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Performance-Based Financing, Motivation and Final Output in the Health Sector: Experimental Evidence from the Democratic Republic of Congo *

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Abstract

Performance-based financing becomes a common strategy to improve health sector quality. The findings of this paper imply that performance-based financing should take motivational effects and levels of provider capacity into account. Using a field experiment in the Democratic Republic of Congo, we find that financial incentives led to more effort from health workers on rewarded activities, without deterring effort on non-rewarded activities. We also find a shift from intrinsic to extrinsic motivation. Finally, the increased effort by health workers proved unsuccessful and led to a reduction in revenue, suggesting that health workers lacked the capacity to develop appropriate strategies to perform.

JEL Codes: H52, 015, I21, I28

1 Introduction

Long-standing concerns about the cost, accessibility and quality of health services have raised a growing interest in financial incentives for medical care providers. Performance-based financing (PBF) is a mechanism by which health facilities are, at least partially, funded on the basis on their production of a pre-determined output. It is a central idea in economics that incentives

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encourage effort and thus performance in the context of a classic agency problem: to produce a desired outcomes - better health in the population - a principal entity -the government- provides a reward conditional on the agent -health workers- achieving a performance - treating patients - by undertaking a set of actions - specific efforts to attract patients. The reward should reinforce health workers' willingness to achieve the rewarded actions (*motivational crowd-in effect*), as it is often the case for employees in the industry (see Lazear, 2000). However, psychologists have argued for a long time that contingent rewards may actually be negative reinforcers (Lepper et al. (1973), Deci (1975), Deci and Ryan (1985), among others), especially when employees have high initial levels of intrinsic motivation, i.e. when pride in one's work is high and the activity is interesting (*motivational crowd-out effect*). An additional concern is the fact that agents may concentrate their effort on the actions attached to the reward at the expense of other actions that might be important as well in producing the ultimate output (*substitution effect*)[1]. Moreover, when PBF rewards collective rather than individual performances, it may induce a reduction in overall effort and/or change in within-group effort allocation due to free-riding considerations (*free-riding effect*). Finally, larger incentives were found counterproductive compared to smaller ones (Ariely et al., 2009), suggesting that incentives may induce negative stress and that increased motivation may not lead to increased performance (*underachievement effect*). The underachievement effect is particularly observed when the task is difficult and requires some form of creative thinking (Glucksberg, 1962). Since PBF targets performances that are output like the number of patients, rather than input like attendance or technical quality, it requires that health workers develop appropriate strategies and invest in the appropriate inputs to increase the output. The task is thus more difficult that rewards contingent on a specific input[2]: Loevinsohn and Harding (2005) suggest that providers may not possess adequate ability to innovate and change health-seeking behavior if they lack human capital.

This paper makes several contributions. First, even though performance-related payment models have been implemented in many developed and developing countries with the hope of improving the efficiency of the public health sector (see Figure 1 for the implementation of PBF in subsaharian Africa), the scientific evidence on its impact remains thin. This paper constitutes the first randomized study using the random assignment of a large number of health areas on the effects of

[1] This reallocation of attention away from other tasks was developed by Holmström and Milgrom (1991) as the "multitasking" problem.

[2] Two studies provide evidence that rewards contingent on a specific input (respectively attendance and service quality) do motivate health workers to provide more of this input (at least in the short run), but did not lead to any increase in health service utilization (the output) (Banerjee and Duflo, 2008; Peabody et al., 2011).

a performance-based mechanism as a way to allocate public resources in the health sector. Second, since performance plays a central and sensitive role in this type of intervention, the study elaborates on measures of performance that are impervious to gaming. Finally, it provides a comprehensive view on the effects of PBF, including its motivational and substitution effects in addition to the effect on performances, which is a novelty in the empirical literature on PBF in developing countries.

Until 2011, the studies of the impact of PBF did not use credible comparison groups: they compare very small groups (generally 2-3 districts) which were not randomly assigned to the different treatments (Soeters, 2011; Rusa et al., 2009; Soeters et al., 2005; Eicher et al., 2007; Soeters and Griffths, 2003; Forsberg, 2001), or the situation before and after the introduction of PBF (Sondorp et al., 2008; Eicher et al., 2007; Meessen et al., 2007). The vast majority of the papers advocate that PBF improves accountability, efficiency, quality and quantity of service delivery (see Loevinsohn and Harding (2005) and Eichler and Levine (2009) for an overview). However, the interference of confounding factors and the fact that is often not possible to isolate the effects of financial incentives from other elements[3] make the question of the impact of PBF largely unanswered (Christianson et al. (2008), Eldridge and Palmer (2009), Oxman and Fretheim (2009)). Olken et al. (2012) reports on an experiment using a PBF mechanism to improve the efficacy of a grant program to village committees in Indonesia. Since the PBF mechanism was applied to village committees rather than health workers, this program tests how incentivized village committee members could monitor health workers rather than the direct effect of incentive on health worker behavior[4]. Basinga et al. (2011) conducted a quasi-experimental study on the effect of PBF on use and quality of health services that is the closest to our study. The study took place in Rwanda and combines randomization and a difference-in-difference strategy in order to control for potential selection effects[5]. It finds that PBF is an efficient way to increase health service utilization of some of the targeted services and targeted health outcomes (Basinga et al. (2011), De Walque et al. (2013)), as well as worker productivity (Gertler and Vermeesch, 2013). However, the study does not inform about the effects of PBF on

[3] PBF has commonly been a part of a package that may include increased funding, technical support, training, changes in management, and new information systems. In most studies, the level of resources allocated to the health facilities in different treatments is not similar, as well as the level of technical supervision and information system.

[4] For the incentivized village committees, 20% of the grant depended on the relative performance of the village with respect to a set of educational and health outcomes. The study finds that the incentive led to an increase in health workers' attendance, better health outcomes, and an absence of negative spillovers on untargeted outcomes.

[5] 166 facilities were grouped into 8 pairs and one side of each pair was randomly assigned to pay-for-performance funding, while the other side continued with the traditional input-based funding until 23 months after study baseline. The paper uses a difference-in-difference strategy in order to control for potential selection effects since the number of units of randomization was very small and some post-randomization reassignment of some districts happened because of administrative boundaries' reorganization.

the provision of non-targeted services (substitution effect), and it does not provide direct evidence on motivational effects. To conclude, the literature on the effect of PBF on health outcomes is still limited due to the small number of studies providing clean identification of the impact of the incentive, and due to the lack of evidence on motivational and substitution effects in developing countries[6] (Miller and Babiarz, 2013).

This paper presents the findings of a research project conducted in the Haut-Katanga district of the Democratic Republic of Congo (DRC) between 2009 and 2013 to study the effect of a PBF approach compared to a fixed payment approach. The 96 health areas present in the Haut-Katanga district were randomly assigned to performance-based or fixed payments, while ensuring that the same amount of governmental resources was allocated to each group to neutralize the ressource effect. In this study, the PBF mechanism was based on a point system where the number of points was determined by the number of patients for 7 services (plus 3 additional services for referral facilities), relative to all PBF-group facilities. The two mechanisms have been in place from June 2010 to September 2012. Administrative data was collected throughout the project, spotchecks of health workers' attendance were performed in July, August and September 2012, and a final independent survey was administered from December 2012 to Feburary 2013 -after the incentives have been withdrawn. The objective of this research was to provide evidence on the effects of the performance-based payment on (i) the supply of and prices of health services, (ii) health workers' work-related stress and motivation, (iii) service utilization, and (iv) the population health status. The analysis distinguishes targeted and non-targeted services in order to check for the potential substitution effect of incentives. It is important to note that there are many different PBF approaches (see Miller and Barbiaz (2013) for a review). In this study, the design of the performance-based strategy was kept simple so that it could be feasibly implemented in the difficult conditions of DRC. Consequently, the strategy lacked some of the more technically complex attributes that might be seen in other PBF interventions, especially stringent quality measures tied to performance payments. The payment was only conditional on the number of patients for some pre-determined services. The results should thus be considered as specific to this particular PBF approach, although we refer to it in the rest of the paper as "PBF" for simplicity.

This study finds that the introduction of the financial incentives in the treatment group led

[6]The literature is more developed in the context of high income countries, although identification issues also limit the scope of many studies. For instance, Mullen, Franck and Rosenthal (2010) use a difference-in-difference strategy on US data and show that pay-for-performance did not lead to any major improvement in quality nor notable substitution effect of non-rewarded services for rewarded ones.

to concrete changes in health workers behaviors. Health workers made more effort to attract patients: (1) they were found to be present at facilities more often; (2) fees for targeted services were significantly reduced; (3) the health workers organized more preventive health sessions at facilities; (4) the health workers conducted more community-based outreach activities to sensitize the population about the services offered by the facility. Overall, the financial incentives induced an intensification of effort to increase utilization of targeted health services. Equally important, the evaluation found that the increased effort invested in the targeted services did not happen at the expense of the effort invested in the non-targeted services: there were no substitution of non-rewarded activities for rewarded ones. Also, although the reward was contingent on service volumes, it did not have a negative effect on service quality (which did not increase neither).

Surprisingly, the increased effort did not led to any change in utilization of health services by the population, which echoes the argument by Glucksberg (1962) or Ariely et al. (2009) that increased motivation may not lead to increased performance. It is crucial to think about the barriers that impede the increase in utilization of health services and were not addressed in the strategies implemented by the incentivized health workers, such as the lack of awareness about the benefit of health care services, or the general dissatisfaction with the quality of care. This result suggests that health workers did not develop innovative actions able to stimulate the demand for health services, which is arguably not an easy task in a context where people are generally low educated and uninformed about modern medicine. As facilities in the treatment group reduced the prices of their services more than comparison facilities without attracting more patients, there was less total revenue in these facilities (42% less), even though the two groups received the same subsidy payment level from the government. Consequently, the financial incentive payment mechanism resulted in a 34% reduction in staff revenues, and in a reduction in health worker job satisfaction. The lower levels of job satisfaction might be due to the fact that an increase in effort led to a reduction in income, or to the exposure to the incentive itself. Our study cannot disentangle between these two explanations.

Finally, an important result is that staff attendance, which was found *higher* in the incentivized health facilities than in the comparison facilities when the incentives were in place, was found *lower* few months after the incentives were withdrawn. Also, the previously incentivized health workers were found to attach more importance on job material benefits relatively to non-material benefits than non-incentivized health workers. We show that these effects are not attributable to

the decrease in worker income, suggesting that incentive-based payments deterred some of staff intrinsic motivation.

There are key policy implications of our findings for governments considering PBF as a way to allocate public ressources to the health sector. First, PBF increases health worker overall motivation without deterring service quality or non-rewarded services, meaning that health workers are strategic but not cynical so that they would swap non-rewarded actions for rewarded ones. However, two types of precaution should be considered. First, contingent rewards might reduce the intrinsic component of health worker motivation so incentives should be used as a permanent instrument otherwise it would backfire. Second, our results suggest that contingent rewards might not be appropriate when the task is difficult and requires sophisticated strategies, because incentivized agents provided more-of-the-same effort but did not develop novel ideas to reach complicated goals. The translation of motivation into performance may thus be better in contexts where the rewarded task is easy.

The remainder of the paper is organized as follows. Section 2 discusses the theoretical background. Section 3 presents the context in which the experiment was set up and the experimental design. Section 4 examines the data and econometric approach. Section 5 presents the effects of PBF compared to a fixed payment approach, and Section 6 concludes.

2 Theoretical Background

In this section, we consider a simple framework that provides some structure to the findings in the literature that extrinsic rewards may backfire (Glucksberg (1962), Deci (1971), Lepper et al. (1973), Deci and Ryan (1985), Kohn (1993), Ariely et al. (2009), among others). The motivation for this section is to show that reasonable assumptions on workers' behavior, different from informational and reputational effects, are able to produce predictions consistent with the evidence found in the literature.

Let's consider that an agent engages into a certain task if and only if her interest in the activity is larger than the cost of undertaking the activity c. If the agent succeeds in producing the output, her benefit in the activity is two-fold: the intrinsic value that the agent attributes to the output, V, and a contingent reward b. If she does not succeeds the benefit is zero, and the probability that she succeeds if she undertakes the activity is her ability θ. Her utility of engaging into the activity is thus given by $U = \theta(V + b) - c$. Holding everything else equal, the reward b therefore increases

the probability that the agent engages into the activity.

Benabou and Tirole (2003)'s framework provides an explanation of why rewards may be counter-productive during the period when incentives are in place in presence of information assymmetries: rewards from a knowledgeable principal may inform a more ignorant agent about the difficulty of the task c, or about her ability to succeed in the task θ, or even about the intrinsic value of the task V[7]. These informational effects of rewards have a negative impact on agent utility which might be large enough to offset the positive impact of θb. Moreover, the permanent nature of informational effect makes the effect on motivation also permanent after incentives have been withdrawn. Benabou and Tirole (2006) adds another explanation of why extrinsic rewards might crowd out agent's effort during the period when incentives are in place due to the idea that an agent concerned by social reputation or self-respect concerns might want to reduce her effort in response to the introduction of extrinsic rewards in order to signal her intrinsic motives. As Gneezy et al. (2011) summarizes, economists think about the effects of incentives on behavior in terms of information and signaling.

However, the literature suggests that informational and reputational effects are unlikely to drive all situations where rewards backfire. For instance in Deci (1971), Zeevi (1971) or Lepper et al. (1973), students who are offered external rewards for performing at some tasks like solving a serie of puzzles or art activity are less likely to engage into these tasks after the external reward has been withdrawn. The authors do not find evidence that they feel less able to perform or find the task more difficult, but they find that students express less interest in the task itelf. The explanation through information asymmetries does not fit well with these observations because it sounds unlikely that the students learned much about the difficulty of the puzzles, or their ability to perform the puzzles, or the intrinsic value of solving puzzles. In such contexts where information assymmetries seem small or non-existent, the decrease in motivation after the reward was withdrawn should be found somewhere else. In fact, the authors point to the fact that the introduction of extrinsic motives causes a shift in attention from the value that the agent attributes to the output V in favor of the external benefit b. Actions perceived as "ends" in the absence of external motives tend to become "means" when external rewards are introduced (Lepper et al. 1982). Deci and Ryan (1985) argues that rewards change the locus of control from internal to external and make agents bored, alienated and reactive rather than proactive. Kohn (1993) notes that rewards make people less enthousiatic about their behaviour. Overall, what psychologists term the "overjustification effect" is compatible

[7] Individuals may have imperfect memory why they engaged in the task. Note that in this case there is no need for the principal to have information that the agent does not have. It is just information that the agent had and lost.

with situations where principals and agents have similar information about agent's ability or the difficulty and intrinsic value of the task to start with, but agents pay less *attention* to the intrinsic value of the task after they were offered extrinsic rewards.

We thus propose (and test in our empirical analysis) an alternative habit-forming based theory of motivation by introducing a parameter α reflecting the attention paid to the extrinsic benefit from the task b, and a parameter β reflecting the attention paid to its intrinsic value V. Total motivation is given by: $U = \theta((\beta V + \alpha b) - c$ where α and β reflect weights attached to extrinsic versus intrinsic motives in agent's utility. Our framework is based on two key assumptions: (1) First, $\beta = f(\alpha)$ with $f^{'}(.) \leq 0$, which stands for the idea that people have limited attention in the sense that more attention paid on extrinsic motives can only decrease attention paid on intrinsic ones, or do nothing. (2) Second, attention is prone to habit-forming: as soon as attention is drawn on a motive, it remains permanently because people don't forget. For example, an awareness campaign that would draw agent's attention to the intrinsic value of the task would shift β from 0 to a positive value. Similarly, the introduction of a financial remuneration for succeeding at the task would shift α from 0 to a positive value. Then the levels of V and b are likely to vary over time depending on new information, experience, principal's decisions etc., but agent's attention paid on intrinsic and extrinsic motives cannot disappear. Attention parameters α and β evolve over time only through the relationship $\beta = f(\alpha)$ in contexts where attention is limited (f non constant).

Under this framework, post-reward motivation is smaller than pre-reward one if and only if $f^{'} < 0$. The mechanism is as follows:

Before Exposure to Extrinsic Rewards The agent has never received any extrinsic reward for engaging into the task ($b = 0$), and therefore she does not pay attention to extrinsic motives ($\alpha = 0$). The utility of engaging into the activity is $U_0 = \theta f(0)V - c$.

During Exposure to Extrinsic Rewards The principal introduces an extrinsic reward $b > 0$, and the agent pays a level of attention $\alpha > 0$ to the reward. The utility of engaging into the activity is now $U_1 = \theta(f(\alpha)V + \alpha b) - c$. Since $\alpha > 0$, $f(\alpha) < f(0)$ and U_1 can be both smaller or larger than U_0 depending on the size of the increase in motivation due to the new extrinsic reward αb relative to the loss in motivation due to the shift of attention paid on intrinsic motives $(f(0) - f(\alpha))V$. Typically small rewards in contexts where intrinsic motives are large would decrease the total motivation, while large rewards in contexts where intrinsic motives are small would increase the

total motivation.

After Exposure to Extrinsic Rewards The principal stops providing the agent with rewards (b is back to 0). However, attention parameters remain the same because attention is prone to habit-forming, and the utility of engaging into the activity is now: $U_2 = \theta f(\alpha)V - c$. U_2 is smaller than U_1 if and only if $\alpha > 0$, meaning exposure to extrinsic reward in the previous period effectively drew agent's attention on extrinsic motives. Moreover, U_2 is smaller than U_0 if and only if $f^{'} < 0$, meaning agent's attention is limited.

In a context of unlimited attention ($f^{'} \equiv 0$), the introduction of an extrinsic reward would attract some new attention from the agent without decreasing pre-existing attention paid to the intrinsic value of the task V. After the extrinsic reward is withdrawn, pre-existing attention paid to V would remain intact and motivation would be back at its pre-reward level, without any detrimental effect on later motivation.

In the empirical part of the paper, we test this theoretical framework by eliciting the relative size of α and β and comparing agents who have been exposed to extrinsic reward (the performance-based financing system) and people who have not. A testable prediction is that α should be larger and β smaller among the former than the latter. We also provide evidence on the comparison between U_0, U_1 and U_2.

Finally, rewards may backfire not because of reduced motivation, but because increased motivation is accompanied by reduced performance. There are two main explanations for the reduced performance. One is the multitask interpretation proposed in Hölmstrom and Milgrom (1991) where agents focus on the rewarded actions at the expense of other actions that might be necessary complement to perform well, which we refer to as a substitution effect[8]. Second, Glucksberg (1962) and Ariely et al. (2009) observe that people who are offered a reward for performing at some tasks perform better at simple tasks but worse at tasks calling for -even rudimentary- cognitive skills, indicating that rewards generate negative stress limiting one's creative thinking (Baumeister, 1984). In this case, lower ability is associated with larger rewards ($\theta'(b) < 0$) not because the agent infers that his ability is lower than expected, but because larger rewards constitutes larger stakes and larger stress which narrows the mind and reduce ability to perform (Kamenica, 2012). McGraw and McCullers (1979) explains that reward leads to underachievement when the task requires open-

[8]For instance, increased use of prenatal visits might not lead to a reduction in child mortality if mothers do fewer postnatal visits

minded thinking because the focus of attention limits one's capacity to draw unusual connections between elements. Under negative stress, the agent initially provides *more* effort and yet produces a smaller output[9]. In other words, U is larger but a change in the content of the effort makes it less productive. One example would be a student whose motivation in passing her exam gets larger due to the promise of a gift conditional on passing, who would spend hours and hours reading her lessons without being able to learn because her mind would be distracted. In the context of health workers exposed to financial rewards, the phenomena may show itself through motivated but stressed out workers who would be more tense, less staid with patients, or would decrease time spent with the patients in order to consult more of them, etc.

All in all, the theory leaves thus room for both positive and negative effects of financial incentives on both workers' effort and performance, making the question empirical in essence.

3 Experimental Set-Up

3.1 Background on Health in DRC and Haut-Katanga

The Democratic Republic of Congo (DRC) is the second largest country in Africa by area, with the fourth largest population at 66 million (World Bank, 2012). It is also among the poorest countries in the world: the country is ranked second from the bottom of the Human Development Index (186 out of 187 in 2012) (UNDP, 2012), with an estimated per capita income of US$ 220 (current) in 2012 (World Bank, 2012). Impoverished by decades of war, instability and bad governance, it is not surprising that DRC is not on track to reach the health-related MDGs. Since the democratic elections in 2006, the country has started a slow reconstruction phase and a decentralization process, with the election of provincial governments, including provincial ministers of health. Developing and putting in place effective service delivery models such as Performance-based Financing (PBF) is be a strategy for improving health outcomes among the population.

The district of Haut-Katanga entails 1.26 million people in the province of Katanga in the south-eastern corner of the DRC. From September to November 2009, a survey was conducted in order to better understand the health situation in Haut-Katanga by providing a description of the functioning of the health facilities as well as the characteristics and behavior of the health workers, patients and households in the region. The survey sample entailed 152 health facilities (5% referral

[9] After some periods, the agent may observe that her effort is *de facto* not as much productive as expected as adjust her effort accordingly.

centers, 71% health centers and 24% health posts)[10]. Descriptive statistics from this survey can be viewed in Appendix Table 4. This survey indicated that the initial situation of the health facilities in Haut-Katanga was worrying not primarily because of the coverage for basic health services but rather because of the poor quality of health services. Indeed, as for coverage for health services, the ratio of health workers to total population was quite good with 1 health worker for every 1860 individuals[11], meaning that staffing was not the main issue in Haut-Katanga. Accessibility of health facilities was also pretty good: 87% patients live at 10km or less and 70% spent less than an hour to come to the facility.

However, the poor quality of infrastructure was striking: only one out of four facilities had access to a water tap, the same for electricity. The majority had only low-cost basic equipment. One health worker out of four did not receive any fixed wage from the health facility. As a consequence, the typical health worker earned 61% of his income from the health facility, while 39% from other jobs and/or agricultural production. However, health workers spent 52 hours per week working in the health facility. They received 35 patients the week before the survey, which means that each health worker received about 7 patients per working day, so health workers were not overworked and should spend some time waiting for patients to come. Patients reported quite short consultation time (16 minutes on average), and twice as much waiting time before the consultation (30 minutes on average)[12]. 56% of patients had to pay a fee for the service, although the median fee for a visit was quite low 800FC (0.88$).

In this survey, the health status of the population was found preoccupying: 25% of the sample had been sick in the last four weeks, with malaria and diarrhea being the most prevalent diseases. Concerning maternal health, 31% of births in the last 12 months were not attended in a formal health facility. Mothers utilized more prenatal than postnatal health services: 76% of women pregnant in the last 12 months had at least one prenatal visit while only 10% attended a postnatal visit. However, only a third of prenatal visits included the minimum tests, according to women's recall. Despite frequent immunization campaigns, only 13% of children under 5 years-old were able to present an immunization card (although based on mother's declaration a majority of children got immunized at least once). Finally, we found low exposure to prevention campaigns other than immunization, with around two thirds of the households never exposed to any HIV prevention,

[10] 161 health facilities were recognized as part of the government health system in the district, among which 5 hospitals were excluded from the study and 4 health centers could not be reached.

[11] The ministry of health considers that there should be at least one health worker for every 1500 individuals.

[12] This survey did not allow for assessing the technical quality of medical procedure.

child nutrition, or maternal health campaign.

3.2 Experimental Design

Payment Calculation

In Haut-Katanga district, the 96 health areas (totalizing 152 health facilities) were randomly assigned to one of two payment systems. In the fixed payment group, the amount allocated to each facility was calculated based on the staff in the facility: a list of eligible workers was established at the beginning of the pilot by the Ministry of Health. Each worker was entitled to a given amount of governmental payment depending on his/her grade and experience. In contrast, payments to the PBF health facilities were to be made after verification of declared service volumes by facilities. The targeted services included seven services at the primary care level (outpatient first curative consultations, prenatal consultations, deliveries, obstetric referral, children completely vaccinated, tetanus toxoid vaccination, and family planning consultations) and three additional services at the secondary care level (C-section, blood transfusion, and obstetric referrals to hospitals). Relative prices for each service are presented in Appendix Table 1.

Formally, payments to health facilities can be written as:

$$P_{i,m} = \alpha_i + \beta_m Q_{i,m}$$

where $P_{i,m}$ is the payment to facility i in month m, α_i represents a fixed component, $Q_{i,m}$ is the vector of targeted service quantities provided by facility i in month m, and β_m is the vector of prices that the government attach to each targeted service in month m. The PBF group was characterized by a pure performance-based mechanism ($\alpha_i = 0$ and $\beta_m > 0$), whereas the comparison payment group had a pure fixed payment ($\alpha_i > 0$ and $\beta_m = 0$). In order to ensure neutrality in the level of financing between the two groups and isolate the incentive effect from the resource effect, the total budget allocated to health facilities in the PBF group was the same as the total budget allocated to health facilities in the fixed payment group:

$$\forall m, \sum_{i=1}^{n} \alpha_i = \sum_{i=1}^{n} \beta_m Q_{i,m}$$

where n is the number of health facilities in the PBF and in the fixed-payment group. Hence, noting $\overline{Q_m}$ the average service provision in the PBF group in month m and $\overline{\alpha}$ the average payment

in the fixed payment group:

$$\overline{\alpha} = \beta_m \overline{Q_m}$$

Since the budget of the health provincial authorities was fixed and could not vary every month depending on the average service provision in the PBF group, $\overline{\alpha}$ was fixed and β_m was adjusted accordingly at $\frac{\overline{\alpha}}{\overline{Q_m}}$[13]. Although relative prices attached to the targeted services were constant, absolute prices and facility payments were thus determined by the quantity of services provided by the facility *relative to* the quantity of services provided by the other incentivized health facilities. The budget used in this experiment estimated at \$0.43 per capita per year (average monthly facility payments were \$550 and the average catchment area population was 12,900)[14]. The average monthly payment by facility from June 2010 and September 2012 does not differ in the fixed payment and in the PBF group. This confirms that the experimental design was respected and that the study isolates the incentive effect from any resource effect. Figure 2 shows the distribution of the average monthly facility payment over the study period by treatment status. Payments proved more disperse under PBF than uner fixed-payment, suggesting heterogenous responses to the incentive with some health facilities getting less than under a fixed payment mechanism and others getting more.

Performance Verification

Service volumes were measured by use of monthly reports submitted by facilities, in which the number of patients for each targeted service was reported. Subsequent verification of declared service volumes was conducted by verification agents through (i) comparing reported volumes with those found in health facility registers[15], and (ii) verifying that the information noted in the registers was true by conducting community verification: a random sample of 30 patients[16] from registers were selected and visited by independent associations to check the accuracy of the information reported in the facility register[17]. A system of financial sanctions was integrated in order to reduce

[13]The other way to equalize the two total budgets is to fix $\beta_m = \beta$ and adjust $\overline{\alpha}$ accordingly at $\beta\overline{Q_m}$. This technique was used in the Rwanda experiment where the governmental budget could increase according to the average service provision in the incentivized group.

[14]This is lower than in other contexts where output budgets range between \$2 and \$3 per capita per year.

[15]Register verification was also meant to take place in health facilities under the fixed payment mechanism since the government wanted to improve the accountability of health facilities in general, not only as an element of PBF. At endline, the average number of register verifications in the last 12 months is 7 in both in the PBF and in the fixed-payment group (p-value of the test of equality of means in the two group = 0.48).

[16]The 30 patients were chosen such that each targeted service is present in the sample, but none of the non-targeted services.

[17]Community verifications were meant to take place only in the PBF group as part of the financing mechanism. However, we conducted community verifications in the fixed payment health facilities for impact evaluation purposes (1 community verification by facility in the comparison group). The fixed payment health facilities had no incentive to cheat on service volumes so the comparison of discrepancy rates between the PBF and the fixed payment groups

providers' incentives to submit fraudulent reports and over-report phantom patients.

In reality, the community verification system proved weak: first, PBF facilities only received on average 3 community verifications throughout the pilot. Second, there was no effective financial sanction associated with being caught for fraudulent over-reporting. Specifically, the reductions in payments were proportionally equal to the percentage of patients not being identified through community verification. For example, if 18% of patients were not found through community verification, the facility would only receive a reduction of 18% in their corresponding payment and no additional sanctions were enforced. Despite the weak verification process, we did not find any significant difference in the propensity to report phantom patients in the registers: the average proportion of missing patients was found 17% in the comparison group whereas 21% in the PBF group, the difference being not statistically significant (p-value 0.25). However, the health workers in the PBF group were significantly more likely to fill out consultation reports for their patients than in the fixed payment group: in the endline survey, 94% of health workers declared that they fill out a consultation report for each patient in the PBF group, whereas only 78% of health workers in the comparison group (the difference is significant at the 1% level). Since patients are reported in the register based on consultation reports, service utilization is under-reported in the fixed-payment group. It is interesting to note that the issue with administrative data is not that incentivized health workers inflate artifically the number of patients, but rather that the non-incentivized workers under-report the number of patients as they don't have any financial benefit of paying the cost of reporting accurate service volumes. Overall, it is crucial to rely on an independent source of information about service utilization for the impact evaluation since administrative data does not give an accurate idea of service utilization in the fixed-payment group.

Autonomy of Payment Allocation

It was found that the autonomy of payment allocation among facility staff in the PBF group led to a more egalitarian distribution of payments among workers. In the fixed payment group, 77% of health workers received a share of the payment, whereas 93% of workers in the PBF group (the difference is significant at the 1% level)[18]. Actually, PBF benefitted to non-technical workers (pharmacists, managers, secretaries, receptionists and maintenance workers) who are not in the

allow for differentiating cheating from natural -unavoidable- discrepancies due to the fact that some patients moved or were absent at the time of the verification.

[18]This information was collected at endline from the facility heads. The facility heads listed the workers in the facility, indicated whether each of them received a share of the last payment, and the corresponding amount.

governmental payroll and therefore do not receive a share of the fixed payment[19]. Consistently, the average last payment to health workers showed less dispersion in the PBF group: the standard deviation is 36% lower in the PBF group than in the comparison group (the difference is significant at the 5% level), which confirms the finding of a more egalitarian distribution of the payment among workers in the PBF group.

Resulting Structure of Worker Motivation

We want to link our theoretical framework and the actual context of this specific experiment. The task workers engage into is attracting patients, and the output is the number of patients. The experiment manipulates the structure of motivation by adding a contingent reward in worker utility of attracting patients. In the fixed payment group, worker utility of attracting patients is driven by the intrinsic value they attribute to this task, as well as a contingent benefit coming from user fees. In fact, the more health workers consult patients, the higher facility's revenue from user fees, which constitutes a large part of workers' remuneration. Workers in the fixed payment group thus already pay attention to extrinsic motives through this benefit from user fees. Let's denote $(\alpha_0, f(\alpha_0))$ the levels of attention paid respectively on extrinsic and intrinsic motives, and F the level of worker remuneration from user fees, in the fixed payment group. Using the parameters of our theoretical framework, workers' utility of attracting patients in the fixed payment group is thus $U_0 = \theta(f(\alpha_0)V + \alpha_0 F) - c$

The difference with the PBF group is the introduction of a new contingent reward from the government. While governmental payments to the fixed-payment facilities are fixed and do not play a role in workers' decision to attract patients or not, they do play a role in the PBF group by increasing workers' benefit of engaging into this task. Let's denote $(\alpha_1, f(\alpha_1))$ the new levels of attention paid on extrinsic and intrinsic motives resulting from the introduction of this new category of contingent reward, and P the governmental payment. Workers' utility of attracting patients in the PBF group is thus $U_1 = \theta(f(\alpha_1)V + \alpha_1(F + P)) - c$. After government payments are withdrawn, worker utility of attracting patients is unchanged in the fixed payment group, while it becomes $U_2 = \theta((f(\alpha_1)V + \alpha_1 F) - c = U_1 - \theta\alpha_1 P$ in the PBF group.

In the rest of the paper, we will present evidence on the relative size of U_0 and U_1, U_0 and U_2, as well as α_0 and α_1.

[19]Since the fixed payment is calculated based on the number and qualification of workers on the governmental payroll, the workers typically receive the amount of money corresponding to their contribution to the fixed payment.

4 Data and Empirical Strategy

4.1 Data Sources

Five sources of data are used for the impact evaluation.

Baseline Survey A survey was administered in Sept-Nov 2009. The sample of health facilities taking part in the impact evaluation does not entirely coincide with this survey sample : 85% of health facilities involved in the experiment (129 out of 152) were interviewed in this survey. As a result, we perform balance checks on this subsample of our experimental sample.

Administrative Data Administrative data was collected every month from January 2010 to December 2012 from all the 152 health facilities participating in the pilot. This data includes for each month the number of targeted services provided, the payment due to the health facility, the actual payment made to the health facility, whether a performance verification occurred and related indicators (% missing patients and consequent financial sanctions).

Qualitative Data In April and June 2012, qualitative interviews were performed in 31 health facilities randomly selected in 4 out of the 8 health zones (Kafubu, Kipushi, Kasenga and Lukafu). In each facility, one interview was done with the facility head and another one with a health worker (on a voluntary basis). In total, 29 facility heads and 31 health workers were interviewed, all by the same person. They were equally distributed between the PBF group and the control group. Questions were all open and dealt with the perception of the payment (transparency, fairness, understanding of the calculation), the general functioning of the health facility, recent changes that might have occurred, and obstacles to improve the number of patients and the quality of services.

Attendance Spotchecks Unannounced spotchecks were performed in July, August and September 2012 in order to collect data on worker attendance in the health facilities that is impervious to gamming.

Endline Survey A final survey was administered in December 2012-February 2013, four months after the PBF mechanism was withdrawn. The endline survey was administered in 87 out of the 96 health areas involved in the experiment because the rainy season and the insecurity created by the Maï Maï insurgency made it impossible to reach the other 9 health areas. Attrition occurred at

the same rate in both groups, with 44 health areas in the PBF group and 43 in the fixed payment group present at endline.

The endline survey entailed four questionnaires for the facility head, the health workers, patients straight out of consultation, and households living in the catchement area. All facilities in the 87 health areas that could be reached were interviewed, totalizing 123 health facilities. All the technical staff in each health facility was also interviewed up to ten persons[20], totalizing 332 health workers. A sample of ten patients per facility was randomly selected for exit interviews, or the maximum available if fewer are present, totalizing 1,014 patients. Finally, the household questionnaire was administered to 1,708 households: 20 households were interviewed in each of the 87 health areas, among which 10 households randomly chosen in the population and 10 randomly chosen among the households with a pregnancy in the last 12 months[21].

Table Appendix 2 reports the distribution of the endline sample across the treatment and the control groups. Table Appendix 3 shows some descriptive statistics on the endline sample.

4.2 Outcomes of Interest

Accessibility of Health Services - Cost Changes in user fees in the incentivized group would take place as staff understands the economics by which reducing the cost to patients would lead to increased utilization and, therefore, increased payments. The reverse effect may happen on non-targeted services, as a way to compensate for the loss in revenue from targeted services, or discourage demand for non-targeted services. User fees were collected from the facility heads, and also from patients straight out of consultation as well as households who used health services in the last 12 months. In order to compare fees across the largest number of health facilities, we compare user fees for the most commonly offered services: curative consultations, birth delivery, prenatal visits, postnatal visits, and preschool consultations. To improve statistical power to detect effects that go in the same direction within a domain, we also present findings for a Fee Summary Index

[20] In the facilities staffing more than 10 health workers, 10 were randomly chosen from the list of all health workers during the facility head interview. The health workers who were present the day when the interviewer visited the health facility were interviewed on-site, whereas the others were visited at home. Only those health workers who were out of the neighborhood at the time of the survey (because they were on vacation or because they temporarily migrated) could not be interviewed.

[21] The selection of the 20 households was done as follows: four axes in the locality were randomly drawn from a central point, then one household was visited every five houses on each axis. - On two axes, all households were eligible and took the survey if it consented to (otherwise the next household was visited). After each interview, the interviewer went five houses further and continued the selection until he could interview 5 household on each axis. - On the two other axes, only households where a woman had been pregnant in the last 12 months were eligible. If the household did not meet the criteria, then the next household was visited etc. until an eligible household was found. After each interview, the interviewer went five houses further and continued the selection until he could interview 5 household on each axis.

that aggregates information over all these user fees (following Kling et al, 2007), as well as a Fee Summary Index for targeted services (curative and prenatal consultations, and birth delivery) and a Fee Summary Index for non-targeted services (postnatal and preschool consultations).

Accessibility of Health Services - Opening, Attendance, Preventive Sessions and Outreach Activities Information about opening hours was collected from facility heads. Worker attendance (number of health workers present at the facility) and on-the-job effort (number of health workers actually working) was collected from the unannounced spotchecks when the interviewer arrived[22]. The number and qualification of workers, the number of service varieties offered, and the number of preventive sessions organized at the facility in the last 12 months were collected from the facility heads. The number of outreach activities in the community in the last 12 months was collected from the health workers. Finally, patients and household members were asked about waiting time before the consultation, and whether s/he could consult every time s/he visited.

Service Quality Service quality is primarily measured by technical quality. Consultation time is considered as a component of service technical quality, although we use compliance with standard medical procedures as the main indicator. Compliance was assessed on all patients straight out of consultation who were asked whether the three following procedures were applied during the consultation: being weighted, examined and having his tension checked. Compliance was also assessed on women who gave birth in the last 12 months who were asked about standard procedures applied during prenatal visits (weighing, stomach palpation, tension check, stomach measure, HIV test, tetanus shot, blood test, urine analysis and information on immunization schedule) and postnatal visits (stomach palpation, child weighing, child examination, child immunization and child immunization card). We also measure the proportion of patients straight out of consultation who were prescribed drugs without them being examined and the number of days women stay at the facility after giving birth. Beside, we use the proportion of patients who understand the diagnosis and prescriptions, as well as the proportion of patients and household members who are satisfied with the visit, as complementary measures of service quality.

[22]Note that the interviewer reported the number of workers present and working without telling to the facility heads and the workers. The purpose of the visit was officially related to administrative matters and not attendance checks in order to avoid any interference with worker behavior at a later point. Observational data on workers' attendance and on-the-job effort was anonymous and aggregated at the facility level.

Service Utilization First, we asked women in the households whether they have been sensitized about postnatal and prenatal visits, immunization and family planning by health workers, as well as whether they know the schedule of the corresponding sessions at the facility. This information provides evidence on the immediate effects of the outreach activities performed by the health workers.

Second, we measure utilization of health services during the last 12 months at the household level: the proportion of individuals who visited a health facility, who got sick but did not visit, and -for those who visited- the number of days they waited before they visited. We measure utilization of immunization using the proportion of children aged 0-5 who took at least one immunization shot, the number of immunization shots reported in the immunization card, and the proportion of children who have a scar from TB immunization on the shoulder. Since utilization of maternal health services is also an important public health objective, we use indicators as the proportion of attended deliveries among mothers who gave birth in the last 12 months, the proportion of C-sections, the number of prenatal and postnatal visits at the facility, the proportion of mothers supplemented with iron and taking medication to prevent malaria, and the number of months mothers breastfeed their newborn. As for utilization of family planning, we observe the proportion of women and partners who are in favor of the use of family planning, and the proportion of women actually using family planning (we distinguish traditional and modern methods).

Finally, we use the number of patients in the last month as reported by the facility head (at the facility level), and by the health workers (at the individual level). This information provides evidence on service utilization after PBF was withdrawn in order to assess how the effects of PBF on service utilization evolved compared to the period when PBF was in place.

Population Health Status We use mortality rates and under-5 weight-for-height z-score to measure health status in the population. To assess mortality rates, we use information about the number of persons who died in the last 12 months in the household, and among them the number of women who died for perinatal reasons and the number of children under 5. We also use the proportion of new-born in the last 12 months that are still alive. Finally, we use the standard under-5 weight-for-height z-score as an assessment of child nutrition status.

Health Facility Revenue Depending on the price-elasticity and access-elasticity of the demand for health services in the population, it is unclear what the effect of PBF on total resources in

health facilities is. We thus examine all sources of revenue at the facility level the month before the endline survey as reported by the facility head, as well as workers' payment the month before the survey as reported by the facility head and health workers themselves.

The enumerators also observed the quantity and quality of equipment and infrastructure during their visit, which reflect both total revenue and management decisions made at the facility level. We constructed three indices, each index being the first component of a principal component analysis. The quality index is based on direct observation by the enumerator when s/he arrived at the facility for the endline survey of twelve items: building material, waiting room, consultation room, lavabo, soap, clean towels, bathrooms, sterilization material, permanent display of user fees and drugs' costs, use of an examination table and ordinogram. The infrastructure index includes six items: phone ownership, motorized transportation mean ownership, access to clean water, toilet and electricity, and hard roof. Finally, the equipment index includes the quantity of fifteen types of medical equipment owned by the health facility: generator, sterilizer, tensiometer, stethoscope, baby-scales, weighing scale, height gauge, microscope, gynecological examination table, fridge, delivery boxes, fuel, kerosene, bed and solar panel.

Health workers' satisfaction, anxiety and motivation At the time of the endline survey, workers are no longer incentivized in the PBF group so the incentive structure does no longer differ between the two groups: workers' behavior is driven by intrinsic motivation (perceived value of the job) and extrinsic motives (job remuneration). Any difference in worker behavior therefore reflects persistent effects of PBF on either intrinsic motivation, or job remuneration. Staff attendance provides a measure of workers' total motivation (intrinsic plus extrinsic). We also elicit health workers' motives. Workers were asked about the main advantage of their occupation, then about the main inconvenient. These questions were open in order to not induce any type of response and capture occupation characteristics that are the more salient to them and naturally come at the top of their mind. We classified the responses into seven categories of advantages: social recognition, remuneration, material comfort, care about others' health and life, power, interest in the activity, and six categories of disadvantages: lack of social recognition, low remuneration, low material comfort, responsability over others' life, too much pressure and responsability, risk of being sick due to the contact with patients. We calculate the proportion of workers who mention either remuneration or material comfort as the main advantage, or low remuneration or low material

comfort as the main disadvantage. We use this proportion as a measure of the relative importance of extrinsic versus intrincis motives in workers' total motivation.

4.3 Empirical Strategy

Validation of the Experimental Protocol The internal validity of the impact evaluation relies on the comparability of the fixed payment and the PBF groups as observed at endline. With a large number of units of randomization, the law of large numbers insures that the characteristics in both groups are balanced. Here randomization was done on 96 health areas and it is preferable to check out whether the pre-program characteristics of the fixed payment and the PBF groups are similar.

This comparison was done using the 2009 survey. As explained earlier, only 85% of health facilities involved in the experiment took the 2009 survey. As a result, 129 out of the 152 pilot health facilities can be observedto check how characteristics were initially balanced between the fixed payment and the PBF groups.

Most initial characteristics are balanced, although the urban health facilities (17% of the sample) were not equally distributed in the PBF and fixed payment groups: they represent 12% of the PBF health facilities while 23% of the fixed payments ones. Since the urban health facilities, staff, patients and households are likely to differ from the rural ones, Appendix Table 4 present the means of some observables collected in 2009 in the PBF and fixed payment groups and t-tests for the null hypothesis that the difference is zero controlling for a dummy indicating whether the unit of observation is located in a urban area. 8 differences in means are significant at the 10% level or less out of 78 tests, meaning the exact amount that would be expected with random sampling variations.We are therefore confident that most differences in outcomes at endline between the two groups are not driven by initial conditions as long as we control for urban location.

Estimation Strategy For each outcome of interest, we show the estimation results of an equation of the form:

$$Y_i = \alpha + \beta PBF_i + X_i^{'}\gamma + \varepsilon_i$$

Where PBF is a dummy for being in the PBF group. Because the treatment was randomly assigned, it is in expectation uncorrelated with the error term and can therefore be estimated

through OLS. Coefficient β estimates the average local effect of PBF and is presented in the first column of our result tables. We show the p-value for a test that this coefficient is equal to zero in the second column of the result tables.

The unit of observation i varies: it stands either for a health area, a health facility, a health worker, a patient straight out of consultation or a household. Following the results of the balance checks discussed above, we control for the few variables which proved unbalanced in 2009. The set of characteristics X_i varies according to the unit of observation i: At the health area level, it includes a dummy indicating the health zone (the Haut-Katanga province entails eight health zones), a dummy indicating whether the majority of the health facilities in the area are urban, as well as a dummy indicating whether the majority of the health facilities in the area are denominational. At the health facility level, it includes dummies indicating the health zone, whether the health facility is urban, and whether the health facility is denominational. At the health worker level it also includes dummies indicating that the health worker is a female, a doctor, a nurse, as well as the age and number of years of experience of the health worker. At the patient level it includes a dummy indicating that the patient is a female, the age of the patient, and the reason for the visit. At the household level, it includes the sex and age of the household member, and for women a dummy indicating that the woman is literate. The results are robust whether or not these controls are included in the regression. We favor the results controlling for these characteristics since it improves the precision of the estimates. Finally, we clustered error terms at the health area level to take into account potential correlation between units in the same assignment unit.

5 Results

5.1 Accessibility of Health Services

Table 1 and 2 present the effects of PBF on the accessibility of health services: user fees, health facility opening, staff composition and attendance, offered preventive sessions at the facility and outreach activities.

Cost of Health Services In Table 1, we find consistent evidence that user fees for targeted services are lower in the PBF health facilities than in the fixed-payment health facilities. The mean Summary Fee Index for targeted services of the PBF group is 1.08 standard deviations below

the mean of the comparison group (significant at the 10 percent level)[23]. Figure 3 presents the distribution of the Summary Fee Index for targeted services by treatment status. We see a much lower proportion of health facilities at high fee levels and a higher concentration at low fee levels in the PBF group, suggesting that the decrease in the average fee index mostly results from the response of those health facilities which would offer high prices under a fixed payment mechanism. In contrast, the mean Summary Fee Index for non-targeted services of the PBF group is 0.4 standard deviations below the mean of the comparison group, a difference which is not statistically significant. Figure 4 shows that the distribution of the Summary Fee Index for non-targeted services in the PBF group is quite close to the fixed payment group. The health facilities thus strategically responded to the financial incentive by a stronger reduction in the fees for the services that would bring a benefit, without changing the fees for the other services.

The results found on user fees are robust when the information used comes from the households and patients straight out of consultation. We also find that patients straight out of consultation paid 49% less for the drugs in the PBF health facilities than in the comparison facilities (the difference is significant at the 1% level).

Overall, the data consistently suggest that health facilities decreased the cost of targeted health services compared to what they would have done in the absence of PBF, plausibly as a strategy to attract more patients.

Health Facility Opening, Staff Composition and Staff Attendance Table 2 presents the effects of PBF on health facility opening and staff attendance. Results show that PBF did not change the extent to which health facilities are open: 94% of patients and 87% of households report that they could consult every time they visited the facility. According to the facility heads, facilities open on average 30 days per month and 139 hours per week. These results suggest that health facilities are generally open and that the margin of improvement in this domain is almost nonexistent.

Out of a list of 23 health services that could be offered, the typical health facility offers 14

[23]The average user fee is lower in the PBF group than in the comparison group for all the four targeted services, but the differences are statistically significant only for prenatal visits. The effect of PBF on user fees is strikingly large for all targeted services except birth delivery : we observe a 61% reduction in the fee for the second (or more) prenatal consultation (from 132 FC in the comparison group down to 52 FC in the PBF group) and a 48% reduction in the fee for the first prenatal visit (from 850 FC in the comparison group down to 442 FC in the PBF group), both significant at the 10 percent level. We also observe a 55% reduction in the fee for the first curative consultation (from 1,263 FC in the comparison group down to 571 FC in the PBF group) but the difference is not significant.

services[24]. PBF health facilities offer the same number of targeted and non-targeted services as in the fixed payment group.

PBF did not change the composition of the staff within the facilities, neither the quantity of staff – which amounts to 7 workers on average, nor the type of workers –facilities generally count two thirds technical (doctors, nurses and birth-assistants) and one third non-technical workers (pharmacists, managers, secretaries, receptionists and maintenance workers). Doctors represent only 3% of total staff.

We find higher staff attendance under PBF than under fixed-payment in the unannounced visits in July, August and September 2012: 58% in the comparison group while 65% in the PBF group, a 14% increase significant at the 10% level. Figure 9 shows the distribution of staff attendance at facilities by treatment status. We see that staff attendance is higher in the PBF group than in the fixed payment group at any point of the distibution, suggesting that incentivized workers responded quite similarly to the incentive in terms of their presence. The higher attendance due to PBF echoes workers' statements in the qualitative interviews: "If we work a lot, we will have more money and conversely", "We need to work many days and hours in order to have more patients".

Preventive Sessions at Facilities Incentivized workers organized more preventive sessions at facilities in the last 12 months than non-incentivized workers (120 instead of 100, although the difference is not significant), a difference which is significant at the 5 percent level for targeted services (immunization, prenatal care and family planning): 74 preventive sessions were offered for these services in the comparison group, while 106 in the PBF group. For non-targeted services (postnatal care and VIH prevention), the number of preventive sessions is also higher in the PBF group but the difference is not significant[25]. Figures 5 and 6 show the distribution of the number of preventive sessions for targeted services by treatment status. The positive effect of PBF on preventive sessions organized at facilities was thus concentrated on targeted services but did not happen at the expense of non-targeted services.

[24]Curative consultations, pre and postnatal visits, birth delivery and preschool consultations are offered by more than 90% of health facilities. Immunization is offered by 88% and family planning by 84%. A smaller proportion of health facilities offer the other services.

[25]It is important to notice that the supply for preventive sessions for targeted services is already much higher than the supply for non-targeted services (out of 100 preventive sessions in the last 12 months, 74 were devoted targeted services and 26 to non-targeted ones), so the effect of PBF widened the gap between targeted and non-targeted services.

Number of Outreach Activities in the Community The number of outreach activities for targeted services is higher in the PBF group: health workers performed an average of 16 visits to the community in the last 12 months, while 10 in the fixed payment group, which represents a 60% increase (the difference is significant at the 10 percent level. By contrast, the differences in the number of outreach activities for non-targeted services between the PBF and the comparison groups is small and not significant, suggesting no increase at all. Figures 7 and 8 show the distribution of the number of outreach activities for targeted and non-targeted services by treatment status.

Overall, the accessibility of the PBF health facilities was improved via a decrease in user fees, an increased staff attendance and a larger number of preventive sessions organized at the facility and of outreach activities in the community.

5.2 Service Quality

Table 3 presents the effects of PBF on health service quality: technical quality, patients' understanding of diagnosis and prescriptions, and patients' satisfaction. While analysing the results on quality, it is important to keep in mind that this PBF approach did not tie payments to any quality measures.

Technical Quality of Health Services On average, patients report 16-minute consultations and household members report 17-minute consultations in the fixed payment group. We don't observe any difference induced by PBF in consultation time from the patients, but consultation time from the household members is found 20 minutes in the PBF group. This finding at least dispels the fear that incentives based on the quantity of health services would imply maximizing the number of patients at the expense of time spent with each of them.

The average compliance rate with standard medical procedures is found pretty low: 35% for classic patients, 67% for prenatal visits and 62% of postnatal visits. 40% of patients straight out of consultation also report that drugs were prescribed without them being examined. On average, women stayed three days in the health facility after giving birth. Overall, our data show that technical quality is poor and PBF had no impact on it.

Patient's Understanding of Health Services The understanding of diagnosis and next steps seems good: 83% of patients straight out of consultation declared that they understand the diagnosis and next steps and 90% knew what drugs they were supposed to take after the consultation.

Surprisingly, the PBF decreased the proportion of patients who understood which drugs they should take compared to the comparison group from 90% down to 83%. Most of household members (94%) also understood the diagnosis provided by the health worker but the PBF had no impact on this level of understanding.

Patients' Satisfaction Almost all patients – 94% – were satisfied by their visit at the health facility. The main reason for satisfaction is the quality of care (57%). The second reason is the quality of welcome (28%) (note that patients could give multiple responses). It is also worth noting that user fees and equipment quality were not important reasons neither of satisfaction nor of dissatisfaction. We find a similar pattern of results for household members: 91% declared that they were satisfied, mainly thanks to the quality of care (74%). The quality of welcome was less considered as a satisfaction criteria (8%) and user fees and equipment quality were still not cited as major reasons of satisfaction or dissatisfaction. Patients thus seem surprisingly indifferent towards the level of user fees. The PBF did not have any impact on the level of patients' satisfaction.

To conclude on service quality, we don't find any consistent trend that allows us to conclude that the PBF improves the quality of health services. It is important to note that the PBF system implemented in Haut-Katanga was not based on any quality measures unlike other PBF systems. Considering this, we could have expected both an increase in service quality as a strategy to attract patients, or some degradation in the quality of health services due to the focus put on the quantity of health services. None of it occurred, suggesting that workers' investment in service quality was not elastic to an incentive based on service volumes.

5.3 Health Service Utilization and Population Health Status

Table 4 presents the effects of PBF on health services utilisation and health outcomes.

As shown in Table 4, 50% of household members visited a health facility in the 12 months before the survey. PBF had a small negative effect on this proposition reducing it to 47% of the households members (the difference is significant at the 10% level). Unmet needs remain substantial: 25% of people in the population was sick and did not visit a health facility in the last 12 months (the other 75% being either not sick or sick but visited a health facility), without any significant difference under PBF or fixed payment. Finally, household members who visited waited almost 4 days before the visit and PBF did not reduce the waiting time.

85% of children aged 0 to 5 received at least one immunization shot based on mother declaration, which is somewhat confirmed by a more objective measure of tuberculosis immunization: the enumerators could see the TB immunization scar on the shoulder of 60% of children. The average number of immunization shots is 2.7[26]. We do not find any effect of PBF on utilization of immunization.

82% of births in the last 12 months were attended in a health facility. Women who have been pregnant in the last 12 months got 3 prenatal visits and 1 postnatal visit at the facility[27]. Moreover, 38% of these women have been supplemented with iron and 54% have taken medication to prevent malaria. Finally, mothers breast-fed their child for five and a half months on average. The PBF had no impact on these perinatal outcomes. It did not have any impact neither on the use of modern family planning: only 5% of women aged 15-49 use a modern contraceptive method[28].

Overall, we can reject the idea that PBF increased service utilization, which is surprising given the effort made by the health workers to make health services cheaper and more accessible. Since our measure of service utilization covers 12 months preceding the endline survey, the absence of difference in service utilization between the PBF group and the fixed payment group relates mostly to the period when the incentives were in place, and incidentally to the period after the incentives were withdrawn. At baseline, health workers were found to spend numbers of hours in the facility for an average of only 2 patients per working day. Little demand for health services was thus a serious concern to start with. Reasons for the lack of response to lower user fees and improved accessibility could be that prices of health services work as signals for health service quality, or that people are reluctant to use health services because they do not fully understand its benefits. Outreach activities should help but only if health workers are trusted by the community, well-trained, and really take time to inform and convince the population about the benefits of health services. From the qualitative interviews, we understand that the outreach activities were more focused on providing information about the schedule of preventive health sessions than on explaining in details the benefits of the different services. Also, poor families face so many challenges a day causing stress and preoccupation that it might be difficult to carefully weight the costs and benefits of health services and place health service utilization in the top priorities of the day. The important result is that the incentivized health workers were not in a position to identify and address the

[26] Full immunization requires 5 shots, ideally before the child turns 2.

[27] Note that the number of pre and postnatal visits outside the facility, by healers or den mothers, seems quite low since including those visits in the count does not increase much the number of visits.

[28] Modern contraceptive methods are pill, shot, condom, IUD, spermicidal, implant and sterilization.

barriers to health service uptake, which might be particularly severe in the context of Haut-Katanga where the population is poor, low-education and generally uninformed about modern medicine. As a consequence, the indicators of health outcomes (general, maternal, under-5 and new-born mortality, and under-5 weight-for-height z-score) did not improve (see Table 4).

5.4 Health Facility Revenue

Table 5 presents the effects of PBF on the ressources at the facility level, the health worker's payment, and the overall quality of the facilities' infrastructure and equipment.

Total Resources at the Facility Level We find 42% less total resources in the hands of PBF health facilities than comparison health facilities the month before the survey, significant at the 5% level. The average revenue from user fees was half as in the comparison group (p-value 0.15), and the revenue from drugs and medical lab 54% lower (significant at the 10% level). In contrast, we don't observe any difference in fundings from the government nor NGOs. This result is consistent with our previous findings that PBF led to lower user fees and price of drugs than fixed payments without any increase in service utilization. According to the qualitative interviews, incentivized health workers who reduced their fees as a strategy to increase demand found themselves in a situation where they were not able to re-adjust their price schedule and raise prices back to their original values as the population had become accustomed to the reduced prices (even though utilization did not increase) and they were fearful of reducing demand to even lower levels.

Workers' Payment As a consequence, salary to health workers was significantly lower in PBF health facilities than in comparison ones. We find a 34% reduction in workers' total payment in the last month as reported by the facility head, and a 28% decrease as reported by the health workers (significant at the 10% and 5% level respectively). Wages from the government are not statistically different in the PBF and the fixed payment group, but we observe a significant reduction in worker payment from the facility itself (which includes revenue from user fees and drug sales, and incidentally grants from NGOs). This result is thus consistent with the reduced user fees and drug prices observed in the PBF health facilities' revenue.

Quality of the Facility Infrastructure and Equipment We find a significant negative impact of PBF on the quantity and quality of equipment and infrastructure. The mean quality index in

the PBF group is 0.53 standard deviations below the mean in the comparison group. Most of the twelve items included in this index indicate a lower quality of equipment in the PBF facilities - negative differences are significant for four items: lavabo, clean towels, sterilization material and the use of an examination table[29]. Furthermore, the mean equipment index in the PBF group is 0.64 standard deviations below the mean in the comparison group. The components of this index show that PBF facilities have consistently less equipment than the comparison ones. The differences are significant for four medical equipments: microscope, gynecological examination table, fridge and fuel.The day of the survey, the enumerator also checked the availability of five common vaccines[30] and nine common drugs[31]. We find non perfect –although not so bad- availability of these products: four out of five vaccines and seven out of nine drugs were available in the health facility the day of the survey. In the last 12 months, 1.5 vaccines and 5 drugs had missed at least once in the health facility. The PBF had a negative impact on the availability of vaccines the day of the survey, with less than 3.5 out of five vaccines available in the PBF group. However, it had no impact on the availability of vaccines for the last 12 months and on the availability of drugs, either on the day of the survey or in the last 12 months. These findings are likely to be related to the reduced revenue in the PBF group. Because of the lack of resources, PBF health facilities had difficulties in investing in new equipment and renewing the existing one.

Overall, PBF had a significant and substantial negative impact on health facilities ressources, health workers salaries and health faclities infrastructure and equipment.

5.5 Staff Well-Being and Motivation

5.5.1 Staff Well-Being

Table 6 presents the effect of PBF on staff satisfaction, perceived workload, conflicts and stress. All these outcomes are based on self-reported information so it is clearly subjective. Since we do not see any reason why social desirability bias would be different in the PBF and in the fixed payment group, the comparison between the two groups gives evidence on how PBF affected staff subjective well-being.

[29] However, it is worth noting that PBF facilities are more likely to permanently display the user fees and drugs' costs in the facility.

[30] Vaccines: DTaP, Poliomyelitis, BCG, Measles and Yellow Fever.

[31] Drugs: oral rehydration salts, paracetamol, co-trimoxazole, ampicillin, metronidazole, quinine sulfate, mebendazole, tetracycline and Ringer's solution.

Job Satisfaction PBF induced a 14% significant decrease in the job satisfaction of facility staff – going from 5.7 to 4.9 on a scale from 0 to 10. However, we do not find an increase in the proportion of workers who would go for a position in another health facility. In the qualitative interviews, many health workers from the PBF group complained about the PBF system and the frustration they had from the inefficiency of their strong efforts to increase the demand: "If there is no patient, we can't do more than working 26 days". The lower job satisfaction is also likely to be related to the reduced worker salary.

Subjective Workload Overall, more than half of the facility staff find their workload heavy (53%), feel that they had too much work last week (61%) and that they have been tired (56%) in the last seven days. The PBF decreased significantly the perceived workload and fatigue: these three indicators decreased by respectively 16%, 28% and 16%. As shown in the previous section, this does not reflect any difference in the *effective* workload which is similar in both groups. The change in perception could be due to the disappointing impact of the effort facility staff made to increase the number of patients: the increased effort to attract patients made the lack of demand for health services more salient, which could also have contributed to the lower job satisfaction described above.

Conflicts and Stress As PBF induces higher volatility of payments than fixed payments, it could be a source of stress for the workers. In the comparison group, 39% of the workers declare that they worry about the volatility of their remuneration, whereas 49% in the PBF group (a 24% increase), and the difference is close to significant at conventional levels (p-value = 0.11). Actually, we see a large and significant 72% increase in the proportion of facility heads who worry about the volatility of the payment in the PBF group, but no significant increase among the other health workers (result by category of staff not shown). Importantly, this effect is not due to the lower remuneration[32]. In terms of conflict, PBF should increase competition between and within facilities – as payment distribution among health workers can be autonomously decided by the facility head. Competition between health facilities was not perceived by the workers: 36% facility staff reported that the facility is in competition with other health facilities in the fixed payment group, with no significant difference in the PBF group. As for internal competition, the workers declared a level of conflict of 1.72 on a scale from 0 to 10, with no impact of PBF. To provide evidence on the

[32]Workers worry about the level of their remuneration as much in the PBF group as in the fixed payment group.

distribution of worker effort within facility and possible free-riding issue due to PBF, we compared the standard deviation of effort measures within facility: number of outreach activities performed in the last 12 months, number of hours worked the last day and the last week, number of patients consulted the last week and the last month. We don't find any significant difference in the standard deviation of effort measures within facility (results not shown, available upon request). This finding suggests that there was not free-riding taking place despite the collective nature of the incentive, consistent with the lack of increase in conflict within facility. However, 14% of the workers declared that the distribution of the payment within the facility was a source of conflict, while 27% in the PBF group, but the difference is not significant (p-value=0.17).

Overall we observe a lower perceived workload and a lower satisfaction in the PBF group, both likely due to the disappointing impact of increased effort on the number of patients and worker salary. PBF also increased the proportion of facility heads who worry about the volatility of the payment but did not increase the level of conflict within facilities.

5.5.2 Staff Motivation

Staff Motivation When the Incentives were in Place

As shown in Table 2, workers' effort to attract patients is larger under performance-based payment than fixed-payment, which we interpret as an increase in worker motivation due the incentive. Besides, we don't find evidence that the collective nature of the incentive led to free-riding: the standard deviation of a number of effort measures at the worker level, like the number of outreach activities performed in the last 12 months, the number of patients in the last day or last week, or working time at the facility in the last day, week and month, was found statistically similar in the PBF and fixed payment group (results not shown, available upon request).

Staff Motivation After the Incentives were Removed

Table 6 presents the effect of PBF on staff attendance after PBF was removed, and the proportion of workers who report material benefits as the main advantage or disadvantage of the job.

Staff Attendance The positive effect of the incentive on staff attendance reversed at endline after PBF has been withdrawn. The interviewers did not announce the day they would arrive in the facility for the endline survey to avoid manipulation of staff attendance. Attendance rate in the fixed payment group was found 57%, similar to before the payment was withdrawn: 58%. In

contrast, a striking reversal happened in the PBF group where attendance rate was found 65% before the incentive was withdrawn while only 45% after. This represent a substantial reduction in the number of workers observed by the interviewer when s/he arrived: 3.8 in the comparison group while 2.5 in the PBF group (the difference is significant at the 5% level). Figure 10 shows the distribution of staff attendance at facilities after the pilot by treatment status. Staff attendance is lower in the PBF group than in the fixed payment group at any point of the distibution, suggesting again that workers responded quite similarly to the end of the incentive[33].

The financial incentive thus induced higher worker total motivation compared to fixed payments as long as the incentives were in place, but lower total motivation after the incentive was withdrawn. It is important to keep in mind that worker attendance was found higher in the PBF group than in the fixed payment in July, August and September 2012, when the depressing impact of PBF on user fee revenue and worker salaries had already taken place. Also, payments from the governement stopped in the PBF and in the fixed payment group at the same time, which represents the same average reduction in health facilities' revenue by design. The reversal in staff attendance difference between PBF and fixed payment facilities thus happened in a context where facilities' revenue decreased by the same amount. Therefore, the reason for the reversal is unlikely to be driven by the level of worker income, suggesting a change in the structure of worker motivation.

Attention Paid to Material Benefits In the fixed payment group, 38% of workers mention spontaneously remuneration or material comfort as the main advantage or disadvantage of their position, as opposed to non material benefits like social recognition or health benefits to the population. This proportion increases dramatically to 51% in the PBF group (a 34% increase significant at the 5% level). This finding suggests that exposure to PBF changed the salience of financial motives in health workers' mind. Importantly, this change is also unlikely to be driven by the decrease in user fee revenue and workers' remuneration since we observe a significant increase in the proportion of workers who mention financial benefits as the main *advantage* (from 11% to 17%, significant at the 10% level), while a smaller and insignificant increase in the proportion of workers who mention financial benefits as the main *disadvantage* (from 29% to 35%, p-value 0.15). This finding gives evidence of a shift in attention from the intrinsic value that the worker attributes to her job in favor of the external benefit. We interpret this effect as evidence that incentives can not

[33]This result is consistent withdeclarative data from the workers: worker attendance rate in the last seven days is found 78% in the fixed payment group while 71% in the PBF group (p-value of the test of equality 0.04).

only inform ignorant agents about some attributes of the task or their ability to perform, but also change the locus of control from internal to external by increasing the weight of external motives in worker utility.

To summarize the effects of PBF on worker motivation, we find that: 1) When PBF is in place, worker's total motivation is higher under PBF ($U_0 < U_1$) despite the fact that worker salary from user fees are lower than under fixed payments ($F_1 < F_0$); 2) After PBF is withdrawn, worker total motivation is lower in the group who was exposed to PBF ($U_2 < U_0$), which might be attributed to two facts: (i) Worker salary is lower than in the group who was under fixed payments ($F_2 < F_0$); (ii) Attention paid to financial motives relative to intrinsic motives proved more important ($\alpha_0 < \alpha_1$), and this change is not due to the decrease in worker salary.

6 Conclusion

This study examines a performance-based payment mechanism compared to a fixed payment mechanism to health care providers in the district of Haut-Katanga, DRC. The performance-based payment studied was conditional on the number of patients for some pre-determined services, which is one specific approach of PBF. The findings show that the performance-based mechanism led to increased effort by health workers to attract more patients for health services that were included in the performance measure, without crowding out non-targeted services and service quality, nor generating new conflicts within the facilities. However, the increased effort made by the health workers did not lead to significant changes in the utilization of health services by the population, leading to a very disappointing reduction in facility revenue and worker income. This finding suggests that health workers were not able to find the successful strategies and innovate to change health-seeking behavior. A question is whether the lack of inventiveness and creativity required to increase demand for health services is due to the financial incentive itself by focusing attention and limiting thecapacity to draw unusual connections between elements, as argued in the psychological literature, or due to the difficulty of the task itself and the lack of skills and human capital of the health workers in this specific context. Importantly, we also find that PBF created a shift in workers' attention from non-financial to financial motives apart from the reduction in worker income, and that workers decreased their effort after the incentive was removed. In terms of policy

lessons, these finding suggest that financial incentives should be used as a permanent policy rather than a temporary policy in order to limit the adverse effects of the motivational shift, and only in situations where the task is easy so that workers have the capacity to carry out the rewarded output.

The lack of response of the population challenges the idea that the demand for health services is elastic in all contexts: substantial decreases in prices were not able to encourage more demand, nor did improved accessibility. Specific interventions to stimulate demand for health may be combined with supply-side interventions like PBF. When asked about the reason for their (dis-)satisfaction in our survey, people proved mostly sensitive to service quality. One possibility would be thus to include service quality in the set of purchased performances as it was done in Rwanda, with the hope that health providers would engage into quality improvements that would attract more patients. Alternatively, interventions to improve awareness about the benefits of health products or to help people overcome behavioral issues like procrastination could supplement a PBF mechanism.

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Figure 1: Performance-Based Financing in Africa

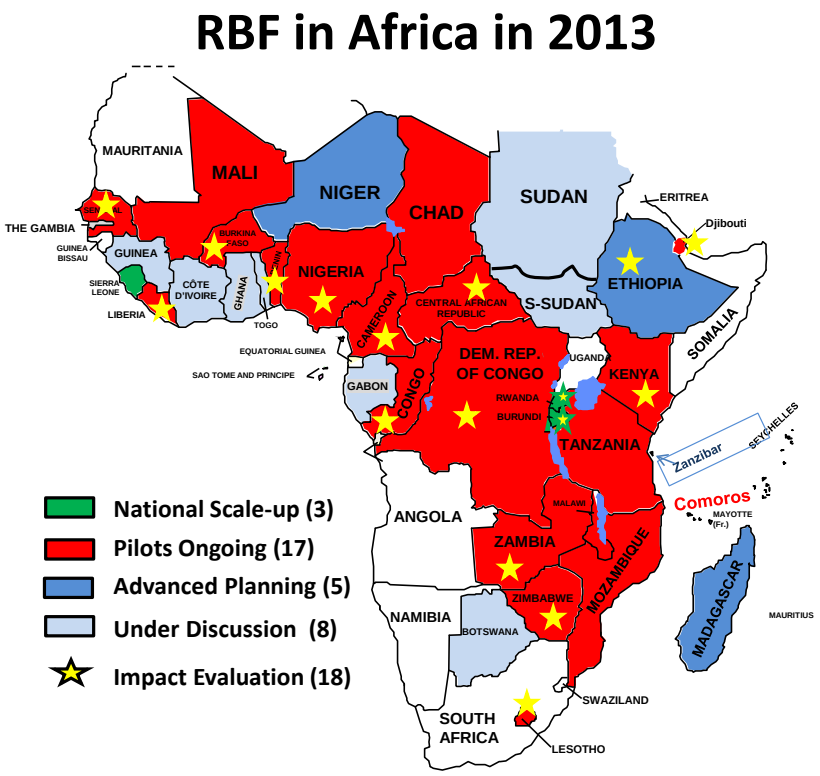

Figure 2: Monthly Payment Distribution, by Treatment Status

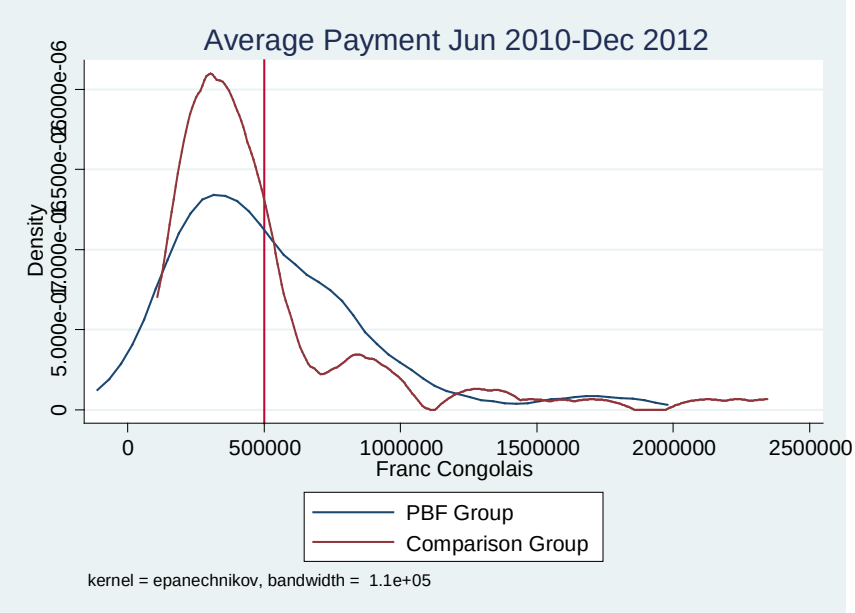

Figure 3: Distribution of the Fee Summary Index for Targeted Services, by Treatment Status

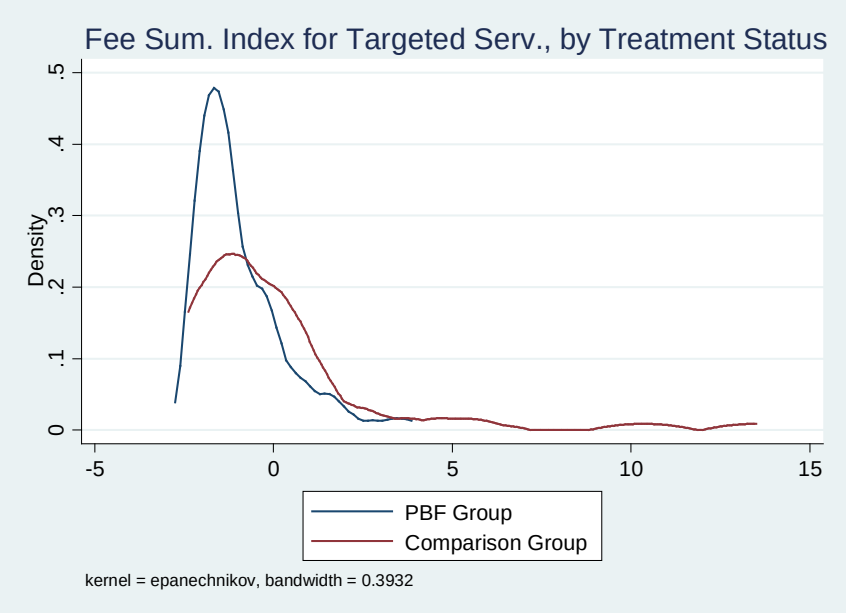

Figure 4: Distribution of the Fee Summary Index for Non-Targeted Services, by Treatment Status

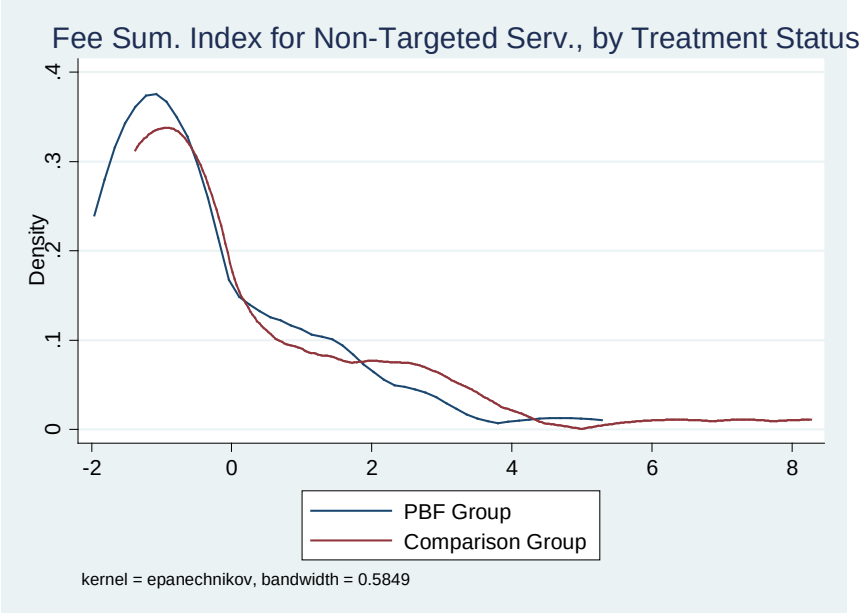

Figure 5: Distribution of Preventive Sessions Organized at Facilities for Targeted Services, by Treatment Status

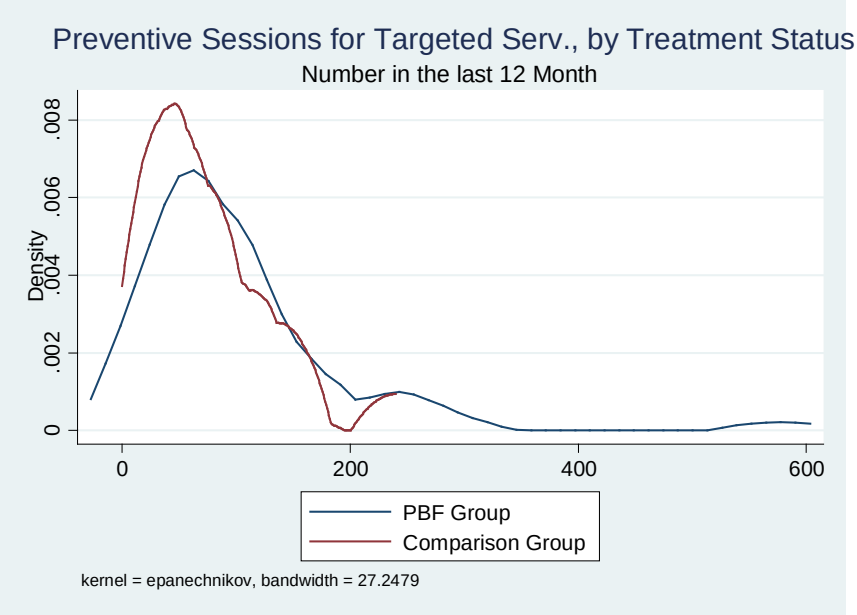

Figure 6: Distribution of Preventive Sessions Organized at Facilities for Non-Targeted Services, by Treatment Status

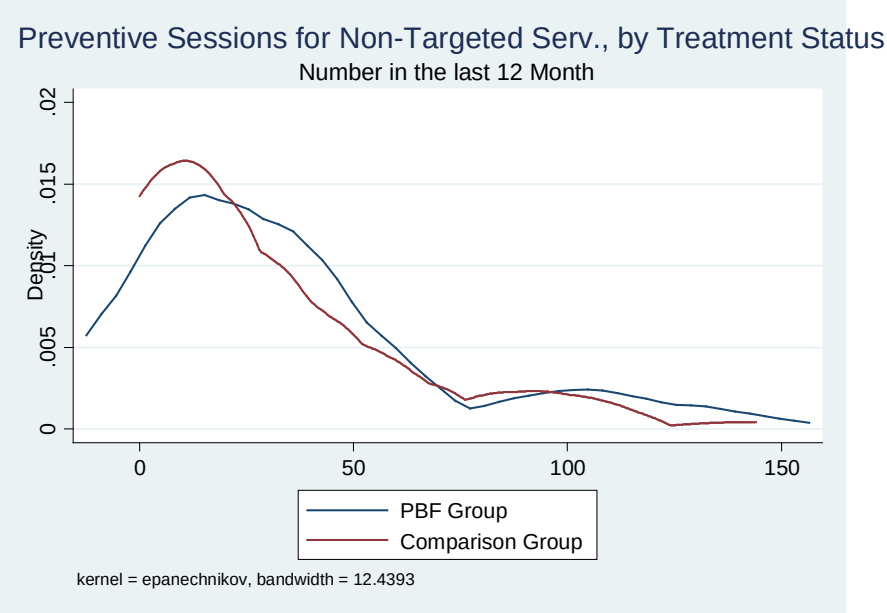

Figure 7: Distribution of Outreach Activities for Targeted Services, by Treatment Status

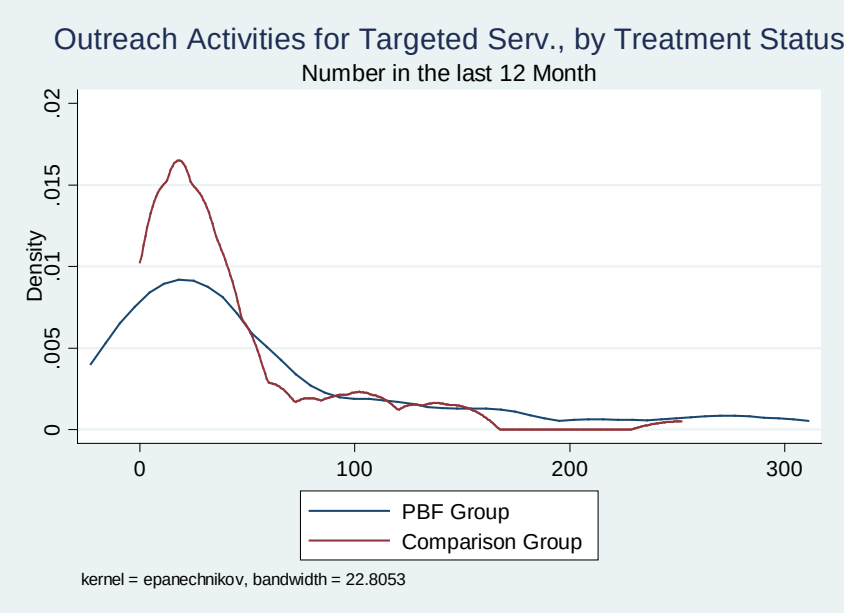

Figure 8: Distribution of Outreach Activities for Non-Targeted Services, by Treatment Status

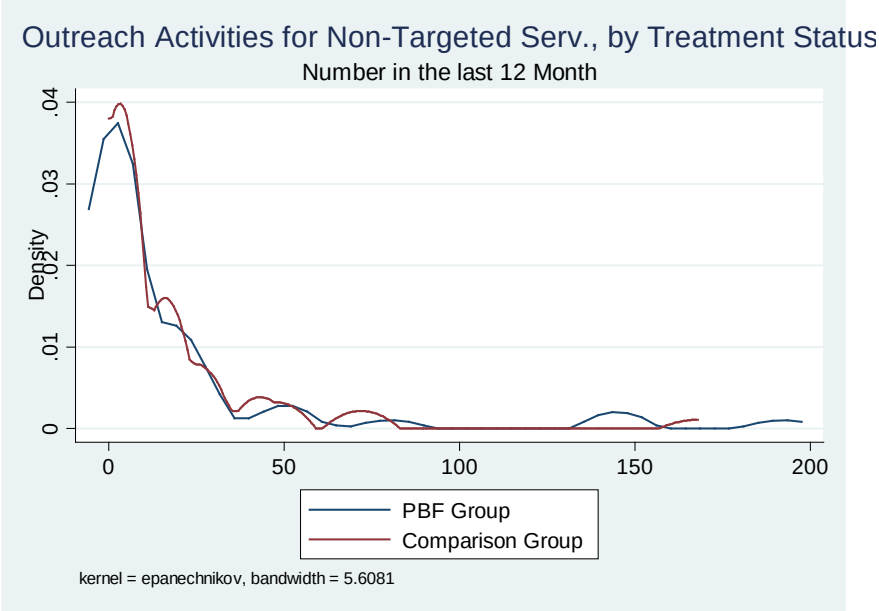

Figure 9: Distribution of Staff Attendance *during* the Pilot, by Treatment Status

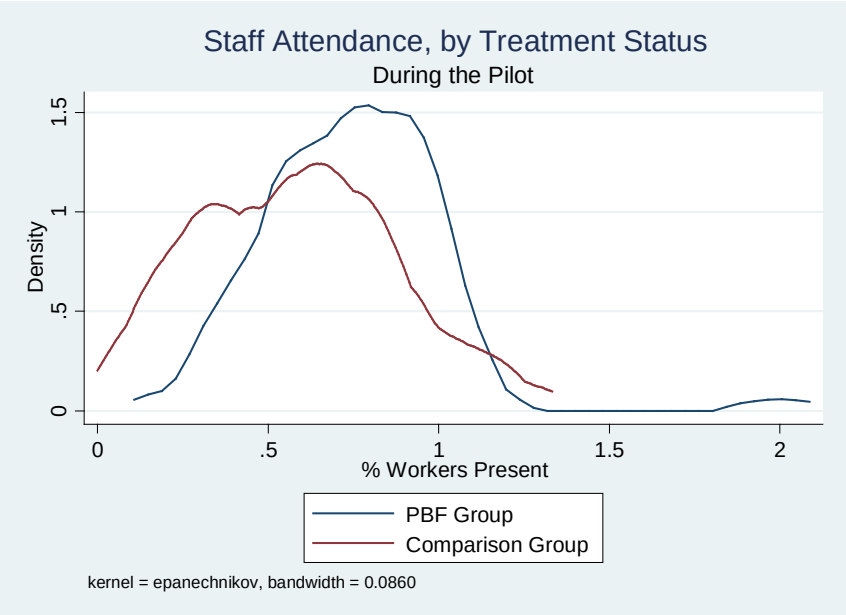

Figure 10: Distribution of Staff Attendance *after* the Pilot, by Treatment Status

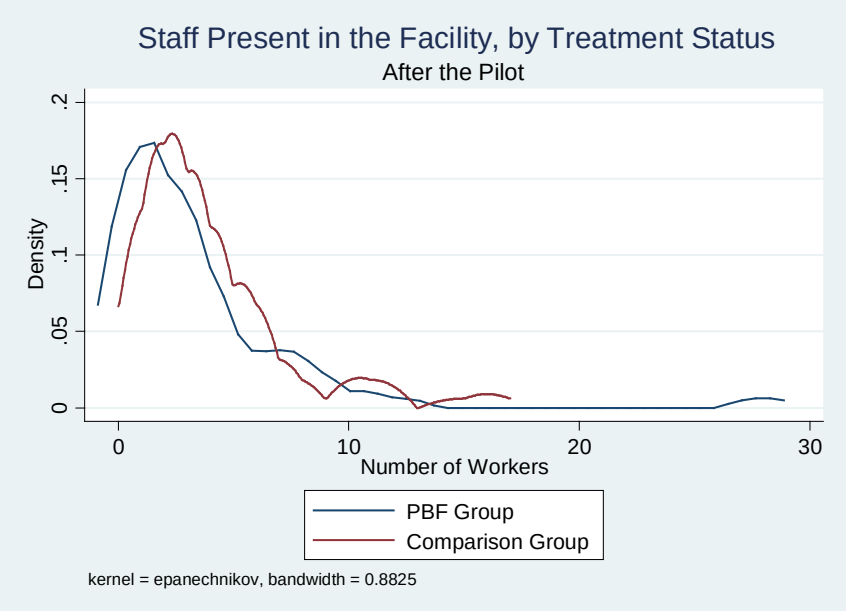

Table 1: Effects on User Fees

	Average Treatment Effect (ATE)	p-value (ATE=0)	Mean of Dep. Var. (Control)	St.dev. of Dep. Var. (Control)	Observations
The Facility Head reports:					
Fee Summary Index at the facility level	-1.077	0.141	.166473	4.212105	93
Fee Summary Index at the facility level, targeted services	-.807	0.061*	.0366889	2.866472	109
Fee Summary Index at the facility level, non-targeted services	-.398	0.346	.1007338	2.064238	95
Targeted Services					
User fee for the first curative consultation	-692.45	0.281	1263.492	4557.316	123
User fee for delivery	-224.185	0.655	2747.414	2423.25	113
User fee for the first prenatal visit	-407.873	0.095*	850	1741.42	118
User fee for the second prenatal visit	-80.801	0.053*	132.2034	264.8622	115
Non-Targeted Services					
User fee for the second curative consultation	-178.082	0.18	459.4828	799.0377	112
User fee for postnatal visit	-57.43	0.386	105.3571	430.8215	111
User fee for preschool consultation	-6.718	0.838	86.66666	154.8281	112
Patients and Community Members report:					
Fee paid for the delivery	301.24	0.762	9532.258	11570.85	773
Fee paid for the last postnatal visit	-71.637	0.35	400.8342	712.8497	392
Fee paid for the last prenatal visit	-112.969	0.125	665.5804	976.022	929
Fee paid for the last immunization shot	-22.096	0.237	87.71028	316.9161	2039
Cost of drugs purchased by the patient at the health facility (FC)	-1106.16	0.005***	2252.593	5166.591	980

Data Source: Endline survey. ***, **, * indicate significance at 1, 5, and 10%. Error terms are clustered at the health area level. We control for the urban/rural location of the health facility.
Fee Summary Index is the equally weighted average of z-scores of its components. The z-scores are calculated by subtracting the control group mean and dividing by the control group standard deviation. The components of the index are fees paid for first and second curative consultations, delivery, prenatal and postnatal visits, and preschool consultation.
Targeted services: first curative consultation, delivery, and prenatal visits
Non-targeted services: second curative consultation, postnatal visit, and preschool consultation

Table 2: Effects on Service Accessibility

	Average Treatment Effect (ATE)	p-value (ATE=0)	Mean of Dep. Var. (Control)	St.dev. of Dep. Var. (Control)	Observations
a. Health Facility Opening, Services Offered and Staff					
Opening					
Number of opening hours per week (as reported by the facility head)	-6.522	0.524	138.9262	47.86586	116
Number of opening days in the last month (as reported by the facility head)	-.139	0.816	29.73016	1.885482	119
The patient could consult each time s/he visited	-.019	0.322	.9375	.2422843	993
The household member could consult each time s/he visited	.016	0.351	.857081	.3500661	4323
Services Offered at the Facility					
Number of services offered by the facility (between 0 and 23)	-.492	0.35	13.55556	3.644606	123
Number of targeted services offered by the facility (between 0 and 10)	-.141	0.606	7.730159	1.715267	123
Number of non-targeted health services offered by the facility (between 0 and 13)	.143	0.723	5.825397	2.393133	123
Staff Composition					
Number of workers in the facility	-.923	0.309	7.047619	5.692181	123
% health workers in the facility	.027	0.425	.683401	.1826084	123
% doctors in the facility	-.001	0.933	.0271569	.0575394	123
Number of workers who left the facility in the last 12 months	-.009	0.972	.7619048	1.011455	123
Staff Attendance					
Av. % workers present in the facility on unannounced visits 1, 2 and 3	.074	0.067*	.5807223	.2924829	138
b. Preventive Sessions Organized in the Last 12 Months (Facility level)					
Number of preventive sessions at facility provided in the last 12 months	20.084	0.291	100.4426	82.87933	118
Number of preventive sessions at facility for targeted services provided in the last 12 months	31.542	0.044**	73.91803	57.09679	119
Number of preventive sessions at facility for non-targeted services provided in the last 12 months	10.808	0.107	26.87097	31.89197	120
c. Outreach Activities in the Last 12 Months (Health Worker level)					
Number of outreach activities performed in the last 12 months	7.184	0.171	15.23295	44.47532	326
Number of outreach activities for targeted services performed in the last 12 months	5.976	0.096*	9.829545	26.42281	326
Number of outreach activities for non-targeted services performed in the last 12 months	1.208	0.523	5.403409	19.53698	326

Data Source: Endline survey. ***, **, * indicate significance at 1, 5, and 10%. Error terms are clustered at the health area level. We control for the urban/rural location of the health facility. Preventive sessions include: immunization, prenatal care and family planning (targeted services), postnatal care and HIV prevention (non-targeted services).

Table 3: Effects on Service Quality

	Average Treatment Effect (ATE)	p-value (ATE=0)	Mean of Dep. Var. (Control)	St.dev. of Dep. Var. (Control)	Observations
a. Technical Quality					
By the patient					
Consultation time (minutes)	1.028	0.422	16.09263	15.51822	974
Compliance rate with medical procedure, any care service	-.015	0.695	.3538175	.3248204	984
Drugs were prescribed to the patient and the patient was not examined	.02	0.66	.4077491	.49187	991
By the household member					
Consultation time (minutes)	2.581	0***	16.98827	15.74057	4309
Number of days in the health facility after the delivery	-.077	0.689	2.313283	1.702673	767
Compliance rate with medical procedure, prenatal care service	.004	0.818	.6657578	.1680248	923
Compliance rate with medical procedure, postnatal care service	.048	0.123	.6166667	.258334	389
b. Patient's Understanding					
The patient understands diagnosis and next steps	.007	0.813	.8268877	.3786932	992
The patient knows what drugs to be taken	-.072	0.039**	.9042357	.294539	991
The household member understands diagnosis	.017	0.241	.9372237	.2426138	4258
c. Patients' Satisfaction					
The Patient reports that s/he was…					
satisfied	.013	0.359	.9430147	.2320279	994
satisfied thanks to user fees	.012	0.48	.0277778	.1644879	990
satisfied thanks to care quality	.003	0.937	.5722222	.4952152	990
satisfied thanks to welcome quality	-.027	0.442	.2796296	.4492334	990
satisfied thanks to equipment quality	0	0.997	.0333333	.1796719	990
dissatisfied thanks to user fees	0	0.	0	0	993
dissatisfied thanks to care quality	-.005	0.671	.0349265	.1837626	993
dissatisfied thanks to welcome quality	0	0.946	.0073529	.0855121	993
dissatisfied thanks to equipment quality	-.006	0.359	.0110294	.1045364	993
The Household Member reports that s/he was…					
satisfied	.004	0.778	.9142857	.2800023	4326
satisfied thanks to user fees	.006	0.646	.0415945	.1997039	4318
satisfied thanks to care quality	-.005	0.857	.7417678	.4377572	4318
satisfied thanks to welcome quality	-.008	0.547	.0836222	.2768804	4318
satisfied thanks to equipment quality	.001	0.855	.0186308	.1352467	4318
dissatisfied thanks to user fees	0	0.934	.0113191	.1058105	4312
dissatisfied thanks to care quality	-.002	0.853	.0487593	.2154112	4312
dissatisfied thanks to welcome quality	-.001	0.844	.0104484	.1017042	4312
dissatisfied thanks to equipment quality	.001	0.76	.008707	.0929245	4312

Data Source: Endline survey. ***, **, * indicate significance at 1, 5, and 10%. Error terms are clustered at the health area level. We control for the urban/rural location of the health facility.

Table 4: Effects on Service Utilization and Health Outcomes

	Average Treatment Effect (ATE)	p-value (ATE=0)	Mean of Dep. Var. (Control)	St.dev. of Dep. Var. (Control)	Observations
Curative Services					
The household member visited a health facility in the last 12 months	-.051	0.006***	.4961274	.5000388	9113
Have been sick in the last 12 month but did not visit a health facility	0,012	0,483	0,2500537	0,4330902	9124
If was sick and visited, number of days before s/he visited a health facility	.014	0.957	3.643269	7.464664	3553
Child Immunization					
Ever had an immunization shot	-.002	0.94	.8486739	.3585063	2448
Number of immunization shots based on the immunization card	-.023	0.961	2.706977	3.186173	833
Has a scar from tuberculosis immunization	.016	0.677	.6	.4900902	2441
Perinatal Care					
The mother delivered in a health facility	-.015	0.684	.8241309	.3810987	961
The mother had a C-section	.018	0.121	.0173697	.130807	773
Number of prenatal visits at a health facility	-.281	0.14	3.357782	2.122774	1120
Number of postnatal visits at a health facility	.055	0.622	.8650306	1.426543	959
Number of prenatal visits, including healers and den mothers	-.292	0.13	3.482944	2.243731	1117
Number of postnatal visits, including healers and den mothers	.058	0.655	1.10041	1.778309	957
The mother is supplemented in iron	.005	0.888	.3875	.487615	1121
The mother takes drugs to avoid malaria	-.037	0.369	.5392857	.4988999	1121
Number of months the mother breast-fed her new-born	.3	0.335	5.494845	3.787549	955
Family Planning					
The women is pro family planning	-.044	0.132	.4632353	.4989086	1874
The partner is pro family planning	-.022	0.443	.316894	.46551	1871
The women uses a modern contraceptive method	.005	0.69	.0505263	.2191437	1873
Number of Patients at Endline (After PBF was withdrawn)					
At the Facility Level, Last Month					
Number of patients for targeted services	-61.714	0.628	605.6102	1194.306	112
Number of patients for all services	-49.916	0.732	832	1378.686	109
At the Health Worker Level, Last Month					
Number of patients for targeted services	-21.383	0.468	156.8494	176.6688	316
Number of patients for all services	-29.925	0.387	239.3313	245.167	309
Health Outcomes					
Weight-for-height z-score	-0.347	0.306	0.4450215	5.516395	2403
Number of persons in the household who died in the last 12 months	.007	0.732	.1366313	.4006933	1708
Number of women in the household who died for perinatal reasons in the last 12 months	-.004	0.427	.009434	.0967264	1707
Number of children under 5 in the household who died in the last 12 month	.012	0.55	.0896226	.3171387	1707
The child born is the last 12 month is still alive	-.01	0.093*	.9897751	.1007032	961

Data Source: Endline survey. ***, **, * indicate significance at 1, 5, and 10%. Error terms are clustered at the health area level. We control for the urban/rural location of the health facility.

Table 5: Effects on Facilities' Total Ressources

	Average Treatment Effect (ATE)	p-value (ATE=0)	Mean of Dep. Var. (Control)	St.dev. of Dep. Var. (Control)	Observations
Total Resources at the Facility Level					
Revenue from user fees	-156138.6	0.148	310434.5	770580.8	120
Revenue from drugs and medical lab	-136695.9	0.083*	252311.2	494647.2	118
Revenue from the government	-979.111	0.991	159759	391370.4	123
Revenue from NGOs and private donors	-17243.2	0.257	11071.43	84488.68	123
Total revenue	-306889.1	0.04**	738938.4	1267279	118
Workers' Payment					
Payment to the Workers (reported by the Facility Head)					
Average total payment per worker in the last month (FC)	-19252.79	0.079*	56168.16	71476.75	118
Average wage from the government per worker in the last month (FC)	-1103.906	0.853	9439.635	49938.38	120
Average payment from the facility per worker in the last month (FC)	-17492.58	0.099*	46466.35	56203.52	121
Payment to the Health Workers (reported by the Health Workers)					
Total payment in the last month (FC)	-35885.75	0.031**	127139.5	174494.9	282
Wage received from the government in the last month (FC)	-4999.407	0.5	23654.04	88004.44	326
Payment received from the facility in the last month (FC)	-28682.54	0.061*	102552.8	153866.8	285
Quality of the Facility Infrastructure and Equipment					
Quality index based on interviewers' observation (Principal Component Analysis)	-.525	0.014**	.1990995	1.511479	116
Infrastructure index (Principal Component Analysis)	.184	0.372	-.1715342	1.425423	110
Equipment index (Principal Component Analysis)	-.639	0.026**	.052816	2.226755	116
Number of types of vaccine currently available (between 0 and 5)	-.744	0.034**	4.16129	1.738603	118
Number of types of vaccine that have been unavailable at some point in the last 12 months (between 0 and	.036	0.929	1.52381	1.740014	118
Number of types of drug currently available (between 0 and 9)	.236	0.646	6.7	3.185241	117
Number of types of drug that have been missing once in the last 12 months (between 0 and 9)	-.276	0.589	5.333333	3.445148	111

Data Source: Endline survey. ***, **, * indicate significance at 1, 5, and 10%. Error terms are clustered at the health area level. We control for the urban/rural location of the health facility.

Table 6: Effects on Staff Well-Being and Intrinsic Motivation

	Average Treatment Effect (ATE)	p-value (ATE=0)	Mean of Dep. Var. (Control)	St.dev. of Dep. Var. (Control)	Observations
Job Satisfaction					
Level of satisfaction of the facility staff for his job (from 0 to 10)	-0,769	0.045**	5,705394	2,783944	455
The facility staff would go for a position in another facility	-0,031	0,564	0,7095436	0,4549178	455
The facility staff would go for a position in another facility for financial reasons	-0,089	0,155	0,6224067	0,485794	455
Subjective Workload					
The facility staff founds his workload heavy	-0,086	0.093*	0,5291666	0,5001917	454
The facility staff reports too much work in the last 7 days	-0,169	0.002***	0,6092437	0,4889482	444
The facility staff felt tired due to the job in the last 7 days	-0,092	0.079*	0,5606695	0,4973471	445
Conflicts, Stress and Anxiety					
The facility staff worries about insecure / volatile remuneration	0,095	0,117	0,3886256	0,4885971	388
The facility staff worries about low remuneration	-0,057	0,256	0,4691943	0,5002369	388
The facility staff reports that the facility is in competition with other facilities	-0,007	0,898	0,3583333	0,4805129	454
Level of conflicts among workers perceived by the facility staff (from 0 to 10)	-0,155	0,521	1,717842	2,203041	453
The health worker reports that PARSS payment allocation is a source of conflict in the facility	.129	0.172	.1413043	.3502439	165
Staff Effort (Attendance) after PBF was withdrawn					
Number of workers in the facility on unnanounced visit 4 (enline survey)	-1.354	0.032**	3.84127	3.418198	123
% workers present in the facility on unannounced visit 4 (endline survey)	-.121	0.099*	.5741979	.3109018	123
Av. attendance rate of workers in the facility in the last 7 days (as reported by the facility head)	-.09	0.155	.7752835	.1929815	123
Attendance rate in the facility in the last 7 days (as reported by the Health Worker)	-.067	0.042**	.7799358	.1429585	331
Importance Attached to Job Remuneration					
The facility staff elicits financial benefits as the main advantage or disadvantage of his position	.117	0.025**	.3833333	.4872145	454
The facility staff elicits financial benefits as the main advantage of his job	.065	0.075*	.1087866	.3120247	452
The facility staff elicits financial benefits as the main disadvantage of his job	.063	0.155	.2916667	.4554796	454

Data Source: Endline survey. ***, **, * indicate significance at 1, 5, and 10%. Error terms are clustered at the health area level. We control for the urban/rural location of the health facility.

Appendix Table 1: Relative Prices of Targeted Health Services

Service	Indicator	Relative Price (USD)
Services targeted at health centers and referral health centers		
Curative care	Per new curative consultation	$0.6
Institutional delivery	Per delivery at the health center	$5
Obstetric referral	Per pregnant woman referred to the referral center/hospital	$5
Full childhood immunization	Per fully immunized child	$3.5
Prenatal care	Per prenatal care consultation	$1.2
Tetanus toxoid vaccination	Per 5th dose of tetanus toxoid vaccination	$2
Family planning	Per woman that uses a modern method of family planning	$4.5
Additional services targeted only at referral health centers:		
Caesarean section	Per caesarean section delivery (and decision-tree has been followed)	$30
Blood transfusion, when appropriate	Per transfusion episode	$5
Obstetric referral	Per delivery referred to the referral center/ hospital"	$5

Appendix Table 2: Endline Sample

Endline Sample, by Payment Status

	PBF Group	Comparison Group	Total
Health areas	44	43	87
Health Facilities	60	63	123
Facility Staff	154	178	332
Patients	470	544	1,014
Households	859	849	1,708

Appendix Table 3: Descriptive Statistics at Endline (Source: 2013 Endline Survey)

	Mean	Standard Deviation	Nb. of Observations
A. HEALTH FACILITY			
The facility is a "Centre de Santé de Référence"	0.11	0.31	123
The facility is a "Centre de Santé"	0.69	0.46	123
The facility is a "Poste de Santé"	0.20	0.40	123
The facility is public	0.66	0.48	123
The facility is religious	0.15	0.36	123
The facility is private/ngo	0.19	0.39	123
The facility is urban/semi-urban	0.17	0.38	123
The facility is rural	0.83	0.38	123
Served population size	12872.76	11570.57	123
Distance to CSR/Hospital (km)	34.85	41.80	123
Distance to supervisor (km)	60.77	58.70	123
% female workers in the facility	0.42	0.20	123
% doctors in the facility	0.03	0.06	123
% health workers in the facility	0.70	0.18	123
The facility entails a pharmacy	0.93	0.25	121
The facility head thinks that current workers can meet the demand	0.79	0.41	121
B. HEALTH WORKERS			
The health worker was there the day of the visit	0.69	0.46	326
The health worker is a female	0.57	0.50	332
Age of the health worker (years)	42.14	11.20	332
The health worker is a doctor in the facility	0.06	0.23	332
The health worker is a nurse in the facility	0.57	0.50	332
Number of weeks of medical training	9.74	15.11	328
Number of years of experience	12.56	10.13	331
Number of years of experience in this center	5.53	5.84	331
The health worker thinks that current workers can meet the demand	0.88	0.32	332
C. PATIENT			
The patient is a female	0.67	0.47	1006
Age of the patient (years)	18.61	17.39	1002
Time to go to the health facility (minutes)	50.89	332.98	1010
Cost to go to the health facility (FC)	249.36	1842.44	1012
Total Cost to go the health facility (FC)	707.79	5978.32	997
The health facility is the first visited	0.17	0.37	1014
The health facility chosen is the closest one	0.65	0.48	1014

Appendix Table 3: Descriptive Statistics at Endline (Continued)

	Mean	St.dev.	Nb. of Observations
D. HOUSEHOLD			
The household is from the Bemba ethnic group	0.46	0.50	1707
The household is from the Baluba ethnic group	0.10	0.30	1707
The household is from the Lamba ethnic group	0.10	0.30	1707
Household religion is christian	0.92	0.27	1707
Time to go to the health facility during dry season (minutes)	41.34	53.41	1698
a. All household members			
Women between 15-49 years old	0.21	0.40	9234
Children under 5	0.27	0.45	9234
Age of the household member (years)	17.17	16.13	9135
The household member is a female	0.50	0.50	9225
Literacy for 15 and above	0.57	0.49	4166
Has ever been to school	0.49	0.50	9234
Number of school years	2.59	3.56	9207
Level of education	0.63	0.73	9218
Currently at school	0.18	0.39	9234
Has worked in the last 12 months	0.32	0.47	9233
If worked, has worked in the agriculture/farm sector	0.84	0.37	2932
Time to go to the health facility (minutes)	44.34	65.59	4345
Cost to go to the health facility (FC)	266.75	1454.21	4336
Total cost to go to the health facility (FC)	4254.49	21808.55	4254
The health facility is the first visited	0.13	0.34	4357
b. Women between 15-49 years old			
Has been pregnant in the last 12 months	0.36	0.48	906
Knows whether and when she would like a child	0.85	0.36	1826
Does not want a child	0.06	0.25	1826
Desired time until next child (years)	2.34	1.07	1428
Sexually active	0.81	0.39	1888
If uses condoms, uses everytime	0.31	0.47	45
c. Women who have been pregnant in the last 12 months			
The pregnancy was wanted	0.68	0.47	1128

Appendix Table 4: Balance Checks

Facilities General Characteristics

Dependant variable	control mean	Coef. on treatment	p value	Number of observation
% Of health facility center vs health post	0.781	-0.033	0.667	129
Number of beds in the facility	8.953	1.811	0.379	129
% Patients in facility with free consultation	16.55	3.249	0.514	128
Health facility affiliation (%)				
Public	0.594	-0.043	0.616	129
Private	0.281	-0.085	0.230	129
Denominational	0.125	0.128	0.068	129
Employee in the facility				
Number of employee in the facility	6.203	-0.061	0.933	129
Number of female employee	3.281	0.377	0.347	129
Number of doctor employed	0.328	0.037	0.746	129
Accessibility				
% Facilities open six days a week	0.234	-0.023	0.757	129
% Facilities open 24h/24	0.797	0.031	0.661	129
Obstacles to service quality (%facilities for each)				
Lack of medication	0.594	-0.079	0.375	129
Lack of materials	0.703	-0.074	0.384	129
Low salary	0.672	-0.045	0.604	129
Lack of equipment	0.672	-0.057	0.509	129
Lack of water	0.641	0.011	0.898	129
Lack of electricity	0.656	-0.090	0.266	129
Lack of financial resources	0.656	-0.105	0.233	129
Operational years of the facility	20.18	-0.046	0.991	122
Population served by the facility	11.129	1283.750	0.660	122
Area served (km2) by the facility	369.0	-23.141	0.880	109

Coefficients from an Ordinary Least Square regression of the dependent variable on the treatment dummy and the urban dummy. * p<0.05, ** p<0.01, *** p<0.001

Appendix Table 4: Balance Checks (Continued)

Facilities Infrastructures and Equipment

Dependant variable	control mean	Coef. on treatment	p value	Number of observation
Infrastructure (% facilities with)				
Water Access	0.625	-0.115	0.198	129
Electricity	0.281	-0.036	0.577	129
Waste disposal	0.719	-0.037	0.650	129
Sewage disposal	0.438	0.150	0.079	129
Equipments (% facilities with)				
Pharmacy	0.844	0.095	0.092	129
Transport mean	0.484	0.171	0.055	129
Phone	0.219	-0.172	0.001**	129
Electricity generator	0.188	-0.021	0.759	129
Autoclave	0.453	0.059	0.512	129
Blood pressure cuff	0.844	-0.095	0.194	129
Stethoscope	0.984	-0.102	0.026*	129
Scale	0.859	-0.018	0.778	129
Height gauge	0.406	-0.035	0.689	129
Microscope	0.422	0.083	0.344	129
Examination table	0.672	-0.117	0.184	129
Refrigerator	0.375	-0.090	0.279	129
Delivery box	0.625	0.002	0.985	129
Fuel for generator	0.0625	-0.006	0.874	129
Kerosene for refrigerator	0.0469	0.085	0.105	129

Coefficients from an Ordinary Least Square regression of the dependent variable on the treatment dummy and the urban dummy. * p<0.05, ** p<0.01, *** p<0.001

Appendix Table 4: Balance Checks (Continued)

Staff Characteristics

Dependant variable	control mean	Coef. on treatment	p value	Number of observation
% Cell phone owner	0.646	-0.048	0.279	457
Staff age	40.31	0.010	0.992	456
Month of training	24.25	-0.928	0.592	452
Staff job position (%)				
Doctor	0.0422	0.016	0.381	457
Pharmacist	0.0844	-0.001	0.983	457
Nurse qualified	0.236	-0.015	0.707	457
Nurse	0.312	-0.008	0.846	457
Midwife	0.156	0.007	0.839	457
Adjunct	0.169	0.001	0.987	457
Staff gender (% female)	0.481	-0.097	0.041*	457
Staff level of education (%)				
No education	0.0759	-0.015	0.538	457
Primary education	0.0802	-0.016	0.539	457
Secondary education	0.312	0.063	0.148	457
Technical education	0.304	-0.045	0.286	457
Higher education	0.228	0.013	0.722	457
Job experience (years)				
Seniority as health agent	10.97	-1.685	0.095	457
Seniority in this facility	4.667	-0.768	0.226	457
Work condition				
Hours worked per week	52.10	-0.236	0.920	421
Had patients over the last month	0.873	0.018	0.564	456
Average number of patient	35.46	-2.798	0.504	392
Consider having too many patients	0.473	0.014	0.790	398
Medical staff satisfaction	0.477	0.050	0.295	457
Would like to leave this facility	0.603	-0.011	0.820	457

Coefficients from an Ordinary Least Square regression of the dependent variable on the treatment dummy and the urban dummy. * p<0.05, ** p<0.01, *** p<0.001

Appendix Table 4: Balance Checks (Continued)

Access, Cost and Service Quality

Dependant variable	control mean	Coef. on treatment	p value	Number of observation
Household distance from health center (km)	6.229	1.314	0.295	775
Number of days with symptoms before visiting the health center	17.766	-1.128	0.755	569
Time waiting at the health center before having consultation	27.759	-4.531	0.341	782
Accessibility of the health facility				
Patients visiting health center for curative care	.499	-0.033	0.352	783
Patients visiting health center for child curative care	.266	-0.044	0.153	783
Time in hours to come from the household to the health center	1.623	0.275	0.445	783
% Patients pay transportation fees to come to the health center	.07	-0.010	0.572	783
% Patients used to this facility	.817	-0.003	0.919	783
Quality of the Service at the Health Facility				
% Patients considering the health agent "friendly"	.634	-0.032	0.365	783
%Patients considering they understand much better the disease	.416	0.041	0.247	783
% Patients satisfied by the visit in the health center	.679	-0.050	0.141	783
Cost for the service				
% Patient paying a fee for the consultation	.559	-0.017	0.629	783
Patient made a gift to health agent	.015	0.012	0.244	783
Consultation				
Length of consultation (minutes)	15.846	1.032	0.382	662
Amount of the consultation fee paid by the patient	2503.609	32.048	0.939	782

Coefficients from an Ordinary Least Square regression of the dependent variable on the treatment dummy and the urban dummy. * p<0.05, ** p<0.01, *** p<0.001