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Performance-based Financing in the Context of Selective Free Health-Care: an evaluation of its effects on the use of primary health care services in Burundi using routine data

Jean-Benoît Falisse, Juvenal Ndayishimiye, Vincent Kamenyero, Michel Bossuyt[1]

Performance-based financing (PBF) is an increasingly adopted strategy in low and middle-income countries. PBF pilot projects started in Burundi in 2006, at the same time when a national policy removed user fees for pregnant woman and children below 5 years. PBF was gradually extended to the 17 provinces of 15 the country. This roll-out and data from the national health information system are exploited to assess the impact of PBF on the use of health-care services. Despite the limited quality of the data and the restricted size of the sample, an effect of PBF is found on the number of anti-tetanus vaccination of pregnant women (20.3 percentage points in target population). Non-robust effects are 20 also found on institutional deliveries and prenatal consultations. Changes in outpatient visits, postnatal visits and children vaccinations are not correlated with PBF. It is also found that more qualified nurses headed to PBF-supported provinces. Health facility-level figures from PBF-supported provinces show that most indicators but those on preventive care are growing through time. The dataset does not include indicators of the quality of care and does not allow to assess whether the impact of PBF is resource-driven or due to the incentive mechanism. The results are largely consistent with other impact evaluations conducted in Burundi and Rwanda. The fact that the impact of PBF is mostly visible on services that became free suggests an important interaction effect between the two strategies. A possible explanation is that the removal of user fees increases accessibility to health care and acts on the demand side while PBF gives medical staffs incentives for improving the provision of services. More empirical research is needed to understand the sustainability of (the incentive mechanism) PBF and the interaction between PBF and other health policies.

keywords: Burundi, evidence-based policy, exemption mechanisms, health-care reform, health facilities, health financing, health information system, health systems, policy evaluation, primary health care

Performance-based Financing (PBF) is currently being implemented, under different names and versions ('Result-based Financing', 'Pay for Performance', etc.), in 32 low-and middle income countries (Fritsche *et al.*, 2014). Yet, the debate about the advantages and disadvantages of this approach has remained mostly theoretical or based on early observations. Few thorough impact evaluations are available and reviews of

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the literature (Witter and Fretheim, 2012; Gorter *et al.*, 2013) have all pointed out to the fact that more empirical research is crucial to elevate the debate beyond issues of implementation and the *expected* benefits and drawbacks of PBF. In these respects, Burundi constitutes an interesting case study. PBF started there in 2006 (Busogoro and Beith, 2010; Basenya *et al.*, 2011), at the same time when user fees were abolished for pregnant women and children under five (Nimpagaritse and Bertone, 2011), and the impact of the experience has just started being documented. The only impact evaluation available (Bonfrer *et al.*, 2013) uses a sample of health centres and households located in eight provinces at three points of time (2006, 2008, and 2010), while this study looks at province-level data in the entire country and during the entire pilot phase of PBF (five years).

The present research takes advantage of the quasi-experimental situation created by the roll-out implementation of PBF across the 17 provinces of Burundi between 2006 and 2010. Existing secondary data are limited but nevertheless allow for examining the trends of key indicators over the years when PBF was piloted in Burundi (2006-2009). In order to explore the mechanisms through which PBF may impact the use of services (Macq and Chiem, 2007; Eldridge and Palmer, 2009), the article also examines the hypotheses that PBF attracts medical staff to the health facilities where it is implemented and reinforces peripheral health facilities.

The first part of the article outlines the context of PBF in Burundi and lays out the mechanisms and expectations behind PBF projects. We then present the methodology and results and discuss the reasons why PBF -in the context of selective free health-care- seems to have a positive impact on the use of some services but not others.

1. Background: PBF in Burundi

In June 2004, the Burundi Ministry of Health (MoH) organized a general meeting on health (the *Etats Généraux de la Santé*) in Bujumbura. It was a unique occasion for the ministry and its partners to discuss the problems of the health sector and propose strategies that should help the country, one of the poorest in the world and just emerging out of a long civil war, to improve its health-care services. The need for an 'evaluation of the performance' of the health system was a key recommendation of the workshop (Ministry of Health of Burundi, 2006a). It was coming against a challenging background: the chronic underfunding of the health system, coupled with a significant health workforce deficit, had resulted in a significant deterioration in the quality of care (Republic of Burundi, 2010). Burundi's health system situation was one of the most preoccupying in the world; in 2004, the total health expenditure was US$ 16 per capita and there was an estimate of 0.03 physicians per 1000 inhabitants (World Bank, 2004).

In 2006, PBF pilot projects began in three provinces (Bubanza, Cankuzo and Gitega). Before those projects, state and international aid support to health facilities had been solely based on inputs; it usually included the rehabilitation and construction of buildings, the purchase of new equipment and drugs, and

the payment of salaries and bonuses. Yet, the use and quality of health services remained very low (Government of Burundi 2006; Burundi Multiple Indicator Cluster Survey 2005). Two partners of the MoH, the Dutch NGOs Cordaid and HealthNet TPO (supported by the Dutch government and later the European Union) then proposed to move from an input-based to an output-based financial support of the health facilities. Their inspiration was reportedly coming from the 1993 World Bank report 'Investing in Health', the agenda of the Millennium Development Goals (MDG), which insisted on concrete results and more transparency, and the PBF experience in neighbouring Rwanda that was then described as "encouraging" (Soeters *et al.*, 2006; Meessen *et al.*, 2007). Although some have since raised the possibility of negative side-effects (Kalk *et al.*, 2010; Kalk, 2011), the experience of Rwanda would later become a model for PBF projects (Rusa *et al.*, 2009).

The PBF approach in Burundi is similar to other PBF experiences (Canavan *et al.*, 2008); its core mechanism consists in establishing results- (or 'output-' or 'performance-') based contracts with health facilities. Through these contracts, the implementing agency (i.e. an NGO or the MoH) pays subsidies for the amount of services delivered by the health facility. Every time a health facility delivers a contracted service, it is eligible for a unit subsidy that can be assigned to different uses: (1) health facility day-to-day operations (drug purchase, cleaning materials, etc.), (2) small investments in equipment and facilities to improve the quality of care, and (3) financial motivation of health workers, traditional birth attendants or community health workers. The services that are part of the contract are determined in advance and encompass most of the activities of the minimum package of activities of a health facility as defined by the MoH (table 1). Contracted services may vary and have varied over time, according to the implementing agency and the priorities of the MoH. Throughout the years, more than half of the contracted indicators at the health centre-level have been services for which users are not required to pay any fee. The integration of PBF in the free health care policy has been described as potentially contributing to the strengthening of the health system (Meessen *et al.*, 2011). With the introduction of PBF, a new set of procedures for monitoring and verification (e.g. counter-verification of results by a third-party agency) has also been implemented to ensure that the services provided are of good quality, that health providers do not 'game' by declaring fabricated services, and that the different functions within the health system are clearly separated (Cordaid – SINA, 2009).

*Table 1: key indicators at the minimum package of activities level (health centre-level)**

curative services	*reproductive health*	*preventive health*	*HIV/AIDS*
outpatient visits (n)	Deliveries	ATV pregnant mothers	HIV/AIDS testing
supplementation in vitamin A	post-natal consultation	distribution of mosquito nets	HIV/AIDS testing for pregnant women
hospitalisation (days)	ante-natal consultation	construction of latrines	patients under ARVs
small surgery	use of intra-uterine	sensitization on malnutrition	PMTCT support
references to hospital	device (IUD)family planning	vaccination of children (polio, BCG, MMR and DPT)	follow-up of HIV+ pregnant women

* This is only a sample of key indicators. At least 42 different indicators have been used at this level by the different partners implementing PBF projects.

The underlying assumptions of the PBF strategy are that it would increase the coverage of services, raise their quality, and strengthen health facilities (Ministry of Health of Burundi, 2006b). These would be achieved through three main mechanisms: (1) the payment of performance-based premium to health staff would constitute an extra extrinsic motivation for health care providers who then, following their own interests, would seek the increase of the quantity and quality of the services provided (Soeters and Vroeg, 2011); (2) the introduction of performance contracts and mandatory (previously quarterly, now bi-annual) PBF development plans at the health facility-level would improve planning and management (Soeters *et al.*, 2006); and (3) the (re-)definition of each actor's role in the PBF would lead to a clearer separation of the different functions and improve the overall functioning of the health system (Bertone and Meessen, 2012).

PBF has taken a growingly important place in the Burundi health system. It was prefigured in the 2006-2010 National Health Development Plan (PNDS) and a national policy for contracting health facilities (*polique nationale de contractualisation*) was developed by the MoH and validated by the Council of Ministers in 2006. The aim of this policy was to develop the use of contracting mechanisms within the health system and harmonize practices. In April 2010, PBF became a nationwide policy and the PBF approach was scaled up to the whole country (table 2). The scaling-up followed a series of discussions between the donors (notably the European Union and the World Bank), the partners that had been implementing PBF pilot projects, and the government. Most inside the Ministry of Health viewed PBF favourably and key donors favoured the approach. At that point of time, no sound impact evaluation of PBF in Burundi was available, although the experience was being depicted positively on the basis of anecdotal evidence and stories of a largely smooth implementation (Toonen *et al.*, 2009; Busogoro and Beith, 2010; Ministry of Health of Burundi, 2010). The functioning and procedures of PBF were defined in guidelines elaborated by the MoH and its different partners. They have regularly re-examined the choice of indicators.

Table 2: rolling-out of PBF

Province	*Organisation*	*Date of launch*
Bubanza	Cordaid	2006
Cankuzo	Cordaid / European Union	2006
Gitega	HealthNet TPO	2006
Bururi	Cordaid	2008 (district of Rumonge), 2009
Makamba	Cordaid / European Union	2008 (district of Nyanza-Lac), 2009
Karuzi	Cordaid / European Union	2009
Rutana	Cordaid / European Union	2009
Ruyigi	Cordaid / European Union	2009
Ngozi	Swiss TPH	2009
Kirundo	Belgian Technical Cooperation	2009
Rest of the country (set of a new national-level PBF system)	Ministry of Health	April 2010

2. Data and Methods

The rollout of PBF (see Table 1) creates the conditions for a quasi-experiment. We exploit it, in line with what Basinga et al. (2011) did for Rwanda, to study the evolution of different services across provinces and time accounting for the presence of PBF projects.

The main problem with assessing the impact of PBF on the use of health services and the health of the population in Burundi is the paucity of data. It is caused by both the logic of NGO and other partners' interventions and the structural weakness of the Burundian health information system. PBF projects mostly cared about their internal consistency, which is whether the activities are proceeding as planned and the beneficiaries seem satisfied with them. As a consequence, data were only collected in the area of implementation, making it very difficult to disentangle a PBF effect from other confounding factors and interaction variables (Khandker and Koolwal, 2010). This problem can be partially circumvented using data that have been collected routinely nationwide by the Burundi National Health Information System (NHIS). However, because of the very limited capacities of the Burundi NHIS, this collection may not have been of prime quality. It only happened for a limited number of variables and usable data are only available at the province-level. This limits the scope of the impact evaluation but does not prevent it.

We choose to mainly focus on activities (1) whose NHIS series are the most complete, (2) which are the core business of health facilities, and (3) which are mainly indicators contracted under the PBF schemes. Consequently, the impact indicators that were retained are: the number of (1) visits (outpatient), (2) ante-natal visits (no data for 2006), (3) delivery at the health facility, (4) vaccinations of children (Polio; tuberculosis (Bacillus Calmette–Guérin, BCG); Diphtheria, Pertussis, and Tetanus (DPT); and Measles, Mumps and Rubella (MMR)), and (5) fittings of intra-uterine devices (IUD) as a family planning method. Two important primary health care services that were not contracted under PBF (prior to 2010) were also

included, post-natal visits and treatment of malaria, in order to see whether PBF produces a side effect on non-contracted services. Finally, we also considered the ratio of stillbirths and perinatal deaths (within 7 days of delivery) relative to the number of institutional deliveries. No indicator for HIV/AIDS-related data were available[2] and data about specific hospital-based activities (the 'complementary package of activities') were too sparse to be used, hence our focus on primary health-care services.

Only three series that contain important gaps (especially for the year 2006) are potentially usable as control variables: (1) the number of qualified medical staff (nurses), (2) the number of public health facilities, and (3) the number of private health facilities, which is also a proxy for the wealth of the province. They are expressed per 10,000 inhabitants. The registered public health expenditures per province were also initially considered but the series was crippled with numerous missing observations and the accounting approach appeared inconsistent from one year to another. The control variables are problematic: 32% of the observations are missing, which led us to replace the missing observations with the average of precedent and subsequent years.

This, and the quality of the dataset, invite to caution, and led us to test different models. We first considered two differences-in-differences models that exploited the five years of data[3]:

(1) $Y_{ij} = c + P_i + Y_j + \beta_1 PBF_{ij} + \varepsilon_{ij}$ -which maximises the number of observations but does not include the three aforementioned control variables. It does include fixed effects for provinces and years.

(2) $Y_{ij} = c + P_i + Y_j + \beta_1 PBF_{ij} + C_{ij} + \varepsilon_{ij}$ -which also includes the three aforementioned controls (C_{ij}) that are of disputable quality.

Y_{ij} is the outcome variable (use of one of the aforementioned services). P_i and Y_j are the fixed effects for years and provinces. PBF is a dummy variable that takes the value 1 when there is a PBF programme in the province that year.

As those models using many years could still suffer from inconsistent standard errors (Bertrand, Duflo, & Mullainathan, 2004), a model that only included the years 2005 (pre-intervention) and 2009 (just before scaling up) was also tested, using the same covariates.

Table 3 presents the situation in 2005, before the PBF projects started. When examining the main indicators and control variables, no statistical difference is detected at the 0.01 level between the group of ten provinces that eventually benefited from the PBF pilot provinces and the control group made of the seven provinces where the PBF was not rolled out before 2010.

[2] The fact that until 2010 there existed a different Ministry for HIV/AIDS, different from the MoH, probably did not help making this information available in the Health Information System.

[3] The analysis was carried out using Stata (12 and 13). Dataset and do-file are available by the authors.

Table 3: Situation in 2005, before PBF started

	7 provinces without PBF until 2010		10 provinces with PBF prior to 2010	
per 10,000 inhabitants / year	*mean*	*sd*	*mean*	*sd*
dependent variables				
outpatients (visits)	9083.38	(4436.62)	9204.59	(4353.62)
antenatal consultations	181.81	(45.31)	141.37	(51.31)
VAT vaccine	157.54	(63.83)	159.11	(59.32)
postnatal consultations	36.47	(19.02)	33.16	(18.98)
deliveries	73.29	(30.53)	64.03	(42.26)
Perinatal mortality & stillbirths	0.03275	(0.01075)	0.03862	(0.01000)
Polio vaccine	354.38	(30.28)	356.28	(75.21)
BCG vaccine	423.40	(58.88)	411.10	(82.71)
DPT vaccine	377.31	(53.63)	376.08	(75.04)
MNR vaccine	349.21	(24.84)	376.63	(93.12)
Intra-uterine device	21.22	(43.84)	5.12	(6.09)
malaria (visits)	not available	not available	not available	not available
control variables				
public health facilities	0.6488	(0.2114)	0.7418	(0.2310)
private health facilities	0.2560	(0.3584)	0.1393	(0.1720)
qualified nurses	6.8197[1]	(13.1980)	1.6771	(0.6691)
Recorded state expenses (in BIF)[2]	897592	(803042)	915742	(514036)

t-test difference between the two groups * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

[1] the 7 provinces without PBF include the capital city, Bujumbura, where the number of qualified nurse per inhabitant in much higher than in the rest of the country.

[2] US$ 1 = BIF 1050 in 2005

In a second part of the results section, we use a different dataset. It is independent from the health information system and was produced by Cordaid and the European Union that implemented PBF in seven provinces (Bubanza, Bururi, Makamba, Rutana, Ruyigi, Cankuzo, Karusi) located in West, South and East Burundi. The dataset covers the monthly provision of PBF-contracted services in 201 health centres and was primarily used to pay the health facilities. Its data were verified within the PBF system and are therefore supposedly more reliable than health information system data. Although this second dataset does not allow for comparison with control areas, it is useful in order to have a closer and second look at the variation of key indicators.

3. Results

Impact on the use of services

Table 4 shows the results using the three models introduced in the last section:

Table 4: impact of PBF

per 10,000 inhabitants	*model 1: 2005-2009, no controls* PBF[a]	SE	*N*	*model 2: 2005-2009, with controls* PBF[a]	SE	N	*model 3: 2005 & 2009, with controls* PBF[a]	SE	*N*
Outpatient	1383.7	1402.1	68	1216.8	1474.9	68	2186.7	2005.8	34
Ante-natal visit	42.09*	24	85	34.55	24.75	85	71.53*	40.41	34
ATV vaccination	97.26*	48.37	65	89.81*	46.12	65	106.6**	47.01	34
Institutional delivery	35.84*	20.16	85	27.68	19.2	85	53.19	39.04	34
Perinatal deaths/deliveries[b]	0.0002	0.0021	85	0.0004	0.0021	85	-0.003	0.0045	34
Vaccination of children									
Polio	11.89	12.73	85	10.3	13.48	85	10.57	25.24	34
BCG	19.75	12.29	85	12.1	15	85	20.37	26.51	34
DPT	-0.204	14.9	85	-1.704	16.65	85	13.04	22.45	34
MMR	44.41	26.9	85	40.35	26.48	85	38.18	28.35	34
IUD	7.675	6.465	84	5.243	3.654	84	0.398	5.895	34
Not PBF indicators									
Post-natal visit	31.06	28.88	82	30.08	31.53	82	20.36	49.46	33
Malaria visit	-6.9	20.07	51	-6.421	22.16	51	-44.78	54.3	17

[a] PBF is the coefficient of the dummy variable PBF in the aforementioned models. SE is the standard error associated to this coefficiant. P values: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
[b] (stillbirths + perinatal deaths within 7 days of delivery) / institutional deliveries

The coefficient of the PBF dummy is statistically significant for a p-value<0.1 and takes a positive sign for three out of twelve indicators in the model without control variables. PBF is positively associated with a significant increase in the completion of three pre-natal consultations, anti-tetanus vaccinations (ATV) for pregnant woman, and deliveries at the health centre. According to those results, and using the MoH/WHO formulas for measuring population targets[4], PBF is associated with an increase of 20.3 percentage points (pp) in ATV coverage, 7.4 pp in institutional deliveries at the health facility, and 8.9 pp in pre-natal consultations. The indicators on institutional deliveries and pre-natal consultations are only borderline significant (for p-value<0.1) when controlling for the number of public health facilities, private health facilities, and number of nurses per habitant. The indicator on ATV remains statistically significant but its value drops by 9%. Similarly, only ATV and pre-natal consultations remain statistically significant (for p-value<0.1) in the model that only considers the years 2005 and 2009. The coefficient of pre-natal consultations is not stable and increases by 40% in this last model.[5]

No sound statistical relationship could be established between PBF and changes in number of outpatient visits, even when disaggregated between patients from the catchment area and from outside the catchment area. Postnatal visits, as well as perinatal deaths, vaccinations, IUD, and malaria treatments do not correlate with PBF either. The results for malaria must be considered carefully as the provinces where the PBF was not implemented are also of higher altitude and their inhabitants are notoriously less exposed than people living in the lowlands and the shores of Lake Tanganyika.

The dataset also allows seeing what could be the impact of PBF on the nursing workforce. In post-conflict Burundi, PBF-supported provinces saw a larger increase in nurses per 10,000 inhabitants between 2005 and the end of 2009 (increase of 197%) than non-PBF provinces (increase of 124%). This difference is statistically significant (two-tailed t-test: t: -1.7947, p-value: 0.092). Yet, it is also interesting to notice that the difference between the two groups fades away when extending the period to the end of the year 2010, the moment when PBF had been scaled up to the whole country.

Evolution of key indicators in the pilot provinces

Data from the PBF pilot projects reveal a general growth of key PBF indicators over the period 2006-2011, particularly those related to curative and reproductive health. Table 6 shows the changes between the mean for the first twelve months[6] of implementation of the PBF and the mean for year 2010 (table 5). Most indicators are clearly increasing over time but those related to the distribution of mosquito nets and vaccination of children. The number of visits (outpatient), which was not correlated with PBF in the

4 For all the indicators: 4.8% * population.

6 Because of possible seasonal impacts and different starting dates for the different groups of provinces, we choose to use yearly averages.

previous sub-section, is only slightly higher in 2010 than in 2006. The figures for coverage take values higher than 100% for four out of seven indicators, which is abnormal and will be discussed.

Table 5: Evolution of a series of key indicators in PBF area, relative to MoH/WHO targets

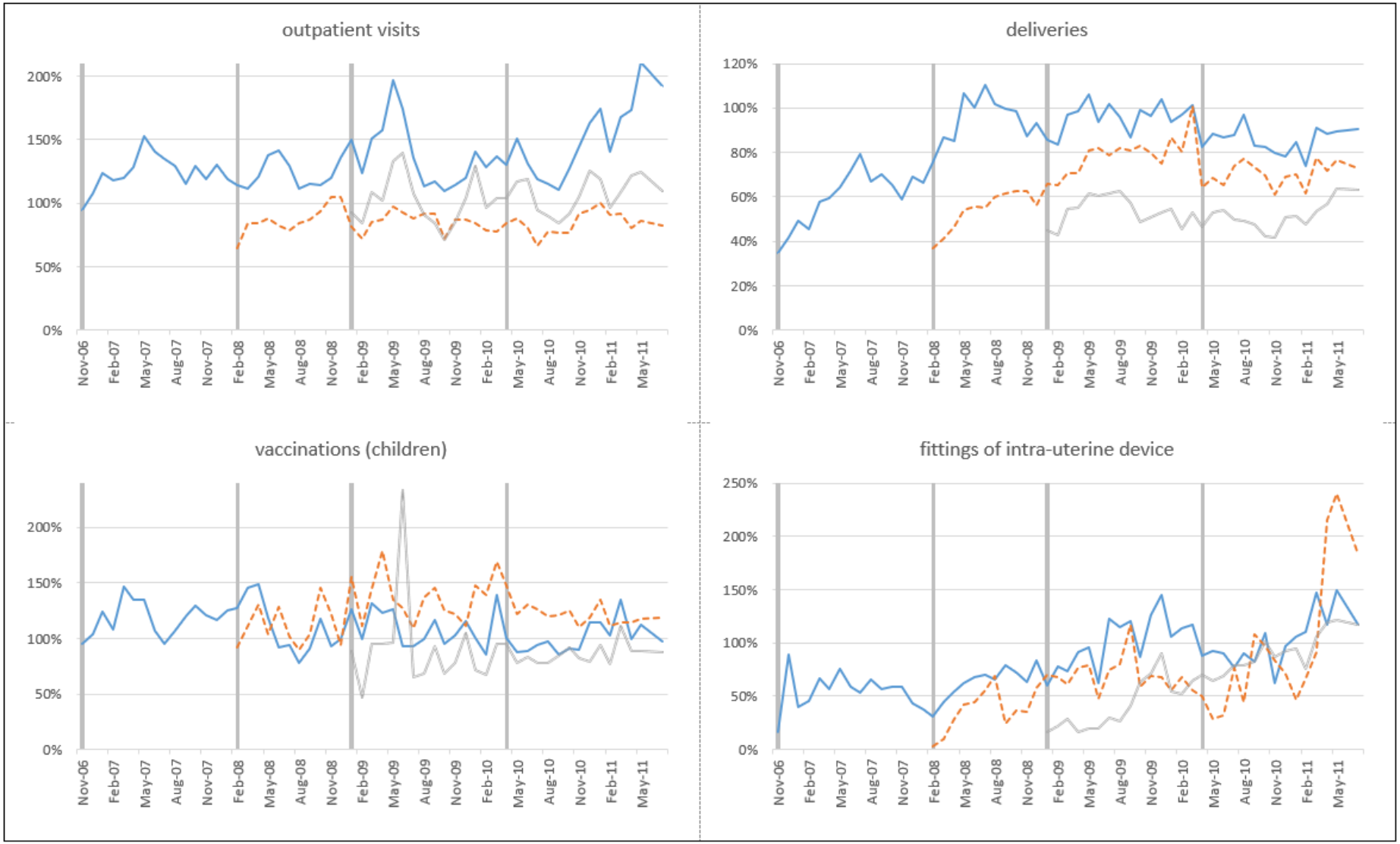
	group[1]	Change (% points)	12 first months		2010	
			mean	sd	mean	sd
Outpatient (visits)	1	8.27%	124.75%	(79.09%)	133.02%	(73.31%)
	2	12.42%**	81.82%	(46.86%)	94.23%	(96.30%)
	3	6.43%***	98.66%	(61.19%)	105.10%	(76.88%)
Full vaccination of children	1	-19.54%***	117.41%	(73.79%)	97.86%	(64.58%)
	2	16.56%**	114.70%	(88.09%)	131.25%	(98.95%)
	3	-11.76%*	93.65%	(152.39%)	81.89%	(49.28%)
Deliveries	1	28.74%***	59.20%	(45.36%)	87.94%	(78.89%)
	2	18.12%***	55.89%	(44.01%)	74.00%	(68.47%)
	3	-5.24%	54.24%	(38.14%)	49.00%	(37.70%)
Ante-natal consultations	1	57.09%***	59.11%	(46.55%)	116.20%	(58.20%)
	2	17.80%***	115.77%	(57.24%)	133.58%	(110.34%)
	3	5.56%***	73.91%	(51.44%)	79.47%	(51.27%)
IUD	1	36.29%***	57.21%	(64.91%)	93.50%	(125.73%)
	2	22.48%***	41.62%	(73.54%)	64.10%	(97.76%)
	3	36.34%***	38.58%	(93.41%)	74.93%	(140.00%)
ATV	1	19.77%***	90.43%	(65.90%)	110.20%	(90.86%)
	2	36.79%***	139.69%	(159.91%)	176.49%	(151.65%))
	3	15.45%***	73.30%	(111.62%)	88.76%	(103.57%)
Malaria (distribution of mosquito nets)	1	-32.08%***	92.91%	(98.53%)	60.83%	(58.47%)
	2	8.21%	57.13%	(82.29%)	65.34%	(68.35%)
	3	-17.48%	63.62%	(405.89%)	46.14%	(45.66%)

t-test (two-tailed, paired) difference between the two periods * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

[1]Group 1 (start 2006): Bubanza and Cankuzo provinces, Group 2 (start 2008): Rumonge district (Bururi province) and Nyanza-Lac district (Makamba province), Groupe 3 (start 2009): Bururi, Makamba, Karusi, Rutana and Ruyigi provinces. Last month available is July 2011 for all groups.

The table also shows significant differences between the three generations of implementation of the PBF (health facilities that started in 2006, 2008, and 2009). However, the three groups have relatively similar growth patterns as shown with the cases of outpatient visits, children vaccination, IUD, and antenatal consultations in figure 1. The same figure also illustrates what seems to be an initial period of growth almost every time after PBF is introduced, before the indicators stabilise after a few months.

Figure 1: evolution of 4 key indicators over time (PBF provinces only) [1]



[1]Group 1 (start 2006) blue plain line: Bubanza and Cankuzo provinces, Group 2 (start 2008) orange dotted line: Rumonge district (Bururi province) and Nyanza-Lac district (Makamba province), Group 3 (start 2009) grey double line: Bururi, Makamba, Karusi, Rutana and Ruyigi provinces. The red vertical lines indicate the progressive roll-out of PBF. Last month available is July 2011 for all groups.

Interestingly, except in the case of antenatal care and outpatient visits, the growth of indicators is also associated with an increase in differences between health centres, which is reflected in standard deviations increasing over time. On a similar note, the widespread hypothesis that PBF leads to a redistribution of the workload from town-based health centres that were historically better equipped to more peripheral facilities that were poorly equipped could not be confirmed by the data. Taking the case of the growth in outpatient visits between the first twelve months of implementation of PBF and the last twelve months available, no sound statistical difference is found between the 34 health facilities located in places identified as towns and the rest (urban: +8.27%, rural: +15.2%; two-tailed t-test t: 0.893, p-value: 0.1864)[7].

4. Discussion

It is necessary to acknowledge the small size of our sample and the average quality of the data we used. The impact evaluation is based on the statistical yearbooks of the HIS routine system, which were assembled in difficult context. There is however no obvious reason to believe that data collection was more, or less, efficient in PBF provinces compared to non-PBF ones[8] and the results therefore probably give a first important indication about the impact of PBF on the use of services in Burundi, in the context of selective free health-care. The main issue with our dataset remains is its very small size and the fact that data is aggregated at the province-level, which gives quite limited statistical power and accuracy. The results are however relatively consistent with what Bonfer *et al.* found using both a different technique and a different dataset, even though the size of the effects is different. The results are also in line with Basinga *et al.* (2011)[9] who worked on Rwanda and found an impact of PBF on institutional deliveries but not on children vaccinations and ante-natal care. Contrary to Basinga *et al.*, but consistently with Bonfer *et al.*, our study finds an impact of PBF on ante-natal care but not on post-natal care.

In the second set of data we used, data are probably sounder as they were verified under the PBF scheme, but there remains a serious problem with the calculation of the target population, which leads to coverage figures well over 100%. This problem may affect not only the reporting of performances but also the comparison between facilities and provinces. It may be a technical problem caused by: (1) the formulas used to calculate the target populations that are inappropriate for Burundi[10], and (2) issues with population figures (extrapolated from the 1990 and 2008 censuses) that led to both over- and under-estimations of the catchment populations, depending on the health facility[11].

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7 No covariates/controls were available to further this analysis.

8 Health centres eventually became contracted to deliver complete monthly health data report but it was well after the strategy was scaled up to the entire country.

institutional

10 We found that the formulas seem to have been imported from Rwanda. They are neither in accordance with international standards nor the product of research conducted in Burundi.

11 We find an average difference of 18% (in absolute value, standard deviation is 0.33 and 62% are over-estimations) between the official population count based on the census and the data provided by an independent study conducted by a European Union project in 2011 in 6 provinces (Santé +, 2011). Using the independently

Despite these limitations, the above-mentioned probable increases in the use of some primary health-care services seem to be indeed linked to the introduction of PBF. This rests on the assumption that PBF intervention provinces were indeed randomly selected -in the sense that the implementation of the scheme was not dictated by the economic, political, or health situation of these provinces. On average, the PBF pilot provinces are not different from the ones of the control group in terms of wealth, health, governance, or experience of the civil war. Cordaid, HealthNet TPO, Swiss TPH and the Belgian Technical Cooperation intervened in the soon-to-be 'PBF provinces' according to the aid coordination framework agreed between the MoH and its partners, which divides the territory between the different partners, and their strategy happened to be PBF rather than input-based. Other partners were present in the other provinces, but did not choose the PBF strategy. Unfortunately, data about the funding levels of the interventions in non-PBF provinces has not been registered, which makes it complicated to assess the marginal return of the PBF strategy comparing to similar size input-based financing approaches. In other words, it is impossible to assess whether the impact of PBF we identified is mostly resource-driven or rests on the PBF mechanism itself (and the new incentives it introduces). Considering the PBF budgets, the main PBF implementer, Cordaid, which intervened in 7 out of 10 PBF pilot provinces, spent the equivalent of between Euro 1,100 and 2,000 per health facility per month –hospitals and health centres altogether and inclusive of all administration overheads, supervision, and verification costs[12].

It is also crucial to recall that the results are those of PBF in the context of selective free health care. Any impact could very well be due to the interaction between selective free health care and PBF, and not to PBF only. The size of this interaction effect is impossible to measure, but it is expected to be quite important, possibly even bigger than the impact of PBF itself. Indeed, several accounts confirm that PBF helped solving some of the issues with the implementation of the free health care policy, which include delays in the reimbursement of health facilities, overcharges, lower quality of care, and the lack of motivation of medical staffs (Bertone and Meessen, 2012). The fact that PBF seems related to an increase in the use of reproductive health services, which are free, but not of curative health services, which are mostly not free, is also a hint. Since financial barriers remain the main deterrent in accessing health care in Burundi (Republic of Burundi, 2010), it is possible that only when those barriers are removed is there room for other strategies for improving the use and quality of health-care services such as PBF. In the field, there are anecdotal evidence of PBF-supported health facilities taking initiatives to increase service provision (and being paid accordingly) such as opening delivery and patients' rooms, extending opening hours, setting up night shifts, and purchasing small equipment. All could impact the use of reproductive health services in obvious ways. However, it seems that those initiatives for improving the quality of services have been limited to the health facility perimeter and health facilities have not significantly improved their community outreach capacities, which would have included the set-up of comprehensive

calculated set of population data in the paper instead of the official one did not change our results fundamentally.

12 From Cordaid PBF projects audit reports. 2006-2010.

community health activities as part of an effective health promotion strategy (Marston *et al.*, 2013). It would explain why PBF seems to have no impact on the use of preventive services.

The results also help unpack a little bit of the 'black box' of the mechanisms and processes through which PBF may be linked to changes in services delivery (Ssengooba *et al.*, 2012). The hypothesis of a change in the nursing workforce is confirmed, with PBF provinces attracting more qualified staff than control provinces. A survey conducted by the MoH, Cordaid, and the EU in 2010 in 6 provinces that benefited from PBF (Bururi, Cankuzo, Makamba, Karuzi Rutana and Ruyigi) helps further understand the situation of the nurses in PBF-supported health facilities. It shows (1) a significant increase of the proportion of qualified nurses in the staff working at peripheral health facilities, which increased from 37% of the staff in 2006 to 71% in 2010; (2) an increase in salaries and bonuses for qualified nurses, from approximately US$ 75 in 2006 to US$ 262 in 2011; and (3) a 5-fold increase in revenues of health facilities during the period 2006-2010 (Cordaid - Ministry of Health of Burundi, 2010). Anecdotal evidence suggests that the word about staff bonuses in PBF-supported health centres quickly spread across the country and created envy among medical staff stationed in non-PBF health facilities. The origin of the new nurses in PBF-supported provinces is unfortunately unknown, and it is not possible to assess whether these new nurses have moved from other health centres or are fresh graduates. Our results also show that it seems possible to quickly restore the imbalance once the PBF strategy is scaled-up. Our dataset unfortunately lacks the statistical power to evaluate other hypotheses related to possible changes in PBF-supported facilities, in particular whether PBF leads to a redistribution of the workload between town-based and more peripheral health facilities. Similarly, our study only looks at the (reported) use of health services and does not assess changes in the health status of the population or in the quality of services.

Although our results show that PBF in a selective free health-care environment could be an encouraging strategy for improving the use of reproductive health services in Burundi, key questions about this strategy and its implementation remain. The question of 'gaming', which has been well documented in high-income contexts (Bevan and Hood, 2006), still needs to be further explored in the context of low-income countries. The increase in the workforce raises the question of the capacity of PBF to continue to stimulate health facilities in the long-run and the sustainability of the incentive mechanism (Cecchi and Duchoslav, 2014). There is also the question of the financial sustainability of PBF. PBF (in the health sector) is now a national priority for the Burundian government as shows its place in the new National Health Development Plan (2010-2015) and Strategic Plan for Poverty Reduction (2011-2015). In 2011, the government of Burundi –the tenth most aid dependant country in the world (in terms of aid/GNI ratio, World Bank, 2011)– contributed to 52% of the financing of the joint PBF and selective free health care system using its own (yet donor-dependant) budget. This contribution certainly is remarkable but is shows that the system remains fragile and aid-dependant; any breach or change in the funding system or in the politico-institutional situation of the country (van de Walle, 2005; Klingebiel and Janus, 2014) could have

far-reaching implications. Although most key officials within the MoH have been staunch supporters of PBF so far, the system remains largely conditioned by direct and indirect (budget support) aid.

Conclusion

Our study finds weak evidence that PBF contributed to the improvement of some indicators related to the use of reproductive health services in Burundi. These results leave some unanswered questions, which include the exact interaction effect of PBF and free health care policies, the impact of PBF on the quality of care, and the empirical evidence of its comparative advantage over similar size input-based approaches.

The fact that the limited results cannot be attributed to PBF itself but to PBF in the context of free health-care for children under 5 and pregnant women is an invitation to consider PBF as part of the larger health system (Meessen *et al.*, 2011). As the lack of obvious PBF impact on indicators of the use of preventive and curative health-care services shows, PBF is not a magic bullet. To improve all services, it will be important to work on the articulation and synergies between PBF and the different strategies for improving the quality and accessibility to health-care such as for instance the exemptions of user fees, the quality and provision of drugs, health insurance, and the improvement of the nursing workforce.

Finally PBF implementing agencies need to do a better job in making better and more tools available for thorough impact evaluations. To further advance our understanding of the impacts of PBF, especially as the PBF strategy expands in many sub-Saharan countries, it will be essential for projects and policy-makers to think about these tools, which could include the randomisation of the pilot PBF-supported health centres or simply the collection of 'impact data' alongside with 'process data', also in control areas, even before the implementation of projects.

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