

A conversation with Dr. Subhash Chandir, July 12, 2018

Participants

- Dr. Subhash Chandir – Director, Maternal and Child Health, Interactive Research and Development and Senior Epidemiologist, Harvard Medical School Center for Global Health Delivery-Dubai
- Elie Hassenfeld – Co-Founder and Executive Director, GiveWell

Note: These notes were compiled by GiveWell and give an overview of the major points made by Dr. Chandir.

Summary

GiveWell spoke with Dr. Chandir of Interactive Research and Development (IRD), the principal investigator of IRD's incentives for immunization study, which received a GiveWell Incubation Grant in 2015. Conversation topics included the study's background, objectives, design, pilot, and current status.

Background

Vaccine coverage in Pakistan

The Pakistani government immunizes children through its Expanded Program on Immunization (EPI). The recommended vaccination schedule comprises six visits and immunizations for nine diseases:

- Bacillus Calmette-Guérin (BCG) at birth
- Three visits (at 6, 10, and 14 weeks) during which infants receive oral polio vaccine (OPV), pentavalent vaccine (which comprises vaccines for diphtheria, pertussis, tetanus, hepatitis B, and Haemophilus influenzae type B (Hib)), and pneumococcal vaccine
- Measles vaccines at 9 and 15 months

Pakistan's infant mortality rate is one of the highest in the world. This is partially due to the country's low vaccination coverage rate (the percentage of children who have received all recommended vaccines) in 12-23-month-old children, which is 54% instead of the optimal 80-85%. For several reasons, however, this number may overestimate the percentage of immunized children. First, these surveys are conducted only up to the measles-1 vaccine and thus exclude the recommended measles-2 vaccine, which is administered at 15 months of age. Second, these surveys do not guarantee completion of the recommended schedule. A child who receives his or her measles-1 vaccine is considered fully immunized, even though he or she may have missed previous visits. Third, while this is the average rate measured by EPI's coverage surveys, it has not been supported by independent surveys.

Consequently, polio continues to be transmitted, particularly in Karachi, the capital of the Sindh province and IRD's study site. According to recent reports, Pakistan will be one of the last countries to eradicate polio.

EPI challenges

The EPI faces a number of challenges, which contribute to the country's suboptimal coverage rate:

- **Exclusion of data and inefficient data processing** – EPI uses a paper-based data collection system, which leads to delays in processing data (it generally takes about four months for an immunization center to send a report to the main program office) and sometimes reported data is incomplete.
- **Suboptimal coverage** – Not enough children appear for all six visits. While around 80-85% attend their first visit, only around 20-25% attend their sixth visit.
- **Delayed or missed vaccinations**
- **Surveillance, monitoring, and reporting** – EPI lacks strong monitoring to verify whether the program is being carried out as intended (for example, to verify whether or not staff are doing their jobs).
- **Lack of demand** – EPI's supply of vaccines is sufficient to vaccinate all of Pakistan's children. However, for a number of reasons, demand for vaccination is very low, and parents do not bring their children to be vaccinated.
- **Vaccine logistics, management, and wastage** – The program has encountered logistical challenges related to the utilization, transportation, stock management, delivery, and wastage of vaccines.
- **Poor staff motivation** – Vaccine workers are not motivated to immunize children or interact with parents. There are 2,046 vaccine workers in the Sindh province, but many do not come to work or work short hours. In addition, workplaces are often unclean.

Research question and objectives

Research question

Previous work demonstrates that incentive-based approaches, which provide financial incentives to parents or doctors, increase immunization uptake and completion rates. However, the majority of this evidence supports the performance of large incentives in the range of \$100-\$150, which are large enough to be effective in developed countries. In contrast, evidence on the performance of small incentives is limited.

The study team expects that using small incentives in low-resource settings and developing countries can achieve similar results, driving parents to immunize their children and driving immunization programs to achieve optimal coverage. Previous IRD research supports the ability of small incentives to improve immunization coverage. From 2005-2006, IRD conducted its first study of incentives, which found that a \$2 incentive improved coverage of the pentavalent-3 vaccine by 2.2 times.

Study objectives

Broadly, IRD conducts research in order to use its findings to improve health policies and practices. IRD always works closely with governments in order to speed up this process, and Dr. Chandir believes that this is one of IRD's strengths. The objectives of this particular study are described below.

Primary objectives

First, the study aims to determine the impact of small incentives on immunization coverage and timeliness in Pakistani children under two years of age. A vaccination is considered timely if it is administered within 4 weeks of the recommended schedule. Timeliness is important because any delay in the recommended schedule increases the amount of time during which children are potentially unprotected from infection. Typically, countries work to achieve optimal immunization coverage before working to achieve optimal timeliness, which delays program success. For example, Bangladesh has achieved optimal immunization coverage rates of around 85% at both the national and divisional levels, but the country's immunization timeliness remains sub-optimal. Though Bangladesh has been working to improve timeliness for several years, progress is slow. To avoid a similar situation and to accelerate progress toward program success in Pakistan, the study team chose to target both coverage and timeliness simultaneously.

Second, the study aims to measure the relative effectiveness and cost-effectiveness of different types of incentive structures on immunization coverage and timeliness. The team will test ten different incentive arms to determine which achieves optimal coverage at the lowest possible cost. This is at the request of IRD's large donors, including Gavi, which supports immunization programs in 70 countries and is expected to use this evidence to implement cost-effective incentive-based approaches in those countries.

Third, the study aims to determine the impact of an SMS reminder function on immunization coverage and timeliness.

Secondary objectives

First, the study aims to measure sero-survey biomarkers in a 15% sub-sample to evaluate the proportion of immunized children. This is intended to validate the coverage rates measured for each of the study arms through a blood test. Because conducting a biomarker survey is costly and logistically complex, it will only be performed on a 15% sub-sample of participants.

Second, the study aims to determine the robustness and scalability of the automatic incentive disbursement system with the government's digital immunization registry. Incentive-based approaches can encourage fraudulent behavior. For this reason, the study team wishes to demonstrate that when synced with the immunization registry, its system can be easily managed to prevent fraud and successfully disburse incentives in a real-world developing country setting.

Study design and pilot

Sample size and participant selection

The study's sample size is 11,200 children. A child is eligible to enroll in the study if he or she is on the first, second, or third visit of the recommended schedule (BCG, pentavalent-1, or pentavalent-2) and is less than 2 years of age. The child's family must also be able to provide a valid phone number in order to participate.

It is possible that the latter requirement could cause the poorest or most marginalized members of the population to be excluded from the study. Because such individuals are at the highest risk of suboptimal vaccine coverage, their exclusion would skew the study's findings and undermine its focus on vulnerable populations. For this reason, the study team recently decided to collect further information from the children excluded for lack of a valid phone number. This data will help to determine if their exclusion is correlated with low socioeconomic status or other indicators of marginalization, which, in turn, will help the study team interpret the results correctly. Because this practice was only implemented in June 2018, data from these children is not yet available.

Study arms

Once enrolled, participants are randomized into twelve study arms, which include ten incentive arms, an SMS group, and a control group. Participants in the ten incentive arms receive mobile conditional cash transfers (mCCTs), which are financial incentives (in the form of mobile money) distributed conditionally based on participant behavior. Of the ten incentive arms, eight disburse incentives through mobile top-ups and are either high incentive or low incentive (defined by the total cost per child), flat rate or sharp rate, and with or without lottery. In flat rate arms, the incentive amount is constant for each visit, while in sharp rate arms, the incentive amount increases as the child progresses through the six visits. This variable was included to determine if an increasing incentive amount could counteract the observed drop in coverage between the first visit and the sixth visit. The remaining two incentive arms disburse incentives through easyPaisa, which is the largest and oldest mobile money transfer system in Pakistan and an IRD partner. The total cost per child in each incentive arm ranges from \$4.80 to \$15. Participants in the SMS group receive SMS reminders without financial incentives, while participants in the control group receive neither SMS reminders nor financial incentives.

2017 pilot

Before beginning the three-year study, the study team conducted a pilot from May 16 to November 3, 2017 at six EPI centers, which led to several discoveries. During the pilot, all mCCTs were sent to participants through easyPaisa. However, for three reasons, participants cashed only 30% of these mCCTs:

1. Participants did not receive enough easyPaisa messages.
2. Participants did not check their phones.

3. During the pilot, the Pakistani government began requiring individuals to be registered in the government's biometric verification system in order to cash mobile money transfers. Thus, unregistered participants could not cash their mCCTs. Currently, about one third of the country is not yet registered and over half of the population's biometric data is not verifiable, so this requirement was the largest reason for the low cash rate, accounting for over 50% of un-cashed mCCTs.

In response, the study team changed the original eight incentive arms to disburse incentives through mobile top-ups, which are equivalent in value to the mobile money transfers but can only be used for mobile phone airtime and cannot be cashed. The team also added two additional incentive arms that would continue to disburse incentives through easyPaisa, in order to gather data that will become relevant when the entire population is registered in the biometric verification system. Finally, the team increased the sample size to account for these changes.

Current status

Pre-registration

This study is pre-registered in three registries, including the International Initiative for Impact Evaluation's (3ie) Registry for International Development Impact Evaluations and [ClinicalTrials.gov](https://www.clinicaltrials.gov).

Delay

The study was scheduled to begin around January 2017 but began about six to eight months late. The delay was caused by:

1. **Funding** – IRD received \$100,000 in GiveWell-directed funds and \$25,000 from the Abdul Latif Jameel Poverty Action Lab before the study's start date. However, the study was delayed as IRD waited for the rest of its funding, \$250,000 from the Global Innovation Fund (GIF).
2. **Institutional Review Board (IRB) approvals** – This study required multiple IRB approvals, including a local approval and an approval from the Massachusetts Institute of Technology. The complexity of the study design led to six months of deliberation before approvals were granted.

Funding

Because of the delay, the study requires a small amount of additional funding for study team support. IRD has had preliminary funding discussions with GIF. At the end of the study's first year, around December 2018, IRD plans to have a call with GIF to discuss GIF's ability to fund the study until its conclusion around March 2020.

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