

# Data and Policy Decisions: Experimental Evidence from Pakistan

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## Abstract

We evaluate a program in Pakistan that equips government health inspectors with a smartphone app which channels data on rural clinics to senior policy makers. The system led to rural clinics being inspected 74% more often. There is also suggestive evidence of a subsequent 57% increase in doctor attendance from monitoring from a dismal base of 23.7%. In addition, we test whether senior officials act on the information provided by the system. We find that highlighting poorly performing facilities raises doctor attendance by 75%. Our results indicate that technology can mobilize data to real effect, even in low capacity settings.

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# 1 Introduction

Information technology is providing governments across the globe with greater access to data to inform policymaking. Technologies like smartphones and tablets make it simple and cheap to collect, compile, and visualize specialized and timely information relevant to a range of decisions. Increasingly, policymakers no longer need to rely on the collection and aggregation of geographically disparate paper records to understand how their government is operating. They can have this information instantly, and presented in the form that best suits their needs.

But will policymakers use these data? Will activating such technologies improve the quality of service provision? These are complex questions where the capabilities of government personnel, the specific government organization, and the broader political and institutional environment all potentially impact the answers.

To provide evidence on these questions, we conduct a randomized controlled evaluation of a smartphone monitoring program in Punjab, Pakistan. The program—officially termed ‘Monitoring the Monitors’—equips government inspectors with a smartphone application that collects data and feeds it to an online dashboard system. This provides real-time information on rural public health clinics in Punjab, Pakistan, aggregated into simple charts and tables for the review of senior health officials.<sup>1</sup> It also includes several fail-safes to ensure accurate reporting: reports are geo-stamped and time-stamped and all staff reported present must be photographed with the inspector. In this environment, irregular inspections (in our baseline, only 23% of facilities had received their required monthly inspection) and doctor absence (doctors were present at 24% of facilities during regular operating hours in our baseline) are serious issues. The smartphone system supplanted the previous paper-based system for collecting operational data on public health facilities, which rarely functioned.

The evaluation spans 35 of 36 districts in Punjab.<sup>2</sup> Punjab is a province of 100 million

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<sup>1</sup>The data include staff attendance, availability of medicine, patient visits, vaccines provided, cleanliness, and so on.

<sup>2</sup>One district was withheld to pilot the system.

people, with many citizens utilizing public health services. The experiment involved 117 inspectors, 35 senior officers, 2,496 rural health clinics (of which, we sample 850), and took place across 240 different parliamentary assembly constituencies. This scale allows us to cluster randomize at a relevant policy unit – the district.<sup>3</sup> This setting also provides variation to begin to speculatively examine whether individual and institutional constraints are relevant to the performance of the system.

Beyond improving the flow of data, the system also changed the behavior of inspectors. Using data from three rounds of independent audits in rural health facilities over the course of a year, we find that the program increased the inspection rate from 24.5% in control districts to 42.6% in treatment districts.<sup>4</sup>

Suggestive evidence points towards large impacts from increased monitoring on unconditional doctor attendance as well. We find that doctor attendance increases by 12.1 percentage points, or 57 percent, in treatment districts relative to control in the post period, conditional on baseline attendance. This result is only suggestive, however, because it is not robust to empirical specification. Similarly, we find suggestive evidence that this increased doctor attendance is driven by inspections themselves (using treatment as an instrument for attendance) and that it may be driven not by doctors showing up more to work but by more doctors being assigned to serve in rural health clinics.

We also built into the experiment a feature that allows us to examine whether providing senior officials with data changes their behavior. Specifically, if more than three of the seven health workers that are supposed to staff a rural clinic are absent during a health inspection, we ‘flagged’ a facility as underperforming by highlighting it in red on the dashboard.<sup>5</sup> We test for effects on officials’ behavior by examining whether doctor attendance increases in

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<sup>3</sup>Indeed, at the conclusion of the evaluation, the system was scaled to cover the province and continues to operate.

<sup>4</sup>The standard error of the difference clustered at the district level is 6.6 percentage points. With 35 clusters, asymptotic reference distributions may not be valid, so we also use Fisher exact tests which do not appeal to asymptotic distributions. The fisher exact p-value of the difference is 0.001.

<sup>5</sup>We selected the threshold of three as this gave us the largest mass of inspections and so afforded the most statistical power.

flagged facilities. We find that flagging increases doctor attendance from 23.6% to 41.3% (standard error of difference = 8.2 percentage points), while it has no effect on the attendance of other, less senior, clinic staff. We interpret this as evidence that policymakers use data when making decisions.

We present two results supporting our interpretation of the ‘flagging’ effect. First, we check whether the result is simply due to mean reversion using alternative placebo cutoffs for flagging. We only find an effect on attendance at the threshold where facilities are actually flagged as underperforming. Second, examine the timing of the response in doctor attendance to dashboard flagging. The timing is consistent with a bureaucrat looking at a dashboard once a week and then calling his or her subordinates to encourage better attendance.

Last, we investigate two dimensions of heterogeneity for flagging effects. First, we find that attendance responds more to flagging when the information is channeled to senior health officials with normatively better personality measures as measured using the Big Five Personality Test and the Perry Public Sector Motivation battery. Second, we find smaller effects in less politically competitive parliamentary constituencies. While speculative, these results suggest that both intrinsic and extrinsic forces are important factors in determining the extent to which senior bureaucrats might act on new information.

Our study principally concerns the potential for information technology and data to increase accountability and improve policy (Duflo et al., 2012; Blum and Pande, 2015; Callen and Long, 2015; Callen et al., 2016; Nealer et al., 2017), but relates to three additional literatures. The first regards whether monitoring of government workers improves attendance (Banerjee and Duflo, 2006; Banerjee et al., 2008; Chaudhury et al., 2006; Dhaliwal and Hanna, 2017). The second broadly studies incentives in bureaucracies in developing countries (Ashraf et al., 2014, 2015; Bertrand et al., 2017; Dal Bó et al., 2013; Deserranno, 2017; Finan et al., 2017; Gulzar and Pasquale, 2017; Khan et al., 2016; Rogger and Rasul, forthcoming; Xu, 2017). The final involves experiments at scale (Muralidharan et al., 2016; Muralidharan and Niehaus, 2017).

The paper proceeds as follows. Section 2 provides background on the ‘Monitoring the Monitors’ program. Section 3 describes the data and the experiment. Section 4 provides results, and section 5 concludes.

## 2 Background

### 2.1 Public Health Services in Punjab

In Punjab, public health services are provided by the Department of Health, headquartered in Lahore and headed by the Secretary of Health. The provincial Department of Health comprises 36 District Health Departments, each headed by an Executive District Officer, hereafter referred to as ‘senior health officials’, who report directly to the Secretary. It is straightforward for the Secretary to hold senior health officials accountable for service delivery. Performance by senior health officials is also commonly rewarded with appointment to a higher office. These officials each oversee public health services affecting several million people. In this paper, we explore whether they, specifically, respond to performance data from the facilities they oversee.

Senior health officials are each supported by several Deputy District Officers, hereafter referred to as ‘health inspectors’, typically one for each sub-district (there are, on average, 3.4 sub-districts per district). Health inspectors are charged with inspecting all of the health facilities in their sub-district at least once every month. Indeed, they are almost exclusively tasked with inspections. There are five classifications of health facilities; we focus on the frontline tier, called Basic Health Units, hereafter referred to as ‘health clinics’. There are 2,496 such health clinics in Punjab, almost all of which operate in rural and peri-urban areas.<sup>6</sup> Health clinics typically consist of a only a few rooms. They provide several basic services, including outpatient treatments, neonatal and reproductive healthcare, and vaccinations. Each health clinic is headed by a doctor, known as the Medical Officer, who is supported

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<sup>6</sup>Each health clinic serves one Union Council, which is the smallest administrative unit in Pakistan.

by a Dispenser, a Lady Health Worker, a Health Technician, a School Health and Nutrition Supervisor, a Computer Operator, and a Midwife. Officially, health clinics are open from 8am to 2pm, Monday through Saturday.<sup>7</sup>

Unlike their superiors, health inspectors rarely ascend to higher leadership positions. And, while they are neither officially or practically accountable for service delivery in the same way that senior health officials are, they do have the authority to punish absent clinic staff by issuing a ‘show-cause notice’, which requires staff to explain their absence to senior health officials. They can also suspend and deny pay to contract staff, including doctors. In severe cases of persistent absence, staff can also be transferred to less desirable locations, but almost never fired.

Medical Officers are of particular interest for this study. These doctors are general practitioners who have completed five years of medical school, and are therefore the most trained health professionals in rural areas. Doctors are either hired centrally as permanent employees of Punjab’s Department of Health, or they are hired at the district level on a contractual basis by a senior bureaucrat. While doctors receive higher income with rising seniority, their portfolio of duties does not usually increase significantly. Very few doctors rise through the ranks to become health inspectors: compared to the 2,496 Medical Officer posts in clinics, there are only 123 such senior positions. Figure 1 depicts this simplified health administration hierarchy in Punjab.

## **2.2 Pre-existing Paper-Based Monitoring System**

During their required monthly inspections, health inspectors are required to collect information on a standard paper form. This form records utilization, resource availability, and worker absence. We provide this form in Appendix B.<sup>8</sup> Once collected, forms are brought to

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<sup>7</sup>Medical Officers, Dispensers, Computer Operators, and Health Technicians are all supposed to be at the clinic during operating hours, while Midwives, Lady Health Workers, and School Health and Nutrition Specialists are typically traveling to provide services. Some clinics also have additional Midwives and Lady Health Workers.

<sup>8</sup>Appendix A reports ancillary results.

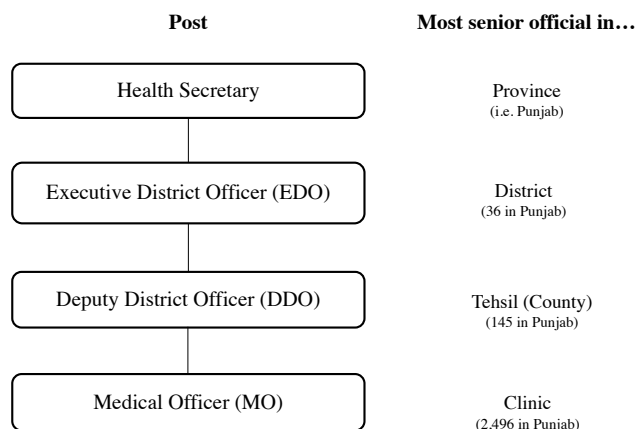


Figure 1: Organization Chart for the Punjab Department of Health

a central district facility, manually entered into a spreadsheet, and aggregated into a monthly report for senior health officials.

This inspection system affords only limited visibility into inspectors’ activities to senior officials. Compounding this problem, senior health officials have only two weak means of sanctioning an inspector: issuing a verbal reprimand or, in serious cases, sending a written request for investigation to provincial authorities. The investigation process is long, highly bureaucratic, and, anecdotally, prone to interference by elected politicians.

### 2.3 ‘Monitoring the Monitors’ Smartphone Monitoring Program

We partnered with the Department of Health to design and experimentally evaluate the ‘Monitoring the Monitors’ program. This program replaced the existing paper-based monitoring system with an Android-based smartphone application, which collects the same data as the paper forms and transmits them instantly to a central online dashboard for the Secretary of Health and senior health officials.<sup>9</sup> The dashboard provides summary statistics,

<sup>9</sup>Appendix C provides the training manual for the mobile application provided to inspectors and Appendix D provides the training manual provided to senior health officials to assist them in using the dash-



charts, and graphs in a format designed in collaboration with senior health officials. Inspections are geotagged, timestamped, and require photos of the inspector and all health clinic staff marked present to check for reliability. The geotagging and timestamping features are designed to ensure inspectors visit health clinics while the staff photos are intended to ensure that the digital reports of staff attendance are accurate.

Figure 2, Panel A, depicts the view of the dashboard that the Secretary of Health sees when first logging on. It presents a bar chart giving the number of health clinic inspections conducted in a district as a proportion of number of inspections assigned that month, allowing the Secretary to compare performance across districts. Panel B provides an alternate view available to senior health officials—a summary spreadsheet where each row corresponds to a different health clinic inspection that occurred a senior health official’s district.

In Section 3.2, we provide full details of our experimental evaluation of the ‘Monitoring the Monitors’ program. Our design allows us to estimate the effect of the reform on health clinic inspections and on doctor attendance, and, separately, the effect of providing information to senior health officials via the dashboard.

## 3 Data and Experiment

### 3.1 Data

To measure the impacts of our smartphone monitoring on health clinic inspections and doctor attendance, we collected primary data on a representative sample of 850 (34%) of the 2,496 health clinics in Punjab.<sup>10</sup> All districts in Punjab except Khanewal are represented in our data.<sup>11</sup> To our knowledge, this is the first representative survey of health clinics in Punjab. Figure 3 provides a map of the health clinics in our experimental sample along with district board.

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<sup>10</sup>Health clinics were selected randomly using an Equal Probability of Selection (EPS) design, stratified on district and distance from the district headquarters. Our estimates of performance are thus self-weighting, and no sampling corrections are used in the analysis.

<sup>11</sup>The smartphone technology was piloted in Khanewal.

Panel A: Summary of Health Clinic Inspection Compliance by District  
 Health Department, Government of Punjab

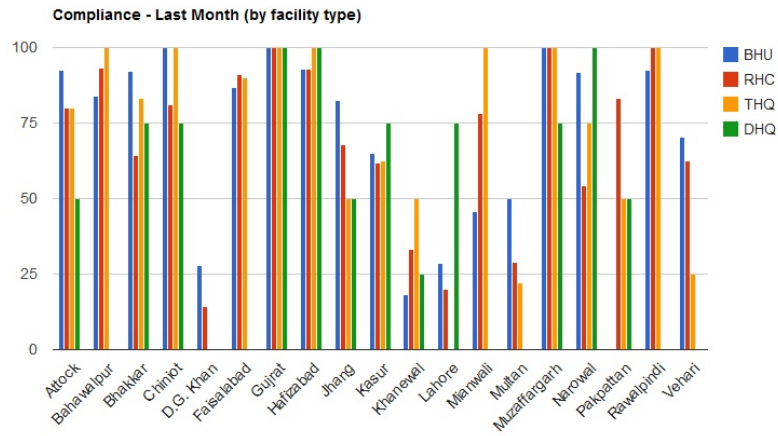


Compliance Status Facility Status Recent Visits Indicators Time Trend Charts Photo Verification Map Change Password Logout

You are currently viewing  (Please click to change view) [Print](#)

### Officer Compliance Report

Officers are required to make the assigned number of visits to facilities in each calendar month. If the number of facilities is less than the assigned number of visits, the officer should repeat visits to some facilities to complete the quota of visits. [View Detailed Report](#)



Panel B: Summary of Health Clinic Inspections within a District

Compliance Status Facility Status **Recent Visits** Indicators Time Trend Charts Photo Verification Map Change Password Logout

You are currently viewing  (Please click to change view) [Print](#)

### Recent Facility Visits

Visits highlighted indicate significant staff absence.

BHU RHC THQ DHQ

Filter by Period   [Clear Filter](#)

Showing all entries

Displaying 1-30 of 734 result(s).  
 Go to page: < Previous 1 2 3 4 5 6 7 8 9 10 Next >

| Facility      | Tehsil     | Visiting Officer       | Date       | MO                  | Other Absent Staff    | Report Summary |
|---------------|------------|------------------------|------------|---------------------|-----------------------|----------------|
| BHU KANI      | JAND       | DDO Jand               | 2012-07-11 | Absent              | LHV, SHNS,            |                |
| BHU BHANGAI   | HAZRO      | DDO Hazro              | 2012-07-11 | Present             | Computer operator,    |                |
| BHU HAJI SHAH | ATTOCK     | DDO Attock/Hassanabdal | 2012-07-11 | Present             |                       |                |
| BHU TRAP      | JAND       | DDO Jand               | 2012-07-11 | Present             | Dispenser, LHV, SHNS, |                |
| BHU DHURNAL   | FATEH JANG | DDO Fateh Jang         | 2012-07-11 | Present             | Computer operator,    |                |
| BHU DAKHNAIR  | ATTOCK     | DDO Attock/Hassanabdal | 2012-07-11 | Present             |                       |                |
| BHU SOJANDA   | ATTOCK     | DDO Attock/Hassanabdal | 2012-07-11 | Position Not Filled | Dispenser,            |                |
| BHU SHAMSABAD | HAZRO      | DDO Hazro              | 2012-07-11 | Present             | Computer operator,    |                |

Figure 2: Online Dashboard Screenshots

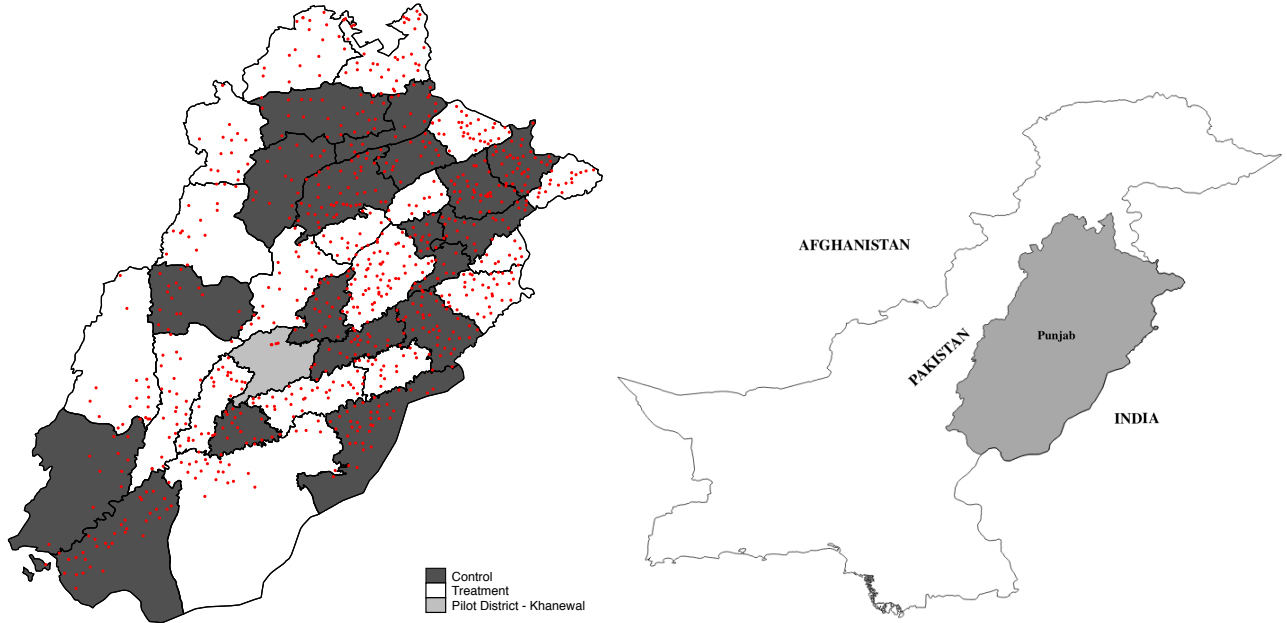


Figure 3: Locations of Health Clinics Surveyed

*Notes:* Borders demarcate districts in Punjab.

boundaries.

Enumerators made three unannounced visits to these 850 health clinics: one before smartphone monitoring began, in November 2011, and two after smartphone monitoring began (in treatment districts), in June and October 2012.<sup>12</sup> Surveys took three weeks to field in each wave.

During these unannounced visits, enumerators collected the same information that health inspectors record—information on health clinic utilization, resource availability, and worker absence—as well as information on the occurrence of health clinic inspections themselves. Enumerators physically verified health clinic staff presence, filling out an attendance sheet at the end of their visit and in private for doctors as well as dispensers, lady health workers, health/medical technicians, school health and nutrition supervisors, and midwives.<sup>13</sup>

<sup>12</sup>Our survey teams were trained by senior enumerators and our team members at four regional hubs. Following these trainings, the teams made visits to health clinics in their assigned districts and remained in regular contact with their team leaders and our research team.

<sup>13</sup>Doctors are officially required to be present and see patients at the health clinic. An unannounced visit therefore captures the official work assigned to doctors. We did not capture data on computer technicians as they are rarely assigned.

Health inspectors record visits by signing paper registers maintained at the health facility. Enumerators measured whether a health inspection occurred in the prior month by interviewing facility staff and verifying the register record.<sup>14</sup> Data collection and entry followed back-checks and other validation processes consistent with academic best practice. Summary statistics from unannounced audits at baseline are presented in Appendix Table A1.

We also conducted face-to-face time use surveys with all health inspectors in Punjab between February and March 2013. During the survey, inspectors listed the time they spent on a variety of tasks during the two working days prior to our survey.<sup>15</sup>

## 3.2 Experiment

Our experimental sample comprises 35 of the 36 districts in Punjab. We remove Khanewal from the experimental sample as that district served as the location for our pilot. We randomly implemented the smartphone program in 18 of the 35 remaining districts. We randomized at the district level for two reasons. First, the intervention channels information about health inspections to district-level senior health officials. Second, all inspectors in a district are required to attend monthly meetings and so interact frequently, while these relations are much weaker across districts. District-level randomization therefore makes sense in terms of the design of program and also reduces concerns about contamination.

We stratified treatment on baseline health clinic staff attendance, the number of clinics in a district (to ensure a roughly even number of clinics in treatment and control), and whether or not the district was being run by the World Bank-led Public Sector Reform Program (PSRP). Figure 3 depicts control and treatment districts. We then re-randomized to achieve

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<sup>14</sup>In some cases enumerators were unable to confidently verify whether or not an inspection had occurred in the prior month. We treat such cases as missing data for analysis and verify in Appendix Table A1 that such cases do not correlate with treatment assignment. In addition, this variable is missing on average 9.7 percent in post-treatment periods and the attrition is not correlated with treatment ( $p=0.6$ ).

<sup>15</sup>Inspectors picked up to three out of 10 possible categories of work to account for each hour between 8am and 6pm. In addition, they were asked to identify when they arrived for, and left from work. We also collected additional information from health inspectors during these interviews, and we also interviewed doctors and senior health officials across our sample through similar face-to-face interviews. We will briefly discuss some of the other data collected through these interviews in Section 4.4.2 below.

balance on a set of variables related to health clinic staff attendance, the frequency of health inspections, and the quality of service provision.<sup>16</sup>

Appendix Table A1 reports balance between clinics in treatment and control districts at the baseline. The only measure showing imbalance is an indicator for doctor presence during our unannounced visit.<sup>17</sup> While stratifying on the share of staff present at baseline achieved balance for five of the six categories of staff that are supposed to be present at health clinics, it did not do so for doctors. We therefore use a difference-in-differences specification to estimate impacts of the program on doctors. Appendix Figure A1 reports a long time series of administrative data on doctor attendance from paper records, showing that these trends were parallel in the pre-treatment period.

## 4 Results

We now present results from our experimental evaluation of the ‘Monitoring the Monitors’ program. We estimate treatment effects on health inspection rates and on health inspector time use with the following specification:

$$Y_{itds} = \alpha + \beta Treatment_d + \varepsilon_{itds}, \quad (1)$$

where  $Y_{itds}$  is either a dummy equal to one for health clinics inspected in the previous month or a measure of health inspector time use.  $i$  refers to the clinic,  $t$  to the survey wave,  $d$  refers to the district, and  $s$  to the randomization stratum that the district was in.  $Treatment_d$  is

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<sup>16</sup>Specifically, we randomized using the ‘big stick’ approach, whereby we redrew our treatment assignment until the minimum p-value from difference in means tests between health clinics in treatment and control districts for a pre-specified set of balance variables was greater than some threshold. In our case we selected a threshold of 0.21. We balanced on the share of assigned health clinic staff who were present during the baseline unannounced visit, whether the health clinic had been inspected in the previous month by its health inspector, whether the health clinic had been inspected in the previous month by its senior health official, the number of antenatal visits recorded on the health clinic register in the previous month, the log of the number of polio vaccines administered at the health clinic in the previous month, whether the health clinic’s doctor claimed a connection to their local parliamentarian, the tenure of the health clinic’s doctor, the log of the population in the health clinic’s catchment area, and the log of the distance of the health clinic to the district’s headquarters.

<sup>17</sup>Treatment districts at baseline have 17.1 percentage point higher doctor attendance (p-value = 0.003).

a dummy variable equal to 1 for treated districts. These regressions use only post-treatment data (survey waves 2 and 3). We cluster all standard errors at the district level.

We estimate treatment effects on health clinic staff attendance and assignment using three specifications, all meant to account for baseline imbalances in our primary outcomes (which are only present and statistically significant for our measure of doctor absence). First, we use a difference-in-differences specification:

$$Y_{itds} = \alpha + \beta_1 Treatment_d + \beta_2 Post_t + \beta_3 Treat_d * Post_{dt} + \delta_t + \gamma_i + \varepsilon_{itds}, \quad (2)$$

where  $Y_{itds}$  is now either a dummy for whether a health clinic staff member is present during our announced visits or a dummy for whether a staff member is currently assigned to work at a health clinic at the point of our unannounced visits,  $\delta_t$  are survey wave fixed effects and  $\gamma_i$  are clinic fixed effects. Second, we use our primary treatment effect specification, equation 1, with adding  $Y_{i0ds}$ , the baseline level of the outcome, to the set of covariates in the regression. Third, we estimate:

$$Y_{itds} = \alpha + \beta Inspected_d + \varepsilon_{itds} \quad (3)$$

where we instrument for whether a facility was inspected in the prior month using our treatment assignment.<sup>18</sup>

## 4.1 Approach to Inference

With only 35 districts in our sample, the asymptotic reference distributions for our test statistics may be invalid. We therefore report Fisher exact p-values (Fisher, 1935) which do not require a limiting distribution (Gerber and Green, 2012). This test assumes a null of no treatment effect for any unit. We perform this test by creating a set of artificial treatment assignments that satisfy the balancing requirements of the assignment protocol for actual

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<sup>18</sup>Tables A3 and A4 therefore report the first stage of this regression.

Table 1: The Effect of Smartphone Monitoring on the Rate of Inspections

|   | Treatment<br>(1) | Control<br>(2)   | Difference<br>(3) | P-value<br>Mean Diff.<br>(4) | P-value<br>Exact Test<br>(5) |
|---|------------------|------------------|-------------------|------------------------------|------------------------------|
| Facility Inspected in the Previous Month (=1)       | 0.426<br>(0.048) | 0.245<br>(0.046) | 0.181<br>(0.066)  | 0.010                        | 0.001                        |
| # of Observations                                   | 759              | 764              |                   |                              |                              |
| Facility Inspected (=1), Wave 2 Only (June 2012)    | 0.519<br>(0.063) | 0.255<br>(0.048) | 0.264<br>(0.079)  | 0.002                        | 0.003                        |
| # of Observations                                   | 366              | 373              |                   |                              |                              |
| Facility Inspected (=1), Wave 3 Only (October 2012) | 0.338<br>(0.053) | 0.235<br>(0.059) | 0.103<br>(0.079)  | 0.200                        | 0.065                        |
| # of Observations                                   | 393              | 391              |                   |                              |                              |

*Notes:* This table reports unconditional average treatment effects of the ‘Monitoring the Monitors’ program on the rate of health clinic inspections. The unit of observation is the health clinic. The data come from primary unannounced surveys after the treatment was launched (wave 2 and 3). The dependent variable is an indicator variable that equals 1 if an inspector visited a clinic within a month prior to the survey, and 0 otherwise. The regression reports differences between treatment and control clinics. P-values reported in column (4) are for the difference in mean between columns (1) and (2) (i.e. that the treatment had no impact). Column (5) reports the Fisher Exact p-values. Standard errors clustered at the district level are reported in parentheses. Results conditional on randomization strata fixed effects, using a difference-in-differences specification, with and without baseline controls, can be found in Appendix Tables A3 and A4.

treatment. For each treatment assignment, a corresponding artificial treatment effect is generated. The effect estimated using the actual treatment assignment is then compared against the 1,000 artificial treatment effect estimates. The p-value is the share of artificial treatment effects that have a larger magnitude than the actual treatment effect.

## 4.2 Impact on Health Inspectors

Table 1 presents estimates of the program’s impact on the rate of inspections. We find that health clinics in treatment districts were 18.1 percentage points more likely to be inspected in the previous month during the treatment period. This represents a 74 percent increase in inspection rates in treatment districts relative to control districts. Breaking this up into the two waves of post-treatment data collection, we find comparable effects, though there is evidence that the effect of treatment had attenuated by October 2012, a year after the introduction of the program.<sup>19</sup>

We examine whether the additional time for inspections come at the costs of other tasks (although inspectors are almost exclusively tasked with performing inspections). Appendix

<sup>19</sup>The p-value corresponding to the test of equal treatment effects in wave 2 and in wave 3 is 0.08.

Table A2 reports the monitoring program’s impact on the time use of health inspectors. We do not find any evidence that health inspectors in treatment districts are spending less time on other tasks after treatment, while they do seem to be spending more time inspecting health clinics. However, we treat these results speculatively, as we only have a sample of 117 inspectors and a noisy measure of time use.

### 4.3 The Impact on Health Clinic Staff

Our estimates indicate that the program increased health inspections; this could increase health clinic staff attendance (an explicit goal of the program). We report estimates of program impact on staff attendance in Table 2. Panels A and B report impacts using a difference-in-differences specification. Panel C reports results using a average treatment effects regression controlling for baseline attendance.<sup>20</sup> Panel D reports a two-stage least squares estimate of the impact of a health facility being inspected on staff attendance, instrumenting for inspection with treatment. We find mixed results here—we find no impacts of monitoring on staff assignment in Panels A and B and we find large, positive, and significant impacts on doctor attendance in Panels C and D. Given that our results are not robust to specification, we treat this as suggestive evidence that monitoring and associated increases in health inspections did lead to greater doctor attendance. In contrast to subsequent doctor attendance however, attendance for other staff does not respond to treatment regardless of specification. One reason for this could be, speculatively, that attendance for other staff is much higher at baseline compared to doctors. Doctors are also in-charge of the facilities so it makes sense that they are the ones to respond to facility monitoring. Finally, some staff, like the School Health and Nutrition Supervisor and Lady Health Workers, have their primary job outside of the specific facility where attendance was audited. Their attendance in the clinic is therefore unlikely to be affected by these reports.

Note our measures of staff attendance are unconditional on staff assignment to facilities

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<sup>20</sup>We do not present results not controlling for baseline attendance as we have a large imbalance in doctor attendance between treatment and control districts at baseline, as reported in Appendix Table A1.



Table 2: The Effect of Smartphone Monitoring on Clinic Staff Attendance

|   | Doctor<br>(1)                 | Dispenser<br>(2)             | Lady Health<br>Visitor<br>(3) | Health<br>Tech<br>(4)        | School Health<br>Nutri. Supervisor<br>(5) | Midwife<br>(6)              |
|---|-------------------------------|------------------------------|-------------------------------|------------------------------|---|-----------------------------|
| <b>Panel A: Difference in Differences with Survey Wave FE</b>             |                               |                              |                               |                              |   |                             |
| Monitoring  | -0.018<br>(0.043)<br>[0.692]  | -0.064<br>(0.061)<br>[0.945] | -0.080<br>(0.053)<br>[0.990]  | 0.030<br>(0.058)<br>[0.511]  | 0.012<br>(0.072)<br>[0.537]               | 0.055<br>(0.065)<br>[0.435] |
| Mean in Controls  | 0.227                         | 0.736                        | 0.594                         | 0.413                        | 0.318                                     | 0.535                       |
| # Districts   | 35                            | 35                           | 35                            | 35                           | 35  | 35                          |
| # Observations  | 2422                          | 2457                         | 2457                          | 2458                         | 2448                                      | 2448                        |
| R-Squared   | 0.032                         | 0.003                        | 0.005                         | 0.004                        | 0.004                                     | 0.002                       |
| <b>Panel B: Difference in Differences with Survey Wave + Facility FEs</b> |                               |                              |                               |                              |   |                             |
| Monitoring  | -0.010<br>(0.043)<br>[0.645]  | -0.067<br>(0.059)<br>[0.968] | -0.075<br>(0.054)<br>[0.942]  | 0.028<br>(0.059)<br>[0.465]  | 0.013<br>(0.072)<br>[0.701]               | 0.055<br>(0.064)<br>[0.386] |
| Mean in Controls  | 0.228                         | 0.736                        | 0.596                         | 0.413                        | 0.318                                     | 0.537                       |
| # Districts   | 35                            | 35                           | 35                            | 35                           | 35  | 35                          |
| # Observations  | 2408                          | 2446                         | 2446                          | 2447                         | 2437                                      | 2437                        |
| R-Squared   | 0.533                         | 0.464                        | 0.447                         | 0.552                        | 0.398                                     | 0.512                       |
| <b>Panel C: Baseline Control with Survey Wave FE</b>                      |                               |                              |                               |                              |   |                             |
| Monitoring  | 0.121**<br>(0.048)<br>[0.009] | 0.001<br>(0.055)<br>[0.688]  | -0.026<br>(0.037)<br>[0.810]  | -0.007<br>(0.054)<br>[0.775] | 0.008<br>(0.066)<br>[0.564]               | 0.008<br>(0.072)<br>[0.706] |
| Mean in Controls  | 0.215                         | 0.746                        | 0.601                         | 0.427                        | 0.301                                     | 0.533                       |
| # Districts   | 35                            | 35                           | 35                            | 35                           | 35  | 35                          |
| # Observations  | 1548                          | 1579                         | 1579                          | 1581                         | 1568                                      | 1566                        |
| R-Squared   | 0.089                         | 0.013                        | 0.017                         | 0.070                        | 0.009                                     | 0.055                       |
| <b>Panel D: IV with Baseline Controls and Survey Wave FE</b>              |                               |                              |                               |                              |   |                             |
| Inspected   | 0.664*<br>(0.381)<br>[0.000]  | -0.091<br>(0.307)<br>[0.555] | -0.214<br>(0.219)<br>[0.976]  | -0.033<br>(0.319)<br>[0.604] | 0.050<br>(0.359)<br>[0.449]               | 0.094<br>(0.383)<br>[0.322] |
| Mean in Controls  | 0.275                         | 0.765                        | 0.571                         | 0.422                        | 0.304                                     | 0.521                       |
| # Districts   | 35                            | 35                           | 35                            | 35                           | 35  | 35                          |
| # Observations  | 1437                          | 1468                         | 1468                          | 1470                         | 1458                                      | 1458                        |
| R-Squared   | -0.313                        | 0.014                        | -0.043                        | 0.061                        | 0.006                                     | 0.043                       |

*Notes:* This table reports average treatment effects of the ‘Monitoring the Monitors’ program on the staff attendance using a difference-in-differences specification. The unit of observation is the clinic, and data come from primary unannounced surveys after the treatment was launched. The dependent variable is an indicator for whether a doctor was present at the clinic during an announced visit. Standard errors clustered at the district level are in parentheses. Square brackets report the Fisher Exact p-values.

as staff assignment itself could be impacted by treatment. We therefore test for treatment effects on doctor assignment directly in Appendix Table A5, with the same set of Panels as our attendance results. We again find mixed results, with weak evidence that doctor assignment is indeed higher, and by a similar magnitude as the increase in doctor attendance, in treatment districts. This would suggest that the mechanism for increased doctor attendance is through senior health officials assigning more doctors to work in rural health clinics. This

is very plausible, possibly due to increased monitoring of senior health officials’ district performance through the web dashboard or simply due to these officials having easier access to information about doctor assignment in their district.<sup>21</sup>

#### 4.4 Do Policy Makers Use Data on Staff Attendance?

The system aggregates and presents data to senior health officials through an online dashboard. In addition to these officials, this dashboard is visible to the Health Secretary and the Director General of Health for Punjab.

To test whether senior health officials would act on these data, we introduced a manipulation to the dashboard that made certain health clinic inspection reports salient. Specifically, we highlighted in red inspection reports that reported three or more staff (of 7 generally) as absent during a health inspector’s visit to the clinic. Figure 2 Panel B provides an example of a dashboard view with some facilities highlighted in red. The exact formula for this arbitrary threshold was not known to anyone but the research team.

We examine whether this manipulation within treated districts affected subsequent doctor absence in our primary data with the following specification:

$$Present\ Survey_{jt} = \alpha + \beta_1 Flagged_{jt-1} + \delta_t + \eta_{jt} \quad (4)$$

*Present Survey<sub>jt</sub>* is a dummy variable equal to 1 if the doctor *j* was absent during an unannounced visit by our enumerator in wave *t*, *Flagged<sub>it-1</sub>* is a dummy variable that equals 1 if the facility was flagged in red on the dashboard in a window of time prior to the primary survey wave *t*.

Selecting the window for which *Flagged<sub>it-1</sub>* is equal to 1 involves trade-offs and provides us substantial discretion in the analysis. We expect it would take at least a few days for senior officials to acknowledge and act on data from the dashboard. Practically, they need to receive

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<sup>21</sup>We attempted to obtain detailed doctor assignment records from the Health Department on multiple occasions and it was clear there was no regular system for keeping track of doctor assignment at this time.

the report that a clinic is underperforming, and then communicate their dissatisfaction to clinic personnel. Senior officials have a number of tools to reprimand clinic staff, with verbal warnings being by far the most common. Staff then need to react and change their behavior. This process will require at least a few days to play out, but should not take more than a few weeks. Also, practically, if the window for which  $Flagged_{it-1}$  is set to 1 is too long, virtually every facility will become flagged, limiting the variation with which to estimate effects. We therefore present estimates of the effect on doctor attendance for a broad number of potential time windows.

Specifically, we run the regression from equation (3) 750 times, varying the window for which we define a clinic as flagged prior to a primary unannounced visit to a clinic along two dimensions—we vary the length of the window being used along the x-axis and the delay from when a clinic is highlighted in red to when the window begins along the y-axis (so for example, a length of 25 and delay of 15 corresponds to considering a clinic as flagged if it was highlighted in red anytime 15 to 40 days prior to an unannounced visit).

We observe a positive, robust, and significant treatment effect of flagging on doctor attendance across a wide range of windows, depicted in the top left panel of Appendix Figure A2. At our preferred window, reported in Table 3, doctor attendance subsequent to flagging on the dashboard increases by 17.7 percentage points or about 75 percent.<sup>22</sup> Conversations with government partners suggest that the most likely driver of this effect is verbal reprimands from senior health officials to doctors in-charge of clinics.

Like our primary treatment results on staff attendance, attendance for other staff does not respond to dashboard flagging. This is likely due to the same reasons cited above: attendance for other staff is much higher at baseline compared to doctor; doctors are also in-charge of the facilities so it makes sense that they are the ones to respond to facility monitoring; and some staff, like the School Health and Nutrition Supervisor and Lady Health Workers, have

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<sup>22</sup>Note that this positive result cannot be directly compared to the estimated average treatment effect of ‘Monitoring the Monitors’ on doctor attendance. To detect the effect of flagging we are limiting our sample to treatment facilities only (those that could be flagged on the dashboard) that were right below or above the staff absence cutoff for flagging.

Table 3: Effect of Flagging Underperformance on the Dashboard

|                        | Doctor<br>(1)    | Dispenser<br>(2) | LHW<br>(3)        | Health Tech<br>(4) | SHNS<br>(5)       | Midwife<br>(6)    |
|------------------------|------------------|------------------|-------------------|--------------------|-------------------|-------------------|
| Flagged                | 0.177<br>(0.082) | 0.076<br>(0.083) | -0.115<br>(0.090) | -0.066<br>(0.092)  | -0.037<br>(0.093) | -0.125<br>(0.091) |
| Unflagged Mean         | 0.236            | 0.676            | 0.703             | 0.405              | 0.324             | 0.568             |
| # Clinics              | 112              | 116              | 116               | 116                | 116               | 116               |
| # Reports              | 130              | 136              | 136               | 136                | 136               | 136               |
| R-Squared              | 0.298            | 0.258            | 0.190             | 0.264              | 0.176             | 0.242             |
| District Fixed Effects | Yes              | Yes              | Yes               | Yes                | Yes               | Yes               |

*Notes:* This table reports on the effect on subsequent doctor attendance of flagging on an online dashboard the fact that a clinic had three or more staff absent to a senior policymaker. Clinics were flagged in red on an online dashboard if three or more of the seven staff were absent in one or more health inspections of the clinic 11 to 25 days prior to an unannounced visit by our survey enumerators. The Discontinuity sample limits to facility reports in which either two or three staff were absent (the threshold to trigger the underreporting red flag). In addition, the sample in all columns is limited to 'Monitoring the Monitors' treatment districts due to the necessity of the web dashboard for flagging clinics. All regressions include survey wave fixed effects. LHWs are Lady Health Workers and SHNS are School Health and Nutrition Supervisors. Standard errors clustered at the clinic level reported in parentheses.

their primary job outside of the specific facility where attendance was audited.

#### 4.4.1 Robustness of 'Flagging' Results

An alternative explanation for the effect of the dashboard would be simple mean reversion. If a facility is underperforming in one month, it might be less likely to do so in a subsequent month. We check this in Appendix Figure A3 where we use placebo thresholds between one and two and three and four absences. There is no clear evidence of an effect at placebo thresholds.

Flagging effects materialize approximately 10-20 days after the reports are first filed on the online dashboard. Throughout the project, we interacted with bureaucrats using the dashboard. They indicated very consistently that they would review the dashboard approximately once a week. A 10 day response is consistent with a manager checking about once a week and then demanding action from their subordinates. We therefore did not expect that attendance would respond immediately. That we only find effects in an intermediate window of a reasonable length is consistent with our explanation of how the dashboard was

used: actions by senior officials and subsequent responses by doctors require time rather than through simple mean reversion. These results can be found on the top left panel of Appendix Figure A2.

#### 4.4.2 Heterogeneity of ‘Flagging’ Results

Whether dashboards affect service delivery reasonably depends not only on the abilities of government personnel but also on the broader political environment. We now examine two sources of heterogeneity, taking advantage of the scale of our experiment.

First, a growing literature documents the role of individuals in public service delivery across the developing world, summarized in Finan et al. (2017). We examine whether personality characteristics of the health officials in our study predict their response to information. To do this, we measured personality characteristics—the Big Five Personality Index and the Perry Public Service Motivation Index—of all of the senior health officials in Punjab. We present results in Table A6. We find that personality characteristics systematically predict responses by senior health officials to our dashboard experiment, as measured by future doctor attendance in flagged facilities: a one standard deviation increase in the Big 5 Personality Index of senior bureaucrats increases the effect of flagging on the likelihood that doctor is present at the clinic during a subsequent unannounced visit by 28 percentage points. We see a similar, though smaller and statistically insignificant, point estimate for the interaction with Public Service Motivation. Of course, these results are merely predictive as we do not have identifying variation in personality traits. In Callen et al. (2017a) we explore this dimension of heterogeneity in greater detail.

Second, we explore whether measures of political competition predict flagging effects. The bureaucrats we worked with to create the program felt strongly that the program would break down when politicians interfered with senior officials’ attempts to sanction their subordinates. Indeed, in our surveys, senior health officials report that politicians routinely interfere in this

way.<sup>23</sup> We match each clinic in our sample to a provincial assembly constituency and study if the treatment effect of flagging on doctor attendance varies by the degree of competitiveness in the previous election. Table A7 presents the results. We find that while flagging increases subsequent attendance by 35.9 percentage points in the most politically competitive third of constituencies, flagging has no apparent effect in the least competitive third. In addition, flagging works better on doctors who do not report a direct connection with a local politician. Indeed, the point estimates, though noisy, suggest the program may have negatively affected attendance of connected doctors. In Callen et al. (2017b) we examine in greater detail the extent to which these political moderators affect the efficacy of the Monitoring the Monitors program.

## 5 Discussion and Conclusion

A fundamental objective of policy research is to convey facts and data to policy makers. We find that providing senior health officials with information on low staff attendance causes them to take corrective action, indicating that data can change how policy makers behave, even in settings with weak institutions. This suggests two additional general lines of inquiry.

First, our test of whether information affects policy decisions is direct. For our senior officials, who are tasked with responsibilities that affect millions, ensuring the functioning of frontline service facilities is a priority. A natural question is whether we would see the same response to a more complicated object, like causal estimates of program effect, cost-benefit analyses, or more general forms of research evidence. The ‘Monitoring the Monitors’ program provides proof-of-concept that technology can mobilize data to real effect. This also suggests, but by no means proves conclusively, that the massive investments being made by governments, technologists, researchers, philanthropists, and aid organizations to promote evidence-based policy can make a difference in developing countries.

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<sup>23</sup>Based on interviews with all senior health officials in Punjab, we find that forty-four percent report a politician interfering in their decision to sanction an underperforming employee during the previous year.

Second, whether data and evidence impact policy likely depends on the characteristics of policy makers, and the political and institutional environment in which they operate. The scale of our experiment provides enough variation to examine preliminarily whether these factors matter. We find some evidence, albeit highly speculative, that these considerations are relevant. The personalities of both inspectors and senior health officials predict how the ‘Monitoring the Monitors’ program impacted them. Similarly, the degree of local political competition predicts where the program will work best. These results are correlational, and should be treated with appropriate skepticism, but do suggest that the effect of data on policy decision might depend critically on context.

Developing countries are witnessing a revolution in the amount of data that can quickly and cheaply be accessed for policy decisions. In our case, the ‘Monitoring the Monitors’ system involved a fixed cost of about 17,800 USD to set up, and a monthly cost of 510 USD to operate.<sup>24</sup> This trend is only likely to accelerate with the rise of remote sensing, digital trace (e.g., cell phone call and mobile money transaction records), smartphones, and other research innovations. A key lesson of this experiment is that, appropriately channeled, these data streams can improve policy outcomes.

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<sup>24</sup>The set up costs included about 4,470 USD to develop the app and about 13,330 USD for smartphones.

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# APPENDIX: FOR ONLINE PUBLICATION ONLY

## A Additional Tables and Figures

### A.1 Tables

Table A1: Randomization Verification

|   | Conventional<br>Monitoring (=1) | Smartphone<br>Monitoring (=1) | Difference            | P-value | Control<br>Observations | Treatment<br>Observations |
|---|---------------------------------|-------------------------------|-----------------------|---------|-------------------------|---------------------------|
| Health clinic open during visit (=1)                      | 0.926<br>[0.262]                | 0.930<br>[0.256]              | -0.004<br>(0.033)     | 0.911   | 420                     | 428                       |
| Number of Staff Assigned to the Health Clinic             | 5.121<br>[0.925]                | 5.285<br>[0.940]              | -0.164<br>(0.121)     | 0.185   | 420                     | 428                       |
| Number of Staff Present                                   | 2.719<br>[1.514]                | 2.883<br>[1.637]              | -0.164<br>(0.181)     | 0.370   | 420                     | 428                       |
| Doctor Present (=1)                                       | 0.237<br>[0.426]                | 0.408<br>[0.492]              | -0.171<br>(0.054)     | 0.003   | 409                     | 414                       |
| Health/Medical Technician Present (=1)                    | 0.396<br>[0.490]                | 0.349<br>[0.477]              | 0.047<br>(0.055)      | 0.392   | 409                     | 413                       |
| Dispenser Present (=1)                                    | 0.706<br>[0.456]                | 0.777<br>[0.417]              | -0.071<br>(0.062)     | 0.259   | 408                     | 413                       |
| School Health and Nutrition Supervisor Present (=1)       | 0.347<br>[0.477]                | 0.341<br>[0.475]              | 0.006<br>(0.060)      | 0.922   | 406                     | 413                       |
| Lady Health Worker Present (=1)                           | 0.581<br>[0.494]                | 0.634<br>[0.482]              | -0.054<br>(0.051)     | 0.298   | 408                     | 413                       |
| Midwife Present (=1)                                      | 0.536<br>[0.499]                | 0.478<br>[0.500]              | 0.058<br>(0.045)      | 0.206   | 405                     | 412                       |
| Health Inspector Has Visited in the Last Month (=1)       | 0.229<br>[0.421]                | 0.219<br>[0.414]              | 0.010<br>(0.055)      | 0.855   | 332                     | 320                       |
| Enumerator Could Not Verify Last Health Inspection (=1)   | 0.210<br>[0.407]                | 0.252<br>[0.435]              | -0.043<br>(0.058)     | 0.467   | 420                     | 428                       |
| Senior Health Official Has Visited in the Last Month (=1) | 0.041<br>[0.198]                | 0.038<br>[0.191]              | 0.003<br>(0.018)      | 0.883   | 246                     | 290                       |
| Number of Antenatal Visits in the Last Month              | 54.255<br>[54.344]              | 59.115<br>[49.144]            | -4.859<br>(9.217)     | 0.601   | 274                     | 288                       |
| Number of Polio Vaccinations in the Last Month            | 480.226<br>[1130.822]           | 649.748<br>[1665.478]         | -169.522<br>(274.994) | 0.542   | 305                     | 326                       |
| Doctor Connected to Local Parliamentarian (=1)            | 0.330<br>[0.473]                | 0.273<br>[0.447]              | 0.057<br>(0.092)      | 0.542   | 91                      | 176                       |
| Doctor's Tenure (in months)                               | 111.732<br>[98.782]             | 106.025<br>[90.214]           | 5.707<br>(20.156)     | 0.779   | 82                      | 161                       |
| Population of Health Clinic's Catchment Area              | 22.159<br>[6.934]               | 24.243<br>[8.161]             | -2.084<br>(1.546)     | 0.187   | 416                     | 426                       |
| Distance of the Health Clinic to the District's HQ (kms)  | 49.521<br>[29.334]              | 49.464<br>[30.817]            | 0.058<br>(5.563)      | 0.992   | 420                     | 401                       |

*Notes:* This table checks balance between treatment and control clinics. The unit of observation is the clinic (basic health unit). The first ten rows report data from the baseline survey of health facilities which involved making unannounced visits to facilities in November, 2011. The last four rows report data based on the February 2008 parliamentary election. The political competition index is a Herfindahl index computed as the sum of squared candidate vote shares in each provincial assembly constituency. Variable standard deviations are reported in brackets. Standard errors are reported in parentheses.

Table A2: The Effect of Smartphone Monitoring on Inspector Time Use

|                                  | Inspecting         |                     | Management in Head Office |                   |                    |                         | Other Work                       |                             |                      | Total                    |                                       |                   |
|----------------------------------|--------------------|---------------------|---------------------------|-------------------|--------------------|-------------------------|----------------------------------|-----------------------------|----------------------|--------------------------|---------------------------------------|-------------------|
|                                  | Clinics<br>(1)     | Hospitals<br>(2)    | Total<br>(1)+(2)<br>(3)   | Clinics<br>(4)    | Hospitals<br>(5)   | Total<br>(4)+(5)<br>(6) | Immunization<br>Campaigns<br>(7) | Official<br>Meetings<br>(8) | Other<br>Work<br>(9) | Total<br>(8)+(9)<br>(10) | Total<br>Work<br>(3)+(6)+(10)<br>(11) | Breaks<br>(12)    |
| <b>Panel A: Without Block FE</b> |                    |                     |                           |                   |                    |                         |                                  |                             |                      |                          |                                       |                   |
| Smartphone Monitoring            | 15.952<br>(13.091) | -13.042<br>(13.539) | 2.910<br>(16.529)         | -5.833<br>(9.786) | -9.067<br>(16.365) | -14.901<br>(16.721)     | 11.620<br>(25.280)               | 35.595<br>(24.789)          | -1.389<br>(29.774)   | 45.827<br>(36.475)       | 33.836<br>(30.754)                    | -2.857<br>(6.136) |
| Exact p-value                    | [0.101]            | [0.827]             | [0.520]                   | [0.544]           | [0.740]            | [0.831]                 | [0.364]                          | [0.125]                     | [0.536]              | [0.146]                  | [0.149]                               | [0.418]           |
| Control Mean                     | 49.444             | 47.963              | 97.407                    | 37.500            | 40.417             | 77.917                  | 96.713                           | 66.944                      | 62.500               | 226.157                  | 401.481                               | 24.444            |
| # Districts                      | 35                 | 35                  | 35                        | 35                | 35                 | 35                      | 35                               | 35                          | 35                   | 35                       | 35                                    | 35                |
| # Observations                   | 117                | 117                 | 117                       | 117               | 117                | 117                     | 117                              | 117                         | 117                  | 117                      | 117                                   | 117               |
| <b>Panel B: With Block FE</b>    |                    |                     |                           |                   |                    |                         |                                  |                             |                      |                          |                                       |                   |
| Smartphone Monitoring            | 23.668<br>(9.562)  | -13.616<br>(11.618) | 10.052<br>(11.419)        | -8.025<br>(8.810) | 6.495<br>(9.823)   | -1.530<br>(12.257)      | 3.367<br>(24.837)                | 36.679<br>(20.898)          | -4.297<br>(33.460)   | 35.749<br>(33.915)       | 44.271<br>(30.900)                    | -2.821<br>(5.554) |
| Exact p-value                    | [0.034]            | [0.891]             | [0.251]                   | [0.482]           | [0.324]            | [0.261]                 | [0.489]                          | [0.194]                     | [0.685]              | [0.302]                  | [0.197]                               | [0.379]           |
| Control Mean                     | 49.444             | 47.963              | 97.407                    | 37.500            | 40.417             | 77.917                  | 96.713                           | 66.944                      | 62.500               | 226.157                  | 401.481                               | 24.444            |
| # Districts                      | 35                 | 35                  | 35                        | 35                | 35                 | 35                      | 35                               | 35                          | 35                   | 35                       | 35                                    | 35                |
| # Observations                   | 117                | 117                 | 117                       | 117               | 117                | 117                     | 117                              | 117                         | 117                  | 117                      | 117                                   | 117               |

Notes: This table reports average treatment effects of the 'Monitoring the Monitors' program on the staff attendance using a difference-in-differences. The unit of observation is the clinic, and data come from primary unannounced surveys after the treatment was launched. The dependent variable is an indicator for whether an assigned doctor was present at the clinic during an announced visit. Standard errors clustered at the district level are in parentheses. Square brackets report the Fisher Exact p-values.

Table A3: The Effect of Smartphone Monitoring on Inspections

|                       | Wave2+3<br>(1)      | Wave 2<br>(2)       | Wave 3<br>(3)    | Wave2+3<br>(4)      | Wave 2<br>(5)       | Wave 3<br>(6)    | Diff-in-Diff<br>(7) | Diff-in-Diff<br>(8) |
|-----------------------|---------------------|---------------------|------------------|---------------------|---------------------|------------------|---------------------|---------------------|
| Smartphone Monitoring | 0.181***<br>(0.066) | 0.264***<br>(0.079) | 0.103<br>(0.079) | 0.161***<br>(0.056) | 0.261***<br>(0.063) | 0.058<br>(0.073) | 0.181***<br>(0.066) | 0.210***<br>(0.065) |
| Exact p-value         | [0.002]             | [0.004]             | [0.066]          | [0.009]             | [0.014]             | [0.191]          | [0.002]             | [0.000]             |
| Control Mean          | 0.245               | 0.255               | 0.235            | 0.245               | 0.255               | 0.235            | 0.240               | 0.239               |
| # Districts           | 35                  | 35                  | 35               | 35                  | 35                  | 35               | 35                  | 35                  |
| # Observations        | 1523                | 739                 | 784              | 1523                | 739                 | 784              | 2175                | 2117                |
| Fixed Effects         | No                  | No                  | No               | Block               | Block               | Block            | Wave                | Wave+Facility       |

*Notes:* This table reports average treatment effects of the ‘Monitoring the Monitors’ program on the staff attendance using a difference-in-differences. The unit of observation is the clinic, and data come from primary unannounced surveys after the treatment was launched. The dependent variable is an indicator for whether an assigned doctor was present at the clinic during an announced visit. Standard errors clustered at the district level are in parentheses. Square brackets report the Fisher Exact p-values.

Table A4: The Effect of Smartphone Monitoring on Inspections (with baseline controls)

|                       | Wave2+3<br>(1)      | Wave 2<br>(2)       | Wave 3<br>(3)    | Wave2+3<br>(4)      | Wave 2<br>(5)       | Wave 3<br>(6)    | Wave2+3<br>(7)      |
|-----------------------|---------------------|---------------------|------------------|---------------------|---------------------|------------------|---------------------|
| Smartphone Monitoring | 0.207***<br>(0.062) | 0.290***<br>(0.077) | 0.129<br>(0.077) | 0.184***<br>(0.054) | 0.304***<br>(0.064) | 0.060<br>(0.072) | 0.183***<br>(0.055) |
| Exact p-value         | [0.002]             | [0.004]             | [0.027]          | [0.008]             | [0.012]             | [0.155]          | [0.008]             |
| Control Mean          | 0.249               | 0.261               | 0.238            | 0.249               | 0.261               | 0.238            | 0.249               |
| # Districts           | 35                  | 35                  | 35               | 35                  | 35                  | 35               | 35                  |
| # Observations        | 1192                | 580                 | 612              | 1192                | 580                 | 612              | 1192                |
| Fixed Effects         | No                  | No                  | No               | Block               | Block               | Block            | Wave+Block          |
| Baseline Control      | Yes                 | Yes                 | Yes              | Yes                 | Yes                 | Yes              | Yes                 |

*Notes:* This table reports average treatment effects of the ‘Monitoring the Monitors’ program on the staff attendance using a difference-in-differences. The unit of observation is the clinic, and data come from primary unannounced surveys after the treatment was launched. The dependent variable is an indicator for whether an assigned doctor was present at the clinic during an announced visit. Standard errors clustered at the district level are in parentheses. Square brackets report the Fisher Exact p-values.

Table A5: The Effect of Smartphone Monitoring on Clinic Staff Assignment

|  | Doctor<br>(1)                      | Dispenser<br>(2)                    | Lady Health<br>Visitor<br>(3)       | Health<br>Tech<br>(4)               | School Health<br>Nutri. Supervisor<br>(5) | Midwife<br>(6)                      |
|--|------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|---|-------------------------------------|
| <b>Panel A: Survey Wave FE</b>                               |                                    |                                     |                                     |                                     |   |                                     |
| Monitoring   | 0.007<br>(0.049)<br>[0.457]        | -0.021<br>(0.016)<br>[0.889]        | -0.038<br>(0.023)<br>[0.942]        | -0.061<br>(0.053)<br>[0.881]        | -0.014<br>(0.118)<br>[0.395]              | -0.061<br>(0.068)<br>[0.833]        |
| Mean in Controls   | 0.532                              | 0.979                               | 0.938                               | 0.749                               | 0.876                                     | 0.855                               |
| # Districts  | 35                                 | 35                                  | 35                                  | 35                                  | 35  | 35                                  |
| # Observations   | 2422                               | 2457                                | 2457                                | 2458                                | 2479                                      | 2483                                |
| R-Squared  | 0.046                              | 0.004                               | 0.002                               | 0.013                               | 0.077                                     | 0.107                               |
| <b>Panel B: Survey Wave + Facility FEs</b>                   |                                    |                                     |                                     |                                     |   |                                     |
| Monitoring   | 0.023<br>(0.048)<br>[0.441]        | -0.024<br>(0.016)<br>[0.878]        | -0.033<br>(0.024)<br>[0.952]        | -0.051<br>(0.052)<br>[0.965]        | -0.010<br>(0.117)<br>[0.380]              | -0.061<br>(0.068)<br>[0.840]        |
| Mean in Controls   | 0.533                              | 0.979                               | 0.937                               | 0.748                               | 0.876                                     | 0.854                               |
| # Districts  | 35                                 | 35                                  | 35                                  | 35                                  | 35  | 35                                  |
| # Observations   | 2408                               | 2446                                | 2446                                | 2447                                | 2473                                      | 2477                                |
| R-Squared  | 0.677                              | 0.521                               | 0.551                               | 0.648                               | 0.558                                     | 0.504                               |
| <b>Panel C: Baseline Control with Survey Wave FE</b>         |                                    |                                     |                                     |                                     |   |                                     |
| Monitoring   | 0.124**<br>(0.051)<br>[0.000]      | -0.019<br>(0.016)<br>[0.832]        | -0.006<br>(0.019)<br>[0.690]        | -0.081<br>(0.055)<br>[0.975]        | -0.014<br>(0.118)<br>[0.381]              | -0.064<br>(0.068)<br>[0.843]        |
| Mean in Controls   | 0.517                              | 0.987                               | 0.942                               | 0.738                               | 0.811                                     | 0.782                               |
| # Districts  | 35                                 | 35                                  | 35                                  | 35                                  | 35  | 35                                  |
| # Observations   | 1548                               | 1579                                | 1579                                | 1581                                | 1623                                      | 1627                                |
| R-Squared  | 0.248                              | 0.039                               | 0.048                               | 0.152                               | 0.001                                     | 0.006                               |
| <b>Panel D: IV with Baseline Controls and Survey Wave FE</b> |                                    |                                     |                                     |                                     |   |                                     |
| Inspected  | (1)<br>0.687<br>(0.447)<br>[0.430] | (2)<br>-0.121<br>(0.096)<br>[0.391] | (3)<br>-0.033<br>(0.120)<br>[0.587] | (4)<br>-0.428<br>(0.331)<br>[0.563] | (5)<br>0.002<br>(0.587)<br>[0.521]        | (6)<br>-0.285<br>(0.379)<br>[0.533] |
| Mean in Controls   | 0.597                              | 0.979                               | 0.938                               | 0.701                               | 0.792                                     | 0.746                               |
| # Districts  | 35                                 | 35                                  | 35                                  | 35                                  | 35  | 35                                  |
| # Observations   | 1437                               | 1468                                | 1468                                | 1470                                | 1509                                      | 1513                                |
| R-Squared  | -0.147                             | -0.083                              | 0.044                               | -0.034                              | 0.001                                     | -0.119                              |

*Notes:* This table reports average treatment effects of the ‘Monitoring the Monitors’ program on the staff assignment using difference-in-differences. The unit of observation is the clinic, and data come from primary unannounced surveys after the treatment was launched. The dependent variable is an indicator for whether a staff member was assigned at the clinic during an unannounced visit. Standard errors clustered at the district level are in parentheses. Square brackets report the Fisher Exact p-values.

Table A6: Heterogeneous Flagging Effects by Senior Health Official Personality

|   | Doctor Present in Unannounced Visit (=1) |                   |                    |
|---|--|-------------------|--------------------|
|   | (1)                                      | (2)               | (3)                |
| Flagged   | 0.177**<br>(0.082)                       | 0.156*<br>(0.084) | 0.210**<br>(0.090) |
| Flagged x Senior Health Official Big Five Index |  | 0.282*<br>(0.150) |                    |
| Flagged x Senior Health Official PSM Index      |  |                   | 0.165<br>(0.126)   |
| Mean of dependent variable                      | 0.308                                    | 0.267             | 0.267              |
| # Observations                                  | 130                                      | 120               | 120                |
| # Clinics                                       | 112                                      | 103               | 103                |
| R-Squared                                       | 0.298                                    | 0.265             | 0.255              |
| District Fixed Effects                          | Yes                                      | Yes               | Yes                |
| Sample  | Discontinuity                            | Discontinuity     | Discontinuity      |

*Notes:* This table reports on the effect on subsequent doctor attendance of flagging on an online dashboard the fact that a clinic had three or more staff absent to a senior policymaker. Clinics were flagged in red on an online dashboard if three or more of the seven staff were absent in one or more health inspections of the clinic 11 to 25 days prior to an unannounced visit by our survey enumerators. The Discontinuity sample limits to facility reports in which either two or three staff were absent (the threshold to trigger the underreporting red flag). In addition, the sample in all columns is limited to Monitoring the Monitor treatment districts due to the necessity of the web dashboard for flagging clinics. The Big Five and PSM indices. The Big Five and PSM indices are z-score averages of the five and six traits within the Big Five and PSM respectively, elicited through responses to statements that represent the trait on a five point Likert scale, in which 1 corresponds to disagree strongly, 2 to disagree a little, 3 to neutral, 4 to agree a little, and 5 to agree strongly. Likert responses are given the same direction. Standard errors clustered at the clinic level reported in parentheses. All regressions include district and survey wave fixed effects and condition on a doctor being posted. All regressions include survey wave fixed effects. Standard errors clustered at the clinic level reported in parentheses. \* $p < 0.1$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$ .

Table A7: Heterogeneous Flagging Effects by Political Competition

|   | Doctor Present in Unannounced Visit (=1) |                     |                    |
|---|--|---------------------|--------------------|
|   | (1)                                      | (2)                 | (3)                |
| Flagged   | 0.177**<br>(0.082)                       |                     |                    |
| Flagged x Doctor Does Not Know Politician                         |  |                     | 0.201*<br>(0.109)  |
| Flagged x Doctor Knows Politician                                 |  |                     | -0.250<br>(0.249)  |
| Flagged x High Competition  |  | 0.359***<br>(0.118) |                    |
| Flagged x Med Competition   |  | 0.004<br>(0.165)    |                    |
| Flagged x Low Competition   |  | -0.087<br>(0.134)   |                    |
| Constant  | 0.191***<br>(0.061)                      | 0.209*<br>(0.117)   | 0.588**<br>(0.233) |
| Flagged x High Comp = Flagged x Med Comp (p-value)                |  | 0.090               |                    |
| Flagged x High Comp = Flagged x Low Comp (p-value)                |  | 0.014               |                    |
| Flagged x Doctor Does Not Know = Flagged x Doctor Knows (p-value) |  |                     | 0.072              |
| # Clinics   | 112                                      | 112                 | 80                 |
| # Reports   | 130                                      | 130                 | 91                 |
| R-Squared   | 0.298                                    | 0.352               | 0.347              |
| District Fixed Effects  | Yes                                      | Yes                 | Yes                |
| Sample  | Discontinuity                            | Discontinuity       | Discontinuity      |

*Notes:* This table reports on the effect on subsequent doctor attendance of flagging on an online dashboard the fact that a clinic had three or more staff absent to a senior policymaker. Clinics were flagged in red on an online dashboard if three or more of the seven staff were absent in one or more health inspections of the clinic 11 to 25 days prior to an unannounced visit by our survey enumerators. The Discontinuity sample limits to facility reports in which either two or three staff were absent (the threshold to trigger the underreporting red flag). In addition, the sample in all columns is limited to Monitoring the Monitor treatment districts due to the necessity of the web dashboard for flagging clinics. All regressions include survey wave fixed effects. Standard errors clustered at the clinic level reported in parentheses. \* $p < 0.1$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$ .



## A.2 Figures

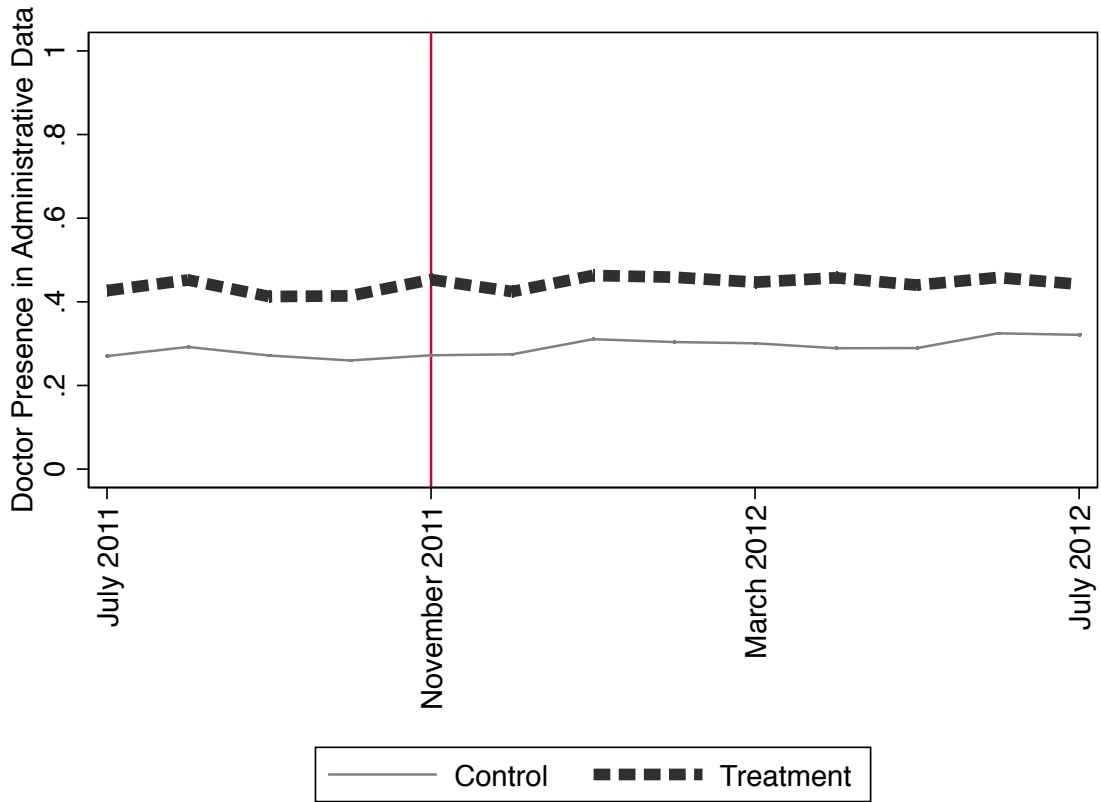


Figure A1: Time-trend on Doctor Attendance Before and After Treatment

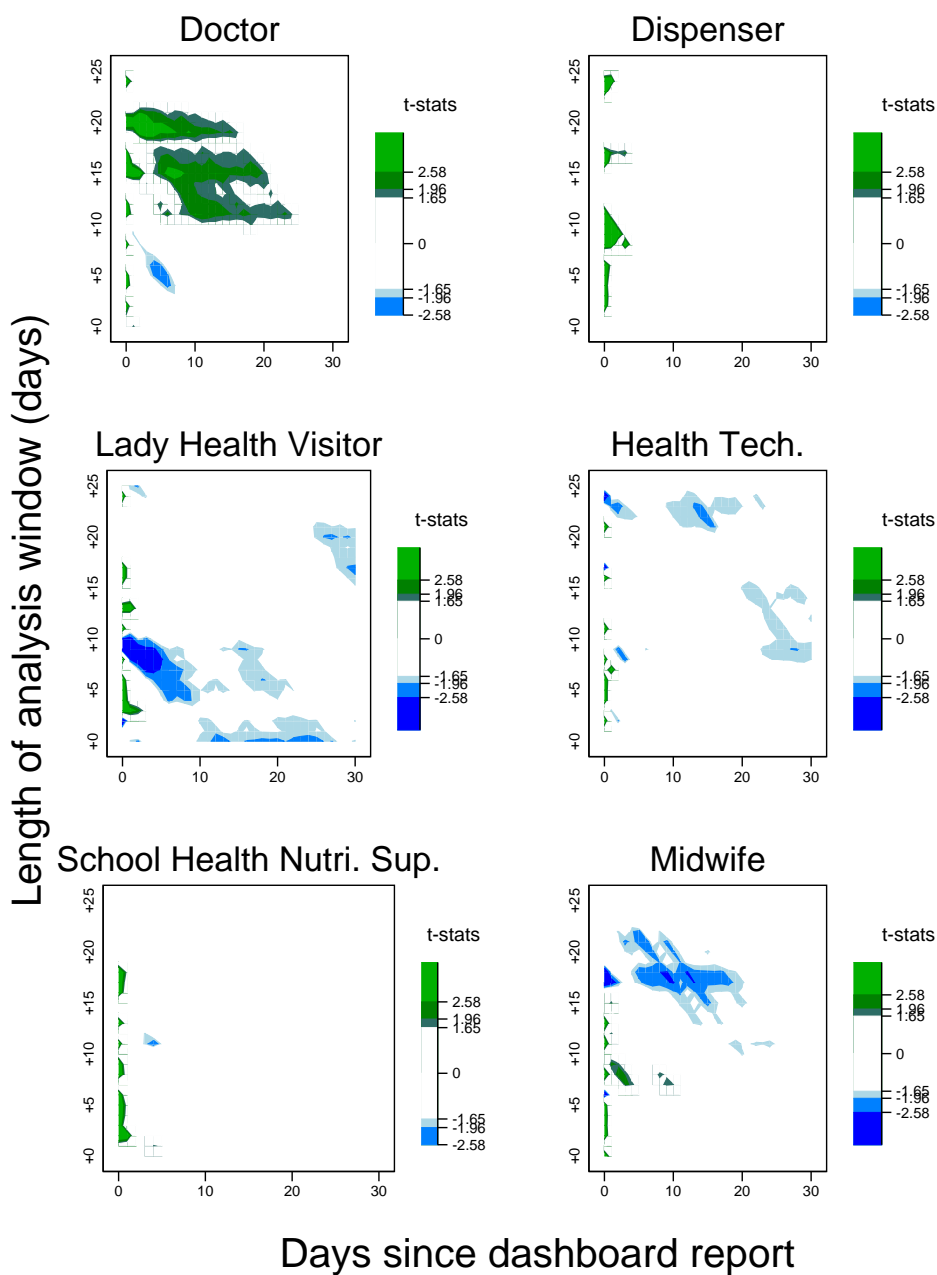


Figure A2: Absence after Flagging

*Notes:* This figure presents robustness of flagging results in Table 3 to the window of time prior to an unannounced visit that a clinic being highlighted in red on the dashboard is considered flagged. Each figure reports t-stats from 1300 hypothesis tests analogous to that conducted in Table 3 column (3) that Flagged = 0, varying the window for which we define a clinic as flagged prior to a primary unannounced visit to a clinic along two dimensions—we vary the length of the window being used along the x-axis and the delay from when a clinic is highlighted in red to when the window begins along the y-axis (so for example, a length of 30 and delay of 15 corresponds to considering a clinic as flagged if it was highlighted in red anytime 15 to 45 days prior to an unannounced visit).

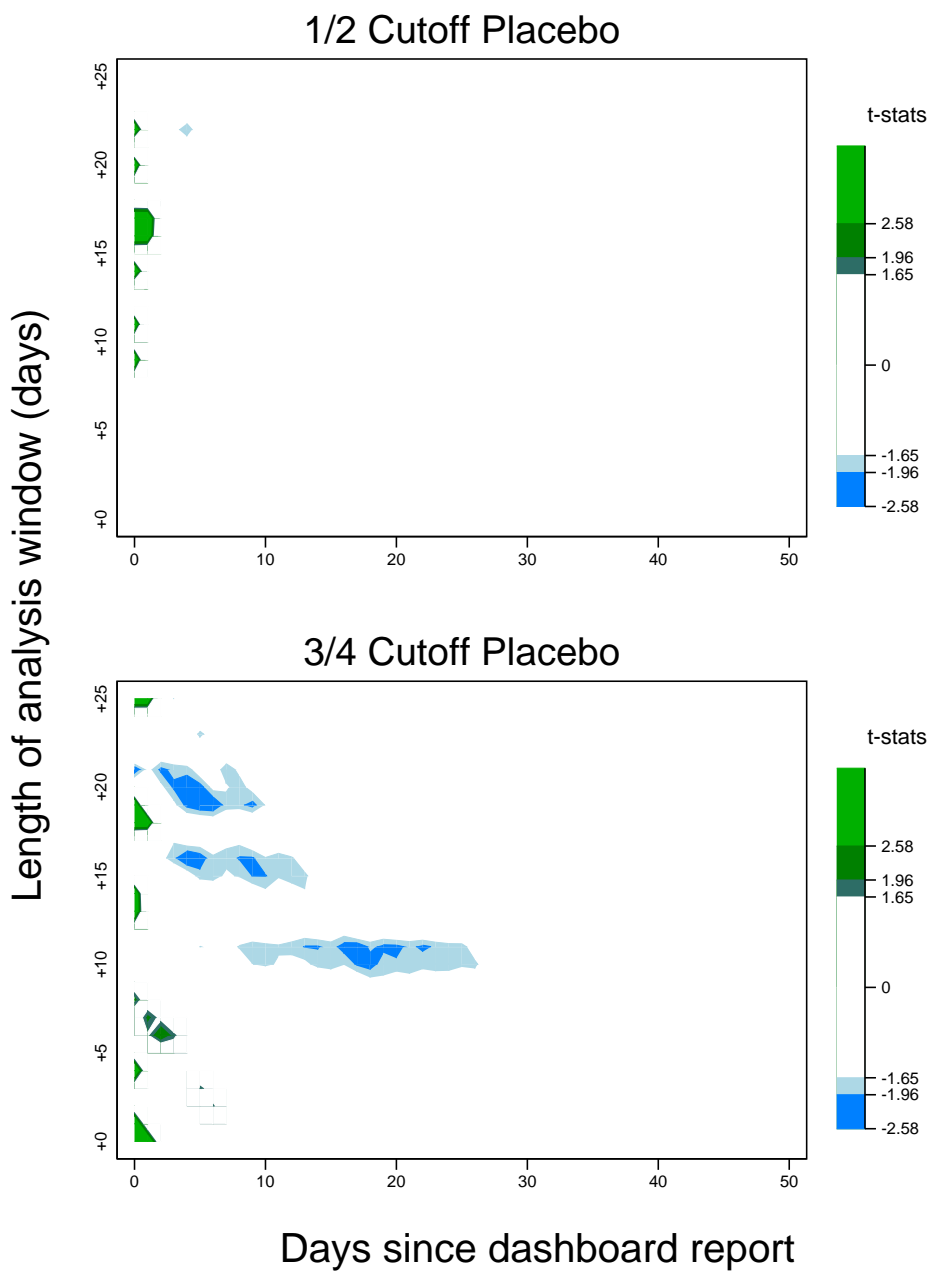


Figure A3: Absence after Flagging Placebos

*Notes:* This figure presents placebo tests for the flagging results in Table 3, coding the data as if the cutoff for a health clinic being highlighted in red was for more than 1 staff absent or more than 3 staff absent, rather than the true cutoff that was used (more than 2 staff absent). Each figure reports t-stats from 1300 hypothesis tests analogous to that conducted in Table 3 column (3) that  $\text{Flagged} = 0$ , with these placebo definitions of flagging, varying the window for which we define a clinic as flagged prior to a primary unannounced visit to a clinic along two dimensions—we vary the length of the window being used along the x-axis and the delay from when a clinic is highlighted in red to when the window begins along the y-axis (so for example, a length of 30 and delay of 15 corresponds to considering a clinic as flagged if it was highlighted in red anytime 15 to 45 days prior to an unannounced visit).



# B Paper Inspection Form

## INSPECTION FORM OF BASIC HEALTH UNIT HEALTH DEPARTMENT (GOVERNMENT OF THE PUNJAB)

### A - BASIC HEALTH UNIT INFORMATION

HMS Code: \_\_\_\_\_ Name of BHU: \_\_\_\_\_ (please tick only one option) UC No. \_\_\_\_\_  
 Managed by: i) PRSP  ii) Dist. Govt.  Name of BHU: \_\_\_\_\_  
 Mauza: \_\_\_\_\_ UC Name: \_\_\_\_\_  
 NA No. \_\_\_\_\_ PP. No. \_\_\_\_\_ District: \_\_\_\_\_ Tehsil: \_\_\_\_\_  
 Name of incharge of the facility: \_\_\_\_\_ Designation: \_\_\_\_\_  
 Mobile No.: \_\_\_\_\_ BHU's Phone (with code): \_\_\_\_\_  
 Name of DDOH: \_\_\_\_\_ Reference No. \_\_\_\_\_ Minutes \_\_\_\_\_ am \_\_\_\_\_ pm  
 Date & Time of arrival for inspection: \_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_ Time: Hours \_\_\_\_\_ Minutes \_\_\_\_\_

### B - CLEANLINESS AND GENERAL OUTLOOK OF THE FACILITY (tick relevant column)

| Sr. No | Location (tick relevant column) | C - DISPLAYS (tick relevant column) |         |      |
|--------|---------------------------------|-------------------------------------|---------|------|
|        |                                 | Good                                | Average | Poor |
| 1      | Boundary Wall                   |                                     |         |      |
| 2      | Lawns                           |                                     |         |      |
| 3      | Waste Disposal                  |                                     |         |      |
| 4      | Water supply                    |                                     |         |      |
| 5      | Labour Room                     |                                     |         |      |
| 6      | Wards                           |                                     |         |      |
| 7      | Toilets                         |                                     |         |      |

### D - AVAILABILITY OF UTILITIES (tick relevant column)

| Sr. No | Name of Utility (tick relevant column) | E - DISPOSAL OF HOSPITAL WASTE (tick relevant column) |               |
|--------|--|---|---------------|
|        |  | Available   | Not Available |
| 1      | Electricity                            |   |               |
| 2      | Telephone                              |   |               |
| 3      | Water supply system                    |   |               |
| 4      | Sul Gas                                |   |               |
| 5      | Sewerage System                        |   |               |
| 6      | Other                                  |   |               |

### F - PURCHASING FEES (give amount)

Fee Deposited during the current financial year till the last calendar month: (Rs.) \_\_\_\_\_  
 Purch/fee being charged @ Rs. \_\_\_\_\_ per patient.

### G - PATIENTS TREATED IN LAST CALENDAR MONTH (give numbers)

| Sr. No | Cases                               | Sr. No | Cases                           | Numbers |
|--------|-------------------------------------|--------|---------------------------------|---------|
| 1      | OPD Cases                           | 7      | Children vaccinated outside BHU |         |
| 2      | Patients registered with NICE No.   | 8      | TP Patients under treatment     |         |
| 3      | Deliveries at BHU                   | 9      | Hepatitis "B" Vaccination Done  |         |
| 4      | No. of PCD slides prepared          | 10     | Antenatal Cases Checked         |         |
| 5      | No. of referrals to other hospitals | 11     | Family Planning Visits          |         |
| 6      | Children vaccinated at BHU          | 12     | No. of referrals by LHW         |         |

### H - SCHOOL HEALTH PROGRAM

| Sr. No. | Indicator   | Numbers  |
|---------|---|----------|
| 1       | Total Number of Students referred by SHKS during previous month           |          |
| 2       | Total Number of Student treated at BHU referred by SHKS                   |          |
| 3       | Total Number of Student referred to other hospitals during previous month |          |
| 4       | Tour Program approved and displayed in DHQ                                | Yes / No |

### I - DOCTORS (give numbers)

| Sr. No | Designation | Sanctioned Posts |    |    | Filled Posts |    |    | Present |
|--------|-------------|------------------|----|----|--------------|----|----|---------|
|        |             | UA               | SL | OD | St. L        | LC | UA |         |
| 1      | MD, WHO     |                  |    |    |              |    |    |         |

This doctor is posted in this BHU but is not present during the visit  
 Details regarding absence of doctors. (Do not write anything if a doctor is present.)

| Sr. No | Designation | Type of Absence on the monitoring day (tick only one box) |    |    | Days of absence during last three calendar months |    |    | Other Types |
|--------|-------------|---|----|----|---|----|----|-------------|
|        |             | UA  | SL | OD | St. L   | LC | UA |             |
| 1      | MD, WHO     |   |    |    |   |    |    |             |

Unauthorized absence (UA), Sanctioned leave (SL), On official duty outside the BHU (OD), Short leave (St.L), Late Corner (LC).

### J - PARAMEDICS (OTHER THAN DOCTORS)

### PARAMEDICS INCLUDES:

| Sr. No | Staff Category    | Sanctioned | Filled Posts | Present |
|--------|-------------------|------------|--------------|---------|
| 1      | Paramedical Staff |            |              |         |

Details regarding absence of Paramedics. (Do not write anything if staff is present.)

| Sr. No | Designation | Name of Paramedic | Type of absence on the monitoring day (tick only one box) |    |    | Days of absence during last three calendar months |    |    | Other Types |
|--------|-------------|-------------------|---|----|----|---|----|----|-------------|
|        |             |                   | UA  | SL | OD | St. L   | LC | UA |             |
| 1      |             |                   |   |    |    |   |    |    |             |
| 2      |             |                   |   |    |    |   |    |    |             |
| 3      |             |                   |   |    |    |   |    |    |             |

### K - PREVENTIVE / OUTREACH STAFF

| PREVENTIVE / OUTREACH STAFF INCLUDES:   |
|---|
| LHW, RHI, Midwife, Dai, Vaccinator, CDC Supervisor, Sanitary Inspector, Sanitary Worker, School Health & Nutrition Supervisor |

### Sanctioned Posts

| Sanctioned Posts | Filled Posts | Present |
|------------------|--------------|---------|
|                  |              |         |

Details regarding absence of Preventive / outreach staff. (Do not write anything if staff is present.)

| Sr. No | Designation | Name of Staff | Type of Absence on the monitoring day (tick only one box) |    |    | Days of absence during last three calendar months |    |    | Other Types |
|--------|-------------|---------------|---|----|----|---|----|----|-------------|
|        |             |               | UA  | SL | OD | St. L   | LC | UA |             |
| 1      |             |               |   |    |    |   |    |    |             |
| 2      |             |               |   |    |    |   |    |    |             |
| 3      |             |               |   |    |    |   |    |    |             |

### L - ADMIN / SUPPORT STAFF

| ADMIN / SUPPORT STAFF INCLUDES:                         |
|---|
| Computer Operator, Naib Qasid, Chowkidar, Mali, Sweeper |

### Sanctioned Posts

| Sanctioned Posts | Filled Posts | Present |
|------------------|--------------|---------|
|                  |              |         |

Details regarding absence of Admin/Support staff. (Do not write anything if staff is present.)

| Sr. No | Designation | Name of Staff | Type of Absence on the monitoring day (tick only one box) |    |    | Days of absence during last three calendar months |    |    | Other Types |
|--------|-------------|---------------|---|----|----|---|----|----|-------------|
|        |             |               | UA  | SL | OD | St. L   | LC | UA |             |
| 1      |             |               |   |    |    |   |    |    |             |
| 2      |             |               |   |    |    |   |    |    |             |
| 3      |             |               |   |    |    |   |    |    |             |

### M - VACANT POSTS (please write full name of posts)

| Sr. No | Name of Post | Number of Vacant Post | Sr. No. | Name of Post | Number of Vacant Posts |
|--------|--------------|-----------------------|---------|--------------|------------------------|
|        |              |                       |         |              |                        |
|        |              |                       |         |              |                        |
|        |              |                       |         |              |                        |

**U - MONTHLY PERFORMANCE**

| Sr. No | Monthly Target                                  | Performance |
|--------|---|-------------|
| 1      | No of children given full immunization coverage |             |
| 2      | Daily OPD attendance                            |             |
| 3      | Delivery coverage at facility                   |             |

**V - GENERAL REMARKS**

Time of Departure from the facility: Hours \_\_\_\_\_ Minutes \_\_\_\_\_ am / pm

*Certified that this basic Health Unit was inspected today by the undersigned and the information stated above is as per facts and record.*

Signature of DDOH/MEA \_\_\_\_\_ Signatures & Stamp of MO/Incharge \_\_\_\_\_ Signatures of DMO/EDOH \_\_\_\_\_

# C Training Manual For Smartphone Application Use

Directorate General Health Services, Health Department, Government of the Punjab



## MANUAL FOR HEALTH FACILITY INFORMATION AGGREGATION SYSTEM



DIRECTORATE GENERAL HEALTH SERVICES  
SUPPORTED BY  
PUNJAB HEALTH SECTOR REFORMS PROGRAM

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Directorate General Health Services, Health Department, Government of the Punjab

## 1. INTRODUCTION

The Health Department of Government of the Punjab is committed to adopting state-of-the-art technology to strengthen governance and improve service delivery for all citizens.

For this purpose, the Punjab Health Sector Reforms Program (PHSRP), with technical assistance from International Growth Centre (IGC) Team, is supporting DGHS and district health managers in strengthening the internal monitoring system of the Health Department. This is being done by introducing a mobile phone based information management system that is being rolled out across different districts of the province.

This initiative will improve the internal information transmission within the Health Department and will ensure that timely, authentic and actionable information is sent quickly from individual facilities to district and provincial health managers on such crucially important issues as absenteeism, medicine stock outs, availability and functionality of equipment etc.

Android-based smartphones have been provided to those district supervisory

officers, such as Executive District Health Officers (EDOs), District Health Officers (DOs), and Deputy District Health Officers (DDOs), who have been tasked with the collection of performance related data from Basic Health Units (BHUs), Rural Health Centers (RHCs) and Tehsil and District Headquarters (THQs and DHQs).

The report submitted by these officers through the phone will be recorded on a website and automatically analyzed for use by managers at various levels. It is expected that this information will become a powerful tool for management both for district and central level officials. This is expected to bring about marked improvement in health service delivery management, particularly at primary and secondary levels of healthcare, leading to better health outcomes for the poor and disadvantaged in the province.

At Directorate General Health Services, Director, District Health Information System (DHIS), supported by the PHSRP and IGC team, is the focal person for implementation of the program at the provincial level. Overall responsibility for the program at the district level lies with EDOs, and Statistical Officers (SOs) are the designated focal persons for managing the system at the district level.

This manual contains basic information about the program and the phone, as well

Directorate General Health Services, Health Department, Government of the Punjab

as details of how to submit data and deal with some problems that may arise.

## 2. ABOUT THE PHONE



The HTC Explorer runs on Android 2.3.5 with HTC's latest custom interface - Sense 3.0, and is equipped with a 3.2 inch capacitive touch screen.

The phone has 4 capacitive touch buttons on the front- HOME, MENU, BACK and SEARCH.



With a 600 MHz processor based on the latest mobile technology, 512 MB of RAM and a 2 GB SD card, the phone is well equipped to deal with advanced tasks associated with smart-phones today.

The phone can be used for browsing the internet using either GPRS or WIFI. It is also equipped with a GPS device and a 3 MP camera which can capture high-resolution images and videos.

For detailed instructions regarding how to undertake different tasks on the phone and a comprehensive guide to unlocking the full potential of the device, please visit the following website:

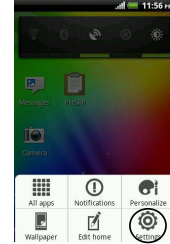
<http://www.htc.com/uk/help/htc-explorer/#overview>

If you encounter any further problems while using the phone, please contact the helpline given at the end of this document.

3

## 3. ABOUT THE APPLICATION

The Android application is very intuitive and simple to use. Before running the application, you must ensure that you are connected to the internet and the GPS is switched on. To confirm that you are connected to the internet, tap the 'Internet' icon on the home screen to launch the phone browser and try opening any webpage (e.g. yahoo.com); if the webpage opens up, it means you are connected to the internet. In this case, tap the phone's 'HOME' capacitive touch button to return to the home screen. To confirm if GPRS (internet) is enabled or not, tap the phone's 'MENU' capacitive touch button while on the home screen and select 'Settings' tab that pops on the bottom right of the screen, as shown below:



Choose 'Wireless & networks' from the list of settings that appear on the screen.



Then scroll down the page to check whether the option of 'Mobile network' is selected or not.

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If it is selected, as shown, then the GPRS is switched on. If not, switch it on by checking this option. Confirm again by returning to the home screen by tapping "HOME" and opening any webpage using the phone's browser. If it still does not open, report the issue on the helpline given at the bottom of this document. If the website opens, go back to the home screen.

To check if the GPS is on or off, check the power control widget on the main screen (the dark grey bar at the top with five large symbols); if the GPS symbol is highlighted, as shown below, the GPS is on. If not, tap the GPS symbol to toggle it on, before starting the application.



Once it is confirmed that the phone is connected to the internet and the GPS is switched on, tap the PHSRP icon on the home screen to start the application.

The application main screen has three buttons- 'Start New Form', 'Send Finished Forms' and 'Manage Application'- as shown below:



In order to start making entries, the application needs to first download the relevant forms. There are four forms for each district; one for each type of facility- BHU, RHC, THQ and DHQ. For the case of the phones handed out, the relevant forms have already been downloaded. However, in case there are any revisions made, all concerned officials will be notified that the forms will have to be updated. **Do not** delete the forms unless you are formally notified to do so.

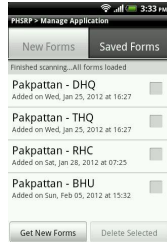
5

6

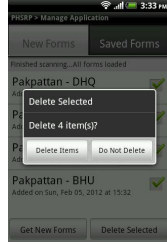


### 3.1. How to update forms if notified

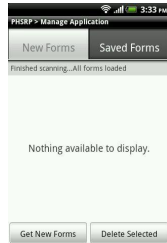
To update the forms on the application if you are notified to do so, tap the 'Manage Application' button. Considering Pakpattan as an example, the following screen will be displayed:



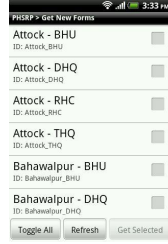
Select all the forms, or just the ones that you need to update as notified, by tapping on the checkboxes on the right, and tap the 'Delete Selected' button at the bottom right. A confirmation will be displayed as follows:



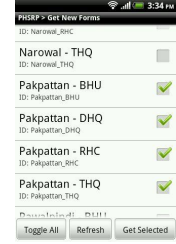
Tap 'Delete Items' to confirm and the selected forms will be deleted. If all the forms are deleted, the following screen will be displayed:



Now, tap 'Get New Forms', to retrieve the updated forms. The application will use the internet to list the updated forms of all districts for download as follows:



If you encounter an error at this point, it means you are not connected to the internet. Ensure that you are connected to the internet by following the instructions given previously and try again. If you encounter an error again, report the issue immediately on the helpline given at the end of this document. If there is no error and the above screen is displayed, scroll vertically to find the forms of your district and select them all by tapping the checkboxes on their right as shown:

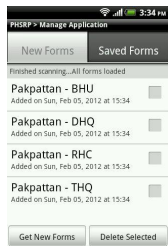


Then, tap 'Get Selected' to download the updated forms of your district. Once the forms are successfully downloaded, the following screen will be displayed:



If there is some sort of error at this point, try downloading the forms again. If you are still unsuccessful, report the issue on the helpline to get an immediate solution.

If all forms are successfully downloaded and the above screen is displayed, tap 'OK' and the following screen will be displayed:



Tap the phone's 'BACK' capacitive touch button at the bottom of the screen to get to the main screen of the application again. You are all set to continue to making and submitting entries now.

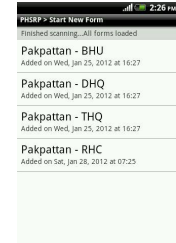
### 3.2. How to fill a form

At this point, it is important to note that completing a form and submitting a form are two different tasks that are performed separately. Filling a form does not require an internet connection, so you can enter data from your inspection visits and save the completed forms regardless of whether the internet is working or not. However, submitting the forms requires an internet connection.

To start filling a form, tap the 'Start New Form' button from the main screen of the application.



The following screen will be displayed, prompting you to choose the type of facility:



Before moving on, it is important to note that if you want to close or discard the entry at any point before saving and exiting, tap the BACK capacitive button on the phone and choose 'discard entry'. If you tap BACK by mistake, simply tap 'Cancel' on the dialogue box that pops up.

Furthermore, if you accidentally tap the phone's 'HOME' capacitive touch button and end up at the home screen while filling in the form, simply tap the PHSRP application icon again to load the application again and it will return you to the screen you were previously at in the form with all previous entries made on the form intact.

### 3.2.1. How to fill a BHU form

To fill a BHU form, choose the BHU form from the list shown above and the following screen will be displayed, instructing how to navigate through the form:



It is important to note here that you will be able to scroll back and forth within the form to check or change your entries before you complete the form, by scrolling laterally in one direction or the other, but whenever you scroll to a screen that requires numerical input from the keypad that pops up (as explained later), all numerical entries will be cleared and you will have to re-enter them.

Scroll laterally, as instructed, to start filling in the form. The next screen will allow you to choose the Tehsil in which the BHU is located, as shown below:



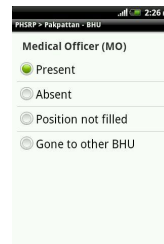
It is important to note at this time that some screens require at least one entry by the user, and you will not be able to move forward in the form unless it is made. To demonstrate, if you attempt to move forward in the form by scrolling laterally when it prompts you to enter the Tehsil in which the facility is located, the following message will appear on the screen:



You will have to select one of the options and then scroll laterally to move to the next screen. The next screen will require you to choose the BHU you are visiting from a list of all the BHUs present in that Tehsil. For demonstration, we select the Tehsil of Arifwala and scroll to the next screen. The following list is displayed:



Scroll vertically to find and choose the specific facility you are visiting, and scroll laterally to move to the next screen:



This screen relates to the availability status of the Medical Officer at the facility. An important thing to note here is that for all non-PRSP districts, the last option will not be shown on this screen as it does not apply to them. As Pakpattan is a PRSP district, the 'Gone to other BHU' option is available on the form.

Another important thing to note here is that all officers are required to make these entries from the perspective of a citizen visiting the facility- so even if the MO is on official leave or out on some official business at the time of the inspection visit, he/she would be marked absent. However, officers would also be required to take a note regarding the reason for absence of the MO in their diaries for such exceptional cases.

For demonstration, we choose Present and scroll laterally to the next screen:



This screen requires you to check all the people not present at the BHU. As mentioned for the case of the MO, the officer will mark people absent based on the perspective of a visiting citizen- if someone is out on official business or on official leave or even if the position is not filled etc., the position holder will be marked as absent, and a note will be made in the officer's diary about the reason for absence for these exceptional cases.

If all the staff is present, you can scroll laterally to move to the next screen without marking any checkbox on this screen. The next screen requires you to mark tablets not available at the facility, as shown:

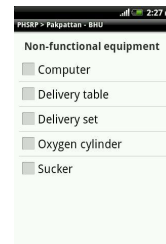


Scroll vertically and mark all the tablets that are out of stock at the BHU. If all tablets are present, scroll laterally to the next screen without marking any checkbox.

Repeat the same procedure for 'Injections', 'Syrups' and 'Other Medicines' in the subsequent screens as shown:

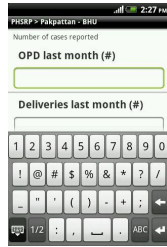


The next screen will require you to mark all equipment that is not functional. Unavailable equipment will also be marked as non-functional:



Leave the screen unmarked if all equipment is available and functional, and scroll laterally to the next screen.

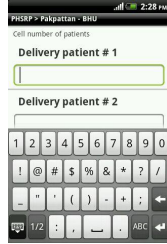
The next screen will require you to tap in numerical values for the number of OPD cases last month, number of deliveries last month and number of Antenatal cases last month. A keypad will pop up at the bottom automatically so that you can enter the numbers. Tap on the entry bar of the next field to enter its number after you are done with the first one, and then move on to the third one after you are done with the second one. All three fields must be filled in order to move to the next screen. To get to the third field, you will have to scroll vertically lower down the page. While scrolling, ensure that you are avoiding the keypad, as scrolling over the keypad will not work.



Once all three entries are filled, scroll laterally to move to the next screen. Once again, ensure that you avoid the keypad as scrolling laterally over the keypad will not work.

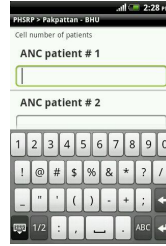
15

The next screen will require you to enter the **mobile numbers** of any **two** randomly selected delivery patients from the BHU records from **last month**. The entry fields are designed to detect invalid numbers, and the application will not let you move to the next screen unless you enter two **valid** mobile numbers.

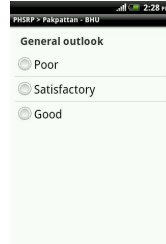


Once the two mobile numbers are entered, scroll laterally to move to the next screen.

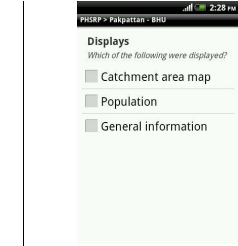
The next screen will require you to enter **mobile numbers** of any **two** randomly selected ANC patients from **last month**. The entry fields on this page are also designed to detect invalid numbers, and the application will not let you move to the next screen unless you enter two **valid** mobile numbers.



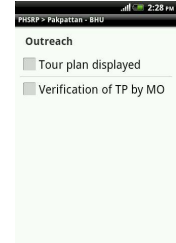
Once the numbers are entered, scroll laterally to move to the next screen:



Choose the most appropriate option and scroll laterally to move to the next screen.



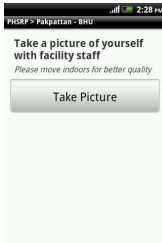
This screen will require you to mark which information was displayed in the BHU. Leave the screen unmarked and scroll laterally to the next screen if none of these were displayed at the facility.



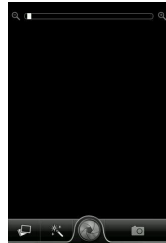
Mark the options appropriately and scroll laterally to move to the next screen.

16

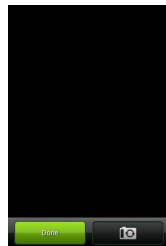
The next screen will require you to take a clear picture of yourself with the essential staff present at the BHU, as shown below:



Tap the 'Take Picture' button to load the camera. For better picture quality, it is advisable to take the picture indoors and have someone take it for you. To take the picture, have that person tap the silver button in the centre-bottom of the screen, as shown below:



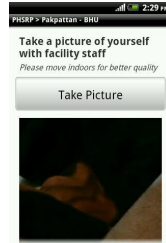
When the picture is taken, you will be given the option of retaking it if you are not satisfied with it. Tap the camera icon on the right to load the camera again and take a better picture, as shown below:



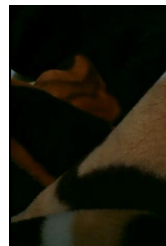
Once you are satisfied with the picture, tap the 'Done' button on the left, and you will be taken to the following screen:

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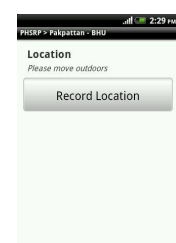
previous screen. Once there, scroll laterally again to move to the next screen:



Scroll laterally to move forward. If, instead, you want to view the picture in full screen again, tap the picture preview box at the bottom, and you will be able to view it in full screen:

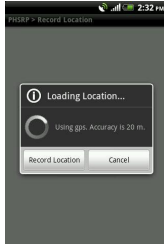


Tap the phone's 'BACK' capacitive touch button at the bottom to return to the

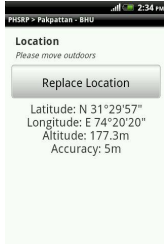


Tap 'Record Location' and the phone will record its location using GPS, network information and GPRS. It is advisable to move outdoors to record location as GPS signals are stronger outdoors. While you wait for the location to be recorded, you might see the accuracy radius values decreasing gradually:

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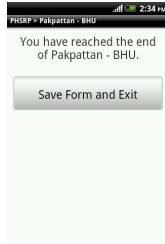


When accuracy radius falls to 5 m, the following screen will be displayed:



GPS satellites are not always in range hence it might take some time for the phone to narrow down its location. If, even after waiting for five to ten minutes, the phone is unable to record its location, ensure that the GPS is toggled on and try

again. If, still, the phone is unable to record its location, contact the helpline immediately for quick resolution. Once the location is recorded, the above screen will be displayed. To move forward, scroll laterally again to get to the following screen:



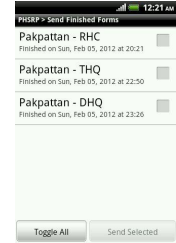
Tap 'Save Form and Exit' to complete the entry. A message will be displayed notifying you that the form was saved successfully and you will be taken back to the main screen of the application.

### 3.3. How to submit completed forms

Once you have completed the form (after pressing the 'Save Form and Exit' button), it needs to be submitted. After completing the form, tap the 'Send Finished Forms' button on the application main screen:



This will take you to a screen where all your completed and un-submitted forms are listed. Select the one you would like to submit or select all if you want to submit all, and tap the 'Send Selected' button on the bottom right of the screen.



If the submission was successful, a message will appear saying so, and the respective completed forms will vanish from this list. If all were selected and successfully sent, all will disappear. Tap the phone's 'BACK' capacitive button to return to the application's main screen.

If there is any error in submission, it can be because of the internet not working. In that case, confirm if the internet is working and try submitting the form/s again. If you are still unsuccessful, report your issue on the helpline given at the end of this document.

Tap the phone's 'HOME' capacitive touch button to exit the application and return to the home screen of the phone once you have successfully submitted the forms.

.....  
Helpline: 0308 4091080

# D Training Manuals For Dashboard Use

Directorate General Health Services, Health Department, Government of the Punjab



## MANUAL FOR HEALTH FACILITY INFORMATION MANAGEMENT SYSTEM (ONLINE DASHBOARD)



Directorate General Health Services  
Supported By

Punjab Health Sector Reforms Program (PHSRP)  
International Growth Centre (IGC)  
Lahore University of Management Sciences (LUMS)

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Directorate General Health Services, Health Department, Government of the Punjab

## 1. Introduction

The Health Department of Government of the Punjab is committed to adopting state-of-the-art technology to strengthen governance and improve service delivery for all citizens.

For this purpose, the Punjab Health Sector Reforms Program (PHSRP), with technical assistance from International Growth Centre (IGC) Team, is supporting DGHS and district health managers in strengthening the internal monitoring system of the Health Department. This is being done by introducing a mobile phone based, online information management system.

This initiative will improve the internal information transmission within the Health Department and will ensure that timely, authentic and actionable information is sent quickly from individual facilities to district and provincial health managers on such crucially important issues as absenteeism, medicine stock outs, availability and functionality of equipment etc.

Android-based smartphones have been provided to those district supervisory officers, such as Executive District Health Officers (EDOs), District Health Officers (DOs), and Deputy District Health Officers (DDOs), who have been tasked with the collection of performance related data from Basic Health Units (BHUs), Rural Health Centers (RHCs) and Tehsil and District Headquarters (THQs and DHQs).

The report submitted by these officers through the phone will be recorded on a website, known as the 'Dashboard', and automatically analyzed for use by managers at various levels. It is expected that this information will become a powerful tool for management both for district and central level officials. This is expected to bring about marked improvement in health service delivery management, particularly at primary and secondary levels of healthcare, leading to better health outcomes for the poor and disadvantaged in the province.

Directorate General Health Services, Health Department, Government of the Punjab

At Directorate General Health Services, Director, District Health Information System (DHIS), supported by the PHSRP and IGC team, is the focal person for implementation of the program at the provincial level. Overall responsibility for the program at the district level lies with EDOs, and Statistical Officers (SOs) are the designated focal persons for managing the system at the district level.

This manual explains what information is available on the online dashboard and how it is displayed, to help managers at different levels to utilize this powerful tool to its full potential in order to improve health care in the province.

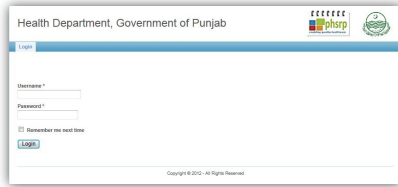
## 2. The Dashboard

The online dashboard can be accessed any time over the internet through the following link:

punjabmodel.gov.pk/phsrp/dashboard

When you open the link, the following page will be displayed, prompting you to enter your username and password, and giving you the option of saving these credentials for automatic login the next time you open the link, as shown in Figure 1.

Figure 1



To access the dashboard, you have to enter the unique username and password already communicated to you and click on 'Login'. Once successfully logged in, you can also change your password for the dashboard by accessing the Change Password section in the blue bar. When you are done using the dashboard, you can click on 'Logout' to end the session.

Figure 2



3

As shown in Figure 2, the blue bar near the top of the page contains all the major sections of the dashboard, allowing you to effortlessly navigate from one part of the online tool to another.

One major feature of this tool is the 'Print' button/icon which is located to the right, just below the blue bar. Clicking this allows you to take a snapshot of whatever is currently being displayed on the dashboard and print it out.

It is important to note that there are two levels of access for the dashboard—the district level and the provincial level. All DCOs, EDOs, DOs and DDOs have access to the district level but not the provincial level, ergo when they log in, they are shown the district level by default. The relevant higher up senior officers, however, have access to the district level as well as the provincial level, so when they log in, their default view is the provincial level, but they can also choose to access the district level by choosing from a drop down list of districts near the top of the webpage.

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### 2.1. The District Level

#### 2.1.1. Compliance Status

The first page that is displayed when you log in the dashboard is the Compliance Status section. Officers can use this section to track their compliance performance for the current month as well the months before. They can also gauge their current standing compared to health officers in the district with respect to compliance.

The most prominent characteristics of this page are the 2 bar charts and the table below them.

The first bar chart represents the percentage compliance of all the health officers in the district for the **last calendar month**, disaggregated by facility type. This is calculated as follows:

$$\text{Percentage compliance} = (\text{total visits performed last month} / \text{visits assigned last month}) \times 100$$

The bars are color coded by facility type, as explained by the legend displayed on the page. Compliance is 100% if the officer performed 100% of the visits assigned to him or more.

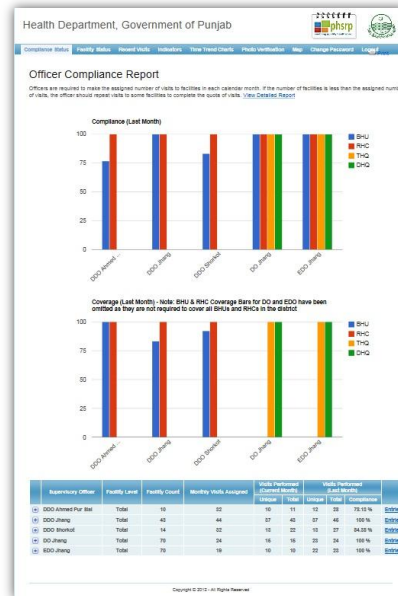
The second bar chart represents the percentage coverage of all health officers in the district for the **last calendar month**, disaggregated by facility type. This is calculated as follows:

$$\text{Percentage coverage} = (1 - (\text{no. of assigned facilities not visited by any officer last month} / \text{facility count})) \times 100$$

Once again, the bars are color coded by facility type, as explained by the legend displayed on the page, as shown in Figure 3.

5

Figure 3



6

The distinction between what the two charts convey is important and is easily explainable using an example. Suppose there are 10 facilities in an officer's jurisdiction and he is assigned a total of 10 visits. If he visits every single facility once, his compliance as well as his coverage will be 100%. If he visits only 1 facility 10 times during the month, his compliance will still be 100% but his coverage will be 10%. Similarly, suppose if the assigned visits are 20 and the facility count is still 10; if he visits each facility once (leading to a total of 10 visits), his compliance will be 50% but his coverage will be 100%. Officers should strive for 100% compliance as well as the maximum possible coverage (which can be less than 100% only in cases where facility count exceeds the number of assigned visits).

The table below the charts gives detailed information regarding compliance figures. The '+' icon before every officer's designation in the 'Supervisory Officer' column can be clicked to expand the table to show information disaggregated by facility type. The information displayed in the table includes the facility count, monthly assigned visits, unique and total visits performed during the current month, unique and total visits performed last month, and the percentage compliance for last month, for every officer in the district, disaggregated by facility type as well as in total.

For cases in which compliance in the last calendar month is low, the table is highlighted red, as shown in Figure 4.

Figure 4

| Supervisory Officer            | Facility Count | Facility Level | Monthly Units Assigned | Visits Performed (Current Month) |       |            | Visits Performed (Last Month) |       |            | Compliance |
|--------------------------------|----------------|----------------|------------------------|----------------------------------|-------|------------|-------------------------------|-------|------------|------------|
|                                |                |                |                        | Unique                           | Total | Compliance | Unique                        | Total | Compliance |            |
| DDO Malak                      | Total          | 27             | 36                     | 17                               | 17    | 47%        | 16                            | 16    | 89.9%      | Easy       |
| DDO Sheikhan/Chakraborty Phewa | Total          | 12             | 36                     | 16                               | 19    | 26%        | 26                            | 26    | 72.2%      | Easy       |
| DDO Mir Malak                  | Total          | 26             | 36                     | 16                               | 23    | 24%        | 24                            | 24    | 62.5%      | Easy       |
| DDO I Malak                    | Total          | 89             | 25                     | 21                               | 21    | 21         | 21                            | 21    | 84%        | Easy       |
| DDO HQ Malak                   | Total          | 89             | 25                     | 0                                | 0     | 0%         | 0                             | 0     | 0%         | Easy       |
| DDO Malak                      | Total          | 89             | 25                     | 0                                | 0     | 0%         | 0                             | 0     | 0%         | Easy       |

The last column provides hyper links, allowing you to jump directly to the relevant entries in the 'Recent Visits' section. The Recent Visits section will be explained in detail later on.

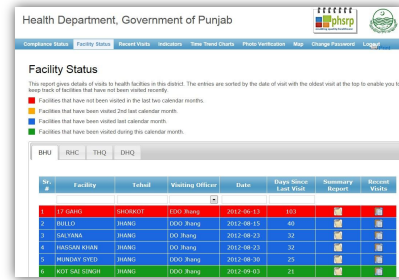
If you are interested to see compliance figures for months before the last calendar month, you can click on the 'View Detailed Report' hyperlinked text located near the top of the page.

Note: Should you find that a visit to a particular facility is not being displayed on the dashboard despite being successfully submitted from the Android smart phone allotted to you, please convey it immediately at the helpline given at the end of this document.

2.1.2. Facility Status

The Facility Status section gives you a list of all the facilities in the district, arranged by the date of last visit with the oldest visited at the top. It is designed to enable you to keep track of facilities that are being neglected. The facilities are color coded, according to the legend displayed on the page, as shown in Figure 5.

Figure 5



The page has different tabs for the different facility types. Each tab displays a table which displays the facility name, the Tehsil/Town it is located in, the designation of the officer who last visited the facility, the date of the last visit and the number of days since the last visit. The corresponding columns also have filters in-built that allow you to view selective information if you choose to.

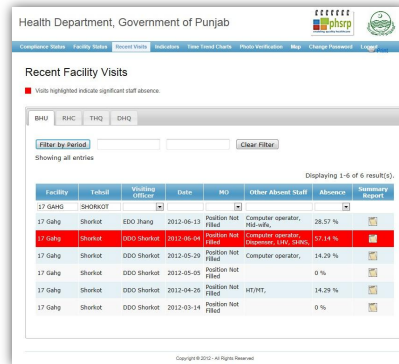
The table also contains a column for Summary Report. Clicking the icon in this column for any row will take you to a page displaying details regarding the last visit to the facility as well as the second last visit, in addition to the Tehsil variable averages (from 30 days from the last visit). Figure 6 shows a cropped screenshot of the page.

Figure 6



Clicking on the icon in the Recent Visits column for any facility, instead, will take you to the Recent Visits section showing you a list of all entries made for that facility, as shown in Figure 7.

Figure 7

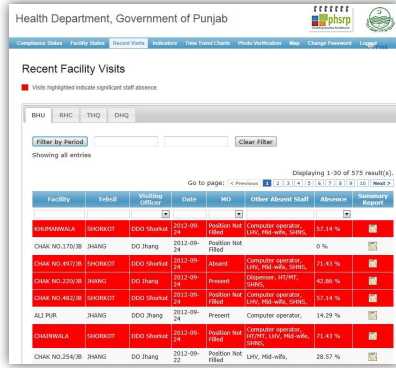


Officers should ensure that all the facilities listed in the Facility Status section are green- some can be blue for cases in which the facility count is more than the assigned visits. Orange or red rows represent neglected facilities and they should be visited as soon as possible.

2.1.3. Recent Visits

The Recent Visits section lists all entries as they come in, with the latest submitted on top. There are different tabs for different facility types. Each facility type tab contains a date filter, which allows you to view entries submitted during a particular time period, and a table consisting of entries, as shown:

Figure 8



To view entries submitted between certain dates, choose the start and end dates from the drop down calendars displayed by clicking on the two white text boxes immediately below the facility type tabs respectively, and click the 'Filter by Period' button.

Some of the entries in the table might be highlighted red, as shown in the above screenshot. These represent facilities where significant staff absence was reported. The table also allows you to display only the highlighted entries or the non-highlighted entries separately, in addition to displaying them all together. The drop down filter for the column labeled 'Absence' can be used to toggle between the selections.

The table also contains information that includes the facility name, the Tehsil/Town it is located in, the visiting officer, the date of visit, the availability status of the MO and the availability status of other staff. It also provides filters for all these categories for selective searches.

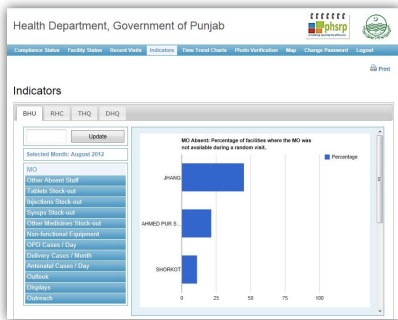
The Summary Report icon at the end of every entry in the table can lead you to a page displaying details regarding the last visit to the facility as well as the second last visit, in addition to Tehsil/Town variable averages (from 30 days from the last visit) as already depicted in Figure 6.

As already mentioned, should you find that a visit to a particular facility is not being displayed on the dashboard despite being successfully submitted from the Android smart phone allotted to you, please convey it immediately at the helpline given at the end of this document.

2.1.4. Indicators

The Indicators section displays charts comparing performance of the different Tehsils/Towns based on the various indicators reported during facility visits. Once again, there are different tabs for different facility types, and different indicators, in some cases, for different tabs. The following screenshot should give you an idea of what the page looks like:

Figure 9



It is important to note that while there are multiple BHUs, RHCs and THQs in each district, the number of DHQs is one or zero. Hence, instead of a comparison across Tehsils/Towns as for the case of BHUs, RHCs and THQs, the DHQ section compares DHQs across districts. Furthermore, all indicator charts that display data expressed in percentages in the DHQ section have an additional red bar which reflects percentage compliance in every district. The compliance bars are intended to be a gauge of how many visits' data is used to derive the charts- ergo, the higher the compliance, the more reflective is the value of the variable of the actual situation in the corresponding district.

For all tabs, there is a text box allowing you to choose which month you want to see the data for. The page displays charts for the last calendar month by default. If you want to access charts for some previous month, you need to click on the white text box, select the month and year from the drop down

menu, click 'Done', and then click the 'Update' button located to the immediate right.

Most indicators in the list have multiple charts that are displayed when you click on any one of them. All charts have descriptive labels that clearly indicate what they represent. Tables 1 through 4 in the appendix show how the charts are arranged for each facility type.

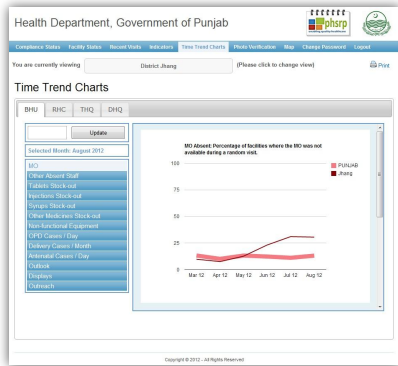
These charts can prove to be a very powerful tool for Tehsil-wise comparison based on the different performance related indicators. However, if taken in isolation, interpretations derived from them may be misleading. For example, if Tehsil 'A' shows 0% MO absence while Tehsil 'B' shows 20% MO absence, it doesn't necessarily imply that Tehsil 'A' is better in MO attendance than Tehsil 'B'. It is possible that only a single visit was performed in Tehsil 'A' in the entire month- during which the MO was present- while, out of the 10 visits performed in Tehsil 'B', the MO was absent in only 2. Ergo, the information displayed in the charts should always be interpreted while considering compliance figures.

2.1.5. Time Trend Charts

The Time Trend Charts section contains line graphs representing the change over time in all the indicators of the different facility types present in the Indicators section as shown in Tables 1, 2, 3 and 4 in the appendix. The general layout of this section is very similar to that of the Indicators section, with the same indicator tabs and option to select a different month for all facility types. However, there is one key difference; the charts contain two lines- a thin one representing the district average and a thick one representing the provincial average- allowing you to compare the average district performance on each indicator to the provincial average, over time, instead of comparing across Tehsils/Towns of the same district. Figure 10 shows how the webpage might look.



Figure 10



You can also compare the performance of any Tehsil/Town compared to the district average over time. This can be done by clicking the drop down button near the top of the page and selecting the Tehsil/Town you want to compare with the district average. In the charts that will be displayed as a result, the thick line would represent the district's average and the thin line would represent the Tehsil/Town average.

These charts can prove to be very useful in observing and comparing trends in different indicators over time, at the provincial, district, as well as the Tehsil/Town level.

2.1.6. Photo Verification

To verify staff presence, the smart-phone Performa requires officers to take pictures of the essential staff present at the facility they are visiting. The Photo Verification section displays all these, sorted by the most recent visit, by officer designation. Figure 11 shows the layout of the page.

Figure 11

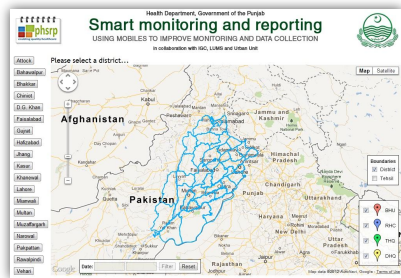


You can view the full size version of any picture by clicking on it. Health officers responsible for supervision of BHUs, RHCs, THQs and DHQs are advised that the pictures submitted should not be blurry or unclear in any way for the convenience and effectiveness of photo verification.

2.1.7. Map

When you click on the tab for the Map section, a separate window (or tab, depending on your browser) will open, displaying a map of Pakistan and its surrounding areas as shown in Figure 12.

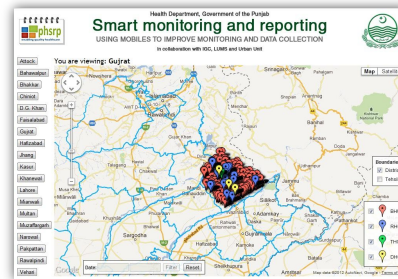
Figure 12



For completing an entry for a facility visit, the smart-phone Performa requires the supervisory officer to record the location of the facility using the phone's GPS. All successfully submitted entries show up on this map when you zoom down to individual district.

In order to view entries for any district, you need to click on the relevant district tab from the list on the left. Once you zoom in, all the relevant entries will show up as place-marks color-coded with respect to the facility type, as shown in Figure 13.

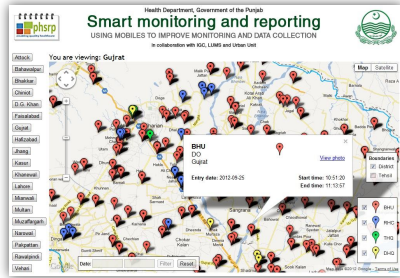
Figure 13



You can zoom further in or out using the zooming tool in the upper left corner of the map. The map also allows you to show or hide District and Tehsil boundaries, and even switch between Map and Satellite view. Furthermore, the date filter allows you to see only those entries submitted during a certain time period.

Clicking on any place-mark reveals a few details regarding the entry that include the supervisory officer's designation, the date the entry was made, the start and end time of the visit and a link to the picture taken for the entry, as shown in Figure 14.

Figure 14



The map allows for spatial review of the coverage and compliance in the District or Tehsil/Town, which can prove to be very useful for circumstances in which information regarding the location and spread of the facilities is crucial.

## 2.2. The Provincial Level

As already mentioned, when you log in to the dashboard with an account that has provincial level access as well as district level access, your default view of the dashboard is the provincial level view. However you can access the district level view for any district by choosing it from the drop down list that appears when you click the 'Punjab' button, which is right below the blue bar near the top of the page.

The Recent Visits and Photo Verification sections in the provincial level view are blank as the usefulness of a combined list of entries or verification pictures coming in from all districts is very limited.

Apart from that, the Map section for both the levels is exactly the same.

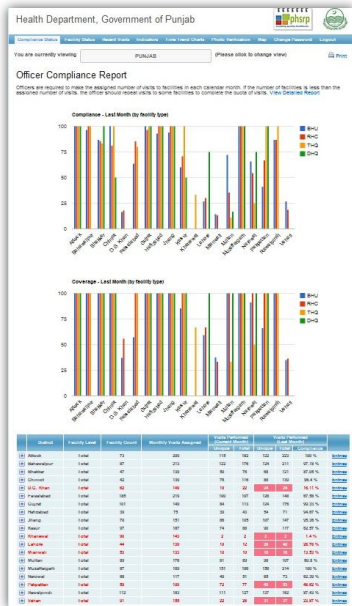
### 2.2.1. Compliance Status

Once again, the first page displayed after a successful login is the Compliance Status section. This is just like the Compliance Status section in the district level view except that instead of a comparison across Tehsils/Towns in a district, you have a comparison of compliance across districts.

The bars in the two charts are color-coded in the same way as in the district level view, and the table below the charts gives detailed information regarding compliance figures for districts, rather than supervisory officer. Again, the '+' icon can be clicked to expand the table to show information disaggregated by facility type. The information displayed in the table includes the facility count, monthly assigned visits, unique and total visits performed during the current month, unique and total visits performed last month, and the percentage compliance for last month, for every district, disaggregated by facility type as well as in total.

Figure 15 shows how the page might look like.

Figure 15



Districts with low compliance in the last calendar month will be highlighted in red. The last column provides hyperlinks, allowing you to jump directly to the relevant entries in the 'Recent Visits' section, as in the district level view.

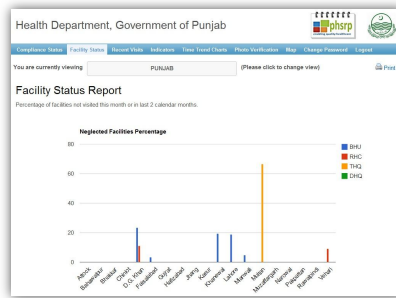
Moreover, if you are interested to see compliance figures for months before the last calendar month, you can click on the 'View Detailed Report' hyperlinked text located near the top of the page, in same way.

This section is very useful for senior officials to track the compliance and coverage status of all districts and compare them if need be.

### 2.2.2. Facility Status

The Facility Status section in the provincial level view is radically different from that in the district level view, as apparent from Figure 16.

Figure 16



The page displays a single bar chart representing the percentage of facilities that are being neglected in each district. The bars are color-coded based on the facility type.

The criterion for a facility to be considered neglected is that it is not visited by any supervisory officer in the current month as well as the last two calendar months. Senior officials can easily identify which district has the highest percentage and take appropriate measures to rectify the situation.

### 2.2.3. Indicators

The Indicators section in the province level view is very similar to that in the district level view in terms of layout and structure. The variables are exactly the same as those in the district level view, as detailed in Tables 1, 2, 3 and 4 in the appendix.

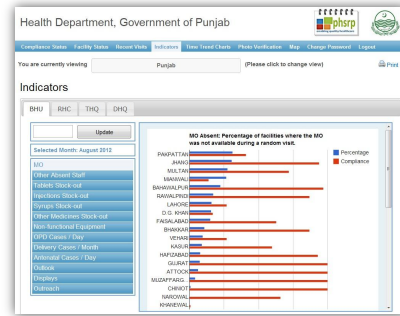
One major difference between the two views, however, is that instead of a comparison across Tehsils/Towns in a district, the provincial level charts compare performance across districts for all the indicators.

Also, indicator charts in the province level view contain extra red bars representing compliance for the BHUs, RHCs and THQs as well as the DHQs, whereas this is only true for DHQs in the district level view of the Indicators section. As previously explained, the compliance bars serve as a gauge of how many visits' data is used to derive the charts- meaning that the higher the compliance, the more the value of the variable is reflective of the actual situation in the corresponding district

Figure 17 depicts a screenshot of the section.

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Figure 17



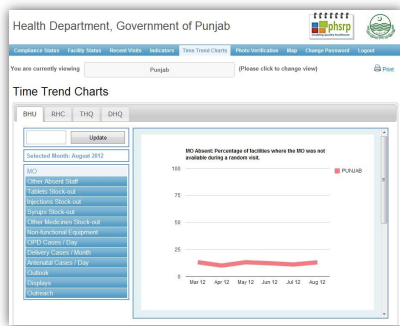
This section can prove very useful to track performance of and across districts in terms of various indicators.

### 2.2.4. Time Trend Charts

The Time Trend Charts section in the province level view is exactly the same as that in the district level view, except that there isn't an extra line for any district on any of the charts; just a thick line representing the trend of provincial averages for the same indicators over time, as depicted in Figure 18.

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Figure 18



As already mentioned, you can move to the district level view if you want a comparison of the provincial average with a district's average, or even to the Tehsil/Town level view if you want a comparison of the district average with a Tehsil/Town's average, over time.

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