Performance-Based Financing for Health: Experimental Evidence from the Democratic Republic of Congo *

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Abstract

The paper studies the effects of a financing mechanism for the health sector in which payment to health facilities is based on the volume of health service provision, as opposed to a fixed payment. Even though performance-based financing (PBF) models have been implemented in developed and developing countries in various settings and forms, the scientific evidence on the impact of these mechanisms on health outcomes remains thin. Using a field experiment in the Democratic Republic of Congo, we give evidence that financial incentives led to more effort from health workers to increase targeted service provision. Equally important, health workers did not substitute service quality or non-targeted services for targeted ones. However, demand for health services was not responsive to the increased supply-side effort. Finally, the increase in overall staff motivation happened at the expense of its intrinsic component.

JEL Codes: H52, 015, I21, I28

1 Introduction

Long-standing concerns about both the cost and the effectiveness of health services have raised a growing interest in financial incentives for medical care providers. Performance-Based Financing (PBF) is an instrument that links financing to pre-determined results, with payment made upon verification that the agreed-upon results have actually been delivered. The central idea is that a principal entity provides a reward, conditional on the recipient undertaking a set of actions to produce a desired outcome. Even though performance-related payment models have been implemented

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in developed and developing countries in various settings and forms, the scientific evidence base on the impact of these mechanisms on specific outcomes remains thin. To date, only one experimental study of the impact of PBF on health service provision and utilization has been completed in Rwanda. In this context, PBF proved an efficient way to increase health service quality and utilization, resulting in improved child health outcomes (Basinga et al. 2011, Gertler and Vermeesch, 2013). A different program providing financial incentive to village committees to invest in health and education also increased the efficiency of spendings and health worker labor supply in Indonesia (Olken et al. 2012).

This paper makes several contributions. First, it constitutes the second randomized experiment testing the efficiency of a performance-based mechanism as a way to allocate public resources to health facilities. As in Rwanda, this study isolates the incentive effect from the resource effect by ensuring resource neutrality over payment mechanism. 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 gamming. Finally, it provides a comprehensive view on the effects of PBF, including its motivational and psychological effects as well as potentially perverse effects on non-targeted outputs.

From 2009 to 2013, a research project was conducted in the Haut-Katanga district of DRC to study the effect of two types of health provider payment mechanisms, including a PBF approach that provided financial incentives linked to service delivery volumes, and a fixed payment approach. The primary objective of this research was to strengthen the evidence on the relationship between performance-related payment mechanisms and health outcomes. More precisely, the paper aims at analyzing the effect of a financial incentive mechanism on (i) the supply for health services, (ii) the price of health services, (iii) health workers' satisfaction, work-related stress and motivation, (iv) service utilization, and (v) the population health status. Theoretically, performance-based payments should increase health workers' motivation and provision of health services for those services which are purchased, which could potentially crowd out the provision for the non-purchased services as well as service quality which was not taken into account in the performance.

We find that the introduction of the financial incentives in the treatment group led to concrete changes in health workers behaviors. Facility staff were found to be present at facilities more often and they made more effort to increase service utilization by the population under performance-based payments. More specifically, it was found that fees for targeted services were significantly lower

in the PBF group than in the fixed-payment group, mainly due to the disappearance of high fees. The facility staff also organized more preventive health sessions at facilities in order to sensitize the population about the services offered by the facility and the health benefits associated with these services. Third, facilities in the treatment group were found to conduct more community-based outreach activities, such as the provision of preventative and curative services at the village level through visits to communities. Overall, the financial incentives induced an intensification of activities to increase utilization of targeted health services. Comparing the distributions of these output indicators between the PBF and the fixed payment groups reveals that a large set of incentivized health facilities responded to the incentive, although similar proportions of health offering the lowest levels of preventive health sessions and outreach activities suggest that some incentivized health facilities did not try to get their share of the cake.

Equally important, the evaluation found that introducing a financial incentive linked to service volumes did not have a negative effect on the quality of services, both for targeted and non-targeted health services (but quality did not increase either). There was also no crowding out effect on the supply for non-targeted health services.

Surprisingly, despite the introduction of different strategies to increase demand for health services by the local population, the efforts of the health workers in the treatment group did not lead to a significant increase in utilization of these services. It is crucial to think about the other barriers that impede the increase of the utilization of health services by the population. The lack of response of the population reflects that obstacles were not addressed in the strategies implemented by the incentivized health facilities, such as geographic barriers, preference for alternative treatment options (traditional care, use of the informal sector, etc.), or general dissatisfaction with the quality of care provided by health facilities (quality of care was found to be the most important factor driving demand and utilization of facility-based health services).

As facilities in the treatment group reduced the prices of their services more than comparison facilities without attracting more patients, the evaluation found that there was less total revenue in these facilities (42% less), even though on average the two groups received the same subsidy payment level from PARSS. According to evidence from the qualitative interviews, health facilities in the treatment group 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. Consequently, the financial incentive payment mechanism resulted in individual staff revenues being 34% less in the treatment than in the control group.

Finally, the financial incentive mechanism had a significant negative impact on job satisfaction of facility staff. The lower levels of job satisfaction found in the treatment group might be an effect of the limited response of the population to the newly introduced efforts to increase patient demand, which resulted in a reduction in facility and staff revenue (i.e. an increase in work led to a reduction in income). It is therefore not clear to what extent the negative effect of the financial incentive on job satisfaction is due to the exposure to the payment mechanism itself or to the difficulties induced by the overall PARSS pilot in the specific context of Haut-Katanga. It is also important to note that staff attendance was found lower in the PBF health facilities than in the comparison facilities several months after the pilot ended, while importance attached to job remuneration proved higher. These findings suggest that incentive-based payments deterred some of staff intrinsic motivation. Incentives should therefore be thought of as a permanent policy in order to steer clear of this motivational crowd–out.

There are four key policy implications of our findings. First, performance-based financing can be an efficient approach to improve the supply of priority health services; Second, the introduction of the financial incentive did not lead to a deterioration of the quality or availability of non-targeted health services; Third, the financial incentive payment mechanism lead to an overall increase in the level of health worker motivation but may have contributed to reduce intrinsic motivation; Finally, the financial incentives linked to quantity did not lead to significant changes in health service utilization by the population. These results suggest that certain strategies could be integrated into the performance-based financing mechanism in order to increase demand and utilization of health services.

The remainder of the paper is organized as follows. Section 2 discusses the existing literature. Section 3 presents the context in which the experiment was set up, the experimental design, and the research questions it seeks to address. 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 Related Literature

Before presenting the literature on the effect of perfromance-based financing mechanism, let us present briefly the literature on the effects of financial incentives (extra-pay or sanctions) given to health workers conditional on some specific output. Banerjee and Duflo (2008) provides a rigorous study on the effect of providing a financial incentive to monitor heath worker attendance. This article reports the results of a randomized experiment carried out with a district administration and a nongovernmental organization (NGO) in India. The presence of government nurses in government public health facilities was recorded by the NGO, and the government financially punished the worst delinquents. Initially, the monitoring system was extremely effective. This shows that nurses are responsive to financial incentives. But after a few months, the local health administration appears to have undermined the scheme from the inside by letting the nurses claim an increasing number of "exempt days." Eighteen months after the intervention started, it had become completely ineffective. The reason was that the increased presence of nurses did not translate into increased service utilization, therefore discouraging nurses to maintain the effort.

In the Philippines, Peabody et al. (2011) find a positive impact of financial incentives based on service quality on physicians' quality. This study is a large randomized experiment evaluating two interventions: a "bonus intervention" through which physicians could receive extra pay (5% physician's salary) based on average clinical competence scores, facility caseload and average patient satisfaction; and a "expended insurance intervention " through which health facilities received greater revenue in the form of insurance benefits covering 100 percent of costs for ordinary cases of common conditions such as pneumonia and diarrhea. 30 districts were randomly assigned to one of those two interventions or to the comparison group. Study population consisted of 617 physicians with similar characteristics at baseline. This study finds that the bonus intervention has a significant effect on service quality, similar to the effect of the "expended insurance intervention. Performance significantly improved after 12 month and the improvement persisted at each subsequent period. However, the bonus intervention had no impact on the number of patients whereas the insurance expansion boosted service utilization.

As for PBF as a mechanism to pay health facilities, there is little evidence to date on its effect on health service delivery and health outcomes. Until 2011, there are a bunch of studies of the impact of PBF but none of them use credible comparison groups. Most of these studies 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). Other studies compare 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 PBF as a way to increase accountability, efficiency, quality and quantity of service delivery. Loevinsohn and Harding (2005) reviews ten studies on the effect of contracting with non-state entities, including non-governmental organizations (NGOs), as a way to improve health care delivery, and concludes that contracting for the delivery of primary care can be very effective and that improvements can be rapid.

As pointed by Eldridge and Palmer (2009) and Oxman and Fretheim (2009), many questions, however, remain unanswered or unevaluated by these studies due to the lack of controls and the interference of confounding factors. Actually, the results might be driven by selection biases leading particular districts to adopt PBF sooner than the other districts, and/or by the natural evolution of health outcomes over time. Therefore, the methodology needs to be improved so that we can learn about the impact of PBF. Another caveat in this literature is that the use of 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. It is often not possible to disentangle the effects of financial incentives as one element of RBF schemes, and there is very limited evidence of PBF per se having an effect.

Olken et al. (2012) reports on an experiment designed to test the role of financial incentives in improving the efficacy of a village grant program in Indonesia. 264 districts were randomly assigned to receive either a block grant with no financial link to performance, or an identical block grant whose allocation among villages was 80% fixed and 20% depending on performance relative to other villages in the district, or no grant at all. Performance was assessed base on 12 maternal and child health indicators as well as education indicators. The study finds that incentives led to more efficient spending of the grant and to an increase in health workers' attendance, but not teachers. Incentivized districts performed better on health than the non-incentivized ones. This study finds no evidence of negative spillovers on untargeted outcomes and no evidence of score manipulation.

Basinga et al. (2011) provides the closest experimental study on the effect of PBF on use and quality of health services to our study. The study took place in Rwanda where 166 facilities

were randomly assigned at the district level either to pay-for-performance funding (intervention group; n=80), or to continue with the traditional input-based funding until 23 months after study baseline (control group; n=86). Payments were based on 14 key maternal and child health care output indicators with penalty if the quality is not reached. The incentive effect was isolated from the resource effect by increasing comparison facilities' input-based budgets by the average pay-for-performance payments made to the treatment facilities. This study finds that the PBF induced an increase in the number of institutional deliveries and in the number of preventive care visits by children under five, although no change in prenatal care visits or immunization. It also finds an increase in some measures of technical quality and in health workers' productivity (as measured by the gap between knowledge and actual practice)? Finally, the study finds significant improvements in child health outcomes. Overall, the impact of PBF proved very positive in Rwanda.

To conclude, the literature on the effect of PBF on health outcomes is limited due to the small number of studies providing clean identification of the impact of the incentive. Except Basinga et al. (2011) and Olken et al. (2012), most studies do not provide a credible counterfactual group and do not isolate the incentive effect from the resources effect. Also, few insights are provided on mechanisms explaining the effects of PBF, like motivational and psychological effects. However, existing papers consistently find positive effects of performance-based financing systems on health care provision and outcomes.

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) would 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 baseline sample entails 152 health facilities (5% referral centers, 71% health centers and 24% health posts)[1]. Descriptive statistics from the baseline sruvey are presented in Appendix Table 4. The baseline survey indicated that the 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[2], 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.

But 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, fixed wages represented only 37% of the total income of facility staff, except for doctors whose fixed wage was a great share of the total income (74%). Another 24% of staff total income came from bonuses. So the typical health worker earn 61% of her income from the health facility, while 39% from other jobs and/or agricultural production. On average health workers spent 52 hours per week working in the health facility and received 35 patients in the last week. This 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), but also short waiting time before the consultation (30 minutes on average)[3]. 56% of patients had to pay a fee for the service, the median fee for a visit being 800FC (0.88$).

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 as the main diseases. Concerning maternal health, 69% of births in the last 12 months were attended in a formal health facility. Mothers utilized more prenatal than postnatal health services: 76% of women had at least one prenatal visit

[1] 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.

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

[3] The 2009 survey did not allow for assessing the technical quality of medical procedure.

while only 10% attended a postnatal visit. However, only a third of prenatal visits included the minimum tests, according to women's recall. Despite a high exposition to immunization campaign, only 13% of children under 5 years-old werer able to present an immunization card (although based on mother's declaration a majority of children got immunized at least once). Finally, we found a low exposure to prevention campaigns other than immunization, with around two thirds of the households never exposed to HIV prevention or child nutrition and maternal health campaign.

3.2 Experimental Design

Formally, payments to health facilities can be written as:

$$P_i = \alpha + \beta Q_i$$

where P_i is the payment to facility i, α represents its fixed component, Q_i is a vector of quantities of service provided by facility i, and β is a vector of prices for each targeted service. In Haut-Katanga district, a PBF mechanism was introduced using a pur point system linked to the volume of targeted services delivered by contracted facilities on the one hand ($\alpha = 0$ and $\beta > 0$), and a pur fixed payment on the other hand ($\alpha > 0$ and $\beta = 0$)[4]. In order to ensure neutrality in the level of financing between the two groups and allow for comparison of the two payment mechanisms independent of the level of money put into the system, the impact evaluation design was such that the total budget allocated to performance bonuses across health facilities in the intervention group was to be the same as the total budget for lump sum payments allocated across all health facilities in the comparison group:

$$\sum_{i=1}^{n} \alpha = \sum_{i=1}^{n} \beta Q_i$$

where n is the number of health facilities in the PBF and in the fixed-payment group. Hence, noting $\overline{Q}^{PBF}$ the average service provision in the PBF group:

$$\alpha = \beta \overline{Q}^{PBF}$$

Therefore, there are two ways to equalize total payments to the PBF and to the fixed-payment groups. One way, which was used in the Rwanda experiment, is to fix β and adjust α accordingly

[4]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.

at $\beta\overline{Q}^{PBF}$. The other way, that was used in this experiment, is to fix α and adjust β accordingly at $\frac{\alpha}{\overline{Q}^{PBF}}$. Facilities' payment was thus determined by the quantity of services provided relative to the other health facilities. The reason for choosing the second adjustment mechanism was that the budget available was fixed and could not vary every month depending on the average service provision in the PBF group as would require the first adjustment mechanism. 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)[5].

The 96 health areas of the district (totalizing 152 health facilities and a catchment population close to two millions) were randomly assigned to one or the other payment system. Payments were to be made on a monthly basis after verification of declared results by facilities in the treatment group. The incentivized 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 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.

According to the design of the pilot, the volume of services was measured by use of monthly information reports submitted by facilities in which the number of services delivered each month were reported. Subsequently verification of declared service volumes was conducted by verification agents through (i) comparing reported volumes with those found in health facility registers, and (ii) verifying that the information noted in the registers was true by conducting community verification by selecting a random sample of patients from registers and visiting them to ensure that they actually visited the facility and received the services noted in the facility registers. Table 1.3 shows that the frequency of verifications of registers was equal in both groups, with on average 7 visits in the last 12 months both in the PBF and in the fixed-payment group (line 1).

For community verification, independent associations should audit regularly 30 patients per health area the check the accuracy of the information reported in the facility registers. The 30 patients were chosen such that each targeted service is present in the sample, but none of the non-targeted services. A system of financial sanctions was supposed to be integrated into the process in order to reduce providers' incentives to submit fraudulent reports and over-reporting of phantom patients. In reality, the community verification system proved weak: first, PBF facilities only

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

received on average 3 community verifications throughout the pilot. One community verification on average occurred in the comparison group as a way to compare the level of cheating between the PBF and the comparison groups (Table 1.3.b, line 1). Second, there was actually no 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 verified through community identification. For example, if 18% of patients were not found through community verification, the facility would only receive a reduction of 18% in their total payment and no additional sanctions were enforced.

In contrast, the amount allocated to each facility in the comparison group was calculated based on the staff in the facility: a list of eligible workers was established at the beginning of the pilot conjointly by Ministry of Health; each worker received a given payment depending on his/her grade and experience.

3.3 Research Questions

The overall objective of the research is to estimate the effect of performance-based payments compared to fixed payments. As the project started, we envisioned and proposed to test the following hypotheses:

Availability of Health Services Does the financing mechanism lead to an increase in the quantity of targeted services provided? The channels of such an increase could be any action allowing for more patients receiving targeted services per day: larger opening hours, more on-the-job effort, higher availability of inputs (medical, drug management, financial). In contrast, is there a crowding-out effect on non-targeted services? Providing incentives for a limited number of services might lead to a reduction in the provision of the non-targeted services, or a change in the quality of care.

Relatedly, we would like to know which health facilities are the most responsive to the PBF mechanism: do those health facilities which provide already more services respond more, or those health facilities which provide initially few health services? Theoretically, we might expect a higher response from those which provide few services since the margin of improvement is higher. However, it might be easier for those facilities who provide more services to increase service provision if the factors explaining that they provide already more (staff motivation, existence of a local demand) also facilitate an increase in service provision.

Cost of health services Does the financing mechanism lead to a change in user fees for targeted services and non-targeted services? Changes in user fees in the intervention 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, and/or as a way to discourage demand for non-targeted services.

Health workers' satisfaction, anxiety and motivation Does the financing mechanism influence the motivation of health personnel? We expect to observe an increase in the motivation of health personnel since their effort will be more rewarded with the performance-based payment mechanism than with the lump-sum payment. A change in the nature of motivation may also occur, with a switch from intrinsic to extrinsic motivation. Change in staff satisfaction can go in both directions: health personnel may end more satisfied with performance-based payments than with fixed payments if they get more utility from the higher efficiency of the health service delivered. They may also end less satisfied in case of increase in pressure and stress at work, or if they lose too much intrinsic motivation.

Service utilization How does the increased performance in the intervention group influence the health-seeking behavior of the population? We hypothetize that the positive effects on supply and prices of targeted services dominate the negative effect on quality of targeted and non-targeted services, as well as the negative effect on prices of non-targeted ones. Under this hypothesis, we expect to observe an increase in the utilization of targeted services, while a decrease in utilization in non-targeted services.

Population health status What is the effect of the financing mechanism on the morbidity and the mortality of the population? We expect a reduction in morbidity and mortality caused by better access to those services that have been targeted by the financing mechanism.

4 Data and Empirical Strategy

4.1 Data

4.1.1 Sources

Five sources of data were used for the impact evaluation. First, a baseline survey was administered in Sept-Nov 2009. Second, administrative data from IRC/PARSS was collected from January 2010 to December 2012. Third, a qualitative survey was administered to a sub-sample of 30 health facilities in April-May 2012. Fourth, unannounced visits (spot-checks) were performed in July, August and September 2012 in order to collect objective data on worker attendance in the health facilities. Finally, a final survey was administered in December 2012-February 2013. The endline sample used for the main analysis included 96 health areas (123 health facilities) and 1,708 households. As the sample of health facilities taking part in the impact evaluation changed between baseline and the beginning of the pilot, only about 70% of health facilities were included in both the baseline and endline surveys. As a result only the endline survey was used for estimating the impacts of the program. Figure 2 presents a flowchart of the project to visualize when data collection took place with respect to payment implementation.

4.1.2 Sampling strategy and Outcomes of Interest

Administrative Data Administrative data was collected every month from all 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 outcomes (% 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 one 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.

Endline Survey The endline survey entailed four questionnaires for the facility head, health workers, patients straight out of consultation, and households living in the neighborhood. All the four endline questionnaires focused on the functioning of the health facilities, attendance, motivation and remuneration of health workers, the cost of health services, the technical and non-technical quality of health services, health service utilization, population health status and patient satisfaction.

The endline survey was administered to 123 health facilities out of the 152 facilities involved in the experiment. It was meant to be administered in all 152 health facilities but attrition took place for two reasons: the rainy season and the insecurity created by the maï maï made it impossible to reach 29 health facilities. Attrition occurred at the same rate in both groups, with 61 health facilities in the PBF group and 62 in the fixed payment group at endline.

All the technical health facility staff in each sampled health facility was interviewed. 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) were not interviewed.

A sample of ten patients (or the maximum available if fewer are present) per facility was randomly selected for exit interviews. Finally, 20 households were interviewed in each community, among which 10 households representative of the population and 10 representative of those households in which a pregnancy/birth has taken place in the last 12 months[6].

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 our endline sample.

4.2 Empirical Strategy

Validation of the Experimental Protocol All the validity of a randomized experiment relies on the comparability of the control and the treatment groups. With a large number of units of

[6]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.

randomization, the law of large numbers insures that the characteristics of both groups are balanced, so that the two groups are perfectly comparable. We randomize 96 health areas, which is not a very large number of units of randomization. Therefore, it is necessary to check that the characteristics of the control and the treatment groups, at least on some observables, are balanced.

Despite randomization, it happened that 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 location is likely to be correlated with many characteristics of the health facilities, staff, patients and households in the neighborhood, Appendix Table 4 present the means of some observables collected at baseline 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 an urban area. We find 4 significant differences out of 62 tests, meaning 6%, which is under to what is expected with perfect balanced groups when testing differences with the significance level of 10%. So we are confident that most differences in outcomes at endline between the two groups are not driven by initial conditions.

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 is either health areas, or health facilities, health workers, patients straight out of consultation or households living in the neighborhood. We control for a set of characteristics X that varies according to the unit of observation: At the health area level, it includes a dummy indicating whether the majority of the health facilities in the area are urban. At the health facility level, it includes a dummy indicating whether the health facility is urban. 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 Effects of Performance-Based Financing on Payments to the Health Facilities

Understanding of the Payment Mechanism The facility heads and health workers were asked whether they knew how the payment was calculated. In the comparison group, only 22% of facility heads and 9% of health workers reported that they knew how the payment was calculated. We expected a larger proportion since the payment in the comparison group was quite simple (it was fixed and depended only on the number of health workers registered in the governmental payroll). It is possible that the question itself was not understood by some facility heads and health workers in the comparison group because they assumed it was irrelevant to declare that they knew how a fixed payment was calculated. In fact, the question was more relevant in the PBF group where the payment was not fixed. In the PBF group, 42% of facility heads and 18% of health workers reported that they knew how the payment is calculated (Table 1.1, lines 1 and 5), which reflects a rather low understanding of the payment.

Those who declared they knew how the payment was calculated were asked whether the payment was conditional or unconditional, and –if conditional- on which condition (lines 2-7). All in all, the exact calculation of payments was unclear but the fact that payments increased with service provision in the PBF group and was fixed in the other group was very clear.

About two thirds of facility heads and health workers perceive the payment as fair, in the sense that they are confident that what is paid is what is earned (lines 4 and 9). This proportion is the same in the PBF as in the fixed-payment group.

Implementation of the Payments As shown in Figure 2, the payments started in June 2010. The last month in which services provision was used to calculate payments to the PBF health facilities was September 2012. The last month in which payments took place was December 2012. Payments were interrupted from December 2011 to March 2012 due to the political insecurity created by national election in November 2011. Payments due within this period of time were disbursed from April 2012 on, grouped with later payments.

Over the two year and half period the two groups of health facilities received the same level of bonus payments (on average $550 per month per facility) (Table 1.2, line 1). Therefore, the main differences between the two groups were (i) the financial incentives generated by the two different payment mechanisms, (ii) the level of community verification of results, and (iii) the level of financial autonomy facility managers had in using the payments to distribute financial bonuses to facility staff.

Figure 3 shows the distribution of average payments received over the whole study period by treatment status. Payments proved more disperse under the PBF regime than the fixed-payment regime: PBF induced more low and high payments, and less medium payments. This result suggest heterogenous responses to the incentive, with some health facilities getting less than under a fixed payment mechanism and others getting more.

The PBF scheme induced more volatility of the payments received by the health facilities than the fixed payment scheme (Table 1.2, line 2), which indicates that the provision of health services relative to the other health facilities is more volatile than staff composition. Indeed, the standard deviation of the payments received by the health facilities is 26% higher in the treatment group than in the comparison group. The ambiguity of expected revenues may have led to feelings of insecurity and inability to financially plan among staff in the treatment group facilities.

It was found that the flexibility provided to health facility managers in the treatment group with respect to bonus allocations among facility staff led to a more egalitarian distribution of payments across health workers, with a higher proportion of non-technical staff receiving bonuses in the treatment group than in the comparison group. In the comparison group, 77% of health workers receive a portion of the payment (Table 1.2, line 5). The list of health workers eligible to receive the payment was established upfront at the beginning of the experiment and updated one time in November 2011. In contrast, no rule about who should benefit from the payment was established for the PBF group. The facility heads could thus decide who should receive the

payment. Given this setting, it is interesting that the proportion of workers who received the payment turned out to be significantly higher in the PBF group, reaching 93% of workers according to the facility heads. It seems that PBF benefitted mostly to non-technical workers (pharmacists, managers, secretaries, receptionists and maintenance workers) (line 6). This suggests that facility heads are more egalitarian than the health authorities who decided on eligibility, may be due to the interpersonal proximity to the workers. Consistently, the average last PARSS payment to health workers was less disperse in the PBF group: the standard deviation is 36% lower in the PBF group than in the comparison group (Table 1.2, lines 7 and 8), which confirms the finding of a more egalitarian distribution in the PBF group.

Accountability As payments were linked to the volume of services delivered, there was a natural risk of over-reporting by facilities in the treatment group. In order to curb this, payments were supposed to be contingent on two routine verification procedures.

The first verification took place at the facility level to check the consistency between facility registers and information sent to service purchaser. The evaluation found that the propensity for facilities to over-report on service volumes decreased with the intensity of verification. As shown in Figure 4, the number of invalid patients proved actually higher in the PBF group than in the comparison group in 2010, suggesting that the PBF health facilities tended to over-report service utilization in the short-term. But there were fewer discrepancies between declared and validated services as supervisors strengthened the attention paid to patient records. Actually, we find that the PBF system improved the quality of patient records. Indeed, health facilities in the PBF group had a strong financial incentive to keep complete records of their patients, whereas the comparison group had no such direct incentive. One key element of the construction of administrative data is consultation reports which are the material used to fill out the register. In the endline survey, we asked health workers whether they write a consultation report for each patient. We observe that health workers in the PBF group were significantly more likely to fill out consultation reports for their patients than in the comparison group (Table 1.3, line 2): in the PBF group, 94% of health workers declared that they fill out a consultation report for each patient, whereas only 78% of health workers in the comparison group (the difference is significant at the 1% level). In the absence of a consultation report, the patient is not reported in the register. Therefore, service utilization is under-reported in the fixed-payment group.

The second verification was performed in the community in order to check that patients recorded on the facility registers coud confirm that they visited the facility for the reason indicated on the register. Despite the weak verification process, we did not find any significant difference in the propensity to report fantom patients: 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 (Table 1.3.b, line 2).

5.2 Effects on Health Service Provision

5.2.1 Cost of Health Services

The facility head was asked about the user fees for each available health service at the time of the survey. In order to compare the fees across the largest number of health facilities of our sample without losing too many observations, we report the user fees used for the most commonly offered services: first and second (or more) curative consultations, birth delivery, first and second (or more) 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 that aggregates information over all these user fees (following Kling et al, 2007). Finally, we present separately a Fee Summary Index for targeted services and a Fee Summary Index for non-targeted services in order to explore the potential price distortion induced by PBF scheme. Results are reported in Table 2.1.

We find consistent evidence that user fees for targeted services were lower in the PBF health facilities than in comparison health facilities. The effect is large, although some estimates are imprecise (we find large differences in user fees across health facilities as shown by user fee standard deviations in column 4). 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. As a result, 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). Figure 5 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 mainly results from the response of those health facilities which would have offered high prices under a fixed payment mechanism.

In contrast, the average user fee for non-targeted services did not differ significantly between the two groups, and the difference is smaller. The mean Summary Fee Index for non-targeted services of the PBF group 0.4 standard deviations below the mean of the comparison group, but statistically similar to it (p-value 0.35). Figure 6 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 much the path of fees for the others. However, we can reject the idea that the health facilities manipulated the fees for the non-targeted services to compensate the reduced fees for the targeted ones.

Table 2.1 confirms that the results found on service prices are robust when the information used comes from the households and patients straight out of consultation. We also find the price of drugs sold at the health facility halved in the PBF group compared to the comparison group. 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 results 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 and increase payments.

5.2.2 Availability of Service Delivery

Table 2.2 presents the effects of PBF on the availability of health service delivery: health facility opening, staff attendance, supply for new services and supply for preventive sessions at facilities.

Health Facility Opening and Staff Attendance Results show that the PBF did not change the extent to which health facilities are open. The interviewers did not announce their visit to the health facilities in order to measure the natural proportion of open health facilities. They found 92% of health facilities open, and this proportion did not significantly differ in the PBF group and

in the comparison group. Interestingly, about the same proportion is found when asking patients and households whether they could consult each time they visited the health facility (resp. 94% and 87%). According to the information from 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 quasi-nonexistent.

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. To measure objectively staff attendance, we implemented unannounced visits in the facilities. Three visits were performed in July, August and September 2012. We find that worker attendance in July, August and September 2012 was higher in the PBF group than in the comparison group (58% in the comparison group while 65% in the PBF group, corresponding to a 14% increase significant at the 10% level). Figure 11 shows the distribution of staff attendance at facilities during the pilot 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 larger staff attendance in the PBF group suggests that the incentive induced more staff motivation than fixed payments. This stronger motivation due to the incentive was echoed by the declaration of the health workers from the PBF group 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".

Supply for New Health Services Another way to improve the availability of health services is to offer more services. Out of a list of 23 health services that could be offered, the typical health facility offers 14 services. 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%. The other services are less frequent. The PBF health facilities do not offer more services than the comparison ones. A plausible hypothesis would be that they would

offer more targeted services. Out of the 10 targeted services, health facilities in the comparison group offer on average 8 services and we find that the PBF health facilities do not differ from the comparison ones. PBF health facilities do not offer less non-targeted services neither.

Supply for Preventive Sessions at Facilities PBF induced more preventive sessions at facilities in the last 12 months than fixed payment (120 instead of 100), although the difference is not significant. In fact, the increase mostly comes from the supply for preventive sessions 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 (the difference is significant at the 5 percent level). Figure 7 shows that this increase does not take place at very low levels but rather at medium and high levels of the distribution of the supply for preventive sessions for targeted services, suggesting a positive response from a large set of incentivized health facilities excluding the ones which offer almost no preventive sessions at all.

The PBF health facilities also offered 11 more preventive sessions at facilities for non-targeted services (postnatal care and VIH prevention), but the difference is not significant[7]. To conclude, we find a positive effect of PBF on the supply for preventive sessions at facilities, concentrated on targeted services. At least, the increase in supply for targeted services with respect to the comparison group did not happen at the expense of non-targeted services, confirming the result on prices that health facilities did not substitute targeted services for non-targeted services.

5.2.3 Outreach Activities

We use three sources of information to assess the effects of PBF on the number of outreach activities in the last 12 months: facility heads (who report the number of outreach activities performed at the facility level), health workers (who report the number of outreach activities that they performed themselves), and patients straight out of consultation (who report the number of outreach activities performed in their community).

Table 2.3 presents the effects of PBF on outreach activities. We find that the number of outreach activities for targeted services is consistently higher in the PBF group, although estimates are quite imprecise (the difference is significant at the 10 percent level using information from the

[7] 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.

health workers, and not significant using information from the facility heads and patients). Yet, differences between the PBF group and the comparison group are sizeable: we find a 32% increase according to facility heads, and a more than 50% increase according to both health workers and patients in the PBF group compared to the comparison group. By contrast, the differences in the number of outreach activities for non-targeted services between the PBF and the comparison groups are small and p-values are large, suggesting no increase at all. Again, we can reject the hypothesis that non-targeted services were substituted for targeted services. The distributions of the number of outreach activities in the last 12 months by treatment status are reported in Figures 9 and 10 (for targeted services and non-targeted services repsectively). The absence of change in the supply for outreach activities for non-targeted services holds for all health facilities, while the increase in outreach activities for targeted services is more important at medium and high levels in the distribution.

To conclude, although we are not always confident to reject the possibility that the observed differences are just due to random sampling errors, the consistency of the information coming from different sources and the large effect sizes make it likely that PBF induced a larger supply for outreach activities for targeted services than in the fixed payment group, which did not happened at the expense of non-targeted services. In the qualitative interviews, health workers from the PBF group reported many outreach strategies.

5.2.4 Service Quality

Table 2.4 presents the effects of PBF on health service quality: technical quality, patients' understanding of diagnosis and prescriptions, and patients' satisfaction.

Technical Quality of Health Services Consultation time is considered as a measure of the quality of care. On average, a consultation last between 16 and 17 minutes, depending on whether we consider patients or household members' declarations (it is interesting to see that both sources of information give consistent estimates as average consultation times are actually very close). We don't observe any change in patients' consultation time due to PBF, although we do observe a significant impact when the consultation time is reported by household members: consultation time is found 17 minutes in the comparison group whereas 20 minutes in the PBF group. This finding at least dispels the fear that incentives based on quantity of health services would imply maximizing the number of patients at the expense of time spent with each of them.

Another measure of the quality of health services is compliance with standard medical procedures. Compliance was assessed on all patients straight out of consultation on one hand, as well as on pre and postnatal care for women that gave birth in the last 12 months on the other hand. Patients straight out of consultation were asked whether the three following procedures were applied during their consultations: being weighted, examined and have his tension checked. On average, 35% of these procedures were applied and this proportion was not affected by the PBF. Women who gave birth in the last 12 months were asked about standard procedures applied at least once 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 find that 67% of prenatal procedures and 62% of postnatal procedures were applied. We don't observe any impact of the PBF on compliance with these specific procedures neither.

According to the patients straight out of consultation, we also note that drugs were prescribed without patient being examined (40%). On average, women stayed three days in the health facility after giving birth. The PBF had no impact on these measures of quality of care.

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. Overall, we don't find any consistent trend that allows us to conclude that the PBF improves the quality of health services. However, it is important to note that the PBF system implemented in Haut-Katanga was not based on any quality measures unlike other systems with more complex refinements. Considering this, we could even have expected degradation in the quality of health services in the PBF group due to the focus put on the quantity of health services, which did not occur even though the PBF did not pay for quality.

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 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 (nor on criteria of satisfaction and dissatisfaction, although this would have been very surprising).

5.3 Effects on Health Service Utilization

As shown in Table 3, the PBF did not have any impact on the number of patients the month before the survey. On average, 50% of the household members visited a health facility in the 12 months before the survey. The PBF had a small negative effect on this proposition reducing it to 47% of the households members. Looking at another indicator of service utilization, we observe that 25% of people in the population was sick and did not visit a health facility in the last 12 months (the others being either not sick or sick but visited a health facility). The PBF had no effect on this unmet demand. Finally, the last indicator is the number of days household members waited before visiting a health facility when they were sick. Through the use of lower user fees than under fixed payment, the PBF could have reduced this delay but it did not: on average, when they were sick in the last 12 months, household members waited between 3 and 4 days before visiting a health facility.

In our sample, most of the children between 0 and 5 years old received at least one immunization shot. This high rate (85%) is confirmed by the objective measure of the tuberculosis immunization: the enumerators could see the TB immunization scar on the arm of 60% of our sampled children. The PBF did not have any impact on immunization.

Among the women who gave birth in the last 12 months, 82% delivered in a health facility. Regarding pre and postnatal care, women got three prenatal visits and one postnatal visit on average, almost all of them attended by a health worker. Moreover, 38% of these women were supplemented in iron and 54% took drugs against malaria. Finally, mothers breast-fed their child for five and a half months on average. The PBF had no impact on the perinatal outcomes. It did not have any impact neither on the use of family planning. Only 5% of women aged 15-49 use a modern contraceptive method (pill, shot, condom, IUD, spermicidal, implant and sterilization).

Our findings on service utilization bring an important lesson that health is not a classic market. The lower user fees and price of drugs, the higher supply for scheduled preventive sessions and the larger number of outreach activities compared to the comparison group did not attract more patients. This finding echoes the results from the baseline survey that health workers spent large amounts of time in the facility for an average of 2 patients per working day, which is very low. The problem of low demand for health services was serious to start with and could not be addressed by the pay-for-performance mechanism.

Several reasons could explain the lack of response of the population. First, prices of health services work as signals for health service quality. In this case, lower service prices might make people think that service quality is low, resulting in a lower demand for health services. Second, people might be reluctant to use health services because they are not familiar with these services and do not fully understand its benefits. In contrast, people might be more familiar with traditional medicines because they have known it since ever and believe more in its efficiency. 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. Finally, people might have procrastination problems facing a present cost of health service for a future benefit. Poor families face so many challenges a day causing stress and preoccupation that it might be difficult to carefully weigh the benefits of health services and place health service utilization in the top priorities of the day. This situation leads people to postpone the decision to visit a health facility in the future, which in the end causes a severe obstacle to health service utilization. This is when financial incentives for users can help.

5.4 Consequent Effect on Health Facility Revenue

How did PBF affect the total resources available for the health facilities and workers? Since the price-elasticity of the demand for health in the population proved nil, the lower user fees and price of drugs caused reduced total resources in PBF health facilities compared to comparison ones. Table 4 examines all sources of revenue at the facility level the month before the endline survey, as well as workers' payment the month before the survey and the quality and quantity of equipment and infrastructure at facilities.

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). This result is consistent with our previous findings that PBF led to lower user fees and price of drugs than fixed payments and that service utilization remained unchanged. This result is also consistent with the declaration of facility heads during the qualitative interviews.

Workers' Payment Consistently with reduced total resources, total salary to health workers was significantly lower in PBF health facilities than in comparison ones. According to the information provided by the facility head, we find a 34% reduction in workers' total payment, primarily due to a significant reduction in the other sources of payment (mainly the facilities' own revenue from user fees and drug sales, and secondarily NGOs' grants). Governmental wages and PARSS payments are not statistically different in the PBF and the comparison group. The reduction in workers' salary is thus the consequence of the reduction in user fees and price of drugs compared to the comparison group. We find the same result using the information from the health workers themselves (a 28% decrease in the total payment the month before the survey in the PBF group compared to the comparison group, due to lower income other than the wage from the government).

Quality of the Facility Infrastructure and Equipment The quality of the infrastructure and equipment in health facilities also depends on health facilities' resources. We constructed three indices to measure the quality of the infrastructure and equipment at the facility level. Each index is the first component of a principal component analysis which includes the following items: - 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. - 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.

Examining the findings for these three indices shows a significant negative impact of PBF on the quality of equipment. 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. However, it is worth noting that PBF facilities are more likely to permanently display the user fees and drugs' costs in the facility.

Furthermore, the mean equipment index in the PBF group is 0.64 standard deviations below the mean in the comparison group (line 3). When looking at each component of this index, we observe 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 (DTaP, Poliomyelitis, BCG, Measles and Yellow Fever) and nine common drugs (oral rehydration salts, paracetamol, co-trimoxazole, ampicillin, metronidazole, quinine sulfate, mebendazole, tetracycline and Ringer's solution). 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 might be related to the reduced health facilities' resources in the PBF group. Because of the lack of resources, it is likely that PBF health facilities had difficulties in investing in new equipment and renewing the existing one.

5.5 Effects on Staff Satisfaction, Anxiety and Motivation

5.5.1 Staff Satisfaction, Stress and Anxiety

Table 5 presents the effect of PBF on staff satisfaction, stress and anxiety. 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.

Job Satisfaction On a scale from 0 to 10, the average level of job satisfaction was close to 6 for the facility heads and the health workers. However, 70% of them would go for a position in another health facility, mostly for financial reasons. The PBF had a significant negative impact on the job satisfaction of facility staff – going from 5.7 to 4.9 which correspond to a 14% decrease. 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", "no patient, no money".

Subjective Workload Overall, more than half of the facility staff found their workload heavy (53%), felt that they had too much work (61%) and that they were tired (56%) in the last seven days. The PBF had a strong significant impact on all these indicators of perceived workload and declared fatigue, in particular for the second indicator with a 28% decrease: only 44% of the facility staff in the PBF group felt that they had too much work in the last week. As discussed in the previous sections, this does not reflect the effective workload which proved similar in both groups. One reason for this could be the disappointing impact of the effort facility staff made to increase the number of patients.

Conflicts, Stress and Anxiety As described earlier, PBF induced higher volatility of payments than fixed payments. This volatility could be a source of stress and anxiety for both the facility heads and the health workers and overall, we note that this concern is shared by 39% of the facility staff. In terms of impact, we observe a 24% increase in the PBF group compared to the comparison group, although the difference is not significant at conventional level (P-value = 0.11). However, when looking only at the facility heads we see a very strong and significant impact of the PBF on this concern which increased by 72% the proportion of facility heads that worried about the volatility of their remuneration. It is important to note that this effect does not reflect the concern around low remuneration on which we observe no impact of the PBF. In terms of conflict, the PBF could have impacted both the competition between facilities – as the payment of each facility depends on the performance of the others – and the competition within workers – as the PARSS payment distribution among health workers can be autonomously decided by the facility head. As for external competition, 36% facility staff reported that the facility is in competition with other health facilities. The PBF had no impact on this perceived external competition. As for internal competition, the facility staff declared a level of conflict of 1.72 on a scale from 0 to 10 which seems

quite low. Moreover, 7% of facility staff declared that the payment allocation within the health facility was a source of conflict with no effect of the PBF on this proportion.

5.5.2 Staff Motivation

Table 6 presents the effect of PBF on staff attendance after the pilot ended and importance attached to job remuneration, as measures of health workers' motivation. Staff attendance after the pilot ended gives evidence on intrinsic motivation since workers are no longer incentivized. Importance attached to job remuneration also gives evidence on how the financial incentive affected the nature of health workers' motives with respect to their occupation.

Staff Attendance after the Pilot Ended The positive effect of the incentive on staff attendance during the pilot reversed at the time of the endline survey, when the incentive had disappeared. The number of workers observed by the interviewer when s/he arrived was 4 in the comparison group but less than 3 in the PBF group (significant at the 5% level). Note that the interviewers did not announce the day they would arrive in each facility to avoid manipulation of staff attendance. This final spotcheck took place 4-5 months after the payments stopped. Figure 12 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. This result is confirmed by worker attendance rate in the last seven days, which decreased from 78% down to 71% (the estimates look very close whether the information comes from the facility heads or from the health workers, but the estimate is more precise based on the information from the health workers, p-value 0.04). We also find that those workers who were found present in the facility as the interviewer arrived demonstrated less on-the-job effort: the number of workers who were in consultation was significantly lower in the PBF group (2.1 in the comparison group versus 1.3 in the PBF group).

The financial incentive thus induced higher staff motivation compared to fixed payments during the pilot, but motivation reversed at a lower level than in the comparison group after the incentive stopped. The reversal suggests that PBF changed not only the level of motivation but also the nature of the motivation, from intrinsic to extrinsic. Actually, without any change in the nature of motivation, the level of motivation would have been back to normal when the incentive stopped. The fact that attendance proved lower in the PBF group than in the comparison group after the incentive stopped gives evidence that workers in the PBF group lost a part of their intrinsic

motivation during the pilot.

Related to staff effort, we also examined the length of waiting time before consultation, as reported by patients straight out of consultation and household members who visited in the last 12 months. Whatever the source, the average waiting time before consultation is 15 minutes and it does not differ between the PBF and the comparison health facilities. Overall, this is pretty short waiting time, suggesting low demand for health services. Therefore, the barrier to increase the number of patients does not seem to be primarily staff motivation but rather lack of demand.

Importance Attached to Job Remuneration On the one hand, 35% of facility heads and health workers declared that they place much importance on job remuneration and the PBF has no significant impact on this proportion. On the other hand, 38% of facility staff emphasized financial benefits as the main advantage or disadvantage of their position as opposed to social recognition and responsibility over the population (note that for at least two thirds it's a disadvantage). The PBF significantly increased by 34% the proportion of facility staff emphasizing financial benefits as the main advantage or disadvantage of their position (this proportion was found 38% in the comparison group whereas 51% in the PBF group).

To summarize the psychological effects of PBF, we first observe that PBF decreased the subjective workload but also job satisfaction in the facilities. Second, PBF increased facility heads' concern about the volatility of their remuneration. More importantly, we find that PBF increased workers' attendance as long as the incentive is there, but attendance felt below its level in the comparison group after the incentive stopped, and more importance is attached to financial remuneration in general, which suggests a shift from intrinsic motivation to extrinsic motivation.

6 Conclusion

This study examines a performance-based payment mechanism to health care providers compared with a lump sum payment mechanism that was not performance-related in the district of Haut-Katanga, DRC. The findings show that the incentives led to increased availability of health services at the facility and community level for those health services that were included in the performance measure, without crowding out non-purchased services nor service quality. These findings show that margins of improvement exist on the supply side in the health sector in DRC. Finally, we find that financial incentives led to greater staff motivation while detterring some of the intrinsic

motivation. This finding points to the sensitive nature of motivation and adds to our understanding of the dynamic between motivational crowd-out and extrinsic motives. From a policy point of view, this finding suggests that financial incentives should be used as a permanent policy rather than a temporary policy in order to limit the adverse effects of motivational shift.

Importantly, these changes did not lead to significant changes in the coverage of health services because the population did not respond to the increased supply for health services. This finding points to the fact that health products are not normal goods: substantial decreases in prices were not able to encourage more demand, nor did larger availability of health services. Health should thus not be thought of as a market. Specific interventions to stimulate demand for health should be combined with supply-side interventions like PBF. Since people proved sensitive to service quality, one possibility would be to include service quality in the set of purchased performances 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

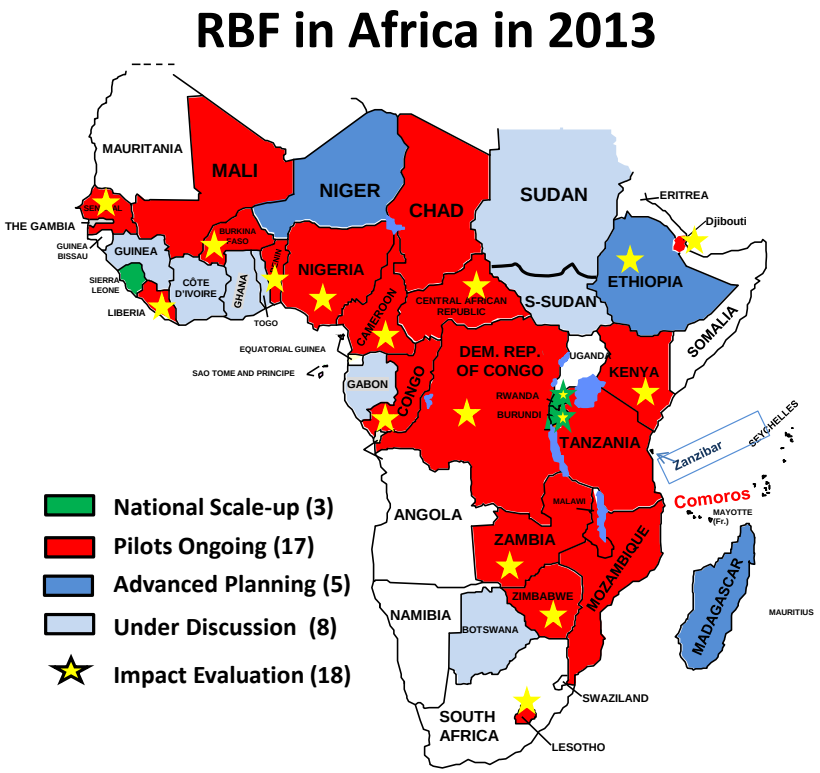

Figure 2: Flowchart of the Haut-Katanga PBF Pilot

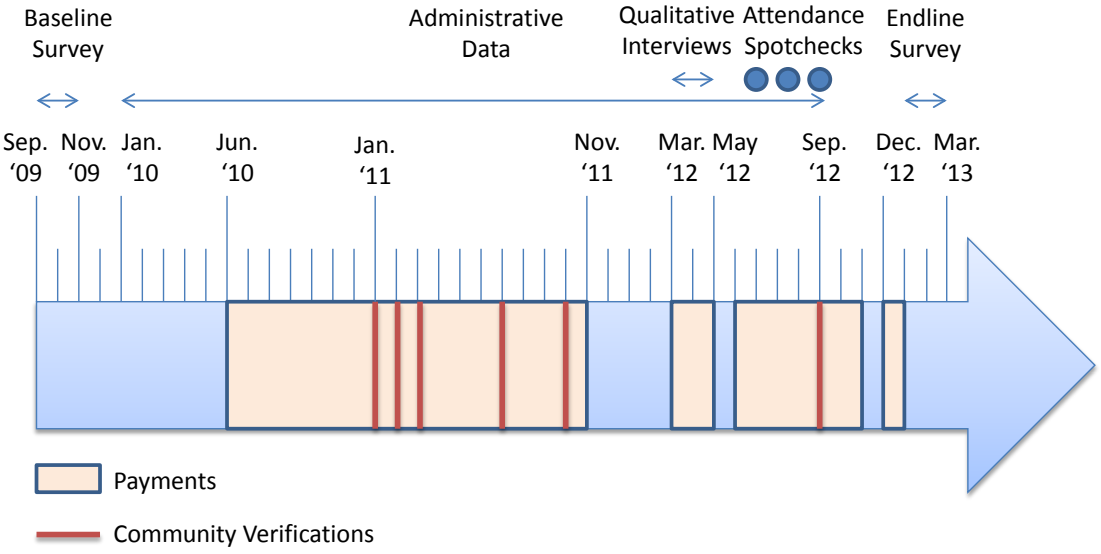

Figure 3: Payment Distribution, by Treatment Status

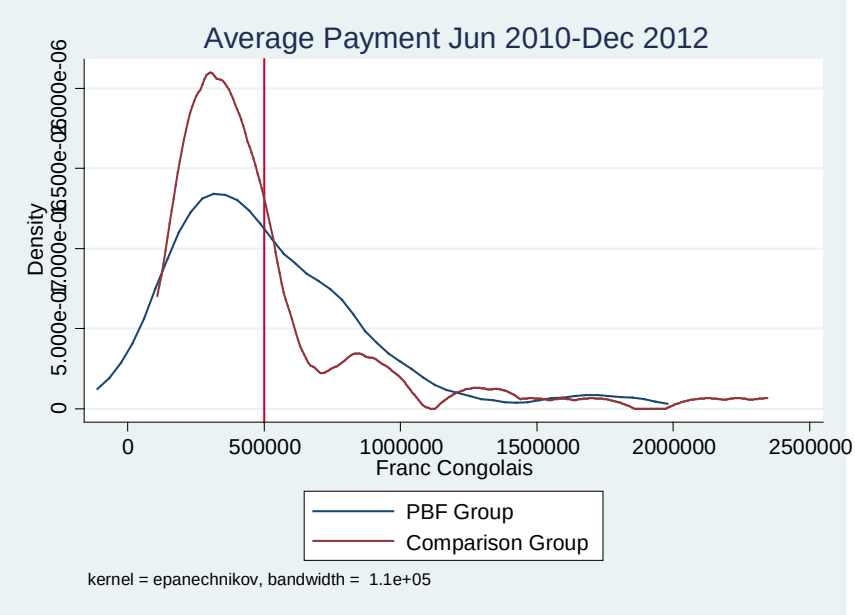

Figure 4: Number of invalid patients in self-reported service volumes, by Treatment Status

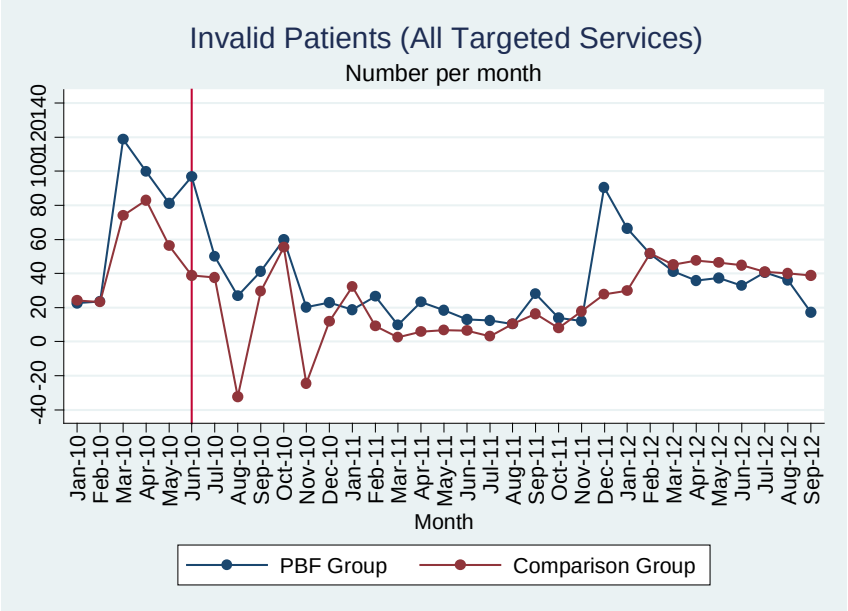

Figure 5: Distribution of the Fee Summary Index for Targeted Services, by Treatment Status

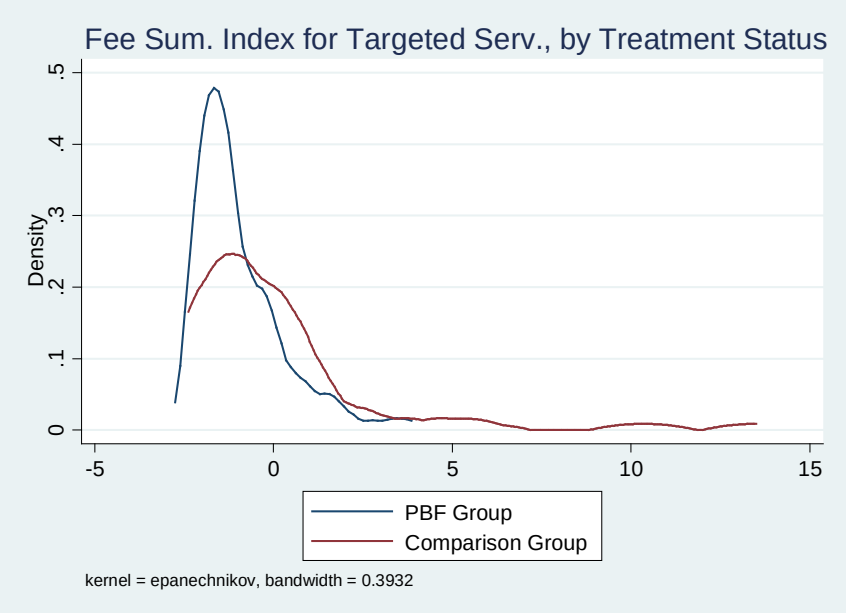

Figure 6: Distribution of the Fee Summary Index for Non-Targeted Services, by Treatment Status

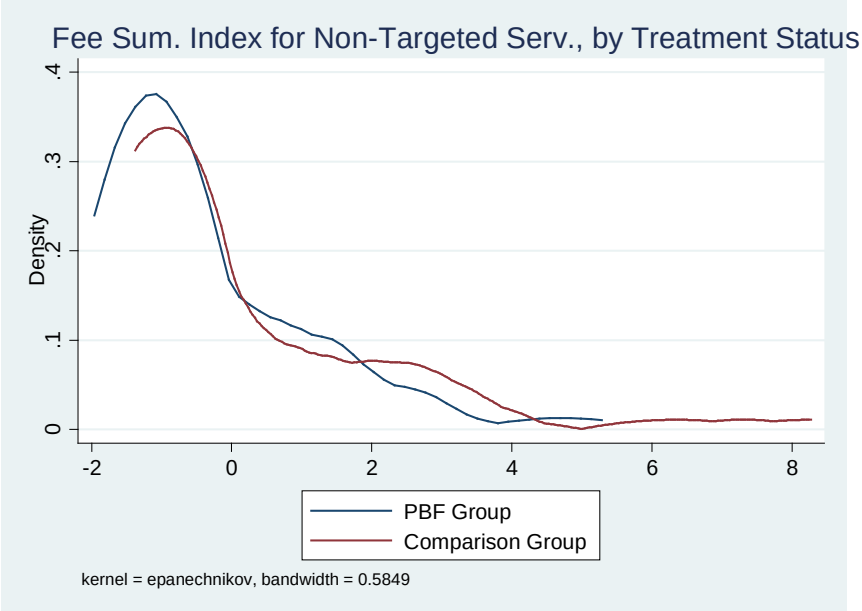

Figure 7: Distribution of Preventive Sessions Organized at Facilities for Targeted Services, by Treatment Status

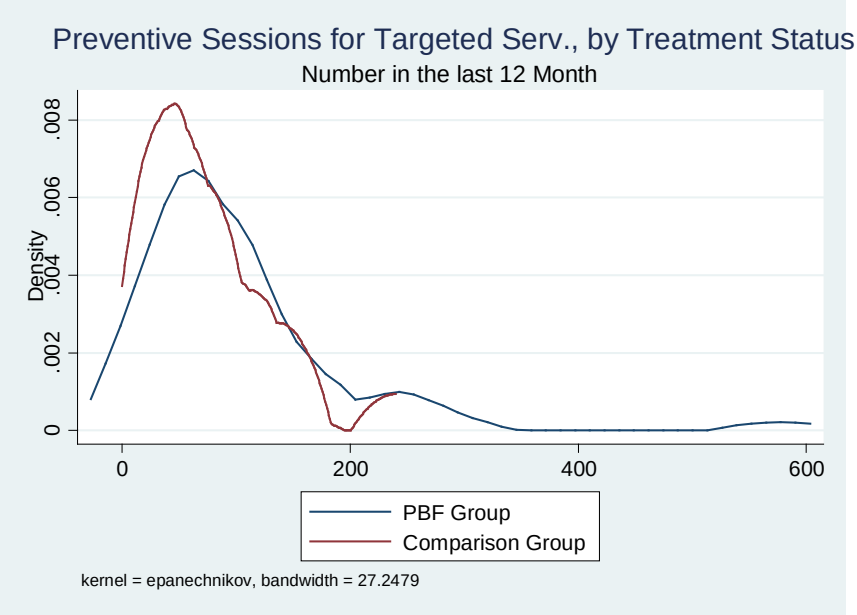

Figure 8: Distribution of Preventive Sessions Organized at Facilities for Non-Targeted Services, by Treatment Status

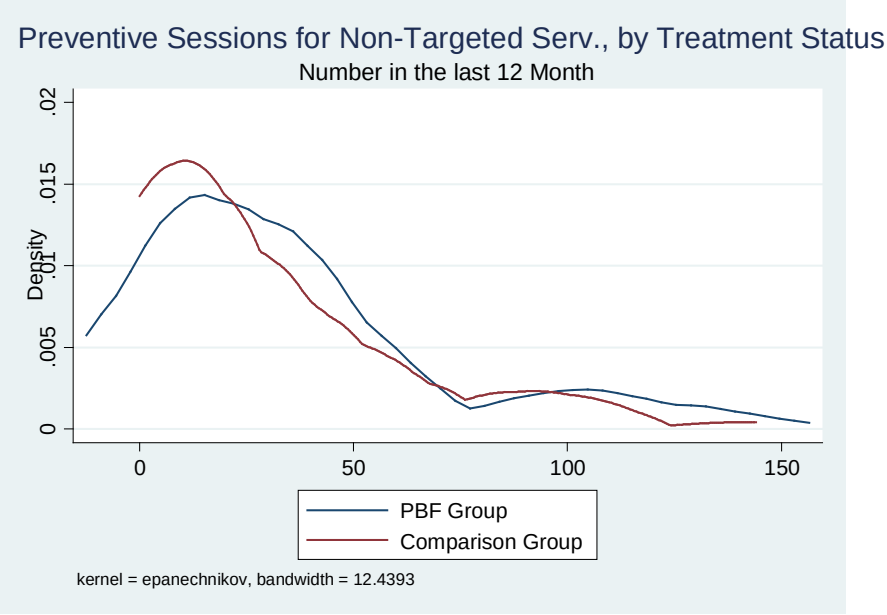

Figure 9: Distribution of Outreach Activities for Targeted Services, by Treatment Status

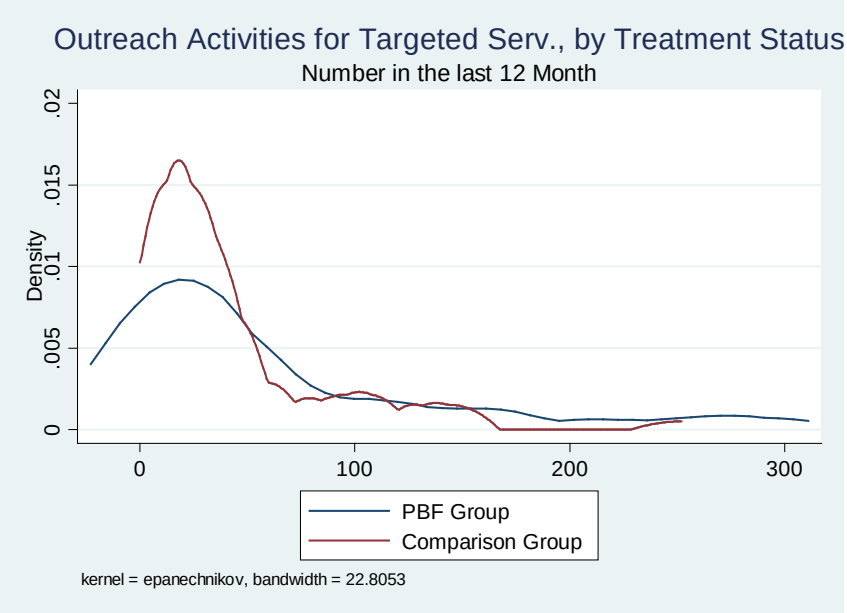

Figure 10: Distribution of Outreach Activities for Non-Targeted Services, by Treatment Status

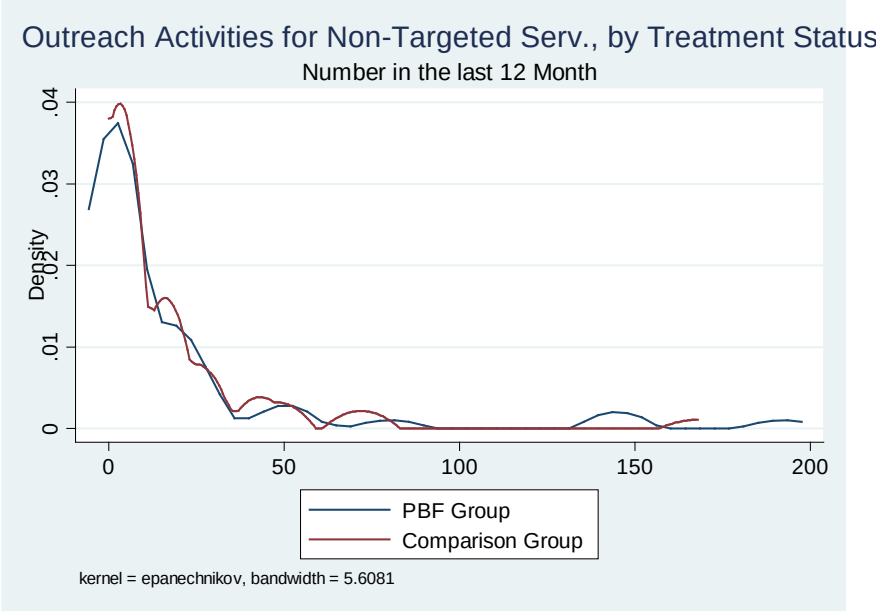

Figure 11: Distribution of Staff Attendance *during* the Pilot, by Treatment Status

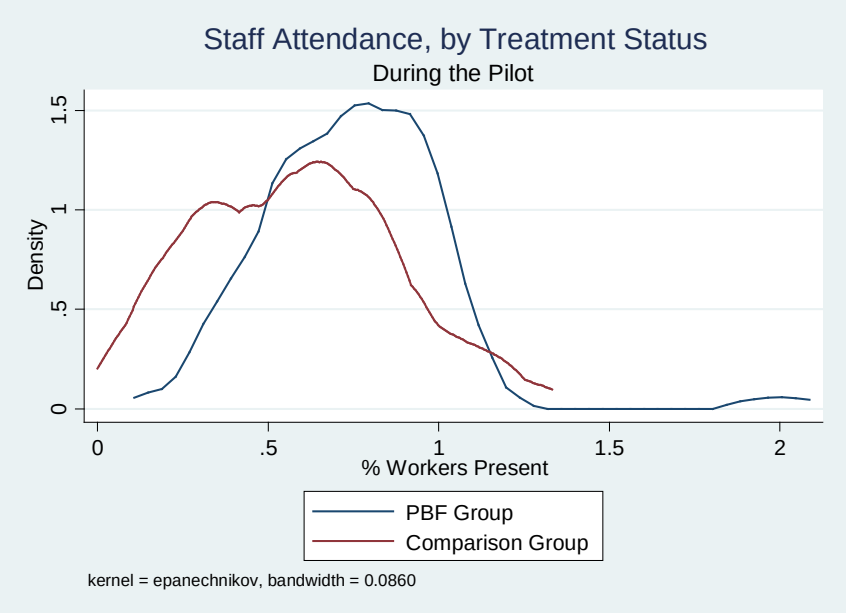

Figure 12: Distribution of Staff Attendance *after* the Pilot, by Treatment Status

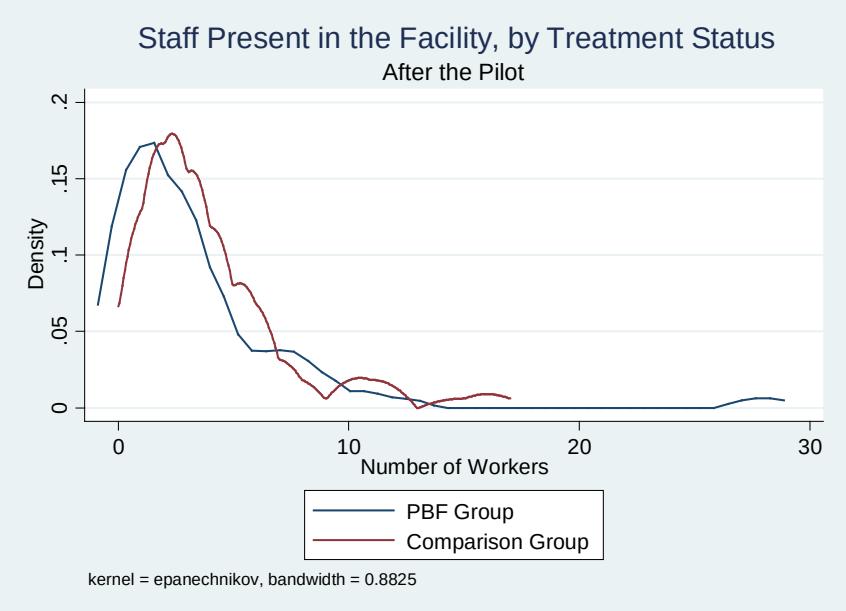

Table 1: Effects on Payments to the Health Facilities

	Average Treatment Effect (ATE)	p-value (ATE=0)	Mean of Dep. Var. (Control)	St.dev. of Dep. Var. (Control)	Observations
1.1. Understanding of the Payment Mechanism, Fairness and Transparency					
The Facility Head reports that…					
S/he knows how PARSS payment is calculated	.202	0.033**	.2222222	.419079	123
S/he knows how PARSS payment is calculated and that it is conditional	.431	0***	.031746	.1767314	123
S/he knows how PARSS payment is calculated and that it is conditional on service provision	.485	0***	0	0	123
PARSS payment paid to the facility level is what is earned	-.008	0.928	.6984127	.4626334	123
The Health Worker reports that…					
S/he knows how PARSS payment is calculated	.093	0.09*	.0898876	.2868276	331
S/he knows how PARSS payment is calculated and that it is conditional	.141	0.011**	.0168539	.1290872	331
S/he knows how PARSS payment is calculated and that it is conditional on service provision	.115	0.019**	0	0	331
His/her remuneration depends on his/her contribution to service provision	.218	0.002***	.3595506	.4812223	331
PARSS payment paid to the facility level is what is earned	-.07	0.288	.6228572	.4860619	327
1.2. Implementation of the Payments					
Average parss payment (FC), Jun. 2010 - Dec. 2012	-17489.36	0.768	500646.9	422386.6	149
Sd. Dev. of PARSS payment, Jun. 2010 - Dec. 2012	82162.46	0.053*	321404.8	261933.6	149
Distribution Scheme within the Facility					
An apportionment basis is used to distribute the payment (from the Facility Head)	.574	0***	.031746	.1767314	123
An apportionment basis is used to distribute the payment (from the Health Worker)	.103	0.111	.0955056	.2947412	331
Who gets the Payment					
% workers who receive PARSS payment (source: Facility head)	.163	0***	.7718557	.2236079	123
The health worker receives PARSS payment (source: Health workers)	.014	0.833	.7865168	.4109218	331
Distribution of the Last PARSS Payment					
Last PARSS payment per health worker (FC)	-10807.59	0.432	95849.72	73842.64	327
St. Dev. of the last PARSS Payment per worker within the facility	-16323.46	0.045**	44842	41468.93	85
1.3. Implementation of Performance Verification					
a. Technical Verifications					
Number of technical verifications in the last 12 months	.564	0.481	7.253968	4.931689	123
The health worker uses a consultation report for each patient	.161	0.001***	.7808989	.4148041	331
The facility is sometimes visited by supervisors	0	0.	1	0	123
Total number of visits by (any) supervisors in the last 12 months	-4.155	0.047**	19.07936	13.88466	123
b. Community Verifications					
Number of community verifications (Jun. 2010 - Sept. 2012)	1.811	0***	.948718	.2220001	154
Av. % missing patients	3.543	0.251	16.92081	20.02851	149

Table 2: Effects on Health Service Provision - Cost

	Average Treatment Effect (ATE)	p-value (ATE=0)	Mean of Dep. Var. (Control)	St.dev. of Dep. Var. (Control)	Observations
2.1. Cost of Health Services					
a. User fees and Cost of Drugs					
The Facility Head reports:					
User fee for the first curative consultation	-692.45	0.281	1263.492	4557.316	123
User fee for the second curative consultation	-178.082	0.18	459.4828	799.0377	112
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
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
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
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

*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.
** Idem but only with targeted services: first curative consultation, delivery, and prenatal visits
*** Idem but only with non-targeted services: second curative consultation, postnatal visit, and preschool consultation

Table 2: Effects on Health Service Provision - Availability of Service Delivery

2. STRATEGIES TO INCREASE THE NUMBER OF PATIENTS (Continued)

	Average Treatment Effect (ATE)	p-value (ATE=0)	Mean of Dep. Var. (Control)	St.dev. of Dep. Var. (Control)	Observations
2.2. Availability of Service Delivery					
a. Health Facility Opening and Internal Management					
Opening					
The facility was open the day of the survey	-.053	0.465	.9206349	.2724789	123
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
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
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					
Number of workers in the facility the day of the survey	.074	0.067*	.5807223	.2924829	138
b. Making Health Services Easily Accessible					
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
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

*Preventive sessions include: immunization, pre- and postnatal care, family planning and HIV prevention
**Preventive sessions for targeted services include: immunization, prenatal care and family planning
***Preventive sessions for non-targeted services include: postnatal care and HIV prevention

Table 2: Effects on Health Service Provision - Outreach Acitivies

	Average Treatment Effect (ATE)	p-value (ATE=0)	Mean of Dep. Var. (Control)	St.dev. of Dep. Var. (Control)	Observations
2.3. Outreach Activities					
a. Number of Outreach Activities in the Last 12 Months					
Performed at the Facility Level (source: Facility Head)					
Total	13.121	0.453	53.53968	69.05206	120
Targeted Services*	12.65	0.361	39.92064	46.35219	121
Non-Targeted Services**	3.924	0.521	13.61905	26.10118	122
Performed by the Health Worker (source: the Health Worker)					
Total	7.184	0.171	15.23295	44.47532	326
Targeted Services*	5.976	0.096*	9.829545	26.42281	326
Non-Targeted Services**	1.208	0.523	5.403409	19.53698	326
Performed in Patient' Community (source: Patients straight out of consultation)					
Total	8.825	0.162	18.83629	35.8214	898
Targeted Services*	8.294	0.194	16.04734	30.52676	906
Non-Targeted Services**	.171	0.851	2.890359	11.66756	942
b. Awareness among Women in the Community					
A health worker made the mother aware of postnatal visits	-.028	0.577	.5093167	.5004315	953
The mother knows the schedule of postnatal care sessions	-.009	0.821	.4171779	.4935977	960
A health worker made the pregnant woman aware of prenatal visits	-.094	0.004***	.8154122	.3883109	1118
The pregnant woman knows the schedule of prenatal care sessions	-.052	0.319	.7053571	.4562896	1121
A health worker made the pregnant woman aware of immunization	-.019	0.688	.6465201	.4784884	1090
The pregnant woman knows the schedule of immunization sessions	-.015	0.654	.7403315	.438857	1083
A health worker made the woman aware of family planning	-.032	0.401	.4351554	.4960433	1842
The woman knows the schedule of family planning sessions	-.02	0.6	.351153	.4775811	1874

*Targeted services include: immunization, prenatal care and family planning

**Non-targeted services include: postnatal care and HIV prevention

Table 2: Effects on Health Service Provision - Service Quality

	Average Treatment Effect (ATE)	p-value (ATE=0)	Mean of Dep. Var. (Control)	St.dev. of Dep. Var. (Control)	Observations
2.4. Service Quality					
a. Technical Quality of Health Services					
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 of Health Services					
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

Table 3: Effects on Health Service Utilization

	Average Treatment Effect (ATE)	p-value (ATE=0)	Mean of Dep. Var. (Control)	St.dev. of Dep. Var. (Control)	Observations
3.1. Number of Patients					
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
3.2. Demand for Health Services					
General Demand					
The household member visited a health facility in the last 12 months*	-0.028	0.072*	0.4961274	0.5000388	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
Number of days the household member waited before visiting 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	-.292	0.13	3.482944	2.243731	1117
Number of prenatal visits with a health worker at a health facility	-.281	0.14	3.357782	2.122774	1120
Number of postnatal visits	.058	0.655	1.10041	1.778309	957
Number of postnatal visits with a health worker at a health facility	.055	0.622	.8650306	1.426543	959
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 family planning	-.068	0.01**	.2044025	.4034759	1878
The women uses a modern contraceptive method	.005	0.69	.0505263	.2191437	1873

*We control for an additional variable: the hh member was sick in the last 12 months

Table 4: Effects on Health Facilities' Total Ressources

	Average Treatment Effect (ATE)	p-value (ATE=0)	Mean of Dep. Var. (Control)	St.dev. of Dep. Var. (Control)	Observations
6.1. Total Resources at the Facility Level					
Revenue of the Facility the last month as reported by the Facility Head					
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 PARSS payment	29812.86	0.669	116388.9	251311	123
Revenue from PARSS to cover the running costs	-13589.66	0.358	23044.76	112156.2	123
Revenue from other sources (NGOs and government)	-34445.51	0.249	31396.83	176646.7	123
Total	-306889.1	0.04**	738938.4	1267279	118
6.2. 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 per worker in the last month (FC)	-1103.906	0.853	9439.635	49938.38	120
Average other payment per worker in the last month (FC)	-13211.64	0.049**	29590.41	39748.77	121
Average PARSS payment per worker in the last month (FC)	-1553.621	0.83	15444.8	31795.58	123
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 in the last month (FC)	-4999.407	0.5	23654.04	88004.44	326
Other payments received in the last month (FC)	-28682.54	0.061*	102552.8	153866.8	285
6.3. 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 5)	.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

Table 5: Effects on Staff Satisfaction and Anxiety

	Average Treatment Effect (ATE)	p-value (ATE=0)	Mean of Dep. Var. (Control)	St.dev. of Dep. Var. (Control)	Observations
7.1. Staff Satisfaction, Stress and Anxiety*					
a. 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
b. 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
c. 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 includes facility heads and health workers.

Table 6: Effects on Staff Motivation

	Average Treatment Effect (ATE)	p-value (ATE=0)	Mean of Dep. Var. (Control)	St.dev. of Dep. Var. (Control)	Observations
7.2. Staff Motivation					
a. Staff Effort after the Pilot Ended					
Attendance					
Number of workers in the facility the day of the survey	-1.354	0.032**	3.84127	3.418198	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
On-the-job effort					
Number of health workers who were working when the interviewer arrived	-.779	0.034**	2.15873	2.001663	123
The Patients report:					
Waiting time (minutes)	-.083	0.975	14.6011	33.88586	994
Waited because of inactive staff	.066	0.581	.3150685	.467758	137
Waited because of excessive demand	-.066	0.581	.6849315	.467758	137
The Household Members Who Visited in the Last 12 Months report:					
Waiting time (minutes)	1.247	0.287	15.07084	19.60033	4317
Waited because of inactive staff	-.041	0.471	.2225806	.4166515	595
Waited because of excessive demand	.053	0.382	.7677419	.4229555	595
b. Importance Attached to Job Remuneration					
The facility staff places much importance on job remuneration	0,044	0,399	0,3485477	0,4775021	455
The facility staff emphasizes financial benefits as the main advantage or disadvantage of his position	0,131	0.021**	0,3833333	0,4872145	454

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