



Consortium for  
Development  
Policy Research

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# Using Incentives to Improve Performance of Polio Workers

## About the project

**Funded by:** International Growth Center

**Key Counterpart:** Commissioner Office, Lahore

**Impact:** The findings of this project were presented to the Commissioner Lahore and the application to monitor polio worker performance was successfully demonstrated. Key messages were also presented to senior policymakers in Punjab and Federal Government.

This policy brief, written by Zara Salman (CDPR) and Shehryar Nabi (CDPR) is based on the paper "Using preference parameter estimates to optimize public sector wage contracts: An Application to Polio Vaccination Drives in Pakistan", authored by James Andreoni (UC San Diego), Michael Callen (Harvard), Karrar Hussain (USC), Yasir Khan (UC Berkeley) and Charles Sprenger (UC San Diego).

## In brief

- New cases of polio have declined dramatically, but Pakistan still holds a dominant share of global cases.
- Low performance of health workers responsible for administering polio vaccines has prevented full eradication.
- Smart-phone based monitoring of health workers during polio campaigns yields higher vaccination rates.

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## Eliminating polio: A service delivery Failure

Eliminating polio in Pakistan is a critical global public health challenge given that Pakistan is one of only two polio endemic countries remaining in the world. In 2014, Pakistan saw 306 new polio cases, which represented more than 85 percent of new global cases. 2015 saw a drastic reduction of new polio cases to 54, but Pakistan still took up a majority of global cases. The prevalence of polio in Pakistan was highly variable over the last five years, so the number of cases could rise again without effective vaccination campaigns.<sup>1</sup>

There is also evidence that the disease has the potential to spread beyond Pakistan. Border crossings have led to the appearance of strains of polio in Egyptian sewers, which were traced back to Pakistan. The World Health Organization has deemed the situation a 'global public health emergency'.

Neighboring India eliminated the disease in 2011, after switching to a more effective vaccine and increasing vaccination efforts. Compared to Pakistan, India had greater capacity to respond, and it did not face as much political unrest or a dangerous border with Afghanistan. Still, many other countries with weak central governments have eliminated the disease. So why has Pakistan been unable to do the same?

Although polio is preventable through inexpensive vaccinations, public health bodies in Pakistan face major challenges to achieving universal coverage. The problem is not a shortage of vaccines nor health workers to administer them. The key issues are a lack of information on who is receiving vaccinations, and poor incentives for health workers to perform vaccinations.

The solution to these problems could be both cheap and portable: smartphones. To test whether they could work for Pakistan, a randomized control trial was conducted to use smartphones for collecting better data on who was receiving vaccinations, and to use that data as a measure of health worker performance. One part of the experiment used monetary incentives to improve worker performance; while the other part of the experiment used customized incentives to tailor the behavior affecting their performance. The goal of the experiment was to motivate workers to be more efficient service providers.

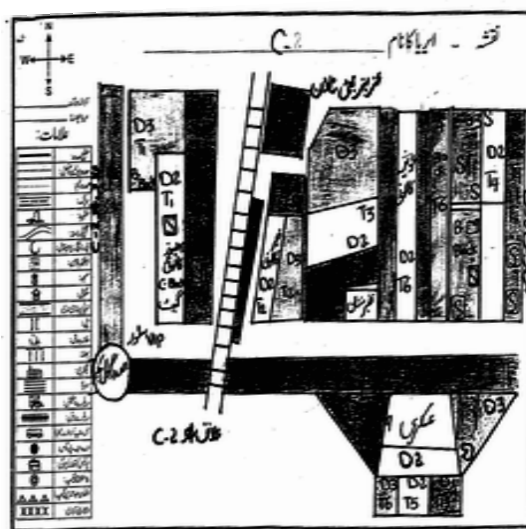
## The current delivery system

The government currently conducts vaccinations during anti-polio campaigns,

which occur about once a month. During these campaigns, a team of Lady Health Workers (LHWs) is assigned a neighborhood to vaccinate all children under the age of five.

Lady Health Workers (LHWs) are given a supply of oral vaccine and a neighborhood map, with a suggested target for vaccination (Figure 1). Currently, LHWs self-report their achievement and no technology exists for monitoring vaccinations. Consistent with the large literature on public sector absence, LHWs often fall short of their suggested targets, but rarely report this.

Figure 1. A map used by health workers during Polio vaccination drives.



Besides a record of daily total vaccinations performed by health workers, information about who has received vaccinations and where they were administered is not centralized. This is because identifying which households need vaccinations and where they are located is determined through paper maps and forms, and the consolidation of all that manual information into a central database is a cumbersome process.

Although monitors could investigate the chalk markings health workers leave at every household to show they have been visited, this system in practice provides for no reliable monitoring process. Indeed, many reported vaccinations never actually take place.

Current incentives for health workers are not based on performance. At the beginning of the experiment, the government paid workers only one hundred rupees – about one US dollar – per day regardless of how many vaccines they administer. This flat rate has subsequently been increased to cater to inflation.

The combination of these factors results in uneven vaccinations: some children are immunized several times and others living in

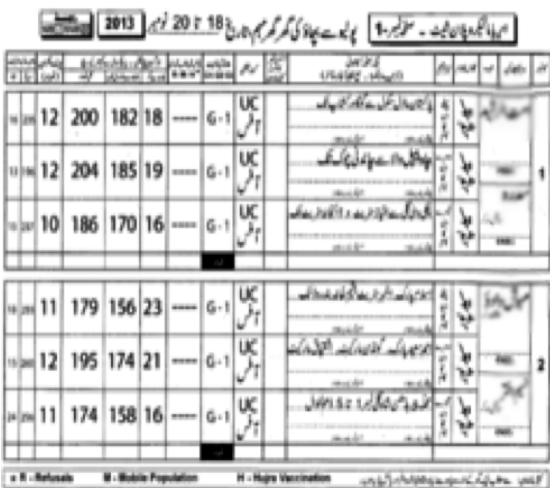
<sup>1</sup>The Global Polio Eradication Initiative. "Wild Polio Virus 2011 -2016". [http://www.polioeradication.org/Portals/0/Document/Data&Monitoring/WPV\\_2011-2016\\_26APR.pdf](http://www.polioeradication.org/Portals/0/Document/Data&Monitoring/WPV_2011-2016_26APR.pdf)

areas hard to access are not vaccinated at all. Better incentives could improve this situation, but the right data is needed before they can work.

The experiment: re-aligning incentives

In both rich and poor countries, pay-for-performance systems that use monetary incentives have proven particularly effective in health care. These systems mandate higher pay for better performance. However, implementing performance pay necessarily requires high-quality, detailed information on performance, which is difficult, or impossible to use when it is recorded on paper (Figure 2) or chalked on the sides of houses.

Figure 2. Forms used by health workers to track Vaccinations



تاریخ	وقت	مکان	حصہ	ملاحظات
12/12/2013	200	182	18	UC
11/12/2013	204	185	19	UC
10/12/2013	186	170	16	UC

تاریخ	وقت	مکان	حصہ	ملاحظات
11/12/2013	179	156	23	UC
12/12/2013	195	174	21	UC
11/12/2013	174	158	16	UC

In collaboration with the Government of Punjab's Department of Health, researchers designed a smartphone-based monitoring system to allow tracking the door-to-door activities of LHWs while performing polio vaccinations. This system would also help determine what incentives provided the best motivation for health workers.

Figure 3. A screenshot of the smartphone



applications used to monitor vaccinations. A total of 505 LHWs were selected to be part of the program, which was tested in Allama Iqbal and Nishtar towns of Lahore over the course of three campaigns. Each LHW in the study was trained to use a smartphone equipped with a vaccination monitoring application (Figure 3).

The LHW was asked to record a set of information related to each vaccination attempt identical to what she had written in the chalk mark. Then she was asked to take a picture of the chalk mark. Data from the smartphone system were aggregated in real-time on a dashboard available to senior health administrators. It provided information on how many children each LHW had vaccinated, the time of the vaccination and the address coded by GPS location.

And in the few cases where parents did not allow their children to be vaccinated, the online dashboard would allow policymakers to identify those households for follow-up.

The experiment also implemented a bonus plus scheme, in which workers were paid more for high performance. They could receive one thousand rupees (about ten dollars) for reaching their targets.

In the first round, the majority of workers were assigned to a smartphone and a bonus plus scheme. Some workers were provided a smartphone but no bonus and the remaining continued to work under existing methods and were treated as a pure control group. All these assignments were made randomly.

Each worker needed to visit 300 households in the first two days of the campaign, but they could set a goal in advance for how many houses they wanted to visit per day. This allowed workers some flexibility over when they performed their vaccinations.

By recording personal goals for the first two days of the campaign, workers could indicate how much they preferred to delay visits from the first day to the second day. Some workers set high targets for the first day, and other workers pushed more vaccinations off to the second day.

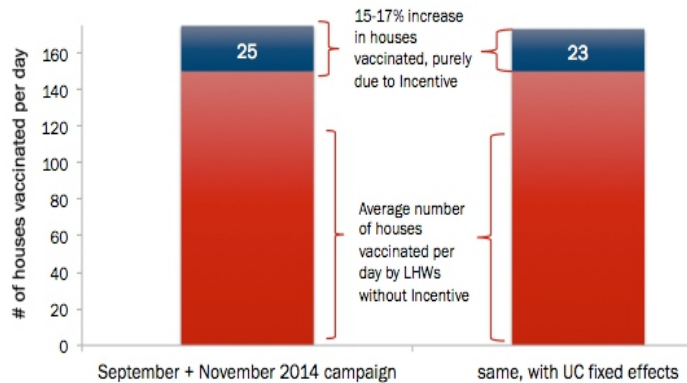
The preliminary findings show that the monetary bonus improved performance. Incentivized workers completed 15 to 17 percent more vaccinations than workers who were not rewarded for performance (Figure 4).

The information on how LHWs set targets from the first round of the campaign was used to design a behavioral incentive scheme tested in the second round. In addition to paying money



for performance, the scheme imposed a penalty for adopting unrealistic goals and an imbalanced schedule of visits across days. The penalty would either add or subtract to the value of a single visit to the total goal of 300 depending on personal preferences.

Figure 4. The impact of bonuses on the total number vaccinations.



For example, if a worker preferred to delay most vaccinations to the second day, those vaccinations were counted less towards the end goal, meaning that she would have to perform far more vaccinations on the second day than she initially preferred. If the incentive worked, she would have taken on more vaccinations on the first day to offset her workload on the second day. By dividing the number of vaccinations across two days more equitably, the LHW would be able to provide smoother and subsequently better quality service. However, regardless of their preferences, as long as they met their targets for both days, the LHWs received a bonus payment.

The results matched the researchers' expectations. Based on data from mobile phones, Figure 5 demonstrates how tailoring incentives according to each LHW's behavior showed less variation per person in the number of vaccinations performed, compared to the group without the tailored incentives. Consequently, the likelihood of LHWs providing smoother services increased by 33%.

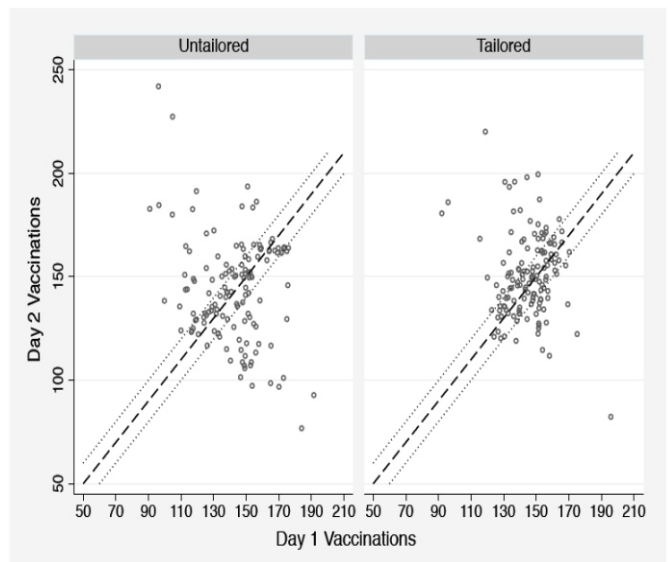
## Way forward

There are multiple demonstrated benefits of this system: worker preferences are balanced to

promote efficiency, the option of a bonus motivates workers to perform well and managers can track workers' progress toward the Health Department's vaccinations goals in real time.

Widespread adoption of these simple tools—just smartphones and apps – could have the following additional benefits:

Figure 5. The impact of incentives tailored to Personal preferences.



1) More vaccination coverage. In upcoming vaccination drives, data collected from smartphones could be used to understand why certain areas remain unvaccinated. A new pay gradient could draw from these results to push workers to cover more neighborhoods.

2) Better incentives. The smartphone system would map out individual tendencies to create well-targeted incentives. Those tendencies can even be utilized for the public's gain.

3) Smarter pay-for-performance schemes. Right now, a number of government programs are using smartphones to monitor employees. These systems could easily be adapted to collect better information so that pay-for-performance schemes can be implemented widely.