Child immunization coverage in urban slums of Bangladesh: impact of an intervention package

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The study assessed the impact of an EPI (Expanded Programme on Immunization) intervention package, implemented within the existing service-delivery system, to improve the child immunization coverage in urban slums of Dhaka, Bangladesh. This intervention trial used a pre- and post-test design. An intervention package was tested from September 2006 to August 2007 in two urban slums. The intervention package included: (a) an extended EPI service schedule; (b) training for service providers on valid doses and management of side-effects; (c) a screening tool to identify immunization needs among clinic attendants; and (d) an EPI support group for social mobilization. Data were obtained from random sample surveys, service statistics and qualitative interviews. Analysis of quantitative data was based on a ‘before and after’ assessment of selected immunization-coverage indicators. Qualitative data were analysed using content analysis. Ninety-nine per cent of the children were fully immunized after implementation of the interventions compared with only 43% before implementation. Antigen-wise coverage after implementation was also significantly higher compared with before implementation. Only 1% drop-out was observed after implementation of the interventions while it was 33% before implementation. At baseline, a significantly higher proportion of children of non-working mothers (75%) were fully immunized compared with children of working mothers (14%). Although the proportion of fully immunized children of both non-working and working mothers was significantly higher at endline, fully immunized children of working mothers dramatically improved at endline (99%) compared with baseline (14%). The findings suggest the effectiveness of a ‘package of interventions’ in improving child immunization coverage in urban slums. However, further research is needed to fully assess the effectiveness of the package, to assess the individual components in order to identify those that make the biggest contribution to coverage, and to assess the sustainability of this package within the existing service delivery system, particularly on a wider scale.

Keywords Child health, immunization, urban, slum, interventions, Bangladesh, EPI
Introduction
Outbreaks of vaccine-preventable diseases are more common in urban slums due to high density of population and a continuous influx of new infective agents (Aaby 2004). In Bangladesh, the rate of urban population growth has recently been 6% per year (meaning that, in only 10 years, the number of people would double if this rate of population growth were to persist) compared with a national population growth rate of 1.5% (Anam et al. 1997; Islam et al. 1997; Khanam et al. 2002). Dhaka city is one of the fastest growing cities in the world, and the greater Dhaka city metropolitan area is anticipated to reach 22.8 million people in 2015, at which time it will be the second largest city in the world after Tokyo (United Nations Human Settlements Programme 2003). The rate of growth of urban slum populations, particularly in Dhaka city, is even greater than that of urban areas in general (Perry et al. 2007). One-quarter of the population of the Dhaka City Corporation (DCC), which is located within the formal boundaries of the city proper, lives in slum households (Perry et al. 2007).

In Bangladesh, although 75% of children aged 12–23 months are fully immunized, the coverage in urban slums remains low. A recent survey in Dhaka city found that the proportion of fully-immunized children in slums aged 12 months was only 54% (DGHS 2007). In their comprehensive review of urban immunization services in developing countries, Atkinson and Cheyne (1994) pointed out some unique challenges that are not faced in rural areas. Among these are rapid population growth, especially among slum populations; multiplicity of types of service providers in the public and private sectors; the need to give priority to other more pressing challenges; and the need to use different strategies to reach marginal groups (Atkinson and Cheyne 1994).

Other barriers to achieving optimal coverage affect both urban and rural populations. Evidence suggests that lack of information and knowledge (on the need for immunization, for subsequent dose(s), and the importance of completing the entire course) and irregular holding of Expanded Programme on Immunization (EPI) sessions contribute to low immunization coverage in urban areas of Bangladesh (DGHS 1997–2000; Blanchet 1989; Laston et al. 1993; Bhattacharyya 1998; Chowdhury et al. 1999). Thus, strategies are required to address children who receive no immunizations (left-outs), those who do not complete all vaccinations before the age of 12 months (drop-outs), and those who receive vaccinations too close together or at an earlier age than is recommended (invalid doses).

Evidence from different countries suggests that interventions are effective to improve full immunization coverage. In Madagascar and Benin, immunization coverage was improved and drop-out was reduced through intensified efforts to strengthen the system and mobilize the community (Gbedenou 1999; Shimp 2004). Modification of the EPI session schedule allows women more time to attend in a particular location. A study conducted in Uganda found that implementation of additional and more convenient outreach sites resulted in a steady increase in coverage and a distinct decline in drop-out rates (BASICS 2003). Results of an earlier study in Bangladesh showed that community monitoring of activities of local health centres resulted in regular attendance of providers, a longer period of stay, elimination of the practice of charging clients, and patients being served with respect (Uddin et al. 2001). A study conducted on National Immunization Day (NID) found that the community played a significant role in increasing polio coverage. Over 46% of parents learned about the NID from community volunteers who actively participated with health providers in child-to-child search (IOCH 2002). Another study found that members of self-help organizations could mobilize children for the completion of vaccination (Manzoor and Bhuiyan 2002). Results of recent studies show that the use of a screening tool in clinics providing the essential services package (ESP) could effectively identify unmet need for immunization (Hossain et al. 2003; Khatun et al. 2003). A study in Indonesia found that training of providers helped to improve immunization coverage (Robinson et al. 1998).

The objective of the present study was to assess the impact of an EPI intervention package in improving child immunization coverage in urban slums, within the existing service-delivery system. Immunization services in Dhaka city are provided through a public-private partnership. The DCC or municipal government is responsible for providing EPI services but it has limited capacity and employs a very small number of vaccinators. DCC health facilities include dispensaries and maternity centres but they are not involved in routine EPI services. Thus, implementation is carried out mainly through national NGOs who deliver more than 95% of immunizations in Dhaka city. The national EPI programme of the Ministry of Health and Family Welfare (MoHFW) supports this system by ensuring the supply of vaccines and other logistic supports (e.g. disposable syringes and needles, refrigerator, cold box, vaccine carriers and vaccine transportation cost) to the DCC and NGOs. The DCC assists the NGOs in planning, monitoring and evaluation.

Within this service-delivery system, vaccines are provided mainly through outreach sites; no immunizations are provided at home. Vaccines are generally provided at each outreach site once per month by vaccinators who have a minimum 10th grade education and training on immunization. Vaccines are distributed to the outreach sites by vaccine carriers who deliver them from the ‘Ward EPI Rooms’, which are located in the DCC zone and NGO main offices. In addition to the outreach model,
paramedics and nurses provide vaccines in some NGO static clinics.

Through a collaborative effort of the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B), the MoHFW, DCC and four leading national NGOs who work in Dhaka city slums, the package of proven interventions was identified and implemented within the existing service-delivery system at no additional cost. The intervention package included: (a) an extended EPI service schedule, (b) training for service providers on valid doses and management of side-effects, (c) a screening tool to identify immunization needs among clinic attendants, and (d) an EPI support group for social mobilization.

Methods

Study design

This was an intervention trial with a pre- and post-test design. The intervention package was implemented for 12 months from September 2006 to August 2007. A pre-intervention survey was conducted in August 2006 and a post-intervention survey in July 2007.

The DCC comprises 10 administrative zones of approximately 1000000 people each. One zone was randomly selected. Within that zone, all slum areas \( (N = 9) \) were mapped and those that fitted the inclusion criteria were identified. The criteria were: (a) unlikely to be demolished in the 12-month study period, (b) limited population mobility, and (c) existence of some educational facilities. Two slums were purposively selected that fitted these criteria and that were not located adjacent to one another. Each slum covered an area of less than 25 km\(^2\) and had a relatively homogeneous population in terms of its socio-demographic characteristics.

The slums were the unit of intervention, in other words the interventions were implemented throughout the entire slug. Routine EPI services were provided in the study slums by four NGOs through 16 outreach sites (9 in one slum and 7 in the other) and 4 static clinics (2 in each slum). Immunizations were provided by vaccinators in the outreach sites and by paramedics in the static clinics.

Intervention package

The EPI intervention package tested in the study areas included:

(a) Extended EPI service schedules: Normally, EPI services are provided from 10:00 am to 2:00 pm. With active collaboration with the DCC and participating NGOs, hours of EPI service were extended up to 5:00 pm to enable working mothers to bring their children for vaccination.

(b) Training for service providers: A three-day refresher training was provided to all the NGO and DCC vaccinators and their supervisors working in the study areas. The training focused on valid/invalid doses and management of side-effects. It was provided by immunization experts from the EPI programme of the MoHFW, DCC and ICDDR,B using a combination of training methods, including lectures, group discussions, PowerPoint presentations and role-play. Participants completed pre- and post-training questionnaires to assess their knowledge. No extra resources were needed for this training because these organizations normally run refresher training sessions for vaccinators and their supervisors.

(c) Use of a screening tool in non-EPI centres: Mothers who visited a health facility in the study areas for reproductive health or child health services were asked about the immunization status of their children of eligible age (accompanying children and others at home) using a screening checklist (Appendix 1). If a child required immunization, it was provided at the clinic if available; otherwise, the child was referred to an EPI session or other vaccination centres.

(d) EPI support group: The NGO and DCC service providers formed EPI support groups in the study areas to involve the community with the programme. The support groups consisted of house owners at the outreach site, mothers of children who have completed all doses of vaccines, school/college students (both boys and girls), school teachers, Imams (religious leaders), local elites, and health service providers from the DCC and NGOs working in the slums. The functions of the groups were to assist in ensuring that all scheduled EPI sessions were held; to assist in ensuring the registration of the EPI target population; to assist the providers in implementing the interventions to reduce drop-outs, invalid doses and left-outs; and to organize meetings with the participation of service providers in order to review EPI performance.

The service providers invited potential members who they identified based on their previous work in the community. They organized meetings with the potential members to discuss the purpose and functions of the groups and to establish group membership. A total of four EPI support groups were formed with 12 members in each group. A half-day orientation, led by officials from the EPI programme of MoHFW, DCC and ICDDR,B, was held for group members. The orientation addressed the importance of immunization and completion of all doses, the concept of invalid/valid doses, and the role of the groups as well as motivational aspects for group members. Monthly meetings were held with the support groups to review their activities, praise their work and motivate them to save children from preventable diseases through their efforts. No financial incentives were given to the group members, although tea was served at the monthly meetings.

This collaborative study, which was funded by the Government of Bangladesh, was conducted by ICDDR,B; the EPI programme of the MoHFW facilitated implementation; and the DCC and NGO staff implemented the interventions through their existing service-delivery mechanisms. No additional funds were provided to the implementing organizations to incorporate the suggested package.

Study population

The study population included mothers of children aged 12–23 months, members of EPI support groups, and service providers.

To facilitate sampling, each selected slum was divided into three sub-sections based on geographical boundaries and
roads. Each sub-section was designed to have approximately 2000 households. Given that an estimated 13% of households have a child aged 12–23 months, each sub-section had approximately 260 eligible children. A sample of about 260 children from each sub-section was sufficient to assess the statistical significance of anticipated changes in immunization coverage indicators, including 7% invalid doses, based on a 95% confidence interval with 90% power. The total sample in the two sub-sections was 520 at baseline and 520 at endline.

From the three sub-sections within each slum, one subsection was randomly selected for the survey. Selection of subsections was conducted at baseline and endline, resulting in different subsections for the two surveys. Within each selected subsection, an enumeration was conducted in order to identify all households with children aged 12–23 months.

Data collection
Data were obtained from three main sources: random sample surveys to assess the immunization coverage (interviews with mothers of children aged 12–23 months), service statistics, and qualitative components. Data were collected before and after the implementation of the interventions to measure the impact. As the study aimed to measure the impact of the interventions, data were not collected from the same mothers in both the baseline survey and the baseline survey.

Survey data
The baseline and endline surveys were conducted over a two-month period immediately before and immediately after the 12-month intervention period. All children aged 0–23 month(s) in the selected sub-sections were enumerated first. From the enumeration list, all mothers of children aged 12–23 months were interviewed. They were asked for the date of birth of their youngest child to identify those aged 12–23 months, and they were asked about the number of each type of vaccination received (card validated; self-reported), with dates recorded from EPI cards when possible. As the mothers did not know the names of the antigens, the interviewers asked a mother three questions from the questionnaire when no card was available, to be sure that the child was vaccinated. This is also done during the national coverage survey by the MoHPW. The questions were: (a) how many times did the mother visit an EPI centre for vaccination of the child?; (b) how many injections were given to the child during each visit?; and (c) how many times was a polio drop given to the child during all the visits?

Service statistics
Service statistics (session-wise daily and monthly targets, monthly attendance, and immunizations provided) were collected from EPI registers and reviewed to ascertain the changes in performance and quality of recording and reporting. In addition, data were collected on the number of EPI sessions held, the number of EPI support group meetings held and activities, and the number of special sessions held outside normal hours. The documentation of such data before and after the intervention allowed us to explore the above-mentioned effects. Data on the use of the screening tool were also collected (number screened for immunization needs, number of needs identified, and number followed up to ascertain if immunization was done).

Qualitative components
In-depth interviews with mothers
Experienced Field Research Assistants (FRAs) conducted in-depth interviews with mothers whose children had received all the doses. Ten randomly selected mothers were interviewed. Data were collected on reasons for completion of all doses for their children, time of vaccination of their children, and barriers they faced in getting their children vaccinated.

In-depth interviews with EPI support group members
In-depth interviews were also conducted with members of the EPI support groups. Eight group members were interviewed covering all categories, such as chairman, member-secretary, and members of the groups formed. Data were collected on perceptions of group activities, advantages and disadvantages of the group, the process followed for organizing sessions that were not held, and barriers faced in implementing group activities.

In-depth interviews with service providers
To ascertain perceptions of service providers about the interventions, in-depth interviews were conducted with six randomly selected service providers from NGOs (vaccinators and their supervisors), two EPI supervisors of the DCC, and four operational-level managers from the DCC and NGOs. Data were collected on perceptions of service providers about the interventions, the process followed to implement the interventions, and barriers faced in implementation.

Observations
Field activities were observed and information documented during the entire study period. The observations focused on activities relating to EPI sessions, daily targets and performance, implementation of the four interventions, problems faced by providers in the implementation of the interventions, and the processes followed to solve the problems identified.

Data analysis
Quantitative data were entered into visual Basics/FoxPro and analysed with SPSS (version 11.5). The quantitative data analysis was based on a ‘before and after’ assessment of the selected immunization-coverage indicators by Pearson chi-square test for proportions and t-test to compare means for continuous variables. It was assumed that changes in the proportion of invalid doses were largely attributable to the training of providers, as this was a focus of training. Changes in the other indicators may be attributable to other individual component interventions. However, it was not possible to assess their individual contributions accurately due to overlapping effects. Contributions of the screening tool, the extended EPI service schedule and EPI support groups were assessed through the process indicators. In particular, the contribution of the screening tool was assessed through calculation of the needs identified using the tool and the needs met, and the effectiveness of the extended EPI service
schedules was assessed based on the increase in attendance at sessions (based on service statistics).

Qualitative data collected through in-depth interviews and observations were transcribed and then translated into English. Data were then analysed manually. When field activities commenced, analysis of qualitative data involved reading through field notes. Data were coded, categorized and abstracted manually, and then analysed using content analysis.

Results
Socio-demographic characteristics
The socio-demographic characteristics of mothers interviewed at baseline and endline did not differ significantly in terms of age, education, sex of child and monthly family expenditure. More than two-fifths of mothers (both at baseline and endline) were either garment workers or domestic helpers/day labourers. Most mothers had access to mass media, although the rate was higher among mothers interviewed at baseline compared with endline. The mean monthly expenditure for the families at baseline and endline was Tk 6000 (US$88).

Childhood immunization
Levels of valid coverage
The level of valid coverage improved dramatically after implementation of the interventions; 99% of children were fully immunized (the 12–23 month old children received all the valid doses of all the recommended antigens by the age of 12 months) compared with only 43% before implementation.

Table 1 Valid coverage among children aged 12–23 months (card and history)

<table>
<thead>
<tr>
<th>Category</th>
<th>Coverage (%)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fully immunized</td>
<td>Baseline (n = 529) 43</td>
<td>Endline (n = 526) 99</td>
</tr>
<tr>
<td>Drop-out</td>
<td>Baseline (n = 175) 33</td>
<td>Endline (n = 5) 1</td>
</tr>
<tr>
<td>Left-out</td>
<td>Baseline (n = 11) 2</td>
<td>Endline (n = 5) 0</td>
</tr>
<tr>
<td>Invalid doses (card only)</td>
<td>Baseline (n = 116) 22</td>
<td>Endline (n = 5) 0</td>
</tr>
</tbody>
</table>

Table 2 Status of 12–23 month old fully-immunized children by age

<table>
<thead>
<tr>
<th>Name of antigen</th>
<th>Age of children</th>
<th>Status of vaccination (%)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline (n = 345)</td>
<td>Endline (n = 352)</td>
<td></td>
</tr>
<tr>
<td>BCG</td>
<td>&lt;42 days 52 (n = 179)</td>
<td>56 (n = 197)</td>
<td>0.289</td>
</tr>
<tr>
<td></td>
<td>≥42 days 48 (n = 166)</td>
<td>44 (n = 155)</td>
<td>0.289</td>
</tr>
<tr>
<td>DPT-1</td>
<td>&lt;42 days 24 (n = 83) 0</td>
<td>0</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>≥42 days 76 (n = 262) 100</td>
<td>(n = 352)</td>
<td>0.00</td>
</tr>
<tr>
<td>DPT-2</td>
<td>&lt;70 days 7 (n = 24) 0</td>
<td>0</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>≥70 days 93 (n = 321) 100</td>
<td>(n = 352)</td>
<td>–</td>
</tr>
<tr>
<td>DPT-3</td>
<td>&lt;98 days 5 (n = 17) 0</td>
<td>0</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>≥98 days 95 (n = 328) 100</td>
<td>(n = 352)</td>
<td>–</td>
</tr>
<tr>
<td>Measles</td>
<td>&lt;270 days 9 (n = 31) 0</td>
<td>0</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>≥270 days 91 (n = 314) 100</td>
<td>(n = 352)</td>
<td>–</td>
</tr>
</tbody>
</table>
Table 3 Status of fully immunized children of non-working and working mothers before and after implementation of interventions

<table>
<thead>
<tr>
<th>Status of occupation</th>
<th>Percentage of fully immunized children</th>
<th>Baseline</th>
<th>Endline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-working</td>
<td></td>
<td>75 (n = 252)(^a)</td>
<td>99 (n = 284)(^b)</td>
</tr>
<tr>
<td>Working</td>
<td></td>
<td>14 (n = 277)</td>
<td>99 (n = 242)(^b)</td>
</tr>
</tbody>
</table>

\(^a\)Significantly higher than working mothers, \(P < 0.001\).
\(^b\)Significantly higher than baseline, \(P < 0.001\).

...reflecting more dramatic improvement among working mothers.

Retention of vaccination card

Most vaccinated children received an EPI card both before and after implementation of the interventions. Of the children who received an EPI card, 64% and 68% retained it before and after implementation, respectively.

Process indicators: performance of interventions

(a) Extended EPI service schedules

Status of holding of EPI sessions

During the year preceding the study period, 31% of planned sessions were not held, while during the year studied, only 4% were not held. The reasons for not holding the planned EPI sessions during the study period were due to faulty planning, i.e. the sessions were planned to be held on government holidays or meeting days. There was no information from service providers about reasons for not holding the planned sessions before the study period.

Service-use during morning and afternoon sessions

During the study period, more children were vaccinated in the afternoon sessions than during the morning sessions. Figure 2 shows the number of children who received BCG, DPT3 and measles vaccines in the morning and afternoon sessions.

Advantages of extended EPI service schedules

The qualitative data show that the mothers, support group members, and service providers highly appreciated the extended EPI service schedules. The Assistant Health Officer of the relevant zone of the DCC commented that the extended timing was a great opportunity for women to vaccinate their children. She said that working mothers, such as garment workers, could immunize their children at a time convenient to them, i.e. during their free time. Four mothers who completed all the doses said, “it would not have been possible for us to complete all the doses for our children if this system was not introduced”.

The support group members, some of whom were working people, also appreciated the extension of service delivery hours. Since they are less busy during the afternoon, it was easier for them to motivate mothers to go to EPI centres at that time. They reiterated the views of mothers that it was easier for working mothers to attend and added that the increased flexibility also benefited non-working mothers in receiving services more conveniently.

(b) Training for service providers on valid/invalid doses and management of side-effects

The proportion of invalid doses decreased markedly after training (Table 1). The incidence of side-effects following any dose of vaccination was calculated to assess the safety of injections for children. Abscess and infections among the children after training were less than 1% compared with 9% before training (Table 4). The table shows that convulsion and swelling also decreased after training (1% compared with 5%). The service providers interviewed reported that the training helped them in counselling about immunization, in reducing...
invalid doses and regarding side-effects. The vaccinators and their supervisors stated that they became more careful about these issues after training than previously.

(c) Use of a screening tool in non-EPI centres

In total 1716 mothers were screened through the checklist, and 188 (11%) children of these mothers were identified as having unmet need for immunization. Of these 188 children, 99 (53%) were vaccinated at the same clinics where they were identified, and the remaining 89 were referred to nearby EPI centres for vaccination. Eighty-one of the 89 referred children were followed up by the project staff and supervisors of the vaccinators, and 79 visited referral clinics and received vaccines. Overall, 95% of the children identified through the screening checklist who were in need of vaccines were vaccinated.

All the service providers interviewed reported that, although this was a new system, the screening checklist helped them reduce the number of drop-outs. They suggested introducing the checklist among drug-sellers in local pharmacies for further improvement of vaccination coverage. Observational data showed that an average of 1–2 minutes was required for each client to use the screening checklist. None of the service providers reported any problem in using it.

(d) EPI support groups

Functioning of the EPI support groups

Of the 28 support group meetings planned for the four EPI support groups formed, 20 were held during the study period. An average of nine group members attended each meeting. Their own documentation of their actions showed that group members sent at least 195 children to EPI centres during the study period. They identified 65 drop-out children, half of whom were motivated and sent to EPI centres directly by members, and the other half were referred to service providers who followed up and ensured that they were vaccinated. They also identified and motivated the mothers of 119 newborns.

Knowledge of mothers about EPI support groups

The mothers were asked during the survey if they knew about any group or committee involved in improving the coverage of child immunization. Although none had any knowledge at baseline, at endline 66% of mothers reported that they knew of a committee (Table 5). When asked for the name of the committee, all of them knew about ‘tika committee’ (local name of an EPI support group) and they all knew a member of the committee. Ninety-seven per cent of the mothers stated that a member of the group had met them and inquired about child immunization. Women reported being told by group members that they could come during the extended EPI hours to vaccinate their children and they needed to complete all vaccinations within the first year of life. They were also informed about the benefits of full immunization.

These findings were echoed by mothers who participated in in-depth interviews who also said that ‘tika committee’ members visited them several times and motivated them to vaccinate their children. Two mothers said, “it would not have been possible to completely vaccinate our children if the tika committee members did not remind us again and again”.

Service providers’ responses to the EPI support groups

The service providers working in the support group areas and participating in in-depth interviews felt that the support groups contributed to mobilizing the community and reducing drop-outs and left-outs. They reported that while they had difficulty visiting all households in the catchment area of the EPI centre, especially in large areas, community members were better able to do this because they lived in close proximity to their neighbours. They also said that as a result of the crowded living conditions, slum dwellers have regular information about pregnant mothers, newborns, which children are vaccinated, and which children are yet to be vaccinated. They could therefore more easily contact mothers and keep track of child immunizations. The NGO service providers added that because the members of the groups were respected among the slum dwellers, they were accepted. In terms of implementation, they said they simply provided the target list to the concerned members of the support groups, and on the morning of an EPI
session day, the group members visited the houses of the targeted children, motivated the mothers and sent the children to the EPI centres for vaccination.

The support group members who participated in in-depth interviews felt that they had played a very important role in reminding mothers about the due dates of EPI doses for their children. They stated that as the mothers in the slums cannot remember the due dates of doses, they visited the children of their assigned areas from a target list, reminded the mothers about the date of a due dose, and sent them to the centre for their child’s vaccination on the EPI session day. All the group members interviewed said that they collected particulars of all the newborn babies during the last 1 year and provided the list of newborns to service providers. Another important activity they performed was keeping track of families that migrated in or out to reduce the number of drop-outs and left-outs. The support group members also stated that the service providers could not visit all the slum areas, because their areas are large. Therefore, the support group members focused their activities on areas more distant from the EPI centres. The retention rate of the volunteers in the support groups was almost 100%. Only one of the 30 group members dropped out during the study period, and she left due to migration out of the slum.

Discussion

This study showed that in the period during which the package of previously tested interventions was implemented as part of the existing EPI service delivery system, immunization coverage improved in urban slums of Dhaka. Improvements were seen in the proportion of children under two who were fully immunized, the proportion who dropped out, and the proportion who received invalid doses. These improvements suggest a positive overall impact of the intervention package.

Since the interventions included in the package had already been proven effective individually, the study did not aim to assess their individual contributions to the overall impact. However, process indicators and qualitative assessments confirmed the potential of the individual interventions. For example, that larger proportions of children were vaccinated in the afternoon sessions than in the morning sessions suggests that the extended hours were popular with mothers. This was confirmed through qualitative interviews with mothers, support group members and service providers. This finding supports the recommendation that EPI service hours should be extended (WHO 1998; Agarwal et al. 2005).

These extended hours are likely most beneficial to working mothers, a group among whom drop-outs and left-outs are high in urban slums (Perry et al. 2007). In urban slums of Dhaka, approximately 40% of women aged 15 to 40 are employed; the proportion is similar in Chittagong (the second largest city in the country) but lower, approximately 27%, in urban slums of other cities (NIPORT 2008). During this study, the hours were extended until 5:00 pm. It was originally suggested that the hours be extended up to 7:00 pm, but this was not considered feasible by the NGOs implementing the services.

The issue of overlapping effects of the different interventions is made clear by the large decrease in the proportion of invalid doses and improvements in management of side effects. While the extended service hours allowed for better coverage overall and may have increased the likelihood that children were brought to the services according to schedule, and community outreach could have improved compliance with the schedule, the refresher training was more likely the driving force behind the changes concerning doses and side effects. This is particularly true given that most providers at all levels of the Bangladesh health care system lack a clear concept of valid/invalid doses (Quaiyum et al. in press) and that other studies have shown the success of training in addressing such coverage issues (Robinson et al. 1998). Although the package as a whole was geared toward urban areas, this particular intervention is relevant in all areas of Bangladesh given that 7% of all DPT doses are invalid in both urban and rural areas (DGHS 2005).

Although the impact of the community support groups was not directly assessed, as in other settings they appear to have been effective in mobilizing the community and improving immunization coverage (Gbedonou 1999; Manzoor and Bhuiyan 2002; MoHFW India 2003; Shimp 2004). The community groups took on the role of channelling (or door-to-door canvassing) that has been shown to be an effective approach to improving EPI coverage (Pegurri et al. 2005). Group members, service providers and mothers—almost all of whom had contact with the groups—responded positively to the groups and felt that they had contributed to the overall impact. In the urban slums, where community bonds are not as strong as in rural areas, the role of these groups is likely to be of particular importance. And as noted by the participants, they have a special role to play in large areas with many target children.

The use of a screening checklist by health care providers was effective in identifying and addressing unmet needs for immunization given that 95% of children identified as having unmet need were immunized. However, because only a small number of children were identified through this mechanism, its potential benefit needs to be weighed against the costs of implementing such a tool. This was not addressed in the current study. Furthermore, because it was implemented only in formal health facilities, it is likely that some children who do not seek care from health facilities were not addressed. Although drop out was less than 1%, expanding this approach to drug sellers, as suggested by the study participants, could broaden the reach of this particular strategy.

Beyond the effectiveness of the package, scalability and sustainability are key issues for any effective intervention. Although neither scalability nor sustainability was formally assessed, a number of factors suggest that this programme is, in fact, both scalable and sustainable. Most importantly, the package of interventions was implemented within the existing local health system by the organizations already providing immunization services in the study sites. The NGOs, DCC and MoHFW are all motivated to improve immunization services for this population. The fact that urban slums have been highlighted as a weak point in the otherwise highly successful EPI programme, in combination with the current focus on achieving the Millennium Development Goals, is likely the reason for this motivation on the part of the MoHFW and the...
DCC. The NGOs are accountable to the DCC and MoHFW for EPI activities in the slums, which encouraged their involvement.

In terms of actual implementation, in this pilot study, which was by nature of limited duration, the organizations involved adopted the recommended interventions into their ongoing programmes. The providers who work for them were willing to extend their working hours with no additional payments and to implement the screening checklist as part of their ongoing work. This required negotiation between the management and staff, but it was possible. Further research into the costs of these changes is needed before it can be determined whether this approach is sustainable over the long term, particularly at limited cost. However, the fact that the NGOs have voluntarily maintained some extension of EPI service hours (to 3:30 or 4:00 pm) since the study ended (personal communication) suggests that they saw the value of this extension.

One component that could easily be adopted into existing programmes is the refresher training. This is already a normal feature of the NGO and DCC programme, and for this study it only required refocusing one such training on immunization. Therefore, this intervention appears to be easily scalable given that materials have already been developed that could be used in other settings. This would require implementing the training in new areas and ensuring through repeated trainings, assessments and supervision that the improvements in provider knowledge and practice are sustained over time.

Whether or not the community support groups are sustainable is a broader issue being faced by the many health programmes implementing this model. The participants were willing and ready to act and worked throughout the project period. They seemed interested to continue their involvement and have in fact remained active since the study ended (personal communication). Whether this could be maintained over the long term, particularly given that they had no financial incentives to participate, would need to be assessed through a longer-term assessment, which was beyond the scope of this study. It would, however, likely require the implementation of a supervisory system that was not included in this study (Fiedler 2000). The success of this approach would likely vary depending on the slum. Rates of migration into and out of slums differ (NIPORT 2008) and may affect the willingness and ability of community members to participate over time. In addition, existing evidence of higher mortality in medium and small slums compared with larger slums (NIPORT 2008) may affect the willingness of the inhabitants and the health services, suggests that this should not have confounded the results. However, conducting the surveys in the same areas would have strengthened the results.

Conclusion

This study has shown a substantial improvement in immunization coverage in two urban slums after the implementation of a package of interventions. The use of a screening checklist, extension of clinic hours, refresher training for providers and development of community support groups appears to have led to almost complete coverage of children under 2 years in these urban slums. That the package was implemented within the existing health systems in these slums, by working with both government and NGO providers, points toward the effectiveness of the package. However, because the package was implemented in only two areas and because the process of developing the interventions and the study included intensive interaction between the parties, the results speak more to its efficacy. This is, however, a promising package for use in urban slums where existing health infrastructure is adequate.

The package, which was developed based on an expert consultation, included both demand-side and supply-side interventions, and the available data suggest that each had a positive impact. Although all of the interventions showed promise, the screening checklist to identify children with unmet need for immunization identified a small number of children, suggesting this may not be as cost-effective as other interventions. At the same time, it may be the only way to reach the small group of children most likely to be left out. Increasing
evidence supports the need for such bundled interventions rather than a 'silver bullet' to solve problems such as inadequate EPI coverage, but such packaging will continue to need to target specific groups that may have less access to services.

While the study shows the promise of this approach, further research is needed to assess the effectiveness of the package, to assess the individual components in order to identify those that make the biggest contribution to coverage, and to assess the sustainability of this package within the existing service delivery system, particularly on a larger scale. In addition, a more complete understanding of the factors affecting implementation would aid in taking this intervention to scale in slums throughout Bangladesh.

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References


Appendix 1 Screening checklist used for identifying unmet needs

Reg. No. ...................

Information relating to services

Age of child ..........

- Vaccine available and vaccinated
- EPI service not available

Referred for vaccination

- Upazila Health Complex
- Union Health and Family Welfare Centre
- Rural dispensary
- Satellite clinic
- Nearest EPI centre
- NGO satellite clinic
- NGO clinic
- Private clinic

Client comes for

Child immunization

Do you have any 0-23 month (s) old child?
- Yes
- No

If Yes:
- Completed all vaccines earlier
- Comes today for vaccination and vaccinated
- Referred for vaccination with advice

Name and designation of user: ______________________________

Service centre of user: ______________________________

Date: ........../......./.......