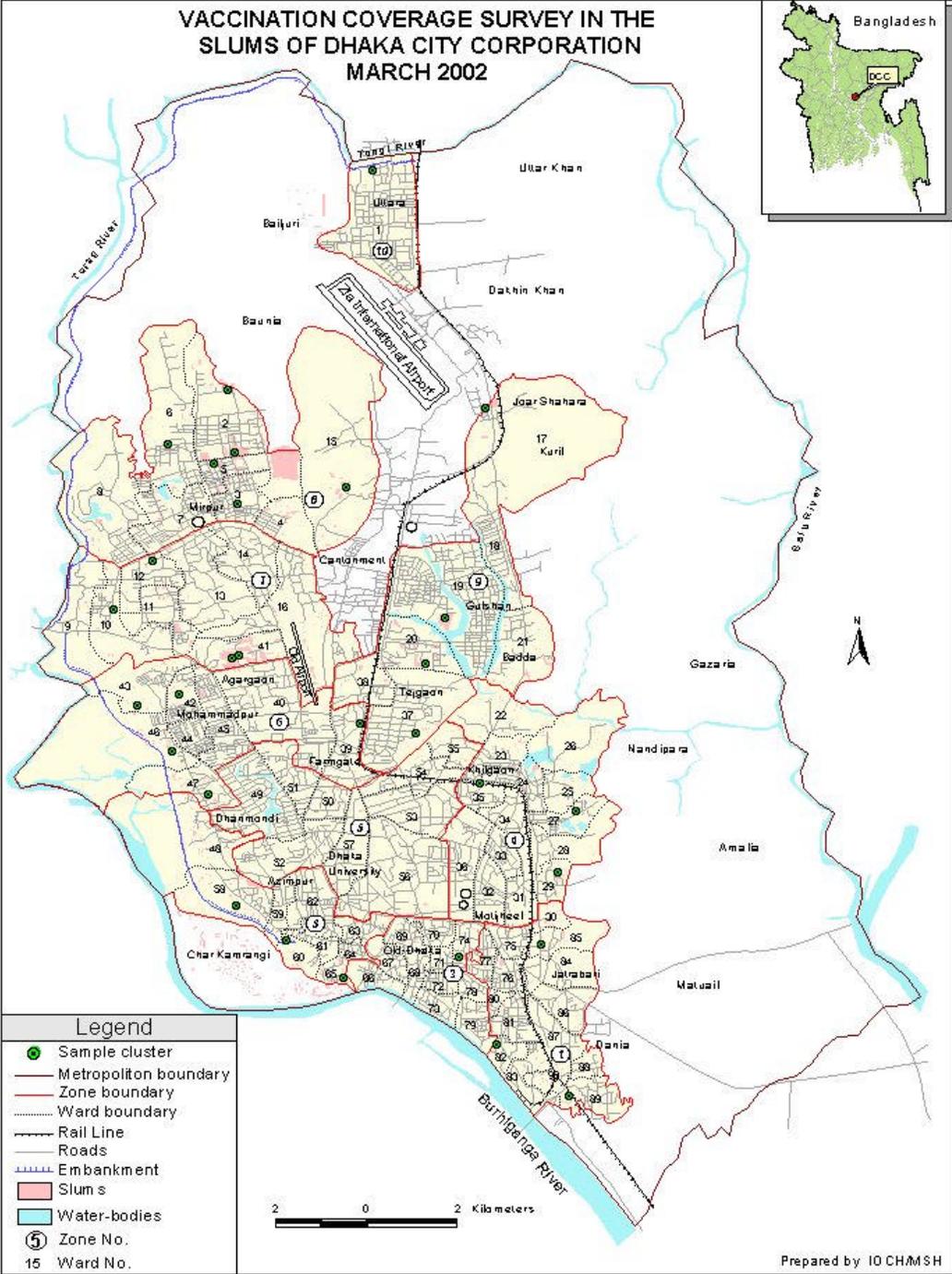
¹ COSAS (Coverage Survey Analysis System) is a dedicated software for analyzing coverage evaluation survey data

- There is a wide confidence interval (+/- 10%). It means that if the result shows 56% 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 $(56-10) = 46\%$ and $(56+10) = 66\%$. 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 to the end of the mouzas 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 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

Routine immunization coverage levels for children

Table 1 shows childhood immunization coverage achieved by the routine EPI in slums of Dhaka City Corporation (DCC) . The crude data shows coverage for BCG, OPV3, DPT3 and Measles at 94, 78, 78 and 70 percent respectively. The corresponding valid coverages for these antigens were 94, 61, 61 and 64 percent. Valid coverage by 12 months for BCG, OPV3, DPT3 and Measles were 93, 59, 59 and 57 percent respectively.

Table 1: Routine immunization coverage levels

Name of the Vaccine	Coverage (%) Immunization of 12-23 months age group		Coverage (%) Immunized by 12 months of age
	Crude data (Access)	Valid data	Valid data
BCG	94	94	93
OPV1	93	80	78
OPV2	84	70	69
OPV3	78	61	59
DPT1	93	80	78
DPT2	84	69	68
DPT3	78	61	59
Measles	70	64	57
Fully immunized	69	51	48
Zero dose	6	-	-

Crude coverage of full immunization of 12-23 months age group was 69 percent. The coverage for the same age group for valid data was 51 percent. When considered for 12 months, the coverage went further down to 48 percent. The relatively lower valid coverage of fully immunized children (compared to crude full immunization coverage) might be explained by high rates of invalid doses, missed opportunities and dropouts (which have been discussed in the following pages).

Table 1 shows considerable difference between crude data and valid data for 12-23 months age group (78% vs. 61% for OPV3 and DPT3, 70% vs. 64% for measles, and 69% vs. 51% for full immunization) reflecting a considerable number of invalid doses, indicating poor quality of services.

Immunization coverage levels by gender

Routine immunization coverage levels for different antigens by gender are shown in Table 2. It indicates that the boys had more access to immunization than the girls. (Boys access to immunization as measured by coverage of DPT1 was 6 percentage points higher than that of

the girls). However, the dropout rate for DPT1 to measles of the boys was higher than that of the girls (29% for boys vs. 20% for girls), leading to lower crude full immunization coverage for boys (68% crude FIC for boys vs. 71% crude FIC for girls) than that of the girls. Interestingly, 14% of measles doses for the girls were invalid due to early immunization (i.e. immunized before 38 weeks of age); while the corresponding figure for boys was 6% only. This relatively higher invalid measles doses for girls led to lower valid full immunization coverage for girls than the boys (46% valid FIC for girls vs. 54% valid FIC for boys).

Table 2: Routine immunization coverage levels by gender

Name of the vaccine	Coverage % Immunization of 12-23 months age group				Coverage % Immunized by 12 months	
	Crude data		Valid data		Valid data	
	Male (%)	Female (%)	Male (%)	Female (%)	Male (%)	Female (%)
BCG	97	91	97	91	95	91
OPV1	96	90	82	78	78	78
OPV2	87	81	72	67	70	67
OPV3	81	75	65	56	61	56
DPT1	96	90	82	76	78	78
DPT2	87	80	72	66	70	66
DPT3	81	75	65	56	61	56
Measles	68	72	64	62	57	58
Fully immunized	68	71	54	46	51	44
Zero dose	4	8	-	-	-	-

Invalid doses and missed opportunities

Table 3 shows that there were a number of invalid doses due to early immunization and/or inadequate interval between the doses. As high as 14% of the DPT1 doses were administered before 6 weeks, and 9% measles doses before 38 weeks of age of the children. In addition, 3% of both the DPT2 and DPT3 doses were invalid as they were given before the 4 weeks interval between the doses.

Table 3: Invalid doses of immunization provided to the children

Antigens	Percentage
DPT1	14
DPT2	3
DPT3	3
Measles	9

Table 4 shows missed opportunities for different antigens. Total missed opportunities (both corrected and uncorrected) for different antigens were quite high, ranging from 0 to 8 cases out of 210. Prevalence of uncorrected missed opportunities for different antigens was low,

ranging from 0 to 2%. The composite index for total missed opportunities was as high as 27, reflecting poor quality of screening during vaccination sessions.

Table 4: Missed opportunities by antigens

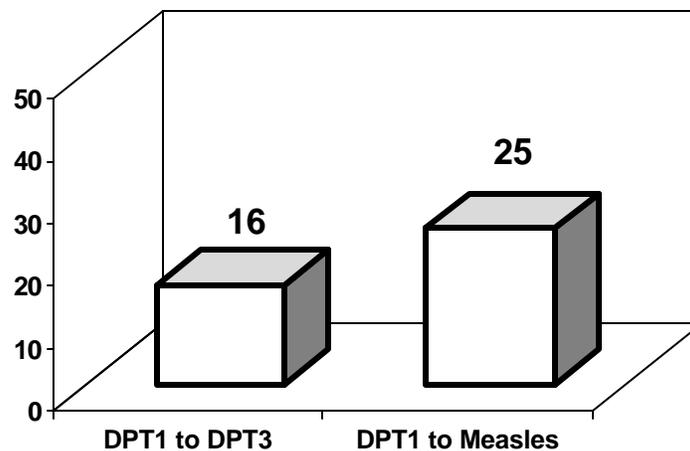
Name of the vaccine	Uncorrected		Corrected		Total
	Number	Percent	Number	Percent	
BCG	5	2	3	1	8
DPT1	5	2	1	1	6
DTP2	0	0	0	0	0
DPT3	0	0	0	0	0
OPV1	5	2	1	1	6
OPV2	0	0	0	0	0
OPV3	0	0	0	0	0
Measles	4	2	3	1	7
Index *					27

** The idea is to propose one composite index reflecting the quality of screening during vaccination sessions.*

Dropouts of child immunization

Figure 1 shows that the dropout rates for different antigens were high too. There was 16% dropout from DPT1 to DPT3 and 25% from DPT1 to measles. These high dropout rates reflect inadequate counseling of parents by the service providers on completion of immunization schedule.

Figure 1: Drop-out rates for child immunization



EPI Card retention

Table 5 shows that 92% of the children interviewed were ever given EPI cards; however, EPI cards were available in 44% of the cases at the time of interview. EPI card retention rate was 48% only, which means that 52% of the EPI cards were lost.

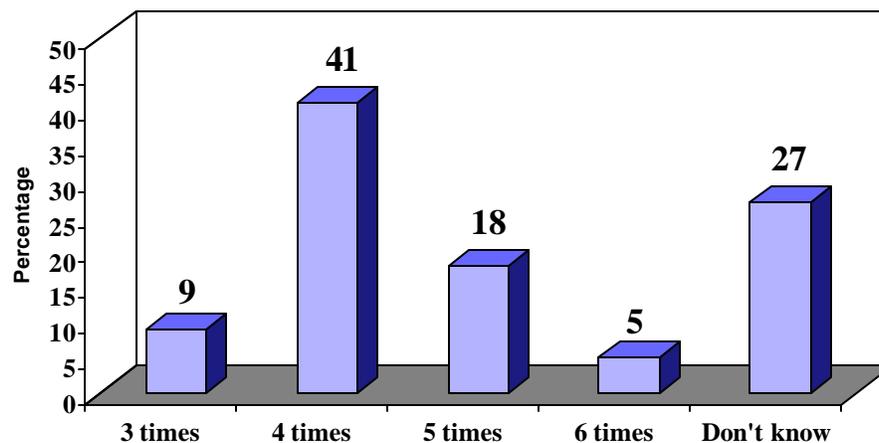
Table 5: EPI cards availability and retention

Card Status	Number	Percentage
EPI card available	92	44
EPI card ever given	193	92
EPI card retention	92	48

Knowledge about required visit to immunization center for full immunization

Figure 2 shows mothers' knowledge about required visits to immunization center for getting a child fully immunized. It shows that less than half of the mothers (41%) could mention correctly the number of times (i.e. 4 times) a child is required to visit immunization center to get fully immunized.

Figure 2: Knowledge about required visits to immunization centers for full immunization



Sources of immunization services

Child immunization services in the slums were mostly provided by the NGO clinics and outreach centers (61%), followed by GOB/CC outreach centers (30%). GBO hospitals and clinics provided immunization to 5% and 3% children respectively. Private clinic, however, provided immunization to 1% cases only (Figure 3).

Figure 3: Sources of child immunization services

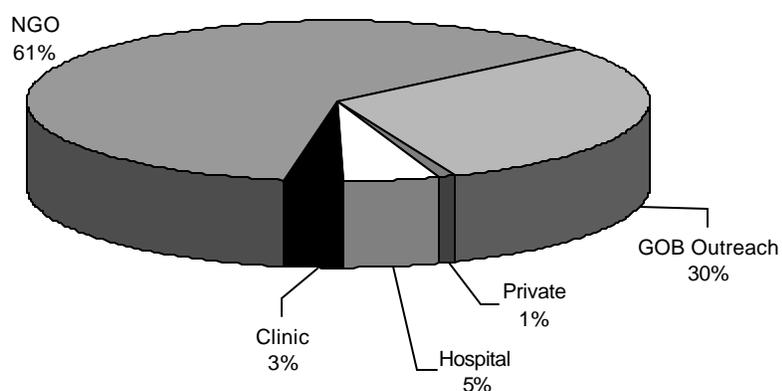


Table 6: Reasons for non-immunization and partial immunization of the children

Reasons for non-immunization or partial immunization	Non-immunized (%) (N=12)	Partially immunized (%) (N=52)
Did not know about need of immunization	18	-
Did not know when to return for 2 nd /3 rd dose.	-	12
Did not know about importance of measles vaccine	-	8
Did not know about place and time of immunization	-	6
Child was sick, and not taken to immunization center	8	11
Mother was sick	-	2
Child was sick, and was taken to immunization center but not given by vaccinator	8	13
Fear of adverse reaction	8	8
Mother was busy with other works	8	21
Future plan to vaccinate the child	-	2
No faith in immunization	50	-
Forgot about date of subsequent doses	-	4
Vaccinator was not available at the site	-	2
Vaccine was not available at the site	-	2
Long distance of EPI center	-	4
Painful for the children	-	2
Others	-	3

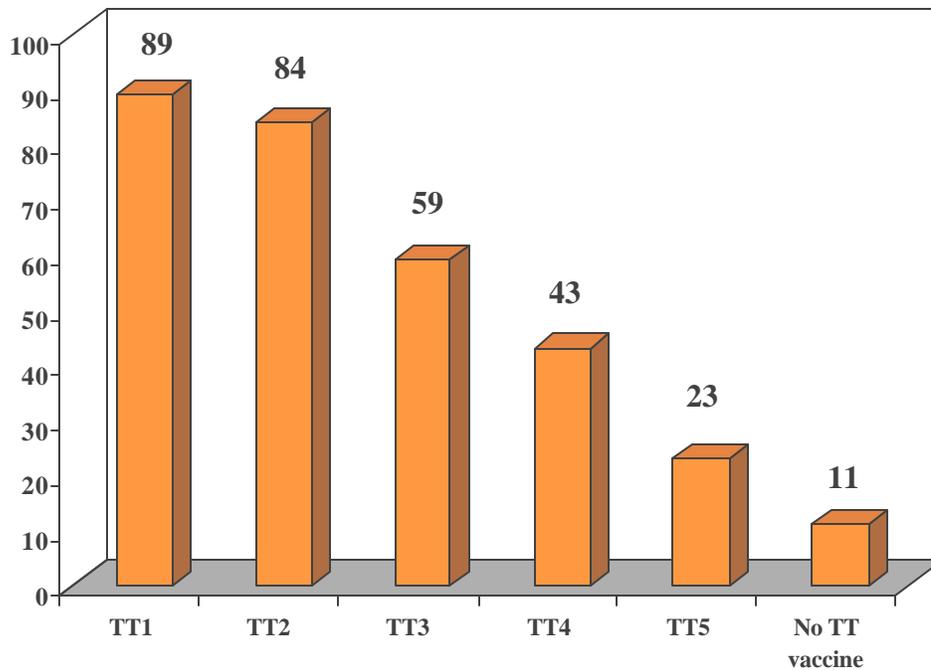
Reasons for non-immunization and partial immunization of the children

Table 6 presents reasons for non-immunization and partial immunization (dropouts) of children. The primary reasons for non-immunization of the children, as reported by the parents, included lack of faith in immunization (50%) and lack of awareness of need and importance of immunization (18%). The main reasons for partial immunization or dropouts were: sickness of the children (24%), mothers' preoccupation with other work (21%), did not know when to return for 2nd and 3rd dose of DPT/OPV or for measles (12%), and fear of adverse reaction (8%).

Routine TT immunization coverage levels for the mothers

Figure 4 shows routine TT immunization coverage levels for the mothers who had given live births during last one year. It shows a considerably high access to TT (89% for TT1), but very low full immunization coverage (23% for TT5). About 89% of the mothers interviewed received TT1, 84% and 59% of the mothers received TT2 and TT3 respectively. Only 23% of women received TT5, which provides lifelong protection against tetanus. About 11% of the women never received any TT vaccine.

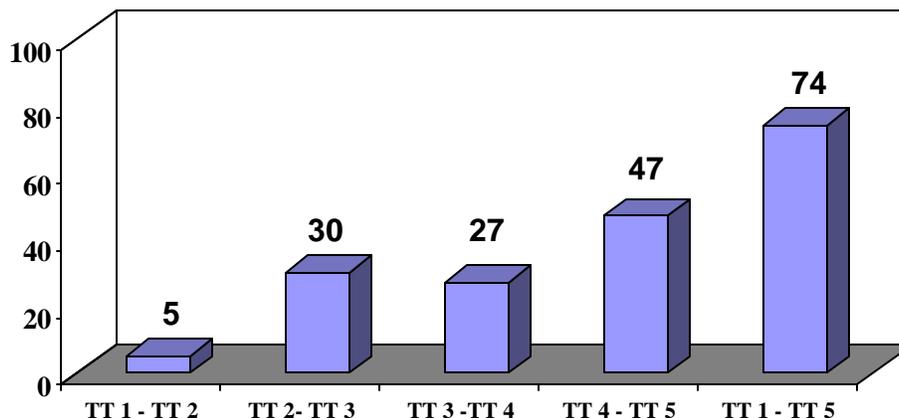
Figure 4: Routine TT immunization coverage levels for the mothers



TT immunization dropout rate

Figure 5 shows a very high TT immunization dropout rate. The dropout rate from TT1 to TT2 was 5 percent. The corresponding rates for TT2 to TT3, TT3 to TT4 and TT4 to TT5 were 30%, 27% and 47% respectively. The dropout rate for TT1 to TT5 was as high as 74%, indicating that 74% of the mothers who received first dose of TT did not complete 5 doses TT immunization schedule.

Figure 5: TT Immunization drop-out rates of the mothers



Invalid TT doses

Table 7 shows that a very high proportion of TT doses were invalid as they were administered before the minimum required interval between the doses. About one quarter of TT3 doses (25%) were given before 6 months interval between TT2 and TT3, and as such were invalid. About 61% of the TT4 doses were invalid, since they were given before one year interval between TT3 and TT4; similarly about half of TT5 doses were invalid for the same reason.

Table 7: Interval between TT1 and TT2, TT2 and TT3, TT3 and TT4, TT4 and TT5 dose

Interval between doses	<1 months		1 months+		<6 months		6 months +		<1 year		1 year +		Total	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%
TT1-TT2	1	0.6	163	99	-	-	-	-	-	-	-	-	164	100
TT2-TT3	-	-	-	-	28	25	85	75	-	-	-	-	113	100
TT3-TT4	-	-	-	-	-	-	-	-	49	61	31	39	80	100
TT4-TT5	-	-	-	-	-	-	-	-	20	48	22	52	42	100

Age distribution of mothers never receiving TT

About 89% of mothers had received first dose of TT indicating good access to TT immunization. However, 11% of mothers ever received any TT vaccine. Table 8 shows age distribution of the mothers who had never received any dose of TT. It shows that the older mothers were more likely not to receive any dose of TT than the younger ones. 57% of the mothers over 35 years of age did not receive any dose of TT vaccine; while the corresponding figures for other age-groups were much lower, ranging from 7% to 20%.

Table 8: Age distribution of mothers who never received any dose of TT

Age group	Received		Never received		Total	
	#	%	#	%	#	%
15-19	37	84	7	16	44	21
20-25	100	93	7	7	107	51
26-30	28	88	4	12	32	15
31-35	16	80	4	20	20	10
36-45	3	43	4	57	7	3
Total	184	88	26	12	210	100

Protection against tetanus at birth

Mothers interviewed were asked about the TT vaccination status during the last pregnancy. The new born was considered protected against neo-natal tetanus if the mother had received required number of valid doses of TT vaccine before the delivery of last child for protection against neo-natal tetanus. Of the mothers who had live births in the previous year, 82% of newborn were found protected against tetanus. It indicates that 18% of the newborn babies were not protected against tetanus at birth (Table 9).

Table 9: Children born protected against tetanus

Status of children born protected	Number	Percentage
Protected	173	82
Not Protected	37	18

Knowledge about full TT immunization

With regard to knowledge about full TT immunization, 67% mothers did not have any idea about the number of TT doses required for women for full immunization; while 16% had wrong idea about the number of TT doses required for full immunization. Only 17% mother could correctly mention that a woman is required to receive 5 doses of TT vaccine for full immunization for lifelong protection against tetanus (Table 10).

Table 10: Knowledge about number of TT doses required for full immunization

Number of TT doses	Number	Percentage
< 5 doses	29	14
5 doses	36	17
>5 doses	4	2
Don't know/ no idea	141	67

TT card retention

Table 11 shows that 79% of the mothers (who had live births in the last year) were ever given TT cards; however, TT cards were available in 36% of the cases at the time of interview. TT card retention rate was 46% only, which means that 54% of the TT cards were lost.

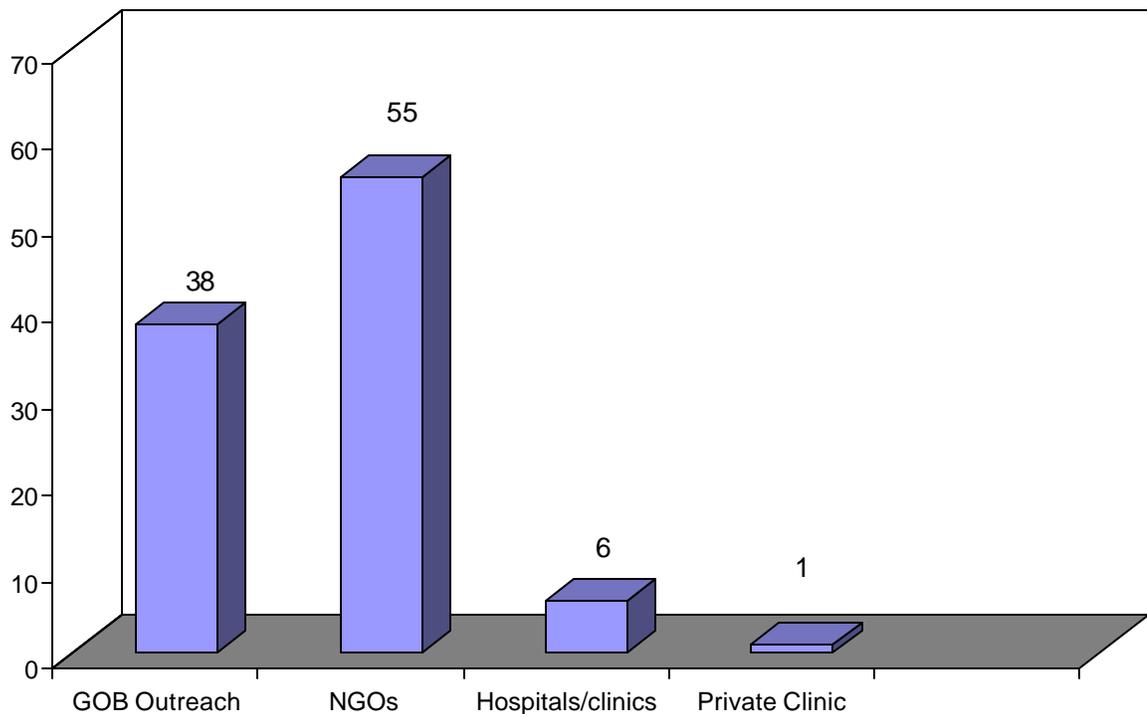
Table 11: TT card availability and retention

Card Status	Number	Percentage
TT card available	76	36
TT card ever given	165	79
TT card retention	76	46

Sources of TT immunization

Over half of the TT immunization in the slums of DCC was provided by the NGOs (55%), followed by GOB outreach centers (38%). GOB hospitals and clinics provided immunization to 6% of the cases only.

Figure 6: Providers of TT immunization



Coverage levels of the 10th National Immunization Campaign-2002

During the 10th NIDs, 90% of the children < 5 years received OPV in both the rounds. The coverage of OPV in the 1st round was 95%; while it was 93% in the 2nd round. Vitamin A capsules were given to 89% of the eligible children (12 – 59 months old) during the 10th NIDs (Table 12). Besides, Vitamin A capsules were also administered wrongly to 10 ineligible children (out of 210) who were <1 year of age.

Table 12: Coverage levels of the 10th NID Campaign

Round	OPV (%)	Vit "A" (%)
1 st round	95	89
2 nd round	93	-
Both rounds	90	-
Any round	99	-

Sources of OPV during the NIDs

Table 13 shows that most of the children received OPV from NID sites during both the rounds of the 10th NIDs. Coverage of mobile team on the day of NID improved in the 2nd round from 1% in the 1st round to 3% in the 2nd round. Similarly, more children received OPV during child-to-child search of the 2nd round compared to that of the 1st round (6% in 1st round vs. 10% in 2nd round).

Table 13: Sources of OPV during the 10th NIDs

Sources of OPV	1 st Round		2 nd Round	
	#	%	#	%
NID Site	187	93	171	87
Mobile Team	1	1	5	3
Child-to-child search	12	6	20	10
Total	200	100	196	100

Reasons for not receiving vaccines from the NID sites of the 10th NIDs

The most important reasons for not receiving OPV from the NID sites of the 10th NIDs were: lack of information about NID campaign (8% for 1st Round and 15% for 2nd Round) and the parents were too busy to take their children to NID sites (27% for 1st Round and 26% for 2nd Round). Besides, a significant proportion of the children (13% in 1st Round and 25% in 2nd Round) who were not taken to the NID sites for OPV waited at their homes to receive OPV during child-to-child search of the health workers (Table 14).

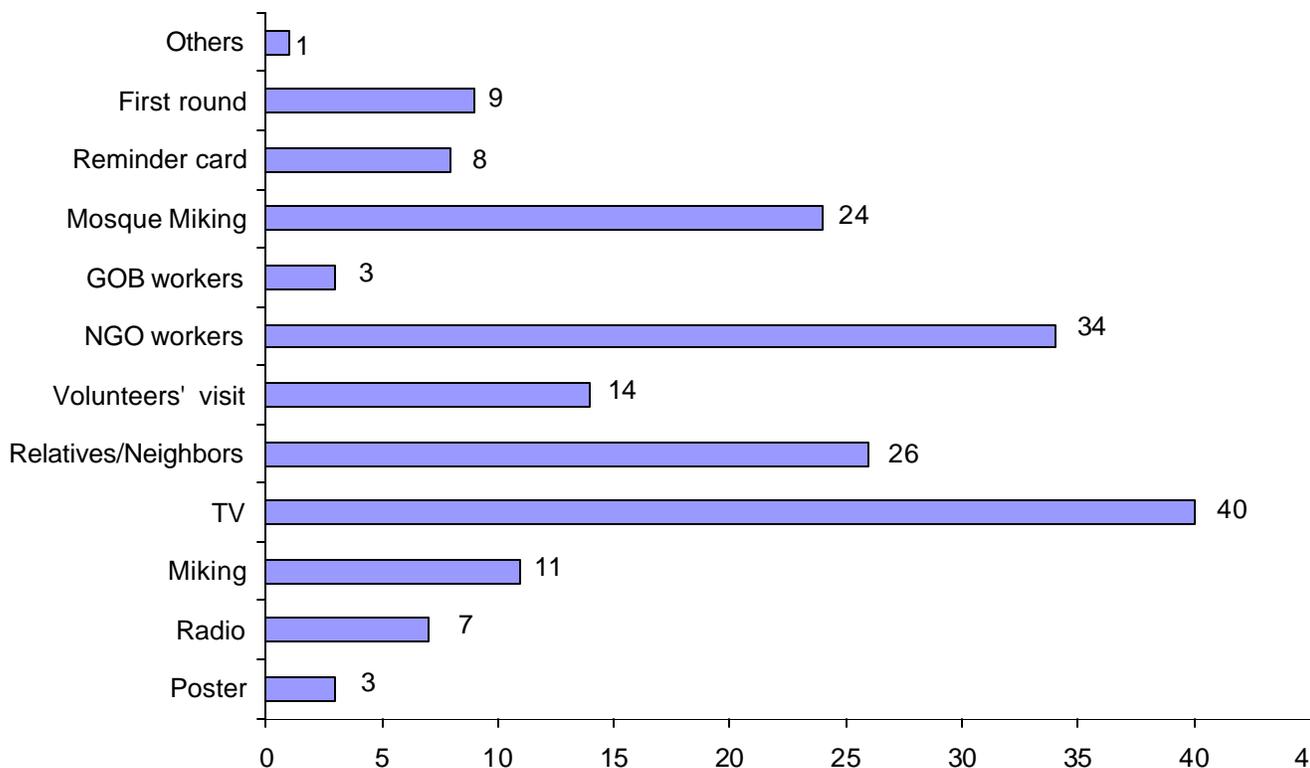
Sources of information of the 10th NID campaign

In the slums of the Dhaka City Corporation, television was major source of information about the 10th NID Campaign (40%), followed by NGO workers (34%). The other sources of information included relatives/neighbors (26%), mosque miking (24%), mobile miking (11%), and IPC by the volunteers during home visits (14%).

Table 14: Reasons for non-immunization of OPV during the 10th NIDs

Reasons	1 st Round (%) (N=23)	2 nd Round (%) (N=39)
Did not know about NID	8	15
Parents were too busy	27	26
Traveling on NID day	9	13
Doesn't believe in vaccine	5	3
Child already vaccinated	4	-
Child sick, not taken	4	-
Child sick, not given	-	3
Long queue	4	-
Waited for child-to-child search	13	25
Vaccine was not available	-	3
Child was away from home	17	3
Place of NID site was too far	-	3
Others	9	6

Figure 7: Sources of information about the 10th NID campaign



Mothers' profile, antenatal and delivery practices

Mothers' age and education

83% of the mothers were <30 years of age, and 50% were in the age-group of 20 – 24 years. Over half of the mothers (55%) were uneducated; only 2% of the mothers had education of SSC level or higher (Table 15).

Table 15: Mothers' characteristics, antenatal and delivery practices

Variable	Percent	Variable	Percent
Mother's Age:		Instruments used for cutting umbilical cord:	
<20 years	12	New blade	28
20-24 years	50	Sterilized blade	64
25- 29years	21	Old blade	1
30-34 years	12	Others	7
35 years+	5	Total	100
Total	100		
Mother's Education:		Medicine/powder applied at the cut of umbilical cord:	
No education	55	Antibiotic powder	12
I-V	33	Talcum powder	1
VI-X	10	Ointment/cream	23
S.S.C+	2	Soil/Soil with oil	5
Total	100	Ash	1
		Oil	14
At least one antenatal check up received during the last pregnancy:		Tablet	1
Received	57	Others	4
Not received	43	Nothing used	39
Total	100	Total	100
Delivery attended by:		Decision to immunize the child was taken by:	
MBBS Doctor	10	Father-Mother jointly	54
Mid wife/Nurse	3	Mother	25
Trained TBA	16	Father	5
Untrained TBA	38	Grand parents	10
Relative/Friends/Neighbor	33	Others	6
Total	100	Total	100

Antenatal Checkup

Only 57% of the mother received at least one antenatal check-up during their last pregnancies. Mother's education seems to have positive association with antenatal checkup. All the women with SSC or more education received at least one antenatal checkup; while nearly half of the uneducated women (46%) did not receive a single antenatal checkup during their last pregnancies (Table 15 & 16).

Table 16: Mothers never receiving antenatal checkup by education
N=210

Mother's education	Never received ANC checkup	
	#	%
No education	53	46
I-V	31	44
VI-X	6	27
S.S.C	0	0
H.S.C +	0	0
Total	90	43

Delivery practices

Most of the deliveries (71%) were attended by untrained traditional birth attendants (UTBA) or neighbors and relatives. Only 13% of the deliveries were attended by graduate doctors or midwives/nurses; while another 16% of the deliveries were attended by trained traditional birth attendants (TTBA). Women with some education were more likely to have their delivery attended by qualified doctors or midwives and nurses. Among the uneducated women, only 10% deliveries were attended by qualified doctors and/or midwives and nurses; while the corresponding figure was 28% for the women with education of class VI - X and 66% for the women with education of HSC+ (Table 16 & 17).

Table 17: Type of persons who attended deliveries by mothers' Education

Mothers' Education	MBBS Doctor		Mid wife /Nurse		TBA		UTBA		Relatives/Friends /Neighbors		Total	
	#	%	#	%	#	%	#	%	#	%	#	%
No education	9	8	2	2	22	19	45	39	37	32	115	100
I-V	5	7	3	4	7	10	28	40	27	39	70	100
VI-X	5	23	1	5	6	27	6	27	4	18	22	100
S.S.C.+	1	33	1	33	0	0	1	34	0	0	3	100
Total	20	10	7	3	35	16	80	38	68	33	210	100

In most of the cases, new blades or sterilized blades were used in cutting the umbilical cords of the newborn babies. Non-sterilized old blades or other instruments were used (for cutting umbilical cords) for 8% cases only (Table 15). The qualified doctors, midwives/nurses and trained TBAs were found more likely to use sterilized blade (for cutting umbilical cords) than the untrained TBAs and neighbors and relatives (Table18). Similarly all the women with education of SSC or above had their children's umbilical cords cut by sterilized blades; while the corresponding figure for uneducated women was 60% (Table 19)

Table 18: Instruments used for cutting the umbilical cords of newborn babies by type of persons who attended delivery

Type	MBBS Doctor		Mid wife/ Nurse		TBA		UTBA		Relatives/Friends /Neighbors		Total	
	#	%	#	%	#	%	#	%	#	%	#	%
New blade	0	0	1	14	7	20	23	29	25	37	56	28
Old blade	0	0	0	0	0	0	0	0	1	1	1	1
Sterilized blade	13	93	5	72	28	80	51	65	33	50	130	64
Others	1	7	1	14	0	0	5	6	8	12	15	7
Total	14	100	7	100	35	100	79	100	67	100	202	100

Table 19: Instruments used for cutting the umbilical cord of newborn babies by mothers' education

Type	No education		I-V		VI-X		S.S.C+		Total	
	#	%	#	%	#	%	#	%	#	%
New blade	32	28	22	33	2	11	0	0	56	28
Sterilized blade	69	60	42	63	17	89	2	100	130	64
Old blade	1	1	0	0	0	0	0	0	1	0.5
Others	12	11	3	4	0	0	0	0	15	7
Total	114	100	67	100	19	100	2	100	202	100

The majority of the mothers (39%) did not apply anything at the cut of umbilical cord of their newborn babies. However, 23% of the mothers applied antibiotic ointment/cream at the cut of the newborn babies and another 12% applied antibiotic powder. Unhygienic practices, i.e. using soil/soil with oil, ash or oil at the cut of the umbilical cord were reported by about 20% mothers (Table 15). Table 20 suggests that certain level of education, such as SSC or more leads to hygienic practices regarding treatment of the cut of the umbilical cord of newborn babies.

Table 20: Medicine/powder applied at the cut of umbilical cord of newborn babies by mothers' education

Type	No education		I-V		VI-X		S.S.C+		Total	
	#	%	#	%	#	%	#	%	#	%
Antibiotic powder	10	9	13	19	2	9	0	0	25	12
Talcum powder	0	0	2	3	0	0	0	0	2	1
Ointment/cream	27	23	13	19	8	36	1	33	49	23
Soil/Soil with oil	6	5	3	4	1	5	0	0	10	5
Ash	2	2	0	0	1	5	0	0	3	1
Oil	16	14	12	17	1	5	0	0	29	14
Tablet	2	2	0	0	0	0	0	0	2	1
Others	4	3	2	3	2	9	0	0	8	4
Nothing used	48	42	25	35	7	31	2	67	82	39
Total	115	100	70	55	22	100	3	100	210	100

Table 21 shows that the deliveries were attended by qualified doctors or midwives/nurses were apparently more likely to use antibiotic ointment/cream at the cut of umbilical cord than those delivered by TBAs , neighbors and relatives. However, these data should be interpreted cautiously, since many other confounding variables, such as economic condition, husband's education, family's health care practices, etc. may effect this particular health care practice. (Because of absence of data, we could not control these variables for this analysis)

Table 21: Medicine/powder applied at the cut of umbilical cord of new- born babies by type of person who attended deliveries

Type	MBBS Doctor		Mid wife/ Nurse		TBA		UTBA		Relatives/Friends /Neighbors		Total	
	#	%	#	%	#	%	#	%	#	%	#	%
Antibiotic powder	1	5	0	0	3	9	13	16	8	12	25	12
Talcum powder	0	0	0	0	0	0	0	0	2	3	2	1
Ointment /cream	9	45	5	71	6	17	17	21	12	16	49	23
Soil/Soil with oil	0	0	0	0	1	3	2	3	7	12	10	5
Ash	0	0	0	0	0	0	1	1	2	3	3	1
Oil	2	10	0	0	4	11	14	18	9	13	29	14
Tablet	0	0	0	0	1	3	1	1	0	0	2	1
Others	0	0	0	0	3	9	3	4	2	3	8	4
Nothing used	8	40	2	29	17	48	29	36	26	38	82	39
Total	20	100	7	100	35	100	80	100	68	100	210	100

Decision making process for child immunization

Decision regarding immunization of children was taken jointly by mother and father in majority of the cases (54%); while for one-fourth of the cases, the mother alone took decision for immunization of their children. Father was reported to be a sole decision maker in 5% cases only. However, grand parents played an important role in this matter accounting for 10% of the cases (Table 15). The Table 22 suggests that a certain level of education, i.e. SSC or above increases mother's role in decision making process for child immunization. Two-third of the mothers with SSC or higher education themselves took decision regarding immunization of their children compared to 25% of the uneducated women .

Table 22: Decision making for immunization of children by mothers' education

Mother's education	Father and mother jointly		Mother		Father		Grand parents		Others		Total	
	#	%	#	%	#	%	#	%	#	%	#	%
No education	61	59	27	25	3	3	5	5	8	8	104	100
I-V	37	54	13	19	6	9	9	13	4	5	69	100
VI-X	8	36	7	32	0	0	5	23	2	9	22	100
S.S.C+	1	33	2	67	0	0	0	0	0	0	3	100
Total	107	54	49	25	9	5	19	10	14	6	198	100

Knowledge about required visit to EPI center for full immunization

Over half of the mothers (59%) did not know how many times their children were required to be taken to EPI center to get fully immunized. Only 41% of the mothers could correctly mention that a child is required to be taken to the EPI center 4 times for full immunization. The Table 23 shows that the women with some education are more likely to know how many times a child is required to be taken to EPI center to get fully immunized than the uneducated women.

Table 23: Knowledge about required visits to immunization center for full immunization of children by mothers' education

Mother's education	3 times		4 times (Correct answer)		5 times		6 times		Don't know		Total	
	#	%	#	%	#	%	#	%	#	%	#	%
No education	11	10	42	37	19	17	7	6	36	31	115	100
I-V	6	9	31	44	16	23	1	1	16	23	70	100
VI-X	2	9	13	59	2	9	3	14	2	9	22	100
S.S.C+	0	0	1	33	0	0	0	0	2	67	3	100
Total	19	9	87	41	37	18	11	5	56	27	210	100

Vaccination Status of the children and their mothers' education

Over two-third of the children (69%) were fully immunized (as per crude data). Table 24 shows that the mothers with some education are more likely to get their children fully immunized than the uneducated mothers. The crude coverage of child immunization (crude FIC) of uneducated mothers was lower than the average crude FIC (69%); while the corresponding figure for the mothers with some education was higher than the average crude FIC.

Table 24: Vaccination status of the children by mothers' education

Mother's education	Total children	All doses received (crude FIC)	
	#	#	%
No education	115	72	63
I-V	70	53	76
VI-X	22	18	82
S.S.C+	3	2	67
Total	210	145	69

Discussions

Access to child immunization in the slums of DCC was good (93% for DPT1); but this high access dropped to 69% for fully immunized children mainly because of high dropout rates of different antigens. (Dropout rate for DPT1 to DPT3 was 16% and DPT1 to measles was 25%). This crude coverage drastically reduced to 51% when validity of doses was taken into account. It further reduced to 48% when valid coverage by 12 months was estimated. This large difference between crude coverage and valid coverage could be well explained by high invalid doses. A large number of invalid doses were provided before the minimum required age or before required interval between the doses. 14% of the DPT1 doses and 9% of measles doses were provided before the required minimum age. Missed opportunities for different antigens were also considerably high. (Missed opportunity for BCG and measles were 8% and 7% respectively with a composite total index of 27) These high rates of dropouts, invalid doses and missed opportunities reflect on the quality of services negatively.

Male children had more access to immunization than the female children. Boy's access to immunization as measured by coverage of DPT1 was 6 percentage points higher than that of the girls. However, the dropout rate for DPT1 to Measles of the boys was higher than that of the girls (29% for boys vs. 20% for girls), leading to lower crude full immunization coverage for boys (68% crude FIC for boys vs. 71% crude FIC for girls) than that of the girls.

Although 92% of the children were ever given EPI cards, the retention rate of EPI cards (child immunization cards) was only 48%. Similarly, TT card retention rate was as low as 46% only. Such a low retention rate of EPI cards/TT cards negatively affect the quality of EPI services provided by the health workers. Level of knowledge of the mothers with regard to full immunization was poor. Over half of the mothers could not mention how many times their children were required to be taken to EPI center to get fully immunized; while 83% mothers did not know how many times a woman is required to receive TT vaccine for lifelong protection against tetanus.

Lack of faith in immunization and lack of awareness of need and importance of immunization were the main reasons for non-immunization (6% of the total children), which indicate that the wrong perception about immunization still persists in the community. While lack of knowledge as to when to return for subsequent doses, fear of adverse reaction, sickness of the child and mothers preoccupation with other work resulted in high drop out rate and consequently contributed to low full immunization coverage rate. Proper counseling at every contact for subsequent dose, reminding the EPI schedule and time to return for subsequent dose by the service providers can decrease dropout rate and improve compliance for full immunization by the end of one year age of the child.

Access to TT immunization for the mothers who had live births in the previous year was high (89% of the mothers interviewed received TT1); but TT dropout rate was also high, resulting in very low coverage of TT5, which provides lifelong protection against tetanus. The dropout rate TT1 to TT5 was as high as 74%, indicating that 74% of the mothers who received first dose of TT did not complete 5 doses TT immunization schedule.

A considerable proportion of TT doses were invalid as they were administered before the minimum required interval between the doses. About one quarter of TT3 doses (25%) were given before 6 months interval between TT2 and TT3, and as such were invalid. About 61% of the TT4 doses were invalid, since they were given before one year interval between TT3 and TT4; similarly about half of TT5 doses were invalid for the same reason.

Of the mothers who had live births in the previous year, 82% of newborn babies were found protected against tetanus, indicating that a large proportion of the newborn babies were not protected against tetanus at birth.

During the 10th NIDs, 90% of the children < 5 years received OPV in both the rounds. The coverage of OPV in the 1st round was 95%; while it was 93% in the 2nd round. Vitamin A capsules were given to 89% of the eligible children aged 12 – 59 months. Besides, Vitamin A capsules were also administered wrongly to 10 ineligible children (out of 210) who were <1 year of age.

Most of the children received OPV from NID sites during both the rounds of the 10th NIDs. Coverage of mobile team on the day of NID improved in the 2nd round from 1% in the 1st round to 3% in the 2nd round. Similarly, more children received OPV during child-to-child search of the 2nd round compared to that of the 1st round (6% in 1st round vs. 10% in 2nd round).

The most important reasons for not receiving OPV from the NID sites of the 10th NIDs were: lack of information about NID campaign (8% for 1st round and 15% for 2nd round) and the parents were too busy to take their children to NID sites (27% for 1st round and 26% for 2nd round). Besides, a significant proportion of the children (13% in 1st round and 25% in 2nd round) who were not taken to the NID sites for OPV waited at their homes to receive OPV during child-to-child search of the health workers.

Television was reported as major source of information about the 10th NID campaign (40%), followed by NGO workers (34%). This finding suggests that television can play important role in communicating the messages of NIDs for the slum population of DCC.

Only 57% of the mothers received at least one antenatal check-up during their last pregnancies. Mother's education seems to have positive association with antenatal checkup. All the women with SSC or more education received at least one antenatal checkup; while nearly half of the uneducated women (46%) did not receive a single antenatal checkup during their last pregnancies

Most of the deliveries (71%) were attended by untrained traditional birth attendants (UTBA) or neighbors and relatives. Only 13% of the deliveries were attended by graduate doctors or midwives/nurses; while another 16% of the deliveries were attended by trained traditional birth attendants (TTBA). Uneducated women were less likely to have their delivery attended by qualified doctors or midwives and nurses.

In 92% of the cases, new blades or sterilized blades were used in cutting the umbilical cords of the newborn babies. The qualified doctors, midwives/nurses and trained TBAs were found more likely to use sterilized blade (for cutting umbilical cords) than the untrained TBAs and neighbors and relatives. Similarly all the mothers with education of SSC or higher had their children's umbilical cords cut by sterilized blades; while the corresponding figure for uneducated mothers was 60%.

About 39% of the mothers did not use anything at the cut of umbilical cord of their newborn babies. However, 23% of the mothers used antibiotic ointment/cream at the cut of the newborn babies and another 12% used antibiotic powder. Unhygienic practices, i.e. using soil/soil with oil, ash or oil at the cut of the umbilical cord were reported by about 20% mothers. It was found that certain level of education, i.e. SSC or more led to hygienic practices regarding treatment of the cut of the umbilical cord of newborn babies.

Deliveries attended by qualified doctors or midwives/nurses were apparently more likely to use antibiotic ointment/cream at the cut of umbilical cord than those delivered by TBAs , neighbors and relatives. However, these data should be interpreted cautiously, since many other confounding variables, such as economic condition, husband's education, families health care practices, etc. may effect this particular health care practice. (Because of absence of data, we could not control these variables for this analysis)

Decision regarding immunization of children was taken jointly by mother and father in majority of the cases (54%); while for one-fourth of the cases, the mother alone took decision for immunization of their children. However, grand parents played an important role in this matter accounting for 10% of the cases. It seemed that a certain level of education, i.e. SSC or higher increased mother's role in decision making process for child immunization.

Mother's education was found to be associated with immunization status of their children. Uneducated mothers were less likely to get their children fully immunized than the educated ones. The crude coverage of child immunization (crude FIC) of uneducated mothers was lower than the average crude FIC (69%); while the corresponding figure for the educated mothers was higher than the average crude FIC.

Conclusions and Recommendations

Access to child immunization in the slums of DCC was good (93% for DPT1); but this high access dropped to 69% for fully immunized children because of high dropout rates of different antigens. (Dropout rate for DPT1 to DPT3 was 16% and DPT1 to measles was 25%). Such high dropout rates imply inability of the EPI program to follow-up and protect the cohort of children initially reached out.

Similarly access to TT immunization for the mothers who had live births in the past year was high, since 82% of the newborn children were protected at birth. 89% of the mothers interviewed received the first dose of TT; but TT dropout rate was very high (74% for TT1 to TT5), resulting in very low coverage of TT5 (23%), which provides lifelong protection against tetanus.

- ***Programmatic strategies must be undertaken to reduce the existing high dropout rates in both child immunization and TT immunization. The program should focus on quality of counseling of mothers/women (on immunization) by the health workers. The health workers at the first contact must counsel the mother/women properly to motivate her to return and to get herself and/or her child fully immunized. He/she must:***
 - *explain to mother the importance of full immunization, and concept of 8 doses and 4 visits required for full immunization of a child;*
 - *tell women of reproductive age the benefit and importance of full TT immunization and the concept of 5 dose TT schedule for lifelong protection against tetanus;*
 - *issue an EPI card/TT card dully filled out and explain the mother/women the importance of keeping the EPI card/TT card in safe and bringing it on the next due date;*
 - *tell the mother/women clearly when she should come back for next doses, and inform her that the date is written in the EPI card/ TT card so that she can check it if forgets the date;*
 - *inform mothers/women of possible side effects of injection and how it should be handled;*
 - *pay attention to the hospitality at the clinic/EPI center, and to supportive environment.*
- ***Program managers and field supervisors should ensure that EPI sessions are held as per plan, and at a regular and adequate interval***
- ***The service providers should be given refresher training to improve their technical skills on counseling of mothers/women on immunization***

There were also too many invalid doses in child immunization (14% for DPT1 and 9% for measles), which further reduced the crude full immunization coverage of 69% to 51% when validity of doses was taken into account. Missed opportunities for different antigens were also high (8% for BCG and 7% for measles). These high rates of invalid doses and missed opportunities reflect service providers' inability to screen the clients properly.

Like child immunization, a very high proportion of TT doses were invalid (25% for TT3, 61% for TT4 and 52% for TT5). A sizable proportion of newborn babies (18%) were found unprotected against tetanus at birth.

- ***Emphasis should be given on screening of clients for immunization to avoid or reduce invalid doses and missed opportunities. The service providers must:***
 - *screen properly each and every child/ woman to decide his/her eligibility for a specific dose of specific antigen;*
 - *check EPI card/ EPI register/ TT card or any other record to decide on the eligibility of a particular dose of specific antigen(s);*
 - *if a child/woman is found not eligible for a dose today, ask him/her to return at a specified date; and explain the reason to her/ mother clearly and patiently.*
 - *check if there is any missed opportunity for other antigen.*
- ***The service providers should be given refresher training to improve their technical skills on screening of clients for immunization.***
- ***The pregnant mothers should be motivated to receive the required number of TT doses necessary to protect their newborn babies.***

EPI card (child immunization card) and TT card play an important role in ensuring good quality of immunization services. It helps the mothers to adhere to immunization schedule, as well as assists the service providers to screen the children for specific doses of specific antigens. Unfortunately, the retention rates of both the EPI card and TT card were very low, 48% and 46% respectively.

- ***Mothers should be explained the benefits and importance of EPI cards/ TT cards for immunization of themselves and their children.***
- ***Mothers should be asked to preserve the EPI card safely until the child is 5 years old, and to bring the card with them whenever they come to the clinic/ EPI center for immunization.***
- ***Mothers should also be asked to carefully preserve their TT cards, and to bring their TT cards with them whenever they come to clinic/ EPI center for TT immunization.***
- ***In the case of loss of EPI card/TT card, it should be provided over and over, and the history of the earlier vaccinations accurately recorded again and again, if necessary.***

Mothers have a poor understanding of full immunization. Over half of the mothers could not mention how many times their children were required to be taken to EPI center to get fully immunized. Similarly, 83% mothers (who had live births in the past year) did not know how many TT doses were required for a woman for lifelong protection against tetanus.

- ***During IPC between the mothers and the service providers and/or at the first contact, the mothers should be clearly explained the importance of full immunization of children and women, and of the immunization schedule of full immunization for both children and women.***

Lack of faith in immunization and lack of awareness of need and importance of immunization were the main reasons for non-immunization (6% of total); while lack of knowledge as to when to return for subsequent doses, fear of adverse reaction and sickness of the child were reported as prime causes for dropouts.

- ***The program should strengthen BCC activities to inform the community of importance of immunization in general, and to motivate the mothers to get their children fully immunized in particular. Very selective and focused mass media campaign may also be conducted to achieve this end.***

10% of the children < 5 years did not receive OPV in both the rounds of the 10th NID campaign. The coverage of OPV in the 2nd round (93%) was 2 percentage points lower than that of the 1st round. In spite of intensive communication activities during NIDs, lack of information of NID campaign as a reason for not receiving OPV from NID site was reported by 8% parents in 1st round and 15% in 2nd round.

- ***Area specific innovative strategies suitable to local situation have to be undertaken during the next NIDs to reach to the left out children.***
- ***More attention should be given to high risk areas and traveling population***
- ***Communication activities need to be strengthened through mass media, such as television, as well as through IPC by the health workers during next NIDs.***
- ***Parents should be encouraged to attend the fixed NID sites/center and discouraged to wait for home visits (by the health workers) during child-to-child search.***

Vitamin A coverage among the children 12 – 59 months was found to be 89%. This level is higher than the study of the slums in Zone 8 of DCC for the same period (80%)⁶. The other figure for DCC has been estimated at 79% by Mitra and Associates⁷. Besides, Vitamin A capsules were also administered wrongly to 10 ineligible children (out of 210) who were <1 year of age.

- ***Special attention should be given to:***
 - ***the exact age group to limit shortage (better screening for age); and***
 - ***no Vitamin A capsules should be given to the parents to administer them to their children either at NID site or in their homes.***

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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 Programme 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 (*p_{pes}*). 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 neighboring 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

List of Selected Clusters for the Survey

Zone	Ward	Name of the Slum	Address of the slum	Total Population	Clu. No
1	82	Nasir Doktorer Bari	Road Sutrapur(west of lohar mosque's gali)	98	1
	85	Shamsu Haquer Basha	Brahmonchiron (Near grave yeard)	60	2
	90	Rezia Begum-er Basha	New Jurain (Alam bag Kabir road)	60	3
2	74	94/3, Nababpur Basti	Nababpur, Dhaka	155	4
3	58	Vagolpur Zelepara Slum	Vagolpur, Hazir bag, Dhaka	2145	5
	60	Shadhurbari Basti	Shahidnagar 1 no. gali (Beribadh Side)	1200	6
	65	Rashed-er Bari	Rahmatgonj Field (South side)	200	7
4	27	Aziaur Rahmaner Bari	89/A, West Madartek	510	8
	29	Jannatbag Basti	79, North Mugda	1326	9
	35	Abul Hashem-er Basti	17/7, Shantibag	714	10
6	39	Railway Colony Basti	Railway Colony Basti, Tejgaon	7440	11
	42	Ring Road Basbari Pukur par basteer	Block-c, Mohammodpur	3450	12
	43	Nobodoy Beribadh Basti	Nobodoy Housing Estate Mohammodpur	5718	13
	46	Katasur Slum	Katasur, Mohammodpur	4500	14
	47	Muchipara Slum	Muchipara, Rayerbazar	3624	15
7	10	Gaidar Basti	Gaidertek, Gabtoli, Mirpur-1	1650	16
	12	Matabborer Potti Basti	South Barishil, Majar Road, Mirpur-1	1320	17
	41	Shardertek Basti	West Agargaon, BNP Basti	2200	18
8		Karam Ali Basti	West Agargaon, BNP Bazar	3850	19
	2	Pa Block Basti	North kalshi, Sec-12, Mirpur	421	20
		4 no. Balurmath Basti	Block-E, Section-12 Mirpur	5329	21
	3	Muslim Camp	Section-10, Block-A, Mirpur	1471	22
	5	Madrasha Camp	Block-C, Section-11, Mirpur	2050	23
9	6	West side Basti of Purabi Hall	Adjacent to Purabi Cinema Hall	1300	24
	15	Vashantek 3 no. Basti	Vashantek, Kafrul, Dhaka	4500	25
	17	Nikunja Beridadh Basti	Road-21, North-West Tanpara	5500	26
	19	Karail Basti	T&T office at Karail, Banani	36000	27
	20	Shattola South & East Basti	IDH Hospital, Mohakhali	18000	28
	37	North Begunbari Tong Ghar	North Begunbari, Tejgaon	6000	29
10	1	Kamarpara (Ranabola) Slum	Section-10 Uttara, Dhaka	2200	30

Annex- C

List of Never Vaccinated Children Identified by Clusters

Ward	Name of the Slum	Address of the slum	Total Population	Cluster No.	Never Vaccinated Children
82	Nasir Doktorer Bari	Road Sutrapur	98	1	1
60	Shadhurbari Basti	Shahidnagar 1 no. gali (Beribadh Side)	1200	6	1
29	Jannatbag Basti	79, North Mugda	1326	9	2
39	Railway Colony Basti	Railway Colony Basti,Tejgaon	7440	11	1
46	Katasur Slum	Katasur, Mohammodpur	4500	14	-
47	Muchipara Slum	Muchipara, Rayerbazar	3624	15	1
5	Madrasha Camp	Block-C, Section-11, Mirpur	2050	23	1
6	West side Basti of Purabi Hall	Adjacent to Purabi Cinema Hall	1300	24	1
15	Vashantek 3 no. Basti	Vashantek, Kafrul, Dhaka	4500	25	1
17	Nikunja Beridadh Basti	Road-21, North-West Tanpara	5500	26	2
19	Karail Basti	T&T office at Karail, Banani	36000	27	1
Total never vaccinated children					12

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2. Joint Review of the Expanded Program on Immunization (EPI) in the Areas of Rural service Delivery Partnership (RSDP), April 2001. Technical Report No. 2, May 2002

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