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THE POLITICAL ECONOMY OF PUBLIC SECTOR ABSENCE: EXPERIMENTAL EVIDENCE FROM PAKISTAN

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ABSTRACT

Public sector absenteeism undermines service delivery in many developing countries. We report results from an at-scale randomized control evaluation in Punjab, Pakistan of a reform designed to address this problem. The reform affects healthcare for 100 million citizens across 297 political constituencies. It equips government inspectors with a smartphone monitoring system and leads to a 76% increase in inspections. However, the surge in inspections does not always translate into increased doctor attendance. The scale of the experiment permits an investigation into the mechanisms underlying this result. We find that experimentally increasing the salience of doctor absence when communicating inspection reports to senior policymakers improves subsequent doctor attendance. Next, we find that both the reform and the communication of information to senior officials are more impactful in politically competitive constituencies. Our results suggest that interactions between politicians and bureaucrats might play a critical role in shaping the success or failure of reforms.

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A randomized controlled trials registry entry is available at
https://www.socialscienceregistry.org/trials/1329/history/

1 Introduction

Addressing public worker absenteeism is a critical policy challenge across much of the developing world (Banerjee, Deaton, and Duflo, 2004; Kremer et al., 2005). The magnitude of the issue is substantial: one in five health providers and one in three education providers are absent at public clinics and schools across Bangladesh, Ecuador, India, Indonesia, Peru, and Uganda (Chaudhury et al., 2006). Correspondingly, a substantial body of research in economics examines the effects of initiatives aimed at reducing public sector absence,[1] finding mixed results. Banerjee and Duflo (2006) emphasize this point in a literature review, stating "it is hard to resist the conclusion that most attempts to boost the presence of teachers and health providers have not been particularly successful."

Our objective in this paper is to understand what determines the success of such reforms. We study a province-wide reform designed to reduce health worker absence in Punjab, Pakistan. This is a setting where reform is very much needed—at baseline doctors are absent from rural health clinics across Punjab over two thirds of the time. Meanwhile, these clinics are the first line of defense for tens of millions of rural Pakistanis for all preventative health care, antenatal services, and basic outpatient services. The reform has two key elements. First, already-existing government health inspectors are equipped with smartphones. An application on the phones replaces paper logs and requires timestamps, GPS-stamps, and pictures of inspectors and all staff marked present for each visit to a rural health clinic. Second, all of the information captured by the inspector, such as the availability of medicines and the presence of key personnel, is aggregated in a user-friendly online dashboard, which is visible to and frequently referenced by senior health officials.

We evaluate the reform using a large-scale randomized control trial in which half of the districts of Punjab were randomly selected for the reform while the other half continued according to the status quo. We find that rural health clinics in treatment districts see

[1] See for instance: Banerjee and Duflo (2006); Banerjee, Duflo, and Glennerster (2008); Olken and Pande (2012); Dhaliwal and Hanna (2014).

inspection rates nearly double, but that these additional inspections and associated increase in attendance data for senior health officials did not decrease doctor absenteeism.

Aware of the mixed results in the literature, we anticipated the reform could fail, and so constructed a research design that would allow us to make progress on understanding why. We focus specifically on whether elected politicians attempt to undermine the reform by interfering with its implementation. Policymakers pointed to interference by politicians as a key reason the reform might fail, indicating that they may have a stake in preserving the status quo.

To this end, we begin by presenting three suggestive facts consistent with political interference in the health bureaucracy prior to our reform. First, through interviews with all senior health officials in Punjab, we find that forty-four percent of these officials report a politician interfering in their decision to sanction an underperforming employee in the previous year. Second, we find more reports of political interference in less competitive electoral districts. In the least-competitive tercile of Punjab's 297 Provincial Assembly constituencies (as measured by the Herfindahl index of vote shares in the most recent election), senior health officials report an average of 4.06 instances of interference, while in the most competitive tercile, they report 1.9 instances ($p < 0.05$). Third, we document a strong correlation between political competition and absenteeism. We use the GPS coordinates of health facilities and independently collected unbiased data on doctor absence to obtain spatial regression discontinuity estimates of the relation between political competition and doctor attendance. Moving from a constituency at the 5th percentile of the Herfindahl index to one at the 95th percentile is associated with a reduction in attendance of 40.5 percentage points ($p < 0.1$). Similarly, we find that doctors who report a direct connection to the local Member of the Provincial Assembly are 21 percentage points less likely to be at their clinic during normal working hours ($p < 0.05$). We are careful in not interpreting these claims as causal. We do not randomize political competition or doctor connections. However, spatial controls help us rule out several alternate explanations. Taken together, these facts are consistent with the

view of the policymakers who championed the project: there is much to suggest politicians directly influence health service delivery, even when this is explicitly the responsibility of bureaucrats.

Next, having established the existence of political interference and its correlation with absenteeism in the cross-section, we document that the average treatment effect of the smartphone monitoring reform on doctor attendance masks important heterogeneity. We find that while the program increases health inspections uniformly across constituencies, doctors only respond to the increase in inspections in the most politically competitive tercile of constituencies, where their attendance probability increases by over thirty percent. By contrast, the reform appears to have weakly negative, though insignificant effects in the second tercile (-8 percentage points) and in the least competitive tercile (-3 percentage points).

In general, when policy reforms designed to constrain rent-seeking span a broad set of heterogeneous political constituencies, there is good reason to check for heterogeneity. Often, politicians can either formally or informally exert substantial leverage over reform implementation and, in many cases, have incentives to do so. Indeed, several recent studies take this approach (Chandra, 2007; Robinson and Verdier, 2013; Hollibaugh, Horton, and Lewis, 2014).

Our setting, however, allows more direct evaluation of whether politicians interfere with reform implementation. Specifically, we manipulate the salience of doctor absence in online data visualizations presented to senior officials who are responsible for the entire health apparatus in their respective districts. We select an arbitrary threshold at which facilities are flagged as suffering from exceptionally low attendance. All health reports that meet this threshold are highlighted in red in a web portal (henceforth termed a 'dashboard') where data are summarized and presented to senior officials. This allows us to compare subsequent absence rates in flagged versus unflagged facilities. To our knowledge, this constitutes the first experimental test of whether providing data to policy actors changes their behavior.

We find that flagging a facility increases subsequent doctor attendance by 27 percentage

points, supporting the idea that one channel through which the smartphone program works is the senior bureaucracy. Next, we find that while flagging a facility increases subsequent attendance by 32 percentage points in the most politically competitive third of constituencies, flagging has no apparent effect in the least competitive tercile (p-value of the difference in estimated effects is 0.062). This is consistent with results in Bertrand et al. (2015) indicating that senior officials in Northcote-Trevelyan style bureaucracies have considerable influence. It appears that senior health officials can respond to reports of absence by getting doctors to go to work in competitive constituencies, but not in uncompetitive ones.

Because our initiative spans 297 constituencies which vary broadly in their local political circumstances, our setting is well-suited to studying the determinants of reform success. We also collect survey data from officials at all levels of the bureaucracy, allowing them to describe whether and how politicians interfere in the process and allowing us to measure the links between doctors and politicians. In addition, we embed a second experiment in our broader evaluation, in which we manipulate the dashboard presentations of data on worker absence. If political interference is a major obstacle to the healthy functioning of the reform, then reports of absence from constituencies with powerful politicians should result in no action, whereas if local politicians are weak then reports of absence should result in better action. The combination of our experiment and a substantial investment in primary data collection allow a range of tests to examine whether interference by politicians affects the quality of the reform. Every test we can construct supports the view that local politicians play a major role in determining the reform's success.

This idea has antecedents in a long literature on interactions between politicians and bureaucrats. The literature provides several reasons a politician may seek to interfere when reforms affect public sector jobs. First, government jobs are ideal for patronage: they can be targeted to individuals, provide a credible stream of benefits, and the terms of the job—such as the wage, posting, and reporting requirements—can often be changed easily (Robinson and Verdier, 2013; Hollibaugh, Horton, and Lewis, 2014). Indeed, this observation has a

long history in political science (Sorauf, 1956; Wilson, 1961; Johnston, 1979; Chubb, 1983; Golden, 2003; Calvo and Murillo, 2004; Meyer-Sahling, 2006; Chandra, 2007; Kitschelt and Wilkinson, 2007; Brusco et al., 2013). The use of public jobs as patronage is also a key vote-buying strategy (Gans-Morse, Mazzuca, and Nichter, 2014). Interference can undermine reforms and negatively impact bureaucratic performance (Stokes, 2005; Brusco et al., 2013; Lewis, 2007, 2011; Muralidharan et al., 2017). Naturally, a politicians incentives to engage in such practices are shaped by and will carry implications for the degree of local political competition (Lindbeck and Weibull, 1987; Besley and Burgess, 2002; Careaga and Weingast, 2003; Rodden, 2006; Gordon and Huber, 2007; Kitschelt and Wilkinson, 2007; Raffler, 2016; Grossman and Michelitch, 2017). More broadly, our paper adds to the literature on the benefits of political connectedness (Callen and Long, 2014; Brollo and Nannicini, 2012; Sukhtankar, 2012; Albouy, 2013; Ansolabehere and Snyder, 2006; Khwaja and Mian, 2005; Fisman, 2001; Ferguson and Voth, 2008). It also appears that these practices may be particularly problematic in South Asia (Chandra, 2007; Mohmand, 2011, 2014), where our study is carried out.

More broadly, a substantial recent body of empirical research examines reforms aimed at making states more effective by reforming policies affecting selection, incentives, and management in the public sector.[2] Such reforms necessarily happen in a political context, and politicians may be particularly interested in retaining de facto control of the incentives public employees face. Our set of experiments provide an example where politicians appear to shape the effectiveness of a reform designed to change the incentives of public employees.

In addition, our results also contribute to a growing literature that highlights the potential for technological solutions to large public sector problems, especially when institutionalized and implemented at scale (Muralidharan, Niehaus, and Sukhtankar, 2014; Banerjee et al.,

[2]See for instance: Ashraf, Bandiera, and Jack (2014); Ashraf, Bandiera, and Lee (2015); Muralidharan and Sundararaman (2011); de Ree et al. (2016); Muralidharan and Sundararaman (2013); Finan, Olken, and Pande (2015); Bertrand et al. (2015); Khan, Khwaja, and Olken (2016); Khwaja, Andrabi, and Das (2016); Rogger and Rasul (2016); Bloom et al. (2015)

2014; Dhaliwal and Hanna, 2014). We show that simple automation of data collection and aggregation through smartphones can have meaningful impacts on the way the business of the state is carried out. Smartphone monitoring nearly doubled inspections at public clinics across Punjab. A necessary element for success appears to be the provision of inspector-level incentives to maintain and use the technology. This was achieved partly because the system channeled information on usage back to relevant stakeholders. As a result, the 'Monitoring the Monitors' program has been rolled out to the entire province of Punjab, and is replicated in several sectors in the province including education, vaccinations, police, roads rehabilitation, and sanitation.

We also present, to our knowledge, the first experiment to test whether the presentation of evidence can impact policy decisions. International donors, governments, and other policy actors increasingly encourage the use of data and evidence in the design of policy, yet little is known about whether providing data to policymakers will impact policy outcomes.[3] Indeed, policymakers may face a set of resource, political, or other constraints that limit their ability to act, no matter how much evidence they are provided (Acemoglu and Robinson, 2012). Our information salience experiment shows that presenting data in an actionable format to senior bureaucrats can affect policy outcomes. However, this is not an unconditional result. Decisions by the senior bureaucracy still occur in a political environment. The dashboard only increased doctor attendance where local politics permitted senior officials to take action against doctors.

The paper proceeds as follows. Section 2 provides essential background information related to the reform. Section 3 introduces the smartphone reform. Section 4 presents our primary and secondary data. Section 5 goes over the main experimental results, while Section 6 presents results on political interference in the baseline and the smartphone experiment. Section 7 shows results from the second dashboard experiment. Section 8 concludes the

[3]A body of research in public administration supports performance-based management in the public sector (Moynihan and Pandey, 2010).

paper.

2 Background

In Punjab province, the provision of health care services is managed by the Department of Health, which is based at the provincial headquarters in Lahore. There are five major types of health facilities, and we focus on the lowest tier, called Basic Health Units (BHUs), which we refer to as 'clinics' hereafter. There are 2,496 such clinics in Punjab, almost all of which exclusively operate in rural and peri-urban areas. Each Basic Health Unit serves approximately one Union Council, which are the smallest administrative units in Pakistan.

These clinics are designed to be the first stop for patients seeking medical treatment in government facilities. They provide several services, including outpatient treatments, neonatal and reproductive healthcare, and vaccinations. Each clinic has a doctor, known as the Medical Officer, who is supported by a Dispenser, a Lady Health Visitor, a School Health and Nutrition Supervisor, a Health/Medical Technician, a Midwife, and other ancillary staff. Officially, clinics are open and all staff are supposed to be present from 8am to 2pm, Monday through Saturday.

We study Medical Officers who head these rural clinics. These doctors are general practitioners who have completed five years of medical school, and are consequently the most trained health professionals in rural areas. Doctors are either hired centrally as permanent employees of the province by the Health Department of Punjab, or on a contractual basis at the District level by a senior bureaucrat.[4] 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 Deputy District Officers (described below): compared to the 2,496 Medical Officer posts in clinics in the department, there are only about 120 such senior positions.

[4]Appendix C details the hiring process.

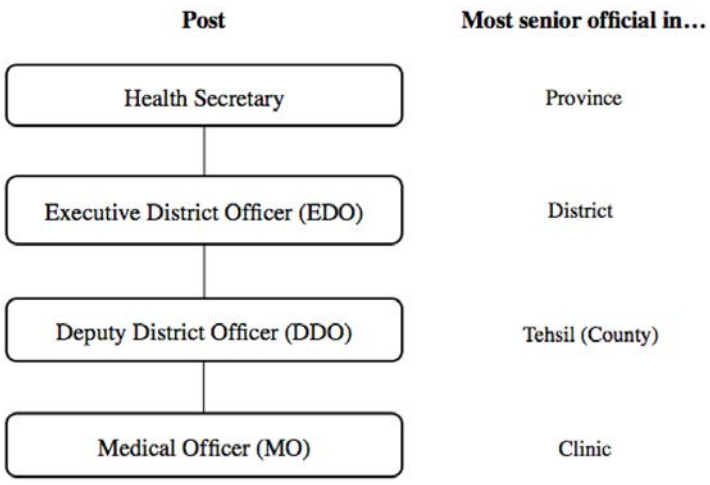


Figure 1: Health Sector Administration in Punjab

Under the umbrella of the Provincial Health Department, district governments are responsible for managing public clinics. The District Health Department is headed by an Executive District Officer (EDO), referred to as a 'senior health official' hereafter, who reports to the Director General of Health Services and the Secretary of the Health Department – the health leadership in Lahore. There are 36 senior health officials in Punjab, one for each district. These officials are supported by several Deputy District Officers, typically one for each county (along with other staff excluded for brevity). Figure 1 depicts this simplified health administration hierarchy in Punjab.

The Deputy District Officers, hereon referred to as 'inspectors', occupy the lowest position in the officer cadre of the district health administration. Inspectors have the authority to punish absent clinic staff by issuing a show-cause notice, which requires staff to explain their absence to the senior health official. 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. The senior health official relies entirely on these inspectors to ensure staff presence.

Inspectors are also required to visit every clinic at least once a month and record infor-

mation collected on a standard form. During the visit, they fill out a paper form at each facility, collecting data on utilization, resource availability, and worker absence. These forms are provided in Appendix G. Once collected, the reports are brought to a central district facility, manually entered into a spreadsheet, and aggregated into a monthly report for senior health officials.

This inspection system limits the ability of senior health officials to monitor their inspectors. It affords only limited visibility into the inspectors' activities. 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 prone to interference by elected politicians.

The career concerns of senior health officials and inspectors are also fundamentally different. The senior health official reports directly to senior provincial authorities who face few bureaucratic hurdles to sanctioning and holding him directly accountable for service delivery in his district. Performance for the senior health official is commonly rewarded with appointment to a higher office. In contrast, inspectors are neither officially nor practically accountable for health service delivery. Appointees to this position have to serve for several years before they are considered for promotion to the next level in the district, and they rarely ascend to leadership positions.

These considerations bear critically on how we should expect health officials to react to new technologies which make monitoring easier. First, senior health officials might embrace a smartphone monitoring system because it makes it easier for them to deliver services effectively, and they benefit professionally from getting their inspectors to do a better job. Correspondingly, this could explain why additional monitoring could lead to an increase in the rate of inspections. It also provides a logic for why senior health officials might respond to reports of absence by encouraging doctors to go to work.

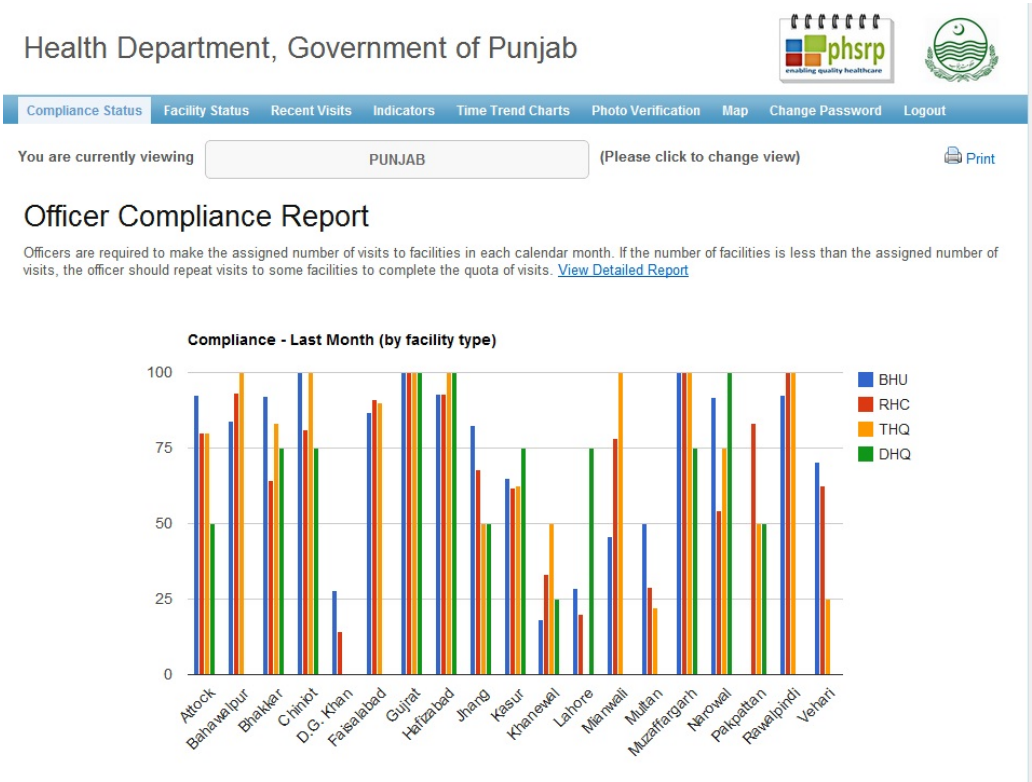
3 The Monitoring the Monitors Program

We partner with the government to design and evaluate the "Monitoring the Monitors" program. The policy objectives of this program were to collect actionable data and improve inspector compliance with monitoring duties. Under this program the government replaced the existing paper-based monitoring system with an Android-based smartphone application, which collected the same data as the paper forms and transmitted them instantly to a central online dashboard. Appendix H provides the training manual for the mobile application provided to inspectors and Appendix I provides the training manual provided to senior health officials to assist them in using the dashboard.

The dashboard provided summary statistics, charts, and graphs in a format designed in collaboration with senior health officials. Inspections were also geotagged, timestamped, and complemented with facility staff photos to check for reliability. The geotagging and timestamping features were designed to increase monitoring of inspectors while the facility staff photos were intended to increase monitoring of doctors. Figure 2, Panel A, shows one view of the online dashboard. It presents a bar chart giving the number of inspections as a proportion of total assigned inspections made by each of the treatment districts, allowing the Health Secretary to compare performance across districts. Panel B provides an alternate view available to senior officials—a summary spreadsheet where each row corresponds to a different facility visit. In Section 3 below, we provide full details of our experimental evaluation of the "Monitoring the Monitors" program. Our design allows us to estimate the effect of providing phones on inspections and on doctor attendance, and, separately, the effect of providing information to senior officials via the dashboard.

The intervention channels information about inspections to district-level health officials; randomization at a finer level is therefore very likely to generate externalities. The Department of Health also determined that sub-district randomization was not administratively feasible. Cluster randomization also allays some concerns about externalities generated by interactions between inspectors in the same district. All inspectors in a district are required

Panel A: Summary of Inspection Compliance by District



Panel B: Highlighting Underperforming Facilities

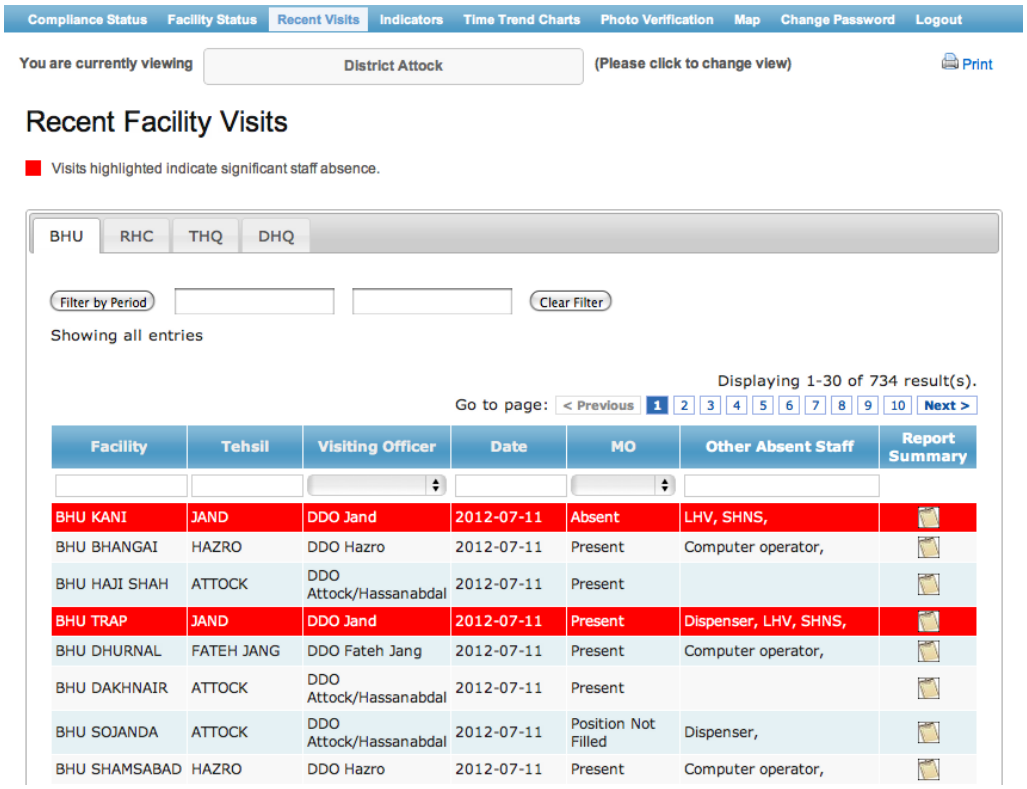


Figure 2: Online Dashboard Screenshots

to attend monthly meetings. While they typically have frequent interactions within districts, these relations are much weaker across districts.

Our experimental sample comprises all health facilities in 35 of the 36 districts in Punjab. We remove Khanewal from the experimental sample as that district served as the location for our pilot. While we have administrative data for all clinics, we monitor a subsample of 850 clinics using independent inspections. This sample is drawn to be representative of clinics in the province. We randomly implemented the smartphone program in 18 of the 35 districts in our experimental sample. In assigning treatment, we stratified on baseline staff attendance and the number of clinics in a district to ensure a roughly even number of facilities in treatment and control. Figure 3 depicts control and treatment districts.

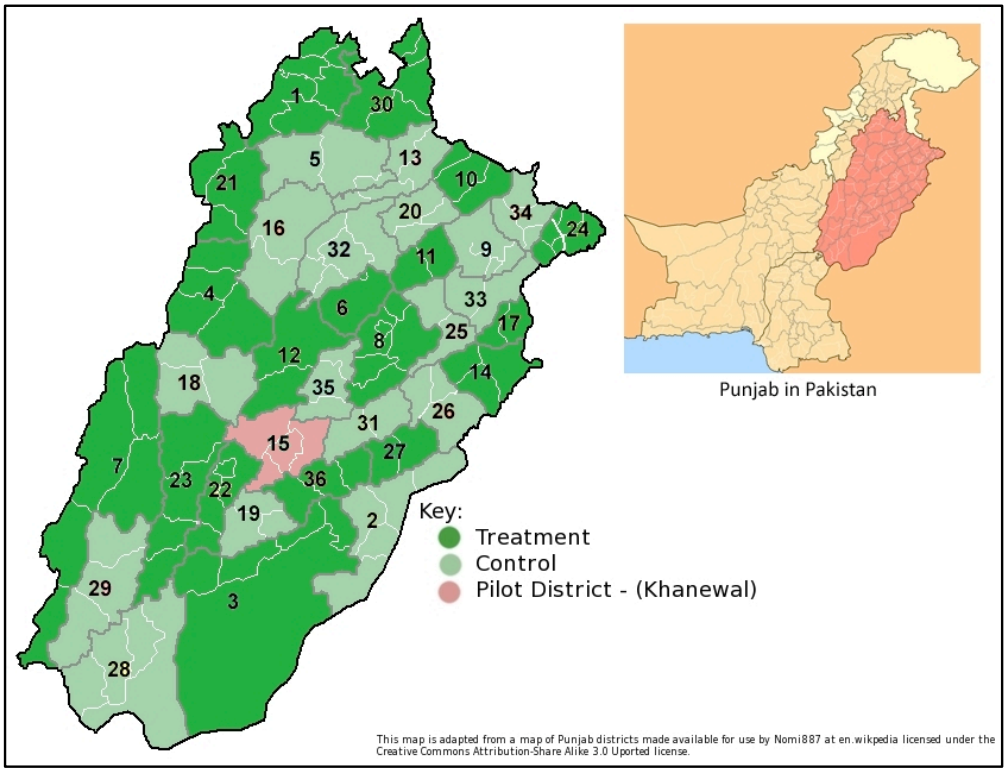


Figure 3: Treatment and Control Districts

4 Data

We use three sources of data: 1) interviews with the universe of senior health officials and inspectors; 2) attendance audits and interviews of doctors in a representative sample of clinics; and 3) data on election outcomes.

4.1 Interviews of Senior Health Officials and Inspectors

We interviewed all senior health officials in Punjab. These included 34 of the 36 Executive District Officers in Punjab,[5] as well as the 116 posted inspectors. All staff were interviewed at their offices or the district headquarters to ensure a high response rate. The interview focused on questions about day-to-day activities of senior health officials and inspectors, including a time-use survey, as well as questions on political interference in the health bureaucracy.

4.2 Representative Survey of Clinics

We collected primary data on a representative sample of 850 of the 2,496 clinics in Punjab. This sample represents 34 percent of the population. Clinics were selected randomly using an Equal Probability of Selection (EPS) design, stratified on district and distance between the district headquarters and the clinic. Our estimates of absence are thus self-weighting, and no sampling corrections are used in the analysis.[6] All districts in Punjab except Khanewal are represented in our data. To our knowledge, this is the first representative survey of clinics in Punjab. Figure 4, Panel A, provides a map of the Basic Health Units in our experimental sample along with the different Provincial Assembly constituencies in Punjab.

Surveyors made three unannounced visits to these facilities: first in November 2011, then in June 2012, and finally in October 2012. Our survey teams were trained by senior

[5]EDO Khanewal was not interviewed as Khanewal is the pilot district for our study, while EDO Faisalabad was not available for interview.

[6]We sampled an equal proportion of clinics within each stratum to preserve an equal probability of selection.

enumerators and our team members at four regional hubs. Following these trainings, the teams made visits to clinics in their assigned districts and remained in regular contact with their team leaders and our research team. Surveys took three weeks to field in each wave.

During the unannounced visits, our team collected information on doctor absenteeism. Each enumerator was asked to fill an attendance sheet for the staff at the clinic at the end of the interview *and* in private. Doctors are officially required to be present and see patients at the clinic. An unannounced visit therefore captures the official work assigned to doctors. This measure was whetted by our government partners.

Importantly, during our doctor interviews, we collected data on doctors' tenure in their post, the distance of their post from their hometown, and whether they know the local Member of the Provincial Assembly (MPA) personally.[7] To ensure sampling of doctors who were not present at their clinics during any of our three visits, we pursued the absent doctors until we could find them and interview them. We detail this process in Appendix A2.

4.3 Election Data

We study elections for seats in the Punjab Provincial Assembly, a legislative body comprising 371 members, including general and reserved seats.[8] Punjab, a province of 100 million citizens, follows a party-based single-member district electoral system. We make use of election data for the 2008 Punjab Provincial Assembly elections.[9] These data provide vote totals by constituency for all candidates running in the election. In cases of by-elections, we consider data from the election that most immediately preceded our program. Appendix B describes the protocol for identifying the constituency corresponding to each clinic. Figure

[7]Connections to politicians are less likely for other staff posted at the clinic. For the empirical analysis below, we generate a time invariant indicator variable that equals 0 unless doctors report they know the local politician in all the waves where this question is answered, in which case, it is coded as 1.

[8]"About Assembly," Provincial Assembly of the Punjab, Retrieved on Sep 7, 2013 from http://www.pap.gov.pk/index.php/faqs/listfaqs/en/12.

[9]We thank Ali Cheema and Farooq Naseer for kindly sharing this data.

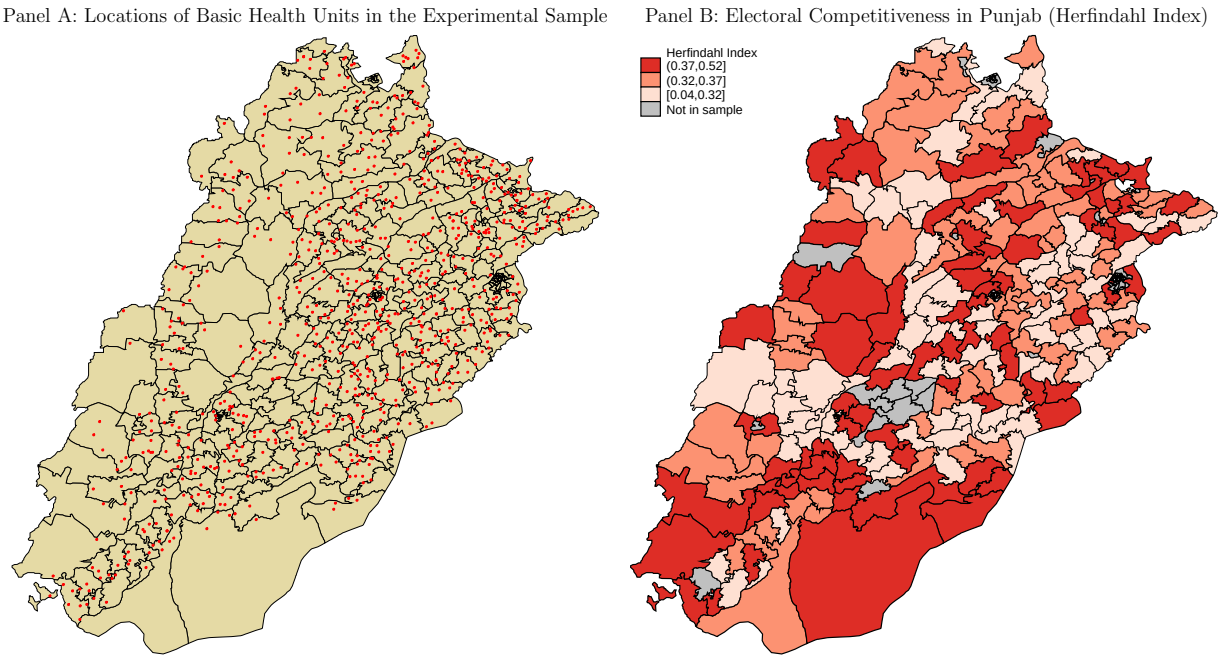


Figure 4: Experimental Sample and 2008 Political Outcomes by Constituency

Notes: Drawn borders demarcate Provincial Assembly constituencies in Punjab. The Herfindahl index in Panel B is computed as the sum of squared candidate vote shares in each provincial assembly constituency during 2008 elections

4, Panel B, shows the degree of political competition, as measured by the Party Herfindahl Index, across Punjab. Higher values of the index correspond to lower political competition. Focusing on the provincial legislature is appropriate because a lot of services, including public health, were devolved to the provincial level under the Eighteenth Amendment to the Constitution of Pakistan.

5 Smartphone Monitoring Experiment Results

We now present results from our experimental evaluation of the "Monitoring the Monitors" program that randomized the smartphone treatment at the district level. While stratifying on the share of staff present during our baseline interview achieved balance for five of the six categories of staff that are supposed to be present at clinics, we have a statistically significant

imbalance for doctors.[10]

We estimate regressions using the following specification:

$$Y_{dit} = \alpha + \beta Treatment_{dit} + \delta_t + \varepsilon_{dit} \tag{1}$$

Y_{dit} is official inspection or doctor attendance, and $Treatment_{dit}$ is a variable equal to 1 for treated districts, where i refers to the clinic, d refers to the district, and t to the survey wave. δ are survey wave fixed effects. We cluster all standard errors at the district level.

In some cases we also estimate a differences-in-difference specification:

$$Y_{dit} = \alpha + \beta_1 Treatment_{dit} + \beta_2 Post_{dit} + \beta_3 Treatment_{dit} \times Post_{dit} + \delta_t + \varepsilon_{dit} \tag{2}$$

where $Post_{dit}$ equals 1 for post-treatment periods (waves 2 and 3), and 0 otherwise. In this specification, the coefficient of interest is β_3.

With only 35 districts in our sample, we account for potential small sample bias in inference by making use of Fisher's exact p-values (Fisher, 1935). The p-values generated with this permutation test do not require an asymptotic limiting distribution for inference (Gerber and Green, 2012). This test assumes a null of no treatment effect for any unit. We perform this test by creating a vector of artificial treatment assignments using a random number generator. 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 effects. The p-value is the share of artificial treatment effects that are larger than the actual treatment effect. For the main treatment effect on inspection rates, we can find no artificial assignment which generates a larger effect than that created by the actual assignment.

[10]Figure A7 reports a long time series of administrative data on doctor attendance from paper records. We find that the difference in levels does not reflect a difference in pre-treatment trends, allaying some concerns that our fixed effects difference-in-difference estimates are not causal.

5.1 Results on Inspector Performance

We begin by examining the impact of treatment on inspectors, where the program provides the sharpest incentives. These results are presented in Table 1. Panel A reports the effect of treatment on inspections. We find that treatment raises the share of facilities in our sample that were inspected in the previous month from 24.2 percent to 42.6 percent. Breaking this up into the two waves of collection, we find comparable effects, though there is some evidence that the effect of treatment had attenuated by October 2012, a year after the introduction of the program.[11]

5.2 Results on Inspector Time Use

The interpretation of the above result is dependent on whether the additional time required to conduct these visits comes at the cost of more pressing tasks that the supervisors are assigning to these inspectors (although they are almost exclusively tasked with performing inspections). In such cases, the increase in shirking penalties, brought about by our program, may drive the inspectors away from other potential functions. In the ideal scenario, the cell phone treatment should be driving shirking inspectors to do their job.

We test for this by administering a time-use survey on the universe of health inspectors in Punjab. Respondents were asked to list the time they spent on a variety of tasks during the two working days prior to our survey.[12] We interviewed inspectors during February and March 2013, a period when the effects of our program were already attenuating. Therefore, any treatment effects on time use would be understated.

[11]Figure A3 in the Appendix shows that inspector boundaries do not overlap in a consistent manner with political constituencies. As a result it is difficult to study heterogeneous effects by inspected connectedness and political competition.

[12]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 thank Asim Ijaz Khwaja for suggesting that we track this.

We present our analysis in Table 1 Panel B.[13] We note three results: first, inspectors in treatment districts report working an extra 74 minutes *overall*. Second, treatment inspectors report spending an additional 44 minutes on inspections. Third, there are no statistically significant differences between treatment and control inspectors in the time they spend on official breaks, clinic management in the headquarters, or duties unrelated to clinic management. These results suggest that inspectors are not substituting effort away from other tasks. Our results on greater inspections may be coming from greater effort exerted by inspectors.

Table 1: The Effect of Smartphone Monitoring

	Treatment (1)	Control (2)	Difference (3)	p-value Mean Diff (4)	p-value Exact Test (5)
Panel A: Treatment Effects on the Rate of Inspections					
Facility Inspected in the Previous Month (=1)	0.426	0.242	0.184	0.008	0.001
	(0.048)	(0.044)	(0.065)		
# of Observations	759	761			
Wave 2 only (June 2012)	0.519	0.253	0.266	0.002	0.003
	(0.063)	(0.047)	(0.079)		
# of Observations	366	372			
Wave 3 only (October 2012)	0.338	0.231	0.107	0.175	0.057
	(0.053)	(0.056)	(0.077)		
# of Observations	393	389			
Panel B: Treatment Effects on Time-Use of Inspectors					
Breaks During Official Duty	16.189	22.500	-6.311	0.338	0.716
	(4.993)	(4.151)	(6.494)		
(i) Total Time Inspecting	121.189	76.961	44.228	0.105	0.073
	(24.152)	(10.966)	(26.525)		
(ii) Total Time Managing in Head Office	47.828	69.485	-21.657	0.273	0.808
	(9.440)	(16.976)	(19.424)		
(iii) Duty Unrelated to Facility Management	281.803	229.975	51.828	0.258	0.121
	(30.167)	(33.481)	(45.067)		
Total Minutes Working (i) + (ii) + (iii)	450.820	376.422	74.398	0.082	0.045
	(18.380)	(37.163)	(41.460)		
# of Observations	122	102			

Notes: This table reports average treatment effects of the 'Monitoring the Monitors' program on the number of inspections (Panel A) and the time-use patterns of inspectors (Panel B). The unit of observation in Panel A is the clinic, and 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 hypothesis test that the treatment had no impact. Column (5) reports the Fisher Exact Test p-values that places column (4) p-values in the distribution of p-values obtained from a 1000 random draws of treatment assignment. Data for results in Panel B come from the survey of the universe of health inspectors in Punjab. The unit of observation for Panel B are these inspectors. Column (1) shows the average, in minutes, of how inspectors in treatment districts spent their time over the last two days on several tasks. Column (2) shows the same for control districts. Column (3) reports the difference between the two. Standard errors clustered at the district level are reported in parentheses.

[13]Table A11 presents more detailed results for the timeuse data.

5.3 Treatment Effects on Doctors

The results above suggest that the smartphone program created a substantial increase in the volume of inspections. If doctors were aware of this increase, it is possible that the program may have also increased assigned doctor attendance.[14] We test for this difference in Table 2 using a differences in difference specification to account for the baseline imbalance in doctor attendance. We find that the smartphone treatment has no impact on average doctor attendance.

Table 2: The Effect of Smartphone Monitoring on Doctors

	Difference in differences (1)
Monitoring	-0.005
	(0.068)
	[0.546]
Mean in Controls	0.424
# Districts	35
# Clinics	670
# Observations	1528
R-Squared	0.009
Only Clinics with Doctors	Yes

Notes: This table reports average treatment effects of the 'Monitoring the Monitors' program on the doctor 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 variable that equals 1 if an assigned doctor was present at the clinic during an announced visit, and 0 otherwise. Standard errors clustered at the district level are in parentheses. Square brackets report the Fisher Exact Test p-values that places the 'true' treatment assignment p-values in the distribution of p-values obtained from a 1000 random draws of treatment assignment.

[14]We recognize that doctor assignment may itself by an outcome of interest. However, this was a dimension of outcomes that was purposefully suppressed by the government because of the Monitoring the Monitors program. We confirm this by testing if our treatment had an impact on the probability of doctor assignment, and as expected do not find any evidence for this. The difference-in-differences coefficient is 0.020 with the p-value of 0.57. Results are available on request.

6 Political Interference and Doctor Attendance

This section examines how politicians affect doctor attendance in Punjab. First, we report summary statistics on political interference in senior officials' sanctions of doctors. Second, we use a spatial regression discontinuity to test for a link between political competition and doctor attendance. Finally, we examine whether connections between doctors and politicians are related to doctor attendance.

6.1 Previous work on public sector jobs

Politicians across much of the developing world, and particularly in South Asia, have considerable ability and willingness to channel state resources Chandra (2007); Mohmand (2011, 2014).

Political interference in the bureaucracy may exist for several reasons. First, government jobs are ideal for patronage: they can be targeted to individuals, provide a credible stream of benefits, and the terms of the job—such as the wage, posting, and reporting requirements—can often be changed easily (Robinson and Verdier, 2013; Hollibaugh, Horton, and Lewis, 2014). This observation has a long history in the political science literature (Sorauf, 1956; Wilson, 1961; Johnston, 1979; Chubb, 1983; Golden, 2003; Calvo and Murillo, 2004; Meyer-Sahling, 2006; Chandra, 2007; Kitschelt and Wilkinson, 2007; Brusco et al., 2013; **?**). Second, government jobs represent a subset of possible vote-buying strategies available to politicians (Gans-Morse, Mazzuca, and Nichter, 2014). The term for such positions—sinecure—has its etymological origins in the medieval church, where it signified a position without (sine) the care (cara) of souls, and described positions that involved little or no actual work.

Understanding the reasons for this interference is important because of political appointments can have deleterious consequences for bureaucratic performance (Stokes, 2005; Brusco et al., 2013; Lewis, 2007, 2011; Muralidharan et al., 2017). First, a politician's willingness to provide patronage to public sector employees will depend on the degree to which he or

she faces pressure in the form of political competition (Lindbeck and Weibull, 1987; Besley and Burgess, 2002; Careaga and Weingast, 2003; Rodden, 2006; Gordon and Huber, 2007; Kitschelt and Wilkinson, 2007; Raffler, 2016). Greater political competition should deter patronage. As a consequence, the impacts of policy reform to address bureaucratic performance should be greatest where political competition is high. The second factor we consider is whether politicians are most likely to provide patronage to bureaucrats with whom they share connections. A broad literature points to the relevance of connections in a number of domains. In political science, elite politicians benefit more from election fraud (Callen and Long, 2014), higher funds during election years (Brollo and Nannicini, 2012; Sukhtankar, 2012) and more transfers to connected areas (Albouy, 2013; Ansolabehere and Snyder, 2006). In economics, firms receive more loans (Khwaja and Mian, 2005), bailouts (**?**), and enjoy higher share and stock prices (Fisman, 2001; Ferguson and Voth, 2008). Given this, we examine whether political connections are relevant in our context.

6.2 Incidence of Political Interference

Influence over public sector positions provides politicians two means of patronage. First, politicians help health officials obtain postings in their region of choice, which is often their home county. Speculatively, we show in Table A5 that doctors who know politicians are more likely to be posted closer to their hometowns. Second, once posted, health officials also appeal to politicians for protection against suspension, transfer, and other sanctions for underperformance.

Often, staff members at the clinics belong to politically powerful clans and families. These staff can provide at least two types of favors to politicians. First, they can activate their networks to mobilize votes (Wade, 1985). Although we do not measure this mobilization directly, various experts interviewed for this project independently confirmed that this is a relevant channel in our context. Indeed, there is evidence that doctors campaign directly for

the candidates while serving in their official capacity.[15] Second, health staff are commonly recruited to assist the election commission with drawing up voter lists and overseeing polling on election day. They can therefore significantly aid or hinder a politician's election campaign by biasing voter lists or by turning a blind eye to vote-rigging. Consistent with this, we find a strong positive relationship between the share of doctors in a constituency who report knowing their politician in 2011 and whether the incumbent wins re-election in 2013. This is true even when we control for the degree of competition during the 2008 election. Table A3 reports these results.

Politicians may also want to provide sinecures to doctors without expectation of any direct reciprocal benefits. In background interviews, three former senior bureaucrats with experience in Punjab's health sector described how candidates needed to publicly demonstrate influence over the local state machinery to garner voters' confidence. The local police, courts and bureaucracy are viewed as being susceptible to elite figures' influence. Politicians' ability to influence state machinery, including affecting the posting and promotion of government officials, affects voters' perception of the candidate. In Punjab, citizens are aware that politicians face limited executive constraints. Consequently, even if doctors do not directly reciprocate, directing a posting to a doctor provides politicians with an important means of indicating their power and competence.

Table 3 reports summary statistics on self-reported incidents of pressure experienced by inspectors and senior health officials. We asked the respondents to report the number of instances where a person of influence pressured either their colleague or themselves into a) not taking action against doctors or other staff that were performing unsatisfactorily in their county or district, or b) assigning doctors or other staff to their preferred posting. Forty percent of officials report experiencing this type of interference and 32 percent of all respondents report pressure coming from elected Members of Provincial Assemblies, politicians

[15]Figures A1 and A2 provide tweets by an election monitoring organization, the Free and Fair Elections Network (FAFEN), of doctors campaigning in their official capacity on behalf of politicians.

whose behavior we focus on in this paper.

More speculatively, in Appendix D we find that political interference occurs more often in less politically competitive constituencies. Broadly, this suggests that politicians who have carved out strongholds are more likely to try to influence health officials. There are a number of reasons such a correlation might exist, but it suggests the possibility that politicians might exert control over bureaucrats as part of a political strategy.

Table 3: Political Interference in Health Bureaucracy

Variable	Mean	SD	N
Panel A: Senior Officials and Inspectors			
Ever influenced by Any Powerful Actor	0.4	0.492	150
Ever Influenced by Provincial Assembly Member	0.322	0.469	149
Instances of Interference by Provincial Assembly Member	2.786	6.158	140
Panel B: Senior Officials Only			
Ever influenced by Any Powerful Actor	0.441	0.504	34
Ever Influenced by Provincial Assembly Member	0.441	0.504	34
Instances of Interference by Provincial Assembly Member	4.000	7.141	29
Panel C: Inspectors Only			
Ever influenced by Any Powerful Actor	0.388	0.489	116
Ever Influenced by Provincial Assembly Member	0.287	0.454	115
Instances of Interference by Provincial Assembly Member	2.468	5.87	111

Notes: This table reports the frequency of interference by politicians in decisions of senior health bureaucrats. Data come from a survey of the universe of senior health bureaucrats and inspectors in Punjab. For each panel, the first variable is an indicator variable for whether the bureaucrat was influenced by any powerful actor to either (a) not take action against doctors or other staff who were performing unsatisfactorily in their jurisdiction (county) or (b) assign doctors to their preferred posting in the previous two years. The second variable measures the same, but restricts attention to influence by provincial assembly politicians, the focus of our study. The third variable is a count of the number of times that bureaucrats report that Members of the Provincial Assembly pressured them to either (a) not take action against doctors or other staff that were performing unsatisfactorily in their jurisdiction or (b) assign doctors to their preferred posting in the previous two years. Of the 150 Senior Officials and Inspectors in our sample, 149 provided responses to this question. We drop nine reports which indicate more than 100 instances of interference (95th percentile). Table A7 presents the data without this restriction. Panel A reports results for all bureaucrats in the sample, while Panel B disaggregates them by Executive District Officers and Deputy District Officers. Panel C reports the results only for Inspectors.

6.3 The Effect of Connections and Political Competition on Attendance

Next, we test whether the degree of political competition affects doctor attendance. We also use our data on connections between doctors and politicians to examine whether connected doctors are at work less often. For this analysis, we restrict ourselves to control districts to avoid reporting correlations induced by our treatment.

Table A1 summarizes the data. We can see that doctor attendance in our control districts is low. While our visits took place during normal operating hours, we were able to locate doctors in only 22.5 percent of our visits. All clinics are supposed to have doctors posted. However, because of a combination of shortage of doctors, a lack of interest in rural postings, and perhaps misreporting to disguise absence, we find that only 53.1 percent of clinics have doctors posted. Even accounting for this low rate, doctors are present at only 42.1 percent of actual postings. Of the set of doctors we observe, 25.3 percent report knowing the MPA personally.[16]

We now test whether the degree of political competition in a constituency causally affects doctor attendance. We do so using a geographic regression discontinuity model. This model allows us to study clinics lying on opposite sides of a constituency boundary. A smooth function in geographic controls is assumed to absorb local level confounders. Naturally, it is possible that some constituency-level characteristics are nearly perfectly correlated with election outcomes, such that differences on either side of the boundary are not exclusively attributable to differences in political competition. With this caveat in mind, we use the following spatial regression discontinuity specification:

$$Present_{ckw} = \beta_1 Knows\ MP_{ck} + \beta_2 Pol\ Comp_c + \beta_3 Knows\ MP_{ck} \times Pol\ Comp_c + \beta_4 \mathbf{X}_{ckw} + f(X_k, Y_k) + \gamma_w + \varepsilon_{ckw} \quad (3)$$

$$\forall\ k \quad s.t. \quad X_k, Y_k \in (-h, h)$$

[16] Appendix Table A4 tests whether doctors strategically misreport their connections to politicians by examining whether the smartphone monitoring program created any changes in how doctors respond to this question. We find that doctors did not change their responses, allaying concerns that these connections are misreported.

where $Present_{ckw}$ is an indicator variable that equals 1 if an assigned doctor at clinic k in constituency c is present during an unannounced inspection in survey wave w. $Knows\ MP_{ck}$ is a dummy variable that equals 1 if a doctor reports knowing their provincial assembly member personally, $Pol\ Comp_c$ is the constituency-level Herfindahl Index that proxies for Political Competition, and $\mathbf{X}_{ckw}$ is a vector of additional covariates, including distance to the county headquarters, as well as one of county, or constituency, fixed effects, to exploit local variation in doctor attendance. All models also include survey wave fixed effects, denoted by γ_w.

The expression $f(X_k, Y_k)$ is a flexible function in two dimensions, latitudes (X) and longitudes (Y) for every clinic k. We follow Michalopoulos and Papaioannou (2013) and Dell (2010) in including a smooth function in longitudes X and latitudes Y.[17] Adding these geographic controls in a flexible way helps the regression absorb spatial trends that might bias estimates. We assign the closest constituency boundary to each clinic in our data so that we compare clinics that provide the closest approximation to random assignment. For each clinic in the data, h refers to the distance to the nearest constituency boundary in kilometers. Finally, to improve precision, clinics are weighted in the regression based on a Triangular Kernel, where weights increase as the distance to the constituency boundary decreases. Figure A6 plots p-values of pre-treatment or time-invariant covariates across several bandwidths. It shows that we have good balance across several covariates.

We report results from this geographic RD as simple well as OLS correlations in Table 4. Column (1) shows the correlation between political competition and doctor attendance. Going from a perfectly competitive constituency to a perfectly captured one reduces absence by 62.4 percentage points. This theoretical number will be lower in practice as the Herfindhal index lies between 0.04 and 0.545 in our sample. Column (2) shows that this effect is robust to the addition of a flexible function in latitudes and longitudes. Column (3) reports the geographic RD results. We restrict attention to a bandwidth of 5 kilometers, and weigh

[17]Here, we set $f(X_k, Y_k) = x + y + x^2 + y^2 + xy + x^3 + y^3 + x^2y + xy^2$.

observations closer to this boundary higher with a triangular kernel. The effect of political competition is robust.

We also report OLS correlations between doctor connections with the local Member of the Provincial Assembly and doctor attendance. Columns (4) and (5) show that doctor attendance is 20.7 and 19.6 percentage points higher respectively for doctors that are not politically connected to their local MPA .[18]

We subject the spatial RD estimates in Table 4 column (3) to a number of robustness checks in addition to confirming balance on pre-treatment covariates in Figure A6. First, in Figure A4, we consider if our results are robust to changes in bandwidths. Though the effect is not distinguishable from zero at the 95 percent level, we see that the point estimate stabilizes in bandwidths larger than 4 kilometers. Next, we check to see if our results are robust to other specifications. In Figure A5 we utilize linear, quadratic, cubic and quartic control functions across several bandwidths and observe minimal fluctuations in the point estimate in bandwidths greater than 4 kilometers.

The results on political competition and political connectedness in the first three columns of Table 4 are broadly consistent with two separate arguments. First, it may be that in highly competitive constituencies, politicians face stronger incentives to make sure health services are effectively delivered. Second, it may be that politicians who can capture constituencies are more likely to provide jobs to doctors as patronage. Doctors in patronage jobs may be expected to work less. These are not mutually exclusive theories, and our estimates suggest both may have some relevance in this context. Critically, however, the survey evidence indicating frequent interference by politicians, coupled with the evidence that doctors connected to politicians work less in columns (4) and (5) provide reason to believe that second jobs-as-patronage theory most accurately characterizes this environment.

These results carry implications for the effectiveness of our experiment. Politically con-

[18] Additionally, we show in Appendix Table A5, that connected doctors are more likely to be posted closer to their hometowns.

Table 4: Political Connections, Competition, and Doctor Attendance

Dependent Variable:	Doctor Present (=1)				
Model:	OLS (1)	OLS (2)	GEO. RD (3)	OLS (4)	OLS (5)
Political Competition Index	-0.624*	-0.719**	-1.593*		
	(0.356)	(0.354)	(0.880)		
Doctor Knows Local MPA Personally (=1)				-0.207**	-0.196**
				(0.083)	(0.085)
Doctor Knows × Political Competition Index					
Distance to District Center (in minutes)		-0.001	-0.003		-0.001
		(0.001)	(0.003)		(0.001)
Mean, Competition ≤ 33 percentile	0.444	0.444	0.423		
Mean, Doctor Knows=0				0.542	0.542
Comp ≤ 33 perc & Mean, Doctor Knows=0					
# Constituencies	105	105	94	86	86
# Observations	623	623	474	509	509
R-Squared	0.155	0.160	0.379	0.249	0.273
County Fixed Effects	Yes	Yes	-	-	-
Constituency Fixed Effects	-	-	-	Yes	Yes
Spatial Controls	-	Yes	Yes	-	Yes
Boundary Fixed Effects	-	-	Yes	-	-
Triangular Kernel	-	-	Yes	-	-
Bandwidth	All data	All data	5 Km	All data	All data

Notes: This table reports on the relationship between doctor attendance and interactions between the political connections of doctors and the degree of political competition. The dependent variable is a dummy equal to 1 if a doctor is present during an unannounced facility inspection performed by our survey team. The political competition index is a Herfindahl index computed as the sum of squared candidate vote shares in each provincial assembly constituency during 2008 elections. It varies between 0.040 and 0.545. All specification samples are restricted to basic health unit facilities in control districts with a doctor assigned. All specifications are OLS and include survey wave fixed effects, as well as controls for distance to the district headquarters. Indicated models weigh observations by a Triangular kernel. Indicated estimates include a geographic control function in longitudes (x) and latitudes (y) of the form $x+y+x^2+y^2+xy+x^3+y^3+x^2y+xy^2$. Standard errors clustered at the constituency level reported in parentheses. *Levels of significance*:*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

nected inspectors and doctors could be less sensitive to monitoring. While monitoring innovations increase the probability of shirking doctors being detected, they may matter less for doctors and bureaucrats who seek protection from local politicians. We will turn to this now.

6.4 Heterogeneous treatment effects on doctor attendance

In addition, the links between doctor attendance, relationships to politicians, and the degree of local political competition, reported in Section 6 above, suggest potential heterogeneity in the impact of the smartphone monitoring program. We use the large degree of variation in competitiveness across the 240 constituencies in our sample to check for impact heterogeneity.

Table 5 reports these results. Column (1) indicates no average impact on doctor attendance. However, consistent with the results in Section 6, results in columns (2) and (3) suggest that the program increased doctor attendance in the most competitive tercile of constituencies (with a $p < 0.1$ using Fisher's exact test). Importantly, this result suggests that an increase in the rate of clinic inspections can lead not only to increased doctor attendance, but also that whether it can do so is a function of the degree of local political competition. By contrast, while not statistically significant, the point estimates suggest that, if anything, the program decreased attendance for doctors in constituencies with low degrees of political competition. One way monitoring might reduce doctor attendance, measured during our independent inspections (which are not coordinated with the smartphone inspections), is by allowing inspectors and doctors to collude on both being present during the smartphone inspection. If, prior to the introduction of the smartphone monitoring system, inspectors and doctors did not communicate regarding inspection schedules, but started doing so because of the program, this might explain the point estimate.[19]

Columns (4) and (5) check for differences in impact by whether doctors are connected to their local politician. In the above analysis, we found that connected doctors are less likely to work. This suggests both that there is greater room for improvement for these doctors, but also that they may be less likely to react to, and perhaps more likely to try to undermine, the monitoring system. The estimates indicate this may be the case. The point estimates, while not statistically significant, suggest a modest positive impact on attendance

[19]There are 245 clinics in treatment districts where doctors are posted and at least one visit was made by an inspector using the smartphone system.

for unconnected doctors and a negative impact for connected doctors. Testing for equality of these estimates also suggests they may indeed be different ($p = 0.13$). While our data do not provide sufficient precision to be conclusive, the heterogeneity we observe here is broadly in line with the prior observation that connected doctors appear to perform worse.

One might be concerned that political competition and doctor connectedness are two variables chosen ex-post to explain heterogeneity. In order to assuage this concern, we apply the machine-learning honest causal tree methodology to our data (Athey and Imbens, 2016), explained in Appendix Section E. We find support for selecting of these two variables over other potential covariates.

7 Dashboard Experiment - Highlighting Absence

The 'Monitoring the Monitors' program was designed to increase the flow of information from doctors and inspectors to senior officials. The program therefore provides information that is essential for senior bureaucrats to improve the performance of doctors and inspectors. Increasing the flow of such information is viewed as holding promise for service delivery in developing countries (Finan, Olken, and Pande, 2015; Banerjee, Duflo, and Glennerster, 2008).

Our setup allows, to our knowledge, the first direct test of whether information communicated to senior officials changes their behavior as measured by performance outcomes.[20] Furthermore, we can check whether senior bureaucrats' ability to correct attendance problems is related to the degree of political competition and doctor connections in the constituency

[20]A large number of studies already highlight the substantial potential for monitoring to improve service delivery. Olken (2007) finds benefits to road construction audits. Ferraz and Finan (2008) show that audits of municipal accounts that reveal corruption reduce politicians re-election prospects. Dhaliwal and Hanna (2014) study the impact of biometric monitoring of staff at primary health clinics in India to show an improvement in lower-cadre clinic staff attendance. Banerjee et al. (2014) study an e-governance reform in the funds flow of a public works program in India (NREGS), and find that the the new platform reduces leakages but does not affect service delivery. Similarly, Muralidharan, Niehaus, and Sukhtankar (2014) study the effect of a biometrically authenticated e-payments infrastructure on NREGS and show that the program reduces leakages without affecting access to beneficiaries.

Table 5: Treatment Effects on Doctors

Dependent Var.	Doctor Present (=1)				
	(1)	(2)	(3)	(4)	(5)
Monitoring	-0.005				
	(0.068)				
	[0.546]				
Monitoring x High Political Competition		0.102	0.142		
		(0.063)	(0.103)		
		[0.057]	[0.068]		
Monitoring x Med Political Competition		-0.059	-0.083		
		(0.067)	(0.085)		
		[0.873]	[0.797]		
Monitoring x Low Political Competition		-0.066	-0.034		
		(0.060)	(0.099)		
		[0.900]	[0.728]		
Monitoring x Doctor Does Not Know Politician				0.011	0.036
				(0.074)	(0.086)
				[0.494]	[0.297]
Monitoring x Doctor Knows Politician				-0.104	-0.216
				(0.150)	(0.135)
				[0.698]	[0.878]
Mean in Controls	0.424				
High Pol. Comp. Mean in Controls		0.202	0.441		
Med. Pol. Comp. Mean in Controls		0.234	0.405		
Low Pol. Comp. Mean in Controls		0.240	0.437		
Mon. x High = Mon. x Med. (p-value)		0.079	0.070		
Mon. x High = Mon. x Low. (p-value)		0.027	0.160		
Mon. x Does Not Know = Mon. x Knows (p-value)				0.500	0.130
Does Not Know Politician Mean in Controls				0.459	0.544
Knows Politician Mean in Controls				0.225	0.261
# Districts	35	35	35	35	35
# Clinics	670	842	664	850	670
# Observations	1528	2398	1518	2416	1528
R-Squared	0.009	0.010	0.013	0.015	0.022
Only Clinics with Doctors	Yes	No	Yes	No	Yes

Notes: This table reports on the effects of the 'Monitoring the Monitors' program on the attendance of doctors. Columns (2) and (3) look at heterogeneous impacts by the degree of political competition in the constituency where the reform is implemented and columns (4) and (5) look at heterogeneity by whether the doctor reports being connected to their local politician. These estimates correspond to specification (2) in the paper, replacing the dependent variable with an indicator equal to one if a doctor is found to be present during an independent inspection. All regressions include clinic and survey wave fixed effects. Standard errors clustered at the district level reported in parentheses. Fisher Exact Test p-values reported in brackets. This test places the 'true' treatment assignment p-values in the distribution of p-values obtained from a 1000 random draws of treatment assignment.

in which a clinic is located. In this sense, we can evaluate how political interference in decision-making of senior health officials may carry consequences for service delivery.

Data collected via the smartphones are aggregated and presented to senior health officials on an online dashboard. In addition to these officials, this dashboard is visible to the Health Secretary, and the Director General of Health for Punjab. Figure 2 Panel B provides an example of a dashboard view visible to the senior health officials.

To test whether actions by senior health officials affect absence, we directly manipulated data on the dashboard to make certain inspection reports salient. Specifically, we highlighted in red inspection reports on the dashboard that reported three or more staff (of 7 generally) to be absent during an unannounced visit to the clinic. The presence of this arbitrary threshold was not known to anyone but the research team.

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

$$Present\ Survey_{jt} = \alpha + \beta_1 Flagged_{jt-1} + \sum_{i=1}^{3} \delta_t + \eta_{jt} \tag{4}$$

$Present\ Survey_{jt}$ is equal to 1 if the doctor j was absent during an unannounced visit by our enumerator in wave t, $Flagged_{it-1}$ 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. For our primary analysis, we define this window as 11 to 25 days before an unannounced visit by our field enumerators. Senior health officials only looked at the web dashboard every week or two, so we would not expect an immediate response from flagging. However, if the window is made too long, virtually every facility will become flagged and we will lose variation.[21]

To minimize possible different trends in absence between facilities that were flagged and not flagged, and thus to isolate the effect of the flagging itself, we restrict our sample to only facility reports in which either two or three staff were absent.

[21]We report robustness in all of our flagging results to the choice of the time window, in Figure 5 and Appendix Figure A8.

Table 6 reports results from this test. Column (1) reports results without restricting the data only to instances where either two or three staff members were absent and column (2) provides results of the same specification with this restriction. The results indicate that flagging underperformance at a facility has a substantial impact on subsequent doctor attendance. Flagging improves attendance by 26.6 percent in a subsequent visit by our enumerators. These results suggest that senior health officials reacted to data provided by the dashboard by encouraging better doctor attendance. Below we discuss whether these results, as well as the heterogeneous impacts that we discuss next, might merely reflect persistence in absence around the flagging threshold by performing a set of placebo tests around other thresholds.

Column (3) examines directly whether the impact of flagging underperformance depends on the degree of political competition in the constituency from which the report originates. It may be that senior health officials can more easily work to correct doctor attendance at a clinic when that facility is in a competitive constituency. The results suggest that this is indeed the case. Flagging a clinic on the dashboard in a highly competitive constituency increases subsequent doctor attendance by 32.3 percentage points. By contrast, flagging a clinic in an uncompetitive constituency reduces attendance, though the estimate is not statistically significant. The difference in estimated impacts is, however, statistically significant at the 10 percent level. Speculatively, district health officials have reported facing pressure and obstacles from influential persons to sanction underperforming health staff. In our survey, 44 percent of the senior health officials and 39 percent of the inspectors reported having faced such pressure. If senior health officials face more political obstacles to sanctioning absent doctors with stronger patrons, this would explain why the effect of highlighting a facility as underperforming could be localized to competitive districts.

Column (4) checks to see whether flagging also has differential impacts depending on whether doctors know their local politician. Mirroring the broader pattern of results, doctors who do not know their politician are more likely to be at work following an instance of their

Table 6: Effect of Flagging Underperformance on the Dashboard

	Doctor Present in Unannounced Visit (=1)			
	(1)	(2)	(3)	(4)
Flagged	0.090	0.266**		
	(0.077)	(0.110)		
Flagged x High Competition			0.323**	
			(0.152)	
Flagged x Med Competition			0.298	
			(0.191)	
Flagged x Low Competition			-0.214	
			(0.257)	
Flagged x Doctor Does Not Know Politician				0.184
				(0.117)
Flagged x Doctor Knows Politician				-0.427
				(0.303)
Constant	0.409***	0.277***	0.259	0.835***
	(0.045)	(0.087)	(0.211)	(0.279)
Flagged x High Comp = Flagged x Med Comp (p-value)			0.917	
Flagged x High Comp = Flagged x Low Comp (p-value)			0.095	
Flagged x Doctor Does Not Know = Flagged x Doctor Knows (p-value)				0.050
# Clinics	195	78	78	69
# Reports	252	88	88	77
R-Squared	0.129	0.340	0.405	0.412
District Fixed Effects	Yes	Yes	Yes	Yes
Sample	Full	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. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

facility being flagged on the dashboard, while connected doctors are less likely. The difference between these two estimated effects is significant at the 5 percent level.

We probe the robustness of our result in column (2) of Table 6 in Figure 5 Panel A. We do so by running the same regression 1300 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 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). For each window, we report using a colored pixel the p-value of the hypothesis test of a null effect of flagging on subsequent doctor attendance. We observe a robust and significant treatment effect of flagging a clinic across a wide range of windows. We repeat the same exercise for the hypothesis tests in

columns (3) and (4) of Table 6 in Appendix Figure A8. Panel A reports p-values for the hypothesis test in column (3) that Flagged x High Comp = Flagged x Low Compl. Panel B reports the p-value for the hypothesis test in column (4) that Flagged x Doctor Does Not Know = Flagged x Doctor Knows. We see our political competition result is extremely robust. Our differential effects by whether doctors know their local political are less robust, which is in-line with previous results.

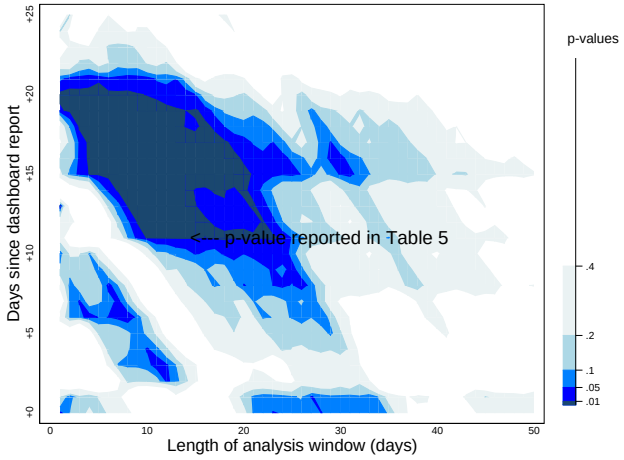
As an additional robustness check, in Figure 5 Panel B, we run the same 1300 hypothesis tests as are conducted in Table 6 column (2) using a placebo threshold between one and two absences on the dashboard. We are not able to reject the null hypothesis of no effect on this placebo flagging in nearly all cases, as we would hope.

We also conduct the same honest causal tree analysis with our flagging results as with our heterogeneous treatment results in Appendix Section E, to verify that political competition and doctor connectedness are two variables that should be chosen to explain heterogeneity in this case as well. Again, we find support for our choice of variables and thus the broad mechanisms we discuss in this paper.

8 Discussion and Conclusion

Absenteeism among civil servants is a highly persistent problem in developing countries. Appropriately, research in social sciences focuses on the technical aspects of this issue, seeing its roots in an information asymmetry between principals and the agents being monitored. If absence is a result of agency problems between senior bureaucrats and local level civil servants, then improving monitoring should be an effective policy response. Correspondingly, a substantial body of recent empirical research explores the potential for monitoring to improve public service delivery. These studies provide mixed results, drawing attention to the importance of context for whether monitoring initiatives will succeed or fail. In particular, understanding whether the political environment can sustain such reforms is critical.

Panel A: True Effect (Comparing 3 vs 2 Absences on the Dashboard)



Panel B: Placebo (Comparing 2 vs 1 Absences on the Dashboard)

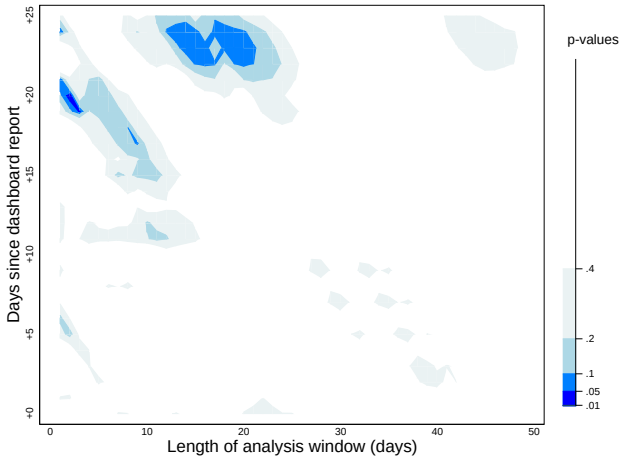


Figure 5: Average Absence after Flagging

Notes: This figure presents robustness of flagging results in Table 6 to the window of time prior to an unannounced visit that a clinic being highlighted in red on the dashboard is considered flagged. Panel A reports p-values from 1300 hypothesis tests analogous to that conducted in Table 6 column (3) that Flagged x High Comp = Flagged x Low Compl., 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). For each window, we report using a colored pixel the p-value of the hypothesis test of a null effect of flagging on subsequent doctor attendance. Panel B conducts the exact same exercise, instead using a placebo threshold between one and two absences on the dashboard to define a clinic as flagged within a given window.

Our results highlight the importance of political economy considerations in determining whether monitoring initiatives will be effective. We find evidence that the effect of monitoring follows a predictable pattern; it has impacts both in competitive constituencies and for employees with limited political connections. This pattern of effects is precisely what would be predicted by a substantial literature in political science on the use of jobs as patronage.

Four pieces of evidence support this interpretation. First, political interference is a routine matter in bureaucratic work. Second, a lack of political competition is associated with more doctor absence, and doctors who have personal connections with politicians show up to work less often. Third, we find that the introduction of a new monitoring technology nearly doubled inspections, with more substantial effects in competitive constituencies. While the technology had no average impacts on doctor attendance, it did increase attendance in competitive constituencies. Fourth, to further probe the internal mechanics of the health bureaucracy, as well as to understand how the above impacts come about, we designed an experiment to test whether absence data affect subsequent attendance. We experimentally manipulated the salience of information on absence to senior bureaucrats in an online dashboard, and found that bureaucrats do indeed have the ability to reduce absence when information is presented to them in an actionable format. However, their ability to make a difference is again limited to areas of high political competition.

Understanding the political rationale for public worker absence potentially opens a broader set of interventions to combat the problem. While naturally speculative, our findings suggest potential for future research that pushes in this direction. First, professionalizing the civil service, and eliminating politicians' involvement in decisions related to bureaucratic hiring, firing, promotion, and posting, would remove the opportunity to use these positions as patronage, if this is the mechanism underlying our results. Such policy reform, however, is hard to implement in practice. An alternate set of solutions may provide more promise: reform should leverage political incentives in policy design. For instance, increasing voter awareness of public worker absence might amplify the political costs from voters not motivated by pa-

tronage. This may be done through public facing information portals. For example, in our case, the dashboard could have been made available to anyone with access to the internet, rather than just to senior health officials.

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APPENDIX: FOR ONLINE PUBLICATION ONLY

A Additional Tables and Figures

Figure A1: Doctors as Political Workers in 2013 Elections

Figure A2: Selected Tweets from Free and Fair Elections Network before 2013 Elections

Figure A3 shows that inspector jurisdictions (tehsils) and political constituencies do not overlap perfectly. Here we present one example where Bhakkar Tehsil is split across two political constituencies, PP-049 and PP-050. The figure also shows that one constituency, PP-050 is split across two tehsils. Finally, we also have instances in our data where the overlap is perfect.

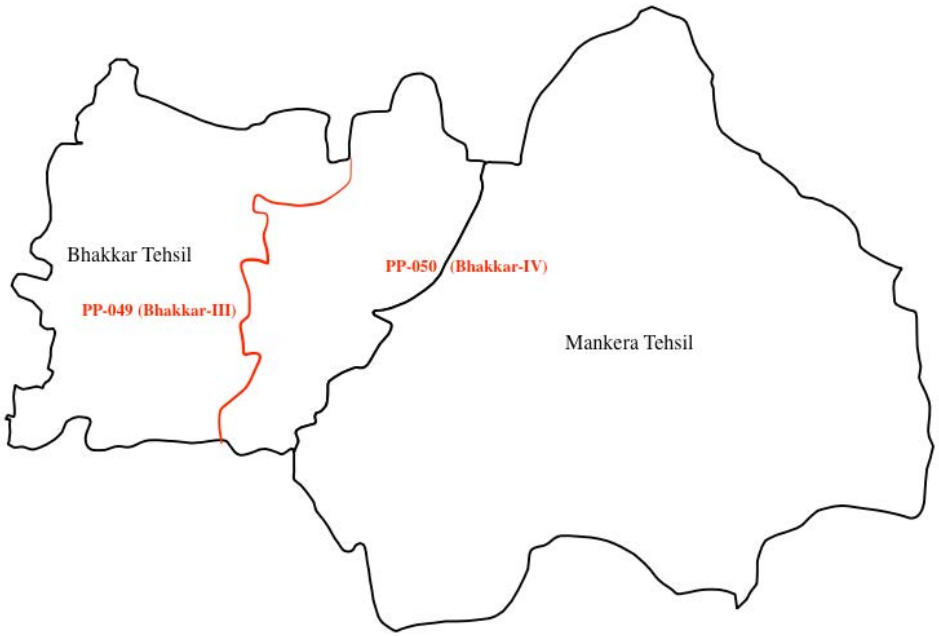


Figure A3: Imperfect overlap between Inspector Jurisdiction and Constituency

Table A1: Summary Statistics

Variable	Mean	Standard Deviation	# Observations
Doctor Present (=1)	0.225	0.418	1193
Doctor Assigned (=1)	0.531	0.499	1193
Doctor Knows Local Politician (=1)	0.253	0.435	269
Doctor Distance to Hometown (min)	123.216	286.306	269
Doctor Tenure (months)	96.027	93.237	261
Distance to District Headquarters (Km)	48.96	29.256	1373
Clinic Catchment Population (1000s)	22.251	6.953	1371
Herfindahl Index	0.348	0.082	1373
Victory Margin Share	0.155	0.105	1373

Notes: Sample is limited to control district clinics, survey waves 1 - 3.

Table A2: Breakdown of Doctor Surveys

	Wave 1	Wave 2	Wave 3	Wave 4	Total
Doctors Assigned in Sample	537	509	488		
Total Interviews	266	252	226	141	885
Number of New Doctors Interviewed	266	128	60	87	541
Balance	271	115	34		

Notes: Doctors were frequently absent during our unannounced visits. Consequently, we had to make a concerted effort to find all of the doctors assigned in our sample. We tracked down 541 doctors after the completion of our three unannounced field visits and an additional announced visit that was specifically carried out to interview doctors that were absent in the previous waves. This table describes the breakdown of our sample.

Table A3: Predicting Reelection of Incumbent

Dependent Variable:	Reelection of Incumbent					
	(1)	(2)	(3)	(4)	(5)	(6)
Doctor Knows MPA	0.537**					0.619**
	(0.235)					(0.240)
Doctor Present		0.053				0.122
		(0.184)				(0.236)
Doctor Tenure			-0.000			-0.001
			(0.001)			(0.001)
Doctor Tenure at Clinic				-0.000		0.000
				(0.001)		(0.001)
Distance to Doctor Hometown					0.000	0.000
					(0.000)	(0.000)
Distance to HQ	0.002	-0.001	0.000	0.001	0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
Political Competition Index	1.461	1.779**	1.730*	1.711*	1.735*	1.555
	(0.929)	(0.844)	(0.988)	(0.954)	(0.969)	(1.006)
Constant	-0.284	-0.234	-0.227	-0.247	-0.275	-0.338
	(0.332)	(0.325)	(0.360)	(0.359)	(0.363)	(0.364)
# Observations	83	94	81	83	83	81
R-Squared	0.107	0.066	0.061	0.061	0.063	0.120

Notes: This table reports reelection probabilities for 2008 winners in the 2013 election. The outcome is an indicator variable measuring this. The regressors are averages of doctor and clinic characteristics from our primary data across the constituency. Each observation is weighted by the number of clinics in our sample in the constituency. Heteroskedasticity robust standard errors reported in parentheses. *Levels of significance:* $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A4: Strategic Misreporting of Connections

	Knows Politician Personally		
	Doctor	Doctor	Inspector
	(1)	(2)	(3)
	(1)	(2)	(3)
Smartphone Monitoring	-0.025	0.006	-0.184
	(0.044)	(0.082)	(0.133)
Constant	0.079**	0.154**	0.569***
	(0.034)	(0.060)	(0.102)
Wave	2	3	-
# Districts	30	25	35
# Clinics	188	114	103

Notes: This table reports whether the 'Monitoring the Monitors' treatment induced strategic misreporting of connections by doctors and health inspectors. Standard Errors clustered at the district level reported in parentheses. Results are robust to clustering at the constituency level in columns (1) and (2). *Levels of significance:* $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A5: Connections and Perks

Dependent Variable:	Distance to Doctor's Hometown (minutes)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Doctor Knows MP Personally (=1)	-100.019***	-94.780**	-94.692**	-79.759**	-245.656***	-518.787**	-635.428**
	(23.374)	(38.983)	(39.039)	(39.567)	(69.086)	(239.558)	(281.251)
Doctor's Years of Service			0.085	0.024			1.791
			(0.264)	(0.201)			(1.306)
Catchment Population (1,000)			0.011	0.291			-7.334
			(4.742)	(3.732)			(18.684)
Distance to District Center (km)			0.875	1.873**			-0.497
			(0.802)	(0.893)			(4.113)
Constant	157.045***	164.940***	122.576	55.548	413.700***	494.535***	549.422
	(37.438)	(42.528)	(133.626)	(96.883)	(97.633)	(138.318)	(388.894)
District Fixed Effects	No	Yes	Yes	No	No	Yes	Yes
County Fixed Effects	No	No	No	Yes	No	No	No
Sample	Full	Full	Full	Full	>50 mins	>50 mins	>50 mins
# Observations	269	220	212	259	85	60	57
R-Squared	0.020	0.179	0.189	0.348	0.050	0.348	0.401

Notes: This table provides evidence that doctors who know their MP personally are less likely to be posted farther from their hometown. Sample: Full - control district clinics; >50 minutes - control clinics where doctor is further than 50 minutes from their hometown. All regressions include county and survey wave fixed effects. Standard errors clustered at the clinic level are reported in parentheses. *Levels of significance:* $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A6: Political Interference in Service Delivery

	Inspectors			Supervisors		
	Mean	SD	N	Mean	SD	N
Colleague ever influenced?	0.479	0.502	117	0.537	0.502	67
by MNA	0.857	0.353	56	0.889	0.319	36
by MPA	0.893	0.312	56	0.889	0.319	36
by other Politician	0.161	0.371	56	0.306	0.467	36
by senior Bureaucrat	0.143	0.353	56	0.222	0.422	36
by Police	0.054	0.227	56	0.056	0.232	36
by Private Person	0.125	0.334	56	0.167	0.378	36
# of times pressure, last year	7	56.761	55	10	19.019	35
# of times decision not changed, last year	2	14.765	52	1	25.871	33
# of times pressure, last 2 years	14	85.219	55	10	21.607	33
# of times decision not changed, last 2 years	3	23.282	52	2.500	27.050	30

Notes: We trim all variables in the lower panel at the 99 percentile.

Table A7: Political Interference in Health Bureaucracy

Variable	Mean	SD	N
Panel A: Senior Officials and Inspectors			
Ever influenced by Any Powerful Actor	0.4	0.492	150
Ever Influenced by Provincial Assembly Member	0.322	0.469	149
Instances of Interference by Provincial Assembly Member	13.49	48.368	149
Panel B: Senior Officials Only			
Ever influenced by Any Powerful Actor	0.441	0.504	34
Ever Influenced by Provincial Assembly Member	0.441	0.504	34
Instances of Interference by Provincial Assembly Member	34	84.779	34
Panel C: Inspectors Only			
Ever influenced by Any Powerful Actor	0.388	0.489	116
Ever Influenced by Provincial Assembly Member	0.287	0.454	115
Instances of Interference by Provincial Assembly Member	7.426	28.179	115

Notes: This table reports the frequency of interference by politicians in decisions of senior health bureaucrats. Data come from a survey of the universe of senior health bureaucrats and monitors in Punjab. For each panel, the first dependent variable is an indicator variable for whether the bureaucrat was influenced by any powerful actor to either (a) not take action against doctors or other staff that were performing unsatisfactorily in their jurisdiction (county) or (b) assign doctors to their preferred posting in the previous two years. The second variable measures the same, but restricts attention to influence by provincial assembly politicians, the focus of our study. The third variable is a count of the number of times bureaucrats report that Members of the Provincial Assembly pressured them. Panel A reports results for all bureaucrats in the sample, while Panel B disaggregates them by Executive District Officers and Deputy District Officers. Panel C reports the results only for Inspectors.

Table A8: Interference in Inspector Decisions and Political Competition

Dependent Variable:	Instances of Political Interference						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Political Competition Index	48.533	27.025*	28.771**	31.700**	8.569	8.145	9.331
	(29.486)	(14.354)	(14.115)	(15.882)	(8.334)	(8.373)	(9.982)
Inspector knows Local MPA Personally (=1)			-4.030***	-3.821**		-3.219**	-3.130*
			(1.466)	(1.526)		(1.456)	(1.648)
Inspector Tenure				0.171			0.081
				(0.133)			(0.144)
Time Spent Monitoring Clinics (mins)				-0.005			-0.006
				(0.010)			(0.009)
Constant	-9.872	-6.535	-5.418	-9.470	-0.552	1.063	-0.308
	(9.248)	(4.339)	(3.924)	(6.319)	(2.849)	(3.042)	(5.372)
# Observations	103	100	100	86	75	75	64
R-squared	0.012	0.046	0.133	0.154	0.007	0.075	0.086
Outcome	-	<100	<100	<100	<100	<100	<100
Sample	Full			Non-overlapping constituencies			

Notes: This table reports the frequency of interference by politicians in health inspectors decisions by the level political competition. The unit of observation is a county-constituency. The dependent variable is a count of the number of times that inspectors report Members of the Provincial Assembly pressuring them to either (a) not take action against doctors or other staff that were performing unsatisfactorily in their jurisdiction (county) or (b) assign doctors to their preferred posting in the previous two years. Of the 123 inspectors covering our experimental sample, we have responses from 103. In columns (2)-(7), we drop four reports which indicate more than 100 instances of interference (99th percentile). These three observations are more than four standard deviations from the mean. The remaining 100 inspectors are responsible for facilities spanning 211 provincial assembly constituencies. 79 of the constituencies belong to multiple inspectors' jurisdictions. Columns (1) through (3) report OLS regressions of the instances of interference on indicator variables for the degree of political competition in the full sample of 211 constituencies. Jurisdictions spanning multiple constituencies are repeated with the level of political competition in each constituency providing an observation. Columns (4) through (6) drop constituencies spanning multiple jurisdictions. Further details about the frequency and source of political interference is provided in Table A6. The political competition index is a Herfindahl index computed as the sum of squared candidate vote shares in each constituency in 2008. Low competition is a dummy variable equal to 1 for constituencies in the top tercile of this index and medium competition is a dummy variable for constituencies in the middle tercile. Standard errors clustered at the jurisdiction (county) level reported in parentheses. *Levels of significance:* $^*p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

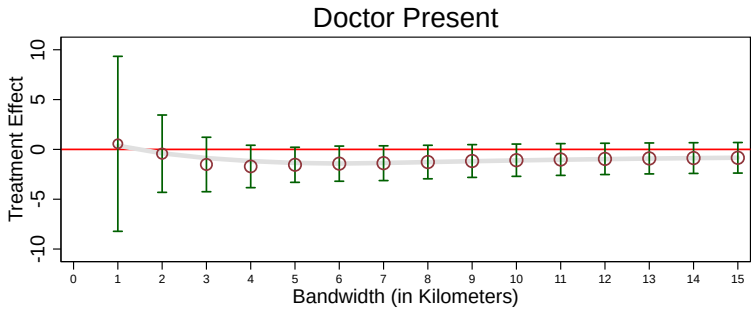


Figure A4: Robustness across bandwidths

Notes: This figure shows robustness of geographic discontinuity estimates to several bandwidths of distance to border. We use a bandwidth of 5 km in column 3 of Table 4. The vertical bars represent 95 percent confidence intervals.

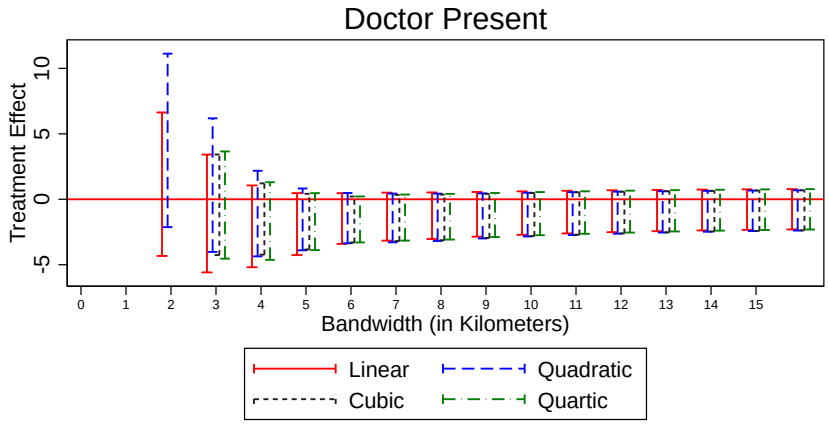


Figure A5: Robustess across Functional Forms

Notes: This Figure reports robustness of Table 4 column 3. The dependent variable is a dummy equal to 1 if a doctor is present during an unannounced facility inspection performed by our survey team. The political competition index is a Herfindahl index computed as the sum of squared candidate vote shares in each provincial assembly constituency. It varies between 0.040 and 0.545. All specification samples are restricted to basic health unit facilities in control districts with a doctor assigned. All specifications are OLS and include survey wave fixed effects, county fixed effects as well as controls for distance to HQ. All observations are weighed by a Triangular kernel and estimates include a geographic control function. The controls functions are of the following forms. Linear: $x + y$, Quadratic: $x + y + x^2 + y^2 + xy$, Cubic: $x + y + x^2 + y^2 + xy + x^3 + y^3 + x^2y + xy^2$, and Quartic: $x + y + x^2 + y^2 + xy + x^3 + y^3 + x^2y + xy^2 + x^4 + y4 + x^3y + x^2y^2 + xy^3$. Cubic control function is a replication of Dell (2010) and Michalopoulos and Papaioannou (2013)'s main specification. *Level of significance*:*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. Standard errors clustered at the constituency level reported in parentheses. The vertical bars represent 95 percent confidence intervals.

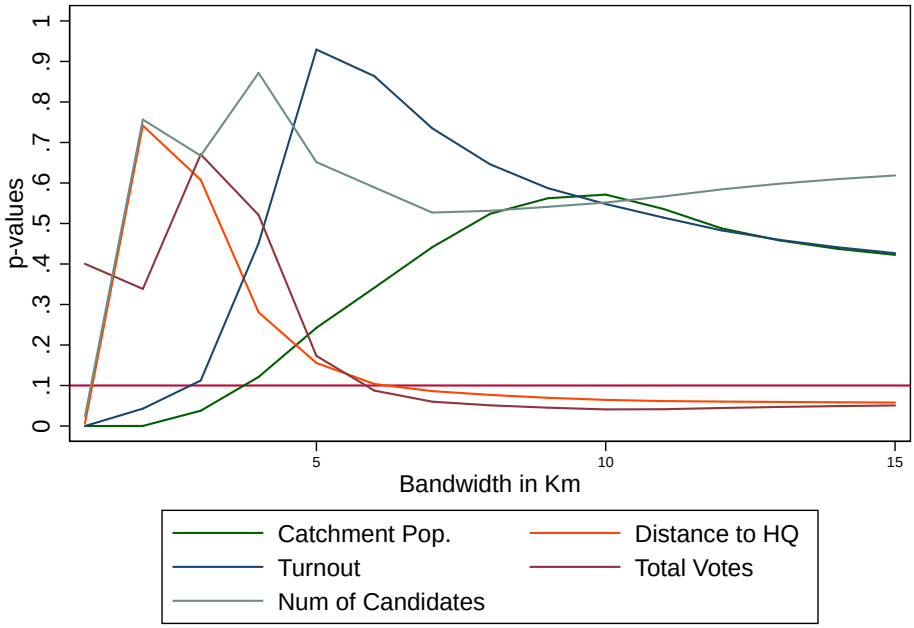


Figure A6: Geographic RD Balance

Notes: This figure shows balance of pre-covariates for the geographic discontinuity analysis. We retain good balance on all variables. We include distance to HQ in all our regressions.

Table A9: Randomization Verification

	Conventional Monitoring (=1)	Smartphone Monitoring (=1)	Difference	P-value	Control Observations	Treatment Observations
Clinic open during visit (=1)	0.926	0.930	-0.004	0.899	417	428
	[0.263]	[0.256]	(0.033)			
Inspector Has Visited in the Last Month (=1)	0.230	0.219	0.012	0.836	330	320
	[0.422]	[0.414]	(0.056)			
Number of Staff Present	2.722	2.883	-0.161	0.379	330	320
	[1.516]	[1.637]	(0.181)			
Number of Staff Assigned	5.115	5.285	-0.170	0.169	417	428
	[0.926]	[0.940]	(0.121)			
Doctor Present (Assigned only)	0.430	0.547	-0.116	0.078	223	309
	[0.496]	[0.499]	(0.064)			
Health Technician Present (=1)	0.516	0.477	0.039	0.519	312	302
	[0.501]	[0.500]	(0.060)			
Dispenser Present (=1)	0.733	0.805	-0.071	0.224	390	399
	[0.443]	[0.397]	(0.057)			
SHNS Present (=1)	0.347	0.341	0.006	0.921	403	413
	[0.477]	[0.475]	(0.060)			
Lady Health Visitor Present (=1)	0.631	0.662	-0.031	0.548	374	396
	[0.483]	[0.474]	(0.050)			
Midwife Present (=1)	0.659	0.650	0.008	0.863	328	303
	[0.475]	[0.478]	(0.048)			
Political Concentration (0 - 1)	0.348	0.346	0.002	0.872	414	423
	[0.083]	[0.078]	(0.014)			
High Competition Constituencies (Bottom Tercile)	0.312	0.362	-0.050	0.489	414	423
	[0.464]	[0.481]	(0.072)			
Medium Competition Constituencies (Middle Tercile)	0.377	0.284	0.093	0.209	414	423
	[0.485]	[0.451]	(0.073)			
Low Competition Constituencies (Top Tercile)	0.312	0.355	-0.043	0.543	414	423
	[0.464]	[0.479]	(0.070)			

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 A10: Randomization Verification Within Subgroups

	High Political Competition			Mid Political Competition			Low Political Competition		
	Control	Treatment	p-value	Control	Treatment	p-value	Control	Treatment	p-value
Clinic open during visit (=1)	0.893	0.907	0.813	0.912	0.934	0.590	0.976	0.953	0.383
	[0.310]	[0.291]		[0.284]	[0.250]		[0.153]	[0.212]	
DDO Has Visited in the Last Month (=1)	0.160	0.209	0.472	0.276	0.229	0.612	0.262	0.198	0.467
	[0.368]	[0.409]		[0.449]	[0.423]		[0.442]	[0.400]	
Number of Staff Present	2.565	2.974	0.170	2.635	2.777	0.506	3.032	2.820	0.444
	[1.504]	[1.865]		[1.532]	[1.508]		[1.486]	[1.461]	
Number of Staff Assigned	4.954	5.252	0.165	5.201	5.223	0.881	5.183	5.360	0.318
	[1.066]	[1.103]		[0.855]	[0.944]		[0.833]	[0.744]	
Doctor Present (Assigned only)	0.388	0.570	0.032	0.375	0.565	0.029	0.515	0.518	0.974
	[0.491]	[0.497]		[0.487]	[0.499]		[0.503]	[0.502]	
Health Technician Present (=1)	0.403	0.390	0.881	0.363	0.291	0.357	0.444	0.349	0.251
	[0.493]	[0.490]		[0.482]	[0.456]		[0.499]	[0.478]	
Dispenser Present (=1)	0.683	0.794	0.132	0.656	0.795	0.094	0.798	0.745	0.540
	[0.467]	[0.406]		[0.477]	[0.406]		[0.403]	[0.437]	
SHNS Present (=1)	0.333	0.418	0.242	0.325	0.291	0.623	0.390	0.295	0.312
	[0.473]	[0.495]		[0.470]	[0.456]		[0.490]	[0.458]	
Lady Health Visitor Present (=1)	0.545	0.624	0.260	0.592	0.641	0.459	0.629	0.617	0.861
	[0.500]	[0.486]		[0.493]	[0.482]		[0.485]	[0.488]	
Midwife Present (=1)	0.553	0.529	0.753	0.529	0.444	0.175	0.540	0.443	0.199
	[0.499]	[0.501]		[0.501]	[0.499]		[0.500]	[0.498]	
Political Concentration (0 - 1)	0.832	0.820	0.547	0.664	0.654	0.191	0.490	0.508	0.329
	[0.082]	[0.083]		[0.026]	[0.025]		[0.088]	[0.067]	

Notes: This table checks balance between treatment and control clinics divided by political competition (Herfindahl index) tercile. 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 row reports 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.

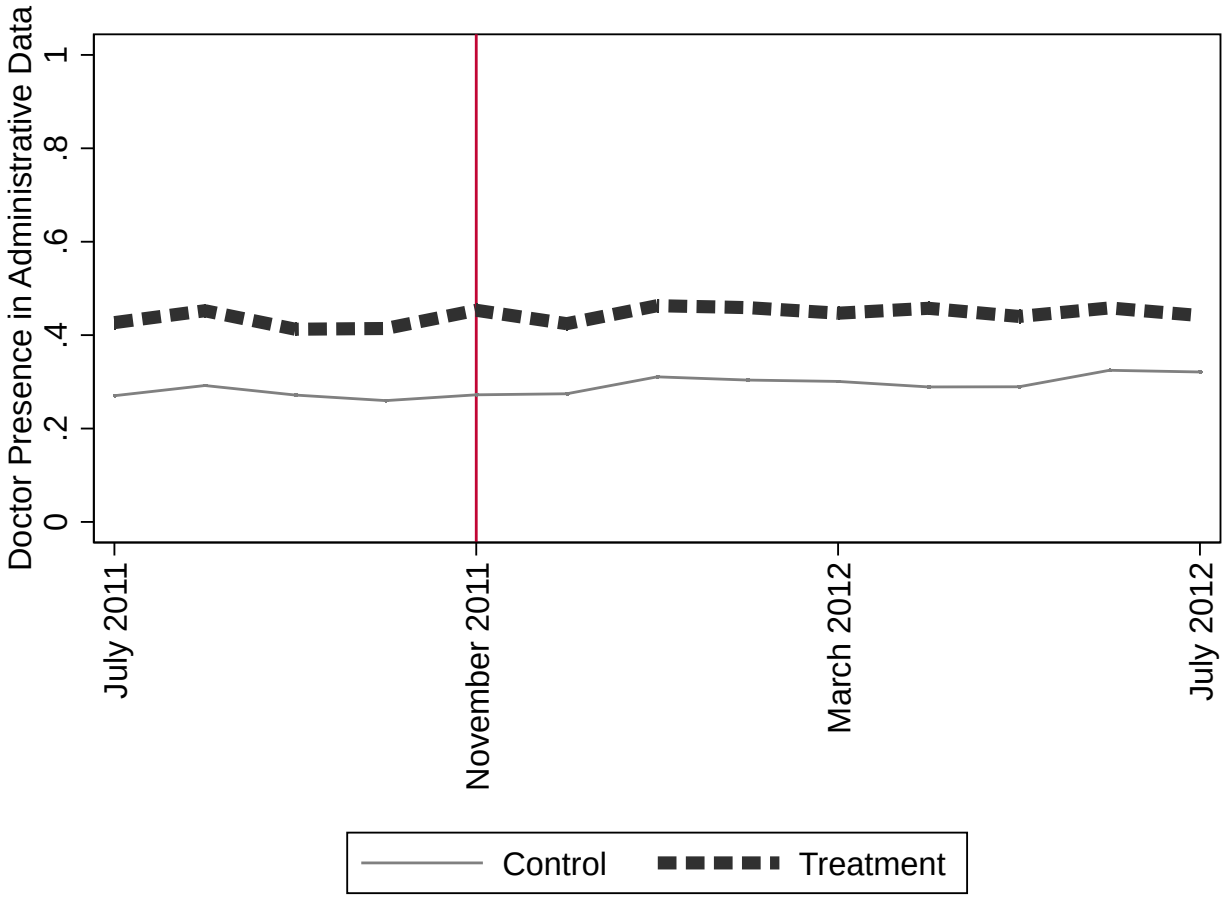


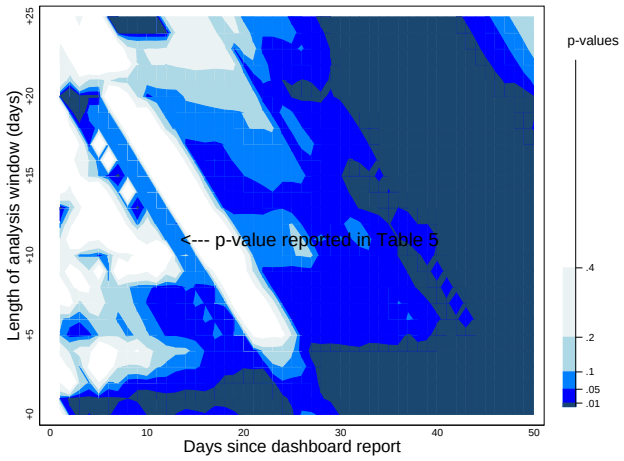
Figure A7: Average Doctor Attendance Before and After Treatment

Table A11: Time-Use of Inspectors

	Treatment (1)	Control (2)	Difference (3)	p-value Mean Diff (4)	p-value Exact Test (5)
Breaks During Official Duty					
Lunch, Prayer, or Tea Break	16.189	22.500	-6.311	0.338	0.716
	(4.993)	(4.151)	(6.494)		
Inspections of Facilities					
Inspecting Clinics	68.648	46.324	22.324	0.183	0.083
	(14.373)	(7.959)	(16.430)		
Inspecting Hospitals	52.541	30.637	21.904	0.217	0.186
	(15.457)	(7.973)	(17.392)		
(i) Total Time Inspecting	121.189	76.961	44.228	0.105	0.073
	(24.152)	(10.966)	(26.525)		
Management of Facilities					
In Head Office, Managing Clinics	23.484	36.765	-13.281	0.272	0.739
	(7.201)	(9.468)	(11.895)		
In Head Office, Managing Hospitals	24.344	32.721	-8.376	0.589	0.702
	(7.588)	(13.365)	(15.369)		
(ii) Total Time Managing In Head Office	47.828	69.485	-21.657	0.273	0.808
	(9.440)	(16.976)	(19.424)		
Official Duty Unrelated to Facility Management					
Managing Immunization Drives	94.918	92.770	2.148	0.933	0.452
	(20.484)	(15.260)	(25.544)		
Official Meetings Unrelated to Facility Management	112.500	55.441	57.059	0.046	0.110
	(21.217)	(17.598)	(27.565)		
Other Official Duty	74.385	81.765	-7.379	0.851	0.539
	(29.151)	(25.875)	(38.978)		
(iii) Duty Unrelated to Facility Management	281.803	229.975	51.828	0.258	0.121
	(30.167)	(33.481)	(45.067)		
Total Official Duty					
Total Minutes Working (i) + (ii) + (iii)	450.820	376.422	74.398	0.082	0.045
	(18.380)	(37.163)	(41.460)		
# of Observations	122	102			

Notes: This table reports average treatment effects of the 'Monitoring the monitors' program on the time-use patterns of inspectors. Data for results come from the survey of the universe of health inspectors in Punjab. The unit of observation are these inspectors. Column (1) shows the average, in minutes, of how inspectors in treatment districts spend their time over the last two days on several tasks. Column (2) shows the same for control districts. Column (3) reports the difference between the two. Standard errors clustered at the district level reported in parentheses. P-values reported in column (4) are for the difference between treatment and control clinics. Column (5) reports the Fisher Exact Test p-values that places column (4) p-values in the distribution of p-values obtained from a 1000 random draws of treatment assignment.

Panel A: The Effect of Flagging by Doctor Connections



Panel B: The Effect of Flagging by Political Competition

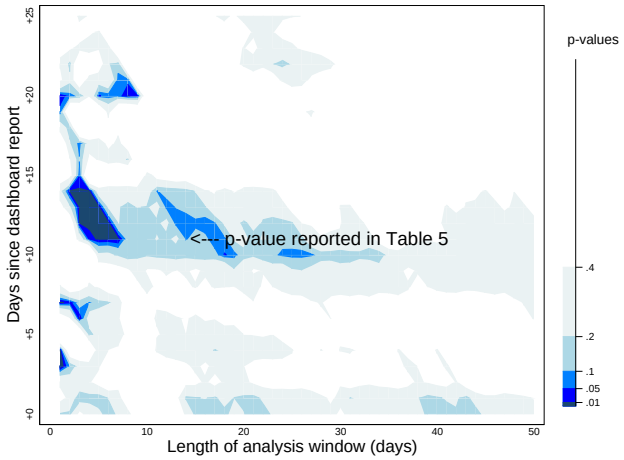


Figure A8: Heterogeneous Effects on Absence after Flagging

Notes: Panel A reports p-values from 1300 hypothesis tests analogous to that conducted in Table 6 column (3) that Flagged x High Comp = Flagged x Low Compl., 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). For each window, we report using a colored pixel the p-value of the hypothesis test of a null effect of flagging on subsequent doctor attendance. Panel B conducts the same exercise for the hypothesis test in Table 6 column (4) that Flagged x Doctor Does Not Know = Flagged x Doctor Knows.

B Matching Clinics to Political Constituencies

We followed a two-pronged strategy to place the clinics in their relevant electoral constituencies:

First, we gathered the GPS coordinates of each clinic in our sample during field surveys. These coordinates were compared with those provided to us by the Health Department and then verified in cases of disagreement. This enables us to place clinics on a geo-referenced map of constituencies.

The Election Commission of Pakistan has publicly released maps of all provincial and national constituencies as PDFs on their website[22]. As these maps lack vector information that is required for direct use with GPS coordinates, we manually converted the PDFs to shape files so that we can place each clinic in the correct constituency polygon. The quality of this approach however, is affected by the reliability of these base maps prepared by the Election Commission of Pakistan.

A second approach helps ensure that the placement of clinics does not hinge solely on the quality of these maps. During the second round of our surveys, we asked all respondents in a clinic to identify the constituency where the clinic is located. In cases where respondents did not know the constituency number, we asked them to name the elected representative from the area. To corroborate this further, we asked the most senior official present at the clinic to identify the political constituency in consultation with colleagues during the third round of the surveys.

We manually compared the names of elected politicians provided by the clinic staff with official lists available on the website of Punjab Assembly. We assigned a constituency number if the name matched with information on the website. At the end of this exercise we had constituency information from multiple respondents. We proceeded by taking the mode of these responses to assign clinics to political constituencies. In cases with disagreements, we

[22]http://ecp.gov.pk/Delimitation/ConstituencyMap/PA.aspx

manually compared the data with official lists of district-wise constituencies and corrected cases with obvious typos. For instance, a district with a constituency number 191 had a reported constituency number of 91, which we corrected.

Through this procedure, we were able to match all but a few clinics to constituencies. We used geo-spatial information and Election Commission of Pakistan's maps to break the tie between the remaining few clinics.

C Hiring Process for Doctors

There are two different hiring processes for the Medical Officers. The first is through Punjab Provincial Service Commission (PPSC). Through this route a Medical Officer becomes part of the bureaucracy either temporarily or permanently, depending on the nature of positions that are being filled. PPSC is a statuary body tasked with hiring of human resources for several arms of the provincial government. The commission floats an advertisement with details of the hiring process. Individuals who have passed the doctor certifications (M.B.B.S.), and are registered with Pakistan Medical and Dental Council, are eligible to apply to these positions. The top candidates are called in for a test and further shortlisted candidates are interviewed by a selection committee. The committee consists of senior officials from PPSC, the Health Department, and the Director General Health Services office, and a senior medical expert. Merit lists generated based on performance in the interview are then communicated to the Health Department by PPSC. The department then decides on the postings based on these lists.

The second process for hiring Medical Officers is devolved at the District Level. The EDO health office advertises vacant positions locally, and shortlisted applicants are interviewed by the EDO himself. The candidates might also be given a test designed by the EDO on the same day. Recommendations of the EDO are conveyed to the Establishment Division of the Health Department, which then issues offer letters to the successful applicants. However, these doctors are only hired on a contractual basis. In order to become permanent employees, long-term contractual doctors have to clear a promotion exam at PPSC. EDOs also have the power to hire and appoint temporary MOs during times of high demand of services, such as in the case of an outbreak of the dengue virus, or flood-prone epidemics. Some of these MOs can be considered preferentially for filling vacancies once the demand normalizes. However, temporary MOs also have to clear a test at PPSC in order to become permanent employees.

D Interference and Political Competition

This section investigates whether the incidence of political interference is related to political competition, a measure of politician strength. We continue using the survey described, and add information on political competition.[23]

As we describe in Section 4, we identified the provincial assembly constituency in which each of our clinics are located. We placed each of these constituencies in a county, the unit at which Monitors operate. We use party vote shares at the Provincial Assembly constituency level for 2008 and compute a Herfindahl index as $\sum_i s_i^2$ where s_i is the vote share for party i.[24] In our sample, our Herfindahl ranges from 0.14 to 0.52. Figure 4 Panel B maps the political concentration measure for each constituency in Punjab. The degree of political contestation appears only weakly correlated with geography.

To explore the relation between political competition and interference, we aggregate our data to the level of a county, which corresponds to the jurisdiction of an inspector. Figure A9 depicts the relation between the Herfindahl index and the number of instances of political interference in a leverage plot. The slope of the line in the leverage plot corresponds to $\hat{\beta}_1$ estimated from the regression:

$$Interference_c = \beta_0 + \beta_1 \overline{Herfindahl}_c + \gamma' \mathbf{X}_c + \varepsilon_c, \tag{5}$$

where $Interference_c$ is the number of times the inspector in charge of county c reports being interfered with, $\overline{Herfindahl}_c$ is the average Herfindahl index across constituencies in the county, and $\mathbf{X}_c$ is a vector of inspector characteristics including their tenure, whether

[23] We perform this analysis for inspectors, as there are only 33 senior health officials in our data and their jurisdiction spans several constituencies. Inspectors, by contrast, have administrative jurisdiction in only one or two constituencies.

[24] We drop two clinics in one constituency (number 124) from our analysis as the Herfindahl Index is 0.786, which is 5.5 standard deviations from the mean and more than 3 standard deviations from the next highest constituency.

they know their local MPA, and the amount of time they report monitoring facilities.[25] We note that the degree of the correlation is reduced and statistical significance is lost if we remove constituencies that span county boundaries. However, given that a politician may have incentive to influence any bureaucrat in a shared jurisdiction, there is an argument for keeping these constituencies in the data.

[25]This regression is weighted by the number of constituencies in a county. Constituencies are intended to have roughly equal populations, so these estimates are comparable to population weighted estimates. A full set of corresponding regressions are presented in Table A8.

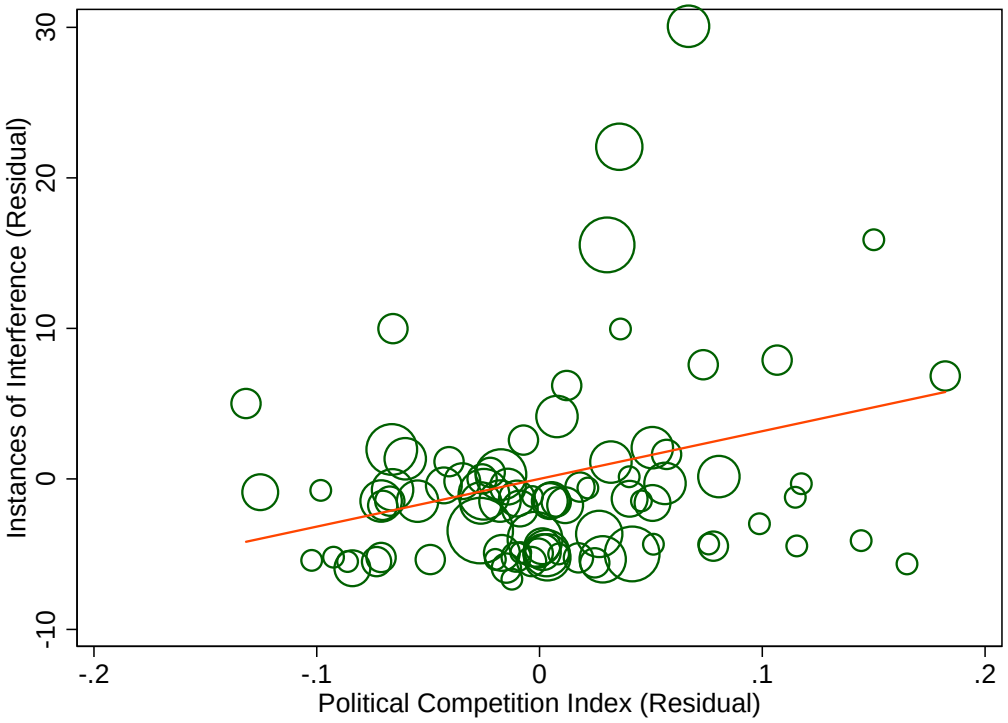


Figure A9: Interference and Political Competition

Notes: This figure shows the correlation between interference by politicians in health inspectors decisions and the mean level political competition in the jurisdictions of inspectors. The unit of observation is a county-constituency. The dependent variable is a count of the number of times that inspectors report Members of the Provincial Assembly pressuring them to either (a) not take action against doctors or other staff that were performing unsatisfactorily in their jurisdiction (county) or (b) assign doctors to their preferred posting in the previous two years. Of the 123 inspectors covering our experimental sample, we have responses from 103. We drop four reports which indicate more than 100 instances of interference (99th percentile). The political competition index is a Herfindahl index computed as the sum of squared candidate vote shares in each constituency. The axis residuals from a regression of the variable on whether the inspector knows the local MPA personally, the tenure of the inspector, as well as the time the inspector spends on monitoring clinics. Regression results for this figure are presented in Table A8. Further details about the frequency and source of political interference is provided in Table A6.

E Honest Causal Tree Selection of Variables for Heterogeneity Analysis

One might be concerned that political competition and doctor connectedness are two variables chosen ex-post to explain heterogeneity in both the impact of smartphone monitoring and of flagging a facility in red on the online dashboard. In order to assuage this concern, we apply the machine-learning honest causal tree methodology to our data (Athey and Imbens, 2016). This is a data-driven approach to "partition the data into subpopulations that differ in the magnitude of their treatment effects." In other words, the methodology, when provided a set of possible variables by which to calculate heterogeneous treatment effects, selects the variables and cut points to partition the data to maximize treatment effect heterogeneity (i.e. out-of-sample predictive power). It doe so by splitting the data into two samples. One is used to construct the partition and another to estimate treatment effects for each subpopulation. Selection criteria is then applied to ensure unbiased point estimates when cross-validation is applied.

For our heterogeneous treatment effects of smartphone monitoring, we present this algorithm with our explanatory variables (political competition and doctors knowing their local MPA) as well as doctors' tenure in the health department and at their clinic and the distance between the clinic and doctors' hometown. In the case of political competition, heterogeneous treatment effects are most clearly described by political competition over these other possible explanatory variables. In the case of doctor connectedness, out-of-sample predictive power is maximized when partitioning the data along multiple variables which include doctor connectedness. These partitions are represented visually in Appendix Figures A10 and A11. We take these results as support for our choice of variables to use to explore heterogeneity and thus the broad mechanisms we discuss in this paper.

For our heterogeneous flagging results, we present this algorithm with our explanatory variables (political competition and doctors knowing their local MPA) as well as doctors'

tenure in the health department and at their clinic and the distance between the clinic and doctors' hometown. In both cases, heterogeneous flagging effects are most clearly described by political competition or doctor connectedness over these other possible explanatory variables. These partitions are represented visually in Appendix Figures A12 and A13. Again, we take these results as support for our choice of variables to use to explore heterogeneity and thus the broad mechanisms we discuss in this paper.

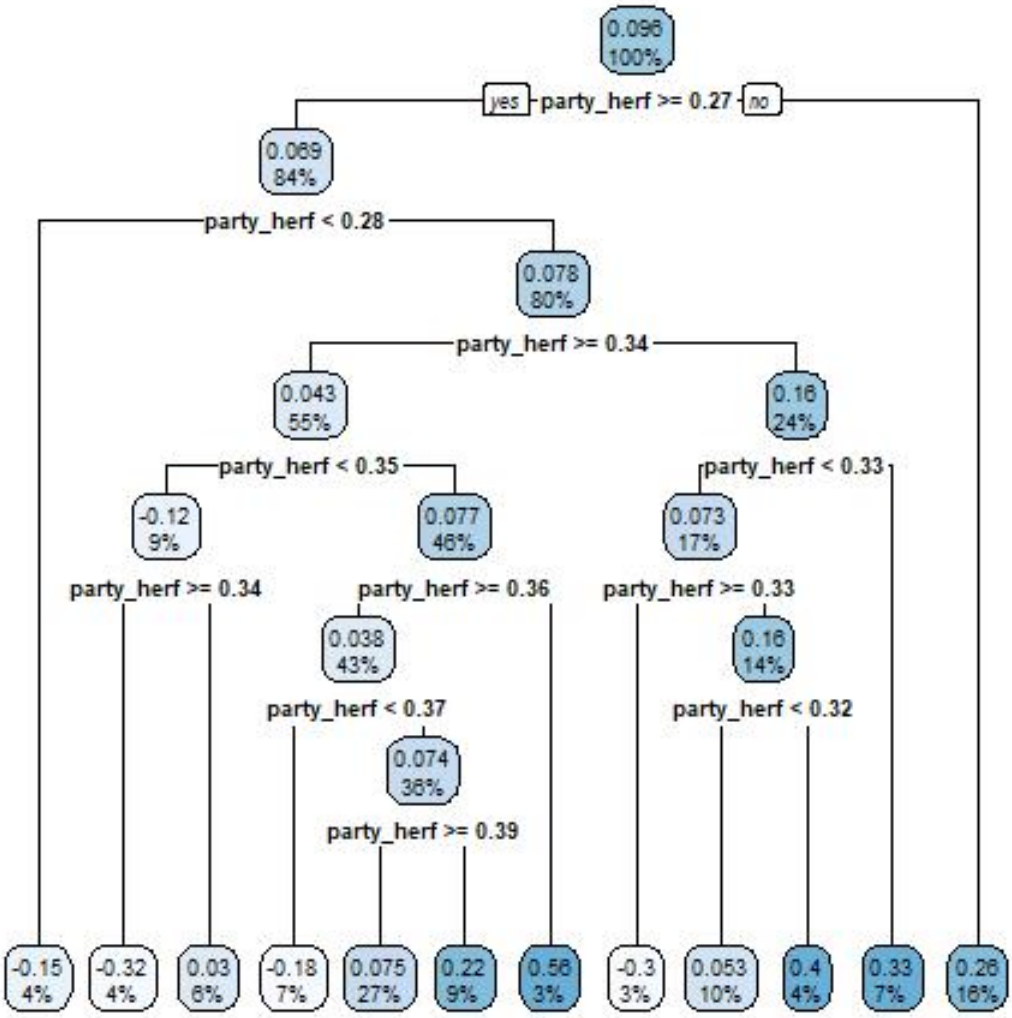


Figure A10: Honest causal tree partition by political competition and other doctor variables for heterogeneous treatment effects

Notes: This figure presents visually the outcome from presenting the honest causal tree algorithm for heterogeneous treatment effects with four variables—political competition, doctors' tenure in the health department and at their clinic, and the distince between the clinic and doctors' hometown. Out-of-sample predictive power is maximized when partitioning the data according to this tree.

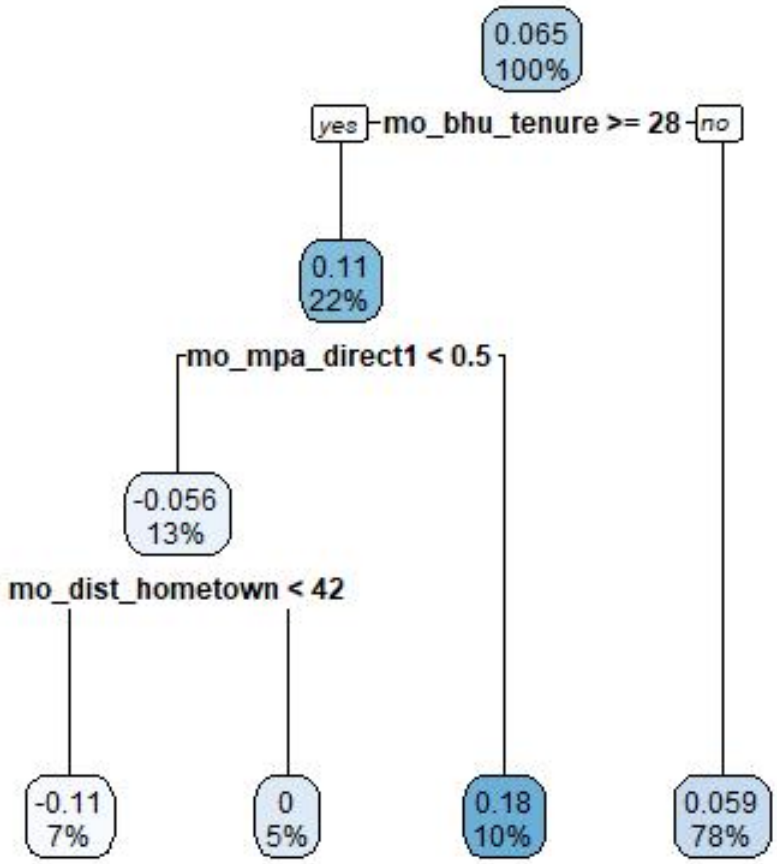


Figure A11: Honest causal tree partition by political connectedness and other doctor variables for heterogeneous treatment effects

Notes: This figure presents visually the outcome from presenting the honest causal tree algorithm for heterogeneous treatment effects with four variables—a dummy for doctors knowing their local MPA, doctors' tenure in the health department and at their clinic, and the distince between the clinic and doctors' hometown. Out-of-sample predictive power is maximized when partitioning the data according to this tree.

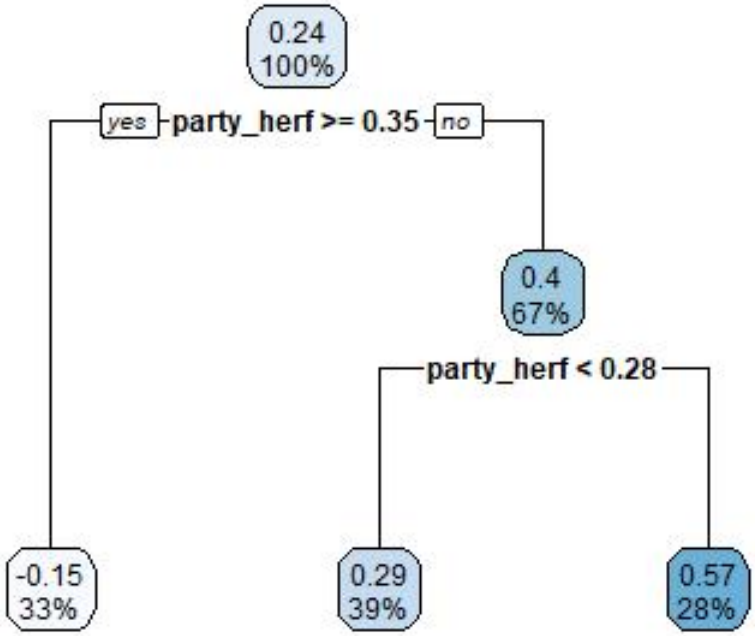


Figure A12: Honest causal tree partition by political competition and other doctor variables for heterogeneous flagging results

Notes: This figure presents visually the outcome from presenting the honest causal tree algorithm for heterogeneous flagging results with four variables—political competition, doctors' tenure in the health department and at their clinic, and the distance between the clinic and doctors' hometown. Out-of-sample predictive power is maximized when partitioning the data according to this tree.

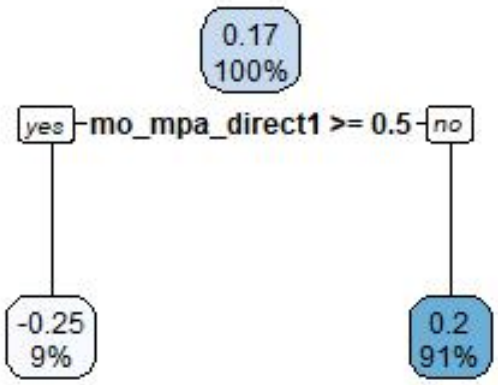


Figure A13: Honest causal tree partition by political connectedness and other doctor variables for heterogeneous flagging results

Notes: This figure presents visually the outcome from presenting the honest causal tree algorithm for heterogeneous flagging results with four variables—a dummy for doctors knowing their local MPA, doctors' tenure in the health department and at their clinic, and the distance between the clinic and doctors' hometown. Out-of-sample predictive power is maximized when partitioning the data according to this tree.

F Robustness to Alternate Measures of Competition

The primary measure of political competition used in the paper relies on the Party Herfindahl index which is calculated for each constituency c as follows:

$$H_c = \sum_i s_i^2$$

where s_i is the vote share of party i

Most measures of political competition rely on an isomorphic transformation of the Herfindahl index. For instance, the Effective Number of Parties index is just an inverse of the Herfindahl index:

$$Effective\ \#\ of\ Parties_c = \frac{1}{\sum_i s_i^2}$$

Golosov (2009) proposes an improvement over the Effective Number of Parties Index to better capture higher concentrated and higher fragmented party systems. This is calculated as follows:

$$G_c = \sum_i \frac{1}{1 + \frac{s_1^2}{s_i} - s_i}$$

where s_1 is the share of the party with the highest number of votes. In this index, the score of the party with then most votes is always 1, and all smaller parties are expressed in relation to this score.

Finally, another approach to measuring political competition relies on only considering the top two parties in a constituency. This measure calculates the margin by which the winning party won the election. The benefit of this approach is that it focuses on the most important players in the constituency. However, this comes at the cost of losing important information on close thirds for instance. This measure is calculated as follows:

$$Victory\ Margin_c = \frac{s_k - s_j}{s_k}$$

where s_k is the vote share of the winning party, while s_j is the vote share of the runner-up.

We plot these three measures against the Party Herfindahl Index in Figure A14, where each dot represents a constituency in our sample. It can be seen that the Effective Number of Parties Index, as well as the Golosov Index are very strongly correlated with our measure of political competition. As expected, given the different nature of competition it is measuring, Victory Margin Share, though positively correlated, does not have as tight a relationship.

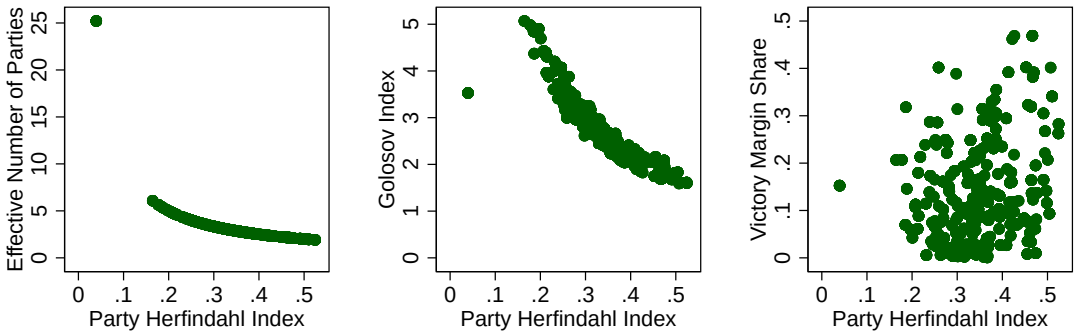


Figure A14: Correlation of Party Herfindahl Index with Alternate Measures

Therefore, to robustness of our results, we focus on Victory Margin Share as an alternate measure of political competition. Political Competition in the Tables presented in this section refers to Victory Margin Share.

Table A12: Robustness: Political Connections, Competition, and Doctor Attendance

Dependent Variable:	Doctor Present (=1)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Political Competition Index	-0.350	-0.413	0.247			-0.353	-0.374*
	(0.267)	(0.256)	(0.588)			(0.233)	(0.222)
Doctor Knows Local MPA Personally (=1)				-0.207**	-0.208**	-0.282**	-0.305**
				(0.084)	(0.091)	(0.130)	(0.139)
Doctor Knows × Political Competition Index						0.322	0.363
						(0.614)	(0.641)
Distance to District Center (in minutes)		-0.001	-0.002		-0.000		0.001
		(0.001)	(0.003)		(0.001)		(0.001)
Mean, Competition ≤ 33 percentile	0.419	0.419	0.366			0.483	0.483
Mean, Doctor Knows=0				0.547	0.547	0.546	0.546
Comp ≤ 33 perc & Mean, Doctor Knows=0						0.546	0.546
# Constituencies	105	105	103	92	92	91	91
# Observations	623	623	495	515	515	514	514
R-Squared	0.154	0.159	0.392	0.257	0.272	0.198	0.204
County Fixed Effects	Yes	Yes	-	-	-	Yes	Yes
Constituency Fixed Effects	-	-	-	Yes	Yes	-	-
Spatial Controls	-	Yes	Yes	-	Yes	-	Yes
Boundary Fixed Effects	-	-	Yes	-	-	-	-
Triangular Kernel	-	-	Yes	-	-	-	-
Bandwidth	All data	All data	5 Km	All data	All data	All data	All data

Notes: This table reports on the relationship between doctor attendance and interactions between the political connections of doctors and the degree of political competition as measured by Victory Margin Share. The dependent variable is a dummy equal to 1 if a doctor is present during an unannounced facility inspection performed by our survey team. The political competition index is a Herfindahl index computed as the sum of squared candidate vote shares in each provincial assembly constituency during 2008 elections . It varies between 0.040 and 0.545. All specification samples are restricted to basic health unit facilities in control districts with a doctor assigned. All specifications are OLS and include survey wave fixed effects, as well as controls for distance to the district headquarters. Indicated models weigh observations by a Triangular kernel. Indicated estimates include a geographic control function in longitudes (x) and latitudes (y) of the form $x+y+x^2+y^2+xy+x^3+y^3+x^2y+xy^2$. Standard errors clustered at the constituency level reported in parentheses. *Levels of significance*:*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

Table A13: Robustness: Treatment Effects by Political Competition

Dependent Var.	Inspected (=1)		Doctor Present (=1)		
	(1)	(2)	(3)	(4)	(5)
Monitoring	0.212***		-0.005		
	(0.064)		(0.068)		
	[0.000]		[0.546]		
Monitoring x High Political Competition		0.221**		0.009	0.020
		(0.081)		(0.065)	(0.110)
		[0.000]		[0.495]	[0.449]
Monitoring x Med Political Competition		0.224**		-0.042	-0.071
		(0.107)		(0.076)	(0.109)
		[0.038]		[0.723]	[0.742]
Monitoring x Low Political Competition		0.185**		0.029	0.072
		(0.077)		(0.061)	(0.096)
		[0.037]		[0.202]	[0.089]
Constant	0.217***	0.217***	0.518***	0.324***	0.516***
	(0.022)	(0.022)	(0.021)	(0.014)	(0.021)
Mon. x High = Mon. x Med. (p-value)		0.979		0.608	0.551
Mon. x High = Mon. x Low. (p-value)		0.734		0.806	0.706
Mean in Controls	0.238		0.424		
High Pol. Comp. Mean in Controls		0.210		0.211	0.409
Med. Pol. Comp. Mean in Controls		0.290		0.213	0.406
Low Pol. Comp. Mean in Control		0.218		0.251	0.454
# Districts	35	35	35	35	35
# Clinics	840	833	670	842	664
# Observations	2171	2153	1528	2398	1518
R-Squared	0.053	0.056	0.009	0.007	0.011
Only Clinics with Doctors	No	No	Yes	No	Yes

Notes: This table reports on the effects of the 'Monitoring the Monitors' program on health inspections and the attendance of doctors. Columns (2), (4), and (5) look at heterogeneous impacts by the degree of political competition in the constituency where the reform is implemented. These estimates correspond to specification (2) in the paper. Political Competition refers to Victory Margin Share computed for each constituency. All regressions include clinic and survey wave fixed effects. Standard errors clustered at the district level reported in parentheses. Fisher Exact Test p-values reported in brackets. This test places the 'true' treatment assignment p-values in the distribution of p-values obtained from a 1000 random draws of treatment assignment.

Table A14: Robustness: Effect of Flagging Underperformance on the Dashboard

	Doctor Present in Unannounced Visit (=1)			
	(1)	(2)	(3)	(4)
Flagged	0.090	0.266**		
	(0.077)	(0.110)		
Flagged x High Competition			0.470***	
			(0.143)	
Flagged x Med Competition			-0.095	
			(0.254)	
Flagged x Low Competition			0.058	
			(0.213)	
Flagged x Doctor Does Not Know Politician				0.184
				(0.117)
Flagged x Doctor Knows Politician				-0.427
				(0.303)
Constant	0.409***	0.277***	0.191	0.835***
	(0.045)	(0.087)	(0.169)	(0.279)
Flagged x High Comp = Flagged x Med Comp (p-value)			0.059	
Flagged x High Comp = Flagged x Low Comp (p-value)			0.109	
Flagged x Doctor Does Not Know = Flagged x Doctor Knows (p-value)				0.050
# Clinics	195	78	78	69
# Reports	252	88	88	77
R-Squared	0.129	0.340	0.411	0.412
District Fixed Effects	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 sample is limited 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. Political Competition refers to Victory Margin Share computed for each constituency. All regressions include survey wave fixed effects. Standard errors clustered at the clinic level reported in parentheses. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

G Paper Inspection Form

INSPECTION FORM OF BASIC HEALTH UNIT
HEALTH DEPARTMENT (GOVERNMENT OF THE PUNJAB)
A - BASIC HEALTH UNIT INFORMATION

HMIS Code: ☐☐☐☐☐☐☐ Name of BHU: _____

Managed by: i) PRSP ☐ ii) Dist. Govt. ☐ (please tick only one option)

Mauza: _____ UC Name: _____ UC No. _____

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. _____

Date & Time of arrival for inspection: ____/____/____ Time: Hours _____ Minutes _____ am / pm

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

Sr. No	Location	Good	Average	Poor
1	Boundary Wall			
2	Lawns			
3	Waiting Area			
4	Building			
5	Labour Room			
6	Wards			
7	Toilets			

C - DISPLAYS
(tick relevant column)

ITEMS		Yes	No
Signboards/Direction Board displayed			
Display in the MO/ Incharge office:	1) Organogram		
	2) Map of Union council showing all localities		
	3) Statistics of the Union Council and the BHU		
	4) Tour Programme of 'outreach team'		

D - AVAILBILITY OF UTILITIES
(tick relevant column)

Sr. No	Name of Utility	Not Available	Available	
			Functional	Non Functional
1	Electricity			
2	Telephone			
3	Water supply System			
4	Sui Gas			
5	Sewerage System			
6	Other			

E - DISPOSAL OF HOSPITAL WASTE
(tick relevant column)

Sr. No	Mode		Yes	No
1	Hospital Waste Segregated as per guidelines			
2	Hospital Waste Lying Open			
3	Burnt by:	(a) Incinerator		
		(b) Other means		
4	Buried			
5	Carried away by municipality			
6	Any other (Please state)			

F - PURCHI FEES (give amount)

Fee Deposited during the current financial year till the last calendar month: ***(Rs.)*** _____

Purchi fee being charged @ ***Rs.*** _____ *per patient.*

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

Sr. No	*Cases*	*Numbers*	Sr. No.	*Cases*	*Numbers*
1	OPD Cases		7	Children vaccinated outside BHU	
2	Percentage of pervious day OPD Cases registered with NIC No.		8	TB 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

S. No.	Indicator	Numbers
1	Total Number of Students referred by SH&NS during previous month	
2	Total Numbers of student treated at BHU referred by SH&NS	
3.	Total Numbers of School visited during previous month	
4.	Tour program approved and displayed in DHQ	Yes / No

I - DOCTORS (give numbers)

Sanctioned Posts	Filled Posts	Present

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	Name of Doctors	Type of Absence on the monitoring day. (tick only one box)					Days of absence during last three calendar months	
			UA	SL	OD	St. L	LC	UA	Other Types
1	MO WMO								

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

J- PARAMEDICS (OTHER THAN DOCTORS)

PARAMEDICS INCLUDES:	Medical Assistant, Medical Technician, Health Technician, Dispenser, Other

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	
			UA	SL	OD	St. L	LC	UA	Other Types
1									
2									
3									

K - PREVENTIVE / OUTREACH STAFF

PREVENTIVE / OUTREACH STAFF INCLUDES.	LHV, RHI, Midwife, Dai, Vaccinator CDC Supervisor, Sanitary Inspector Sanitary Worker, School Health & Nutrition Supervisor

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	
			UA	SL	OD	St. L	LC	UA	Other Types
1									
2									
3									

L - ADMIN / SUPPORT STAFF

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

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	
			UA	SL	OD	St. L	LC	UA	Other Types
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

N - AVAILABILITY OF MEDICINES (give numbers of tablets / bottles etc.)

(Medicines physically available on the date of visit in the stock & as per Medicines Stock Register)

Sr. No.	Medicines	Available		Balance as on 1st of last month (1)	Received Since 1st of last month (2)	Total 3=(1+2)	Consumed since 1st of last month till today (4)	Balance as per register 5=(3-4)
		Yes	No					
1	Cap. Amoxicillin							
2	Syp. Amoxicillin							
3	Tab. Cotrimoxazole							
4	Syp. Cotrimoxazole							
5	Any Other antibiotic Tablet							
6	Tab. Metronidazole							
7	Syp. Metronidazole							
8	Inj. Ampicillin							
9	Tab Diclofenac							
10	Inj. Diclofenac							
11	Syrup Paracetamol							
12	Chloroquine Tab							
13	Syrup Salbutamol							
14	Syp. Antihelminthic							
15	I/V Infusions							
16	Inj. Dexamethasone							
17	Iron/Folic Tab.							
18	ORS (Packets)							
19	Oral Contraceptive Pills							
20	Anti-Histamine Tab.							
21	Inj. Anti-Histamine							
22	Anti-Tuberculosis Drugs							
23	Tetanus Toxoid Injections							
24	Inj. Atropin							
25	Inj. Adrenaline							
26	Ant acid Tab.							
27	Bandages							
28	Antiseptic Solution (Bottles)							
29	Disposable Syringes							

O - INSPECTION OF THE FACILITY BY DISTRICT GOVERNMENT OFFICERS

From Inspection Register. (give number / dates)

Sr. No.	Inspecting Officer	DDO (H)	DO (H)	EDO (H)	DCO or his Representative	PRSP Representative (in PRSP Dist. Only)
1	Number of inspections made during the last six months as per record of inspection book					
2	Date of Last Inspection					

P- PUBLIC OPINION (please give number of persons in the relevant columns.)

Views	Number of persons contacted in the catchment area	PUBLIC OPINION			
		Satisfactory	Average	Unsatisfactory	No Response
1) Presence of Doctors					
2) Attitude of doctors towards patients					
3) Waiting Time					
4) Free availability of medicines					
5) Vaccinators outreach					
6) Vaccination at BHU					

Note: Names and Contact Numbers of at least two persons interviewed during the visit

Sr. No.	Name	Address	Contact Number

Q - DEVELOPMENT SCHEMES / PROVISION OF MISSING FACILITIES (tick the column)

Sr. No	Missing Facilities	Funds provided by		Status of Work			Quality			Observations (use extra page if required)
		PHSRP	District Govt.	Not Started	Halted	% Completed (give number)	Poor	Avg.	Good	
1	BHU Building									
2	Residences									
3	Boundary wall									
4	Electricity									
5	Drinking Water									
6	Latrine/Toilet									
7	Furniture Sui Gas									
8	Sewerage									
9	Other									

R (i)- MEDICAL EQUIPMENT (give numbers)

Sr. No.	Name of Item	Available	Functional	If Non-Functional		Remarks
				Repairable	Unserviceable	
1	Delivery Table					
2	Delivery Light					
3	Hospital Beds					
4	Sucker					
5	Oxygen Cylinders					
6	Autoclave					
7	Glucometer					
8	Safe Delivery Kit					
9	Emergency tray with life saving medicines					
10	Ambu Bag					
11	Bulb Sucker					
12	Baby Warmer					

R (ii) – NON-MEDICAL EQUIPMENT (give numbers)

Sr. No.	Name of Item	Available	Functional	If Non-Functional		Remarks
				Repairable	Unserviceable	
1	Computer					
2	Printer					
3	UPS					

S – RESIDENCES (give numbers)

Sr. No.	Name of Post	Residence Available	Residence Occupied (Yes/No)	Physical Status of Residence		Remarks
				Reside able	Not reside able	
1						
2						
3						

T - SERVICES

Sr. No.		YES	NO
	AIDS & HEPATITIS CONTROL		
1	Syringe cutters available		
2	Syringe cutters being used		
	EPI		
3	Cold Chain intact		
4	All vaccines available at EPI Center		
5	**NATIONAL PROGRAM FOR FP & PHC**		
	LHW monthly meeting held		
6	LHW monthly meeting report completed		
7	Monthly supplies / medicines replenished		
8	**MCH**		
	Labour Room equipment available		
9	Labour Room equipment functional		
10	Family planning services being provided		
11	**LOGISTICS**		
12	General supplies available (Linens, bedside lockers, etc.)		

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**

H Training Manual For Smartphone Application Use

MANUAL
FOR
HEALTH FACILITY INFORMATION AGGREGATION SYSTEM

DIRECTORATE GENERAL HEALTH SERVICES
SUPPORTED BY
PUNJAB HEALTH SECTOR REFORMS PROGRAM

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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

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:

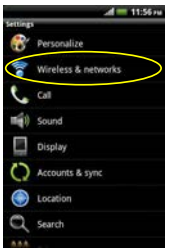
http://www.htc.com/uk/help/htc-explorer/#overview

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

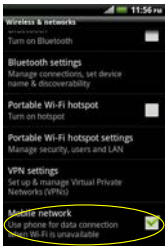
3. ABOUT THE APPLICATION

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.



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.

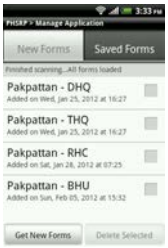
Once it is confirmed that the phone is connected to the internet and the GPS is switched on, tap the PHSRP icon on the home screen to start the application.

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

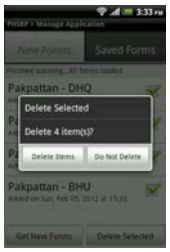
In order to start making entries, the application needs to first download the relevant forms. There are four forms for each district; one for each type of facility- BHU, RHC, THQ and DHQ. For the case of the phones handed out, the relevant forms have already been downloaded. However, in case there are 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.

3.1. How to update forms if notified

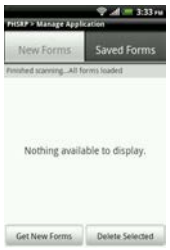
To update the forms on the application **if you are notified to do so**, tap the 'Manage Application' button. Considering Pakpattan as an example, the following screen will be displayed:



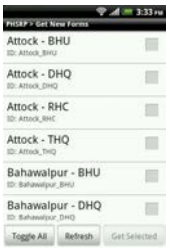
Select all the forms, or just the ones that you need to update as notified, by tapping on the checkboxes on the right, and tap the 'Delete Selected' button at the bottom right. A confirmation will be displayed as follows:



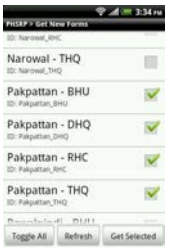
Tap 'Delete Items' to confirm and the selected forms will be deleted. If all the forms are deleted, the following screen will be displayed:



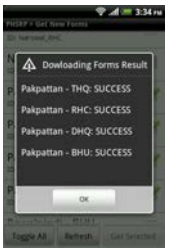
Now, tap 'Get New Forms', to retrieve the updated forms. The application will use the internet to list the updated forms of all districts for download as follows:



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:

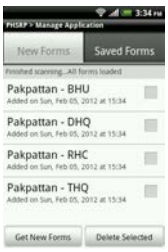


Then, tap 'Get Selected' to download the updated forms of your district. Once the forms are successfully downloaded, the following screen will be displayed:



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:



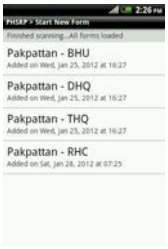
Tap the phone's 'BACK' capacitive touch button at the bottom of the screen to get to the main screen of the application again. You are all set to continue to making and submitting entries now.

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.

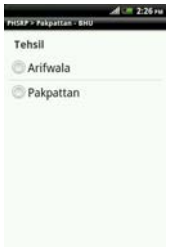
Furthermore, if you accidentally tap the phone's 'HOME' capacitive touch button and end up at the home screen while filling in the form, simply tap the PHSRP application icon again to load the application again and it will return you to the screen you were previously at in the form with all previous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

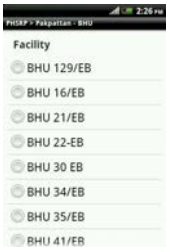
It is important to note here that you will be able to scroll back and forth within the form to check or change your entries before you complete the form, by scrolling laterally in one direction or the other, but whenever you scroll to a screen that requires numerical input from the keypad that pops up (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:

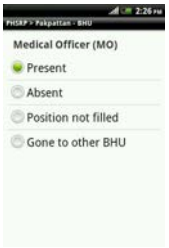


It is important to note at this time that some screens require at least one entry by the user, and you will not be able to move forward in the form unless it is made. To demonstrate, if you attempt to move forward in the form by scrolling laterally when it prompts you to enter the Tehsil in which the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

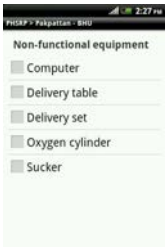
This screen requires you to check all the people not present at the BHU. As mentioned for the case of the MO, the officer will mark people absent based on the perspective of a visiting citizen- if someone is out on official business or on official leave or even if the position is not filled etc., the 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.

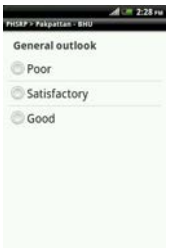
Once all three entries are filled, scroll laterally to move to the next screen. Once again, ensure that you avoid the keypad as scrolling laterally over the keypad will not work.

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:

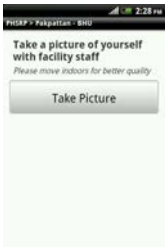


Choose the most appropriate option and scroll laterally to move to the next screen.

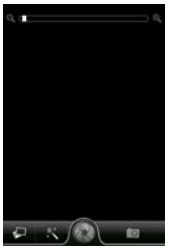
This screen will require you to mark which information was displayed in the BHU. Leave the screen unmarked and scroll laterally to the next screen if none of these were displayed at the facility.

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

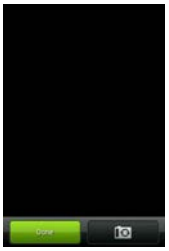
The next screen will require you to take a clear picture of yourself with the essential staff present at the BHU, as shown below:



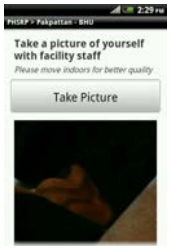
Tap the 'Take Picture' button to load the camera. For better picture quality, it is advisable to take the picture indoors and have someone take it for you. To take the picture, have that person tap the silver button in the centre-bottom of the screen, as shown below:



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:

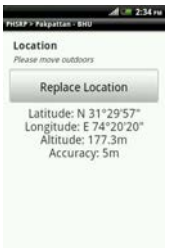


Scroll laterally to move forward. If, instead, you want to view the picture in full screen again, tap the picture preview box at the bottom, and you will be able to view it in full screen:

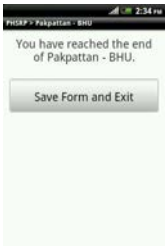
Tap the phone's 'BACK' capacitive touch button at the bottom to return to the previous screen. Once there, scroll laterally again to move to the next screen:

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:

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



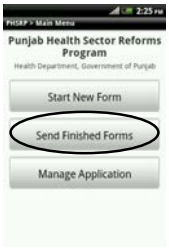
GPS satellites are not always in range hence it might take some time for the phone to narrow down its location. If, even after waiting for five to ten minutes, the phone is unable to record its location, ensure that the GPS is toggled on and try again. If, still, the phone is unable to record its location,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



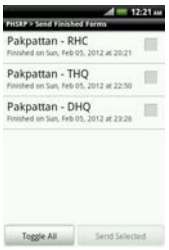
Tap 'Save Form and Exit' to complete the entry. A message will be displayed notifying you that the form was saved successfully and you will be taken back to the main screen of the application.

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

I Training Manuals For Dashboard Use

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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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.

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:

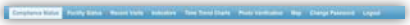
punjabmodel.gov.pk/phsrp/dashboard

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



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.

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 fellow 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:

Percentage compliance= (total visits performed last month / visits assigned last month) x 100

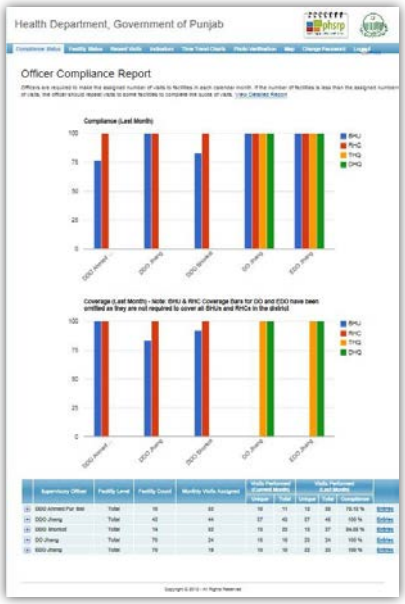
The bars are color coded by facility type, as explained by the legend displayed on the page. Compliance is 100% if the officer performed 100% of the visits assigned to him or more.

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:

Percentage coverage= (1 – (no. of assigned facilities not visited by **any** officer last month/ facility count)) x 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.

Figure 3



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

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 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.

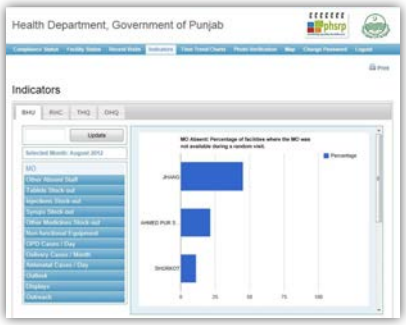
The Summary Report icon at the end of every entry in the table can lead you to a page displaying details regarding the last visit to the facility as well as the second last visit, in addition to Tehsil/Town variable averages (from 30 days from the last visit) as already depicted in Figure 6.

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.

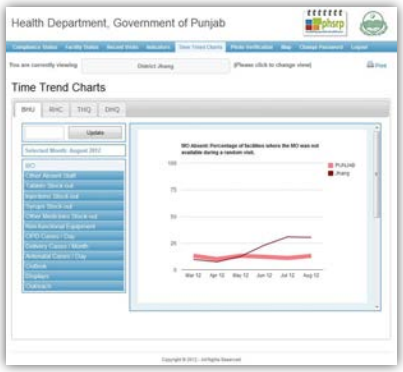
Most indicators in the list have multiple charts that are displayed when you click on any one of them. All charts have descriptive labels that clearly indicate what they represent. Tables 1 through 4 in the appendix show how the charts are arranged for each facility type.

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.

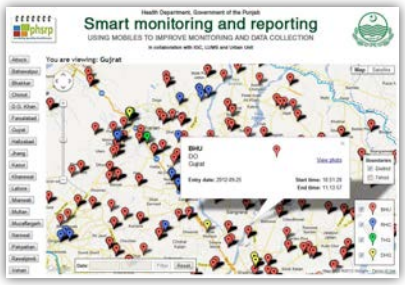
In order to view entries for any district, you need to click on the relevant district tab from the list on the left. Once you zoom in, all the relevant entries will show up as place-marks color-coded with respect to the facility type, as shown in Figure 13.

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.

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.

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.