



Cost and sustainability of a successful package of interventions to improve vaccination coverage for children in urban slums of Bangladesh



K. Hayford^{a,*}, M.J. Uddin^b, T.P. Koehlmoos^c, D.M. Bishai^{d,*}

^a Department of International Health, Bloomberg School of Public Health, Johns Hopkins University, 615 N. Wolfe Street, Baltimore, MD 21205 USA

^b Centre for Equity & Health Systems, icddr, 68 Shahed Tajuddin Ahmed, Sarani, Mohakhali, Dhaka 1212, Bangladesh

^c Headquarters, United States Marine Corps, The Pentagon, Washington, DC, WA, USA

^d Department of Population, Family, and Reproductive Health, Bloomberg School of Public Health, Johns Hopkins University, Baltimore, MD, USA

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ABSTRACT

Objective: To estimate the incremental economic costs and explore satisfaction with a highly effective intervention for improving immunization coverage among slum populations in Dhaka, Bangladesh. A package of interventions based on extended clinic hours, vaccinator training, active surveillance, and community participation was piloted in two slum areas of Dhaka, and resulted in an increase in valid fully immunized children (FIC) from 43% pre-intervention to 99% post-intervention.

Methods: Cost data and stakeholder perspectives were collected January–February 2010 via document review and 10 key stakeholders interviews to estimate the financial and opportunity costs of the intervention, including uncompensated time, training and supervision costs.

Results: The total economic cost of the 1-year intervention was \$18,300, comprised of external management and supervision (73%), training (11%), coordination costs (1%), uncompensated staff time and clinic costs (2%), and communications, supplies and other costs (13%). An estimated 874 additional children were correctly and fully immunized due to the intervention, at an average cost of \$20.95 per valid FIC. Key stakeholders ranked extended clinic hours and vaccinator training as the most important components of the intervention. External supervision was viewed as the most important factor for the intervention's success but also the costliest. All stakeholders would like to reinstate the intervention because it was effective, but additional funding would be needed to make the intervention sustainable.

Conclusion: Targeting slum populations with an intensive immunization intervention was highly effective but would nearly triple the amount spent on immunization per FIC in slum areas. Those committed to increasing vaccination coverage for hard-to-reach children need to be prepared for substantially higher costs to achieve results.

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1. Introduction

Achieving high vaccination coverage in urban slum populations is a persistent problem with few models of success around the world. Yet polio eradication and measles elimination hinge

on vaccination coverage reaching 95% [1]. Cost estimates for vaccinating the last 5–20% of unvaccinated children are primarily based on models using cost estimates from lower coverage levels and extrapolating to a theoretical rising marginal cost curve. Few immunization interventions have successfully reached this population and generated cost estimates of doing so [2,3]. Vaccinating hard-to-reach populations in urban slums will be critical for the success of the polio eradication and measles elimination efforts, but the lack of empiric data on the cost of reaching these populations is an obstacle to projecting the 'endgame' costs of these efforts.

A small, highly successful program for improving vaccination coverage in two slum areas of Dhaka, Bangladesh, provides a case study on the components and costs for achieving 99% vaccination

* Corresponding authors at: Johns Hopkins Bloomberg School of Public Health, Department of Population, Family and Reproductive Health, 615 N. Wolfe Street, Suite E4622, Baltimore, MD 21030, USA. Tel.: +1 410 955 7807; fax: +1 410 955 2303.

E-mail addresses: khayford@jhsph.edu (K. Hayford), jasim@icddr.org (M.J. Uddin), traceyllynnk@hotmail.com (T.P. Koehlmoos), dbishai@jhsph.edu (D.M. Bishai).

coverage among slum dwelling children [4,5]. In 2009, Dhaka had approximately 14.2 million people, one quarter of whom lived in slums [6]. Despite achieving 83% coverage of fully immunized children (FIC) in Dhaka and 84% nationally in 2006, coverage in the slums of Dhaka lagged far behind at 69% [7,8]. In urban areas, the government primarily contracts non-governmental organizations (NGOs) to provide vaccinations in their clinics or through satellite clinics in the community. Satellite sessions are typically scheduled every two weeks, starting at 9–10 am, ending between 1 and 3:30 pm, each serving a 1000 population catchment area. Previous studies found that the limited clinic hours, lack of awareness about the outreach clinics in the community, maternal illiteracy, and fear of vaccinations were obstacles for mothers living in slum areas to consistently bring their children for vaccination [5,9,10].

In 2006–2007, a package of interventions aimed at overcoming barriers to vaccination in slums was introduced in two areas of Dhaka. The intervention consisted of four main components: (a) extending afternoon hours at satellite clinics to 4–5 pm, (b) training for vaccinators on valid doses and adverse events, (c) a screening tool used in clinics to identify children with missed or delayed doses, and (d) a volunteer community group, known as an EPI support group, that assisted vaccinators with satellite clinic sessions [5]. Vaccinators also used a target list, a recording method that generates a list for each upcoming session of the children scheduled for vaccination. The package of interventions was implemented in conjunction with ongoing Expanded Program on Immunization (EPI) activities by the NGO clinics that regularly provide vaccination services in these areas.

Dhaka is comprised of 10 administrative zones of approximately 1,000,000 people each. One zone was randomly selected for this intervention and 2 slum areas within the zone were purposively selected based on the following criteria: (a) unlikely to be demolished in the 12-month study period, (b) limited population mobility, (c) existence of some educational facilities, and (d) slum areas not located adjacent to each other [5]. 22% of mothers in the study had no education, 34% had less than 5 years, and 44% had more than 5 years of education. Approximately one quarter of mothers worked outside the home, primarily as garment workers, day laborers or domestic employees. Mean monthly family expenditures were 6224 taka (US\$92) [4]. The selected slum areas were considered typical for the capital city. Approximately 12,000 households were served in the intervention. A baseline survey revealed that 43% of children had correctly received all vaccinations, referred hereafter as 'valid fully immunized children' or valid FIC, which was primarily due to 44% dropout between BCG vaccination (98% valid coverage), DTP3 (77%), and measles vaccination (54%) [5]. A pre-post evaluation at the end of the 1-year intervention found that valid FIC increased by 56% from 43 to 99% valid FIC. Children of working mothers showed the greatest improvements from 14% to 99% valid FIC, which was primarily attributed to the extended hours. The intervention was managed and supervised by icddr,b in partnership with the Ministry of Health & Family Welfare, EPI, the city government (Dhaka City Corporation), and four NGOs clinics that implemented the intervention.

The success of the intervention generated significant interest in understanding the costs and feasibility of applying the model to other slum areas. Although an initial review indicated the intervention was implemented within the existing service delivery system at no additional cost, we hypothesized that unaccounted costs, including financial and opportunity costs, accrued for the intervention partners. In this paper, we estimate the economic costs of the intervention and explore key stakeholders' perceptions of the intervention components and their sustainability.

2. Methods

The study retrospectively evaluated the incremental economic costs of the slum vaccination intervention including operational costs, training, personnel and supervision. Because it was an incremental analysis, costs did not include any ongoing EPI program costs, focusing instead on new expenditures incurred to increase vaccine coverage. The analysis measured economic costs, which includes financial costs attributable to the intervention and opportunity costs such as uncompensated staff time and other inputs donated or provided in-kind by the community or other groups.

Two types of data were collected in January–February 2010 to capture the costs and programmatic details of the intervention. First, financial and program documents from the intervention and its evaluation were reviewed. The budget for the managing organization, icddr,b, was apportioned into research and program costs by the principal investigator. Publicly available documents, such as a national slum census and EPI coverage evaluation surveys were also reviewed [11,12]. The second approach used semi-structured interviews to estimate the financial costs and opportunity costs attributable to the intervention and to explore perceptions of and satisfaction of all interviewed stakeholders with the intervention. One focus group with an EPI Support Group and nine semi-structured interviews were conducted with NGO clinic managers (4), vaccinators and other program staff (4) responsible for implementing the intervention, and the Assistant Health Officer from the Dhaka City Corporation responsible for the areas where the intervention took place. Interviewees were purposively selected to ensure representation of all NGO clinics and partnering institutions and achieve a balance of perspectives from on-the-ground staff and managers.

We used a combination of activity-based costing (ABC) and an 'ingredients' approach in which we identified all activities of the intervention, estimated costs of each activity based on existing records or information reported during interviews. Costs included compensated and uncompensated staff time, additional facility costs (e.g., electricity costs for extended hours), communications, supplies, additional training, supervision and coordination costs. Salary and time allocation before, during and after the intervention were collected through a set of semi-structured interviews with clinic managers and vaccinators from each NGO. The analysis does not include any existing or ongoing EPI or NGO program costs, such as a capital costs, rent, training, vaccines or vaccine supplies. We took a provider perspective and therefore household costs were not included. The primary effectiveness estimates, valid FIC coverage and number of additional valid FIC, were based on an evaluation of the intervention published previously [4,5]. Discounting was not applied because it was a 1-year intervention with no capital costs. All local currency values were converted using the 2006 exchange rate of US\$1.00 = 68 taka. The study was deemed exempt by the ethical review committees at icddr,b and Johns Hopkins Bloomberg School of Public Health.

3. Results

The total economic costs for the 1-year intervention were \$18,300, of which 73% were allocated for supervision (salary and transport), 11% training, 2% NGO clinic costs (personnel and facility costs), 1% coordination costs, and 13% for other costs including printing, communications and supplies (Table 1). Approximately 96% of economic costs were borne by the managing organization, 2% by the implementing NGOs, and less than 2% by the Dhaka City Corporation. No additional costs were borne by EPI or the Ministry of Health and Family Welfare.

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