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Introduction Of Performance-Based Financing In Burundi Was Associated With Improvements In Care And Quality

ABSTRACT Several governments in low- and middle-income countries have adopted performance-based financing to increase health care use and improve the quality of health services. We evaluated the effects of performance-based financing in the central African nation of Burundi by exploiting the staggered rollout of this financing across provinces during 2006–10. We found that performance-based financing increased the share of women delivering their babies in an institution by 22 percentage points, which reflects a relative increase of 36 percent, and the share of women using modern family planning services by 5 percentage points, a relative change of 55 percent. The overall quality score for health care facilities increased by 45 percent during the study period, but performance-based financing was found to have no effect on the quality of care as reported by patients. We did not find strong evidence of differential effects of performance-based financing across socioeconomic groups. The performance-based financing effects on the probability of using care when ill were found to be even smaller for the poor. Our findings suggest that a supply-side intervention such as performance-based financing without accompanying access incentives for poor people is unlikely to improve equity. More research into the cost-effectiveness of performance-based financing and how best to target vulnerable populations is warranted.

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Several governments in low- and middle-income countries have adopted performance-based financing in the health care sector—payment methods that reward performance. In Africa alone more than thirty-five countries are in the process of introducing performance-based financing.^{1,2} Performance-based financing is a strategy to improve the performance of health care providers through the use of explicit financial incentives for reaching targets on predefined performance measures related to the quantity and quality of health care services.³ Traditionally, in low-income countries, health system fi-

naning is based on prospective budget flows derived from, for example, bed counts or estimates of needed pharmaceuticals. Under performance-based financing, health care facilities are reimbursed retrospectively after verification of the quantity and quality of provided services.

While there is considerable enthusiasm among practitioners and implementers about the promise of performance-based financing,^{4–6} robust evidence on its effects in low- and middle-income countries is still limited.^{7–9} A systematic review by Sophie Witter and colleagues¹⁰ identified one study¹¹ on the effects of bonuses for doctors meeting higher quality standards in the Philippines as

the only study with low risk of bias. This study of the Philippines system found that performance-based financing improved children's general health and reduced wasting, the process of muscle and fat tissue "wasting" away, but had no effect on patient volumes in the studied hospitals or quality scores for hospital care, as assessed through a quality measurement system developed for the study. Similar effects were found for another intervention group for which health insurance reimbursements to hospitals were increased, which suggests that in the Philippines the effects were also driven by increased resources.¹¹

For Rwanda, the first African country to introduce nationwide performance-based financing, results from a difference-in-differences analysis^{10,12} indicated that such financing increased the quality and use of maternal and child health services and child nutritional outcomes. An experiment conducted in the Democratic Republic of Congo showed that performance-based financing led to lower direct payments by patients to health facilities, comparable or better services, and higher quality of care.¹³

Winnie Yip and colleagues¹⁴ recently evaluated a capitation with pay-for-performance intervention in the Ningxia Province of China. This program focused on primary care providers' antibiotic prescribing practices, health spending, outpatient visit volume, and patient satisfaction. The intervention led to a reduction of approximately 15 percent in antibiotic prescriptions and a small reduction in total spending per visit to primary health care providers. No effect on other outcomes was found.

This article adds to the limited scientific knowledge on the effects of performance-based financing in low- and middle-income countries. We exploit the staggered rollout of performance-based financing across provinces in the central African nation of Burundi during 2006–10 and use a difference-in-differences approach to identify the effects of performance-based financing on the use and quality of health care. Our results indicate that the introduction of performance-based financing led to some improvements in maternal care use and in health care facilities' quality scores.

Performance-Based Financing In Burundi

In December 2006 performance-based financing was implemented in Burundi by the Ministry of Health, with help from nongovernmental organizations (NGOs), in three provinces: Bubanza, Cankuzo, and Gitega I. In October 2008 the financing system was implemented in six more

provinces: Karuzi, Makamba, Bururi, Rutana, Ruyigi, and Ngozi. In April 2010 the financing system was implemented in the remaining provinces: Bujumbura-mairie, Bujumbura-rural, Cibitoke, Gitega II, Kayanza, Kirundo, Muramvya, Muyinga, and Mwaro.¹⁵ (Gitega province was split into two similar sized areas: the area where performance-based financing was implemented first [Gitega I] and the remaining area [Gitega II].)

In May 2006, seven months before the introduction of performance-based financing in Burundi, user fees for deliveries, cesarean sections, and care for children under age five were removed at public health care facilities throughout the country.¹⁶ To replace the lost income from eliminated user fees, facilities received payments from the government for the services provided for free. Ensuring timely payment to the facilities proved problematic.^{16,17} In April 2010 the Ministry of Health incorporated payment for maternal and child health services into the performance-based financing scheme.

As of 2014, performance-based financing has been implemented in almost 700 Burundi health care facilities¹ and accounts for around 40 percent of the total average health facility budget. Fifty-two percent of the total funding for performance-based financing is provided by the Burundese government, 28 percent by the World Bank, and the remaining 20 percent from various other donors.^{17,18} Facilities receive payments based on the quantity and quality of health services provided.¹⁹

Quantity is measured through twenty-three output indicators.²⁰ (See online Appendix 1.)²¹ For this study, data were collected for six of these output indicators. Health care facilities report monthly to the Ministry of Health about quantities of health services delivered for each indicator. Reported quantities are verified and validated by a provincial committee through unannounced observation visits to facilities.

In addition to the quantity-based payments, facilities can receive a quality bonus of up to 25 percent. Quality is assessed quarterly by local regulatory authorities on a randomly chosen day using a checklist^{17,22} containing 220 items grouped into the following topics: general infrastructure and communication, business plan, income and costs, hygiene and sterilization, outpatient consultations, family planning, laboratory services, inpatient care, management of essential drugs, availability of essential drugs, maternal care, surgery, tuberculosis screening, vaccination, and antenatal care. The total payment to a facility is calculated as a weighted sum of the number of provided services in the previous three months times their unit payment mul-

tiplied by the quality bonus, which ranges between 1 and 1.25 depending on the score obtained from evaluation of facilities based on results of the checklist assessment.

Study Data And Methods

DATA SOURCES Repeated cross-sectional household surveys were conducted in 2006, 2008, and 2010 in selected provinces. In 2006, data were only collected in four provinces (two intervention and two control); from 2008 onward, the survey was extended to eleven provinces to include all provinces in which performance-based financing was introduced at that time (see Appendix 2 for detailed sample sizes).²¹ Exhibit 1 provides an overview of the timing of performance-based financing introduction relative to the survey dates across provinces. Three phases can be distinguished: phase 0 (baseline), phase I (first stage of rollout), and phase II (second stage of rollout). Note that the data collection in 2008 took place before the second stage of rollout, while the data collection in 2010 took place six months after rollout. Before the baseline, the Ministry of Health selected comparable control provinces in terms of income and presence of for-profit health care facilities. The facilities in the control provinces did not receive additional cash support.

SAMPLE AND OUTCOME MEASURES In each round of data collection, households were randomly selected through a clustered sample design (see Exhibit 1 for sample sizes). From the household surveys, five different samples were distinguished: households, women who delivered in the preceding year, infants, women ages 15–49, and illness episodes (see Appendix 2).²¹ The respondents in the latter sample were household members who reported at least one illness episode in the past thirty days and were, therefore, also indicated as “patients.” In addition, a random sample of seventy-five health care facilities across the study provinces was surveyed and revisited in subsequent waves (see Appendix 2).²¹

The household survey collected detailed information on health care use and self-reported satisfaction with health care. Eight main outcomes were identified directly relating to the services incentivized through performance-based financing. The incentivized services that were studied using these main outcomes included antenatal care received, pregnant woman fully immunized, institutional delivery by qualified staff, child younger than one year completely immunized (at least one immunization and *Bacillus Calmette-Guérin* [BCG] immunization), use of modern family planning, and use of at least

one bed net (see Appendix 1).²¹ Because of time and financial constraints, it was not possible to collect information related to the other incentivized services listed in Appendix 1.²¹ The eighth incentivized outcome is quality of care at facilities. Quality scores were obtained through external audits by qualified health care workers who received specific training and were not residing in the province(s) of study. A detailed checklist was used containing fifty-seven items grouped into the topics of infrastructure and communication, outpatient consultations, maternal care, family planning, vaccinations, laboratory services, drug availability, and medical consumables availability¹³ (see Appendix 3).²¹ Scores are summed to a total result that reflects overall process quality of services delivered in the facility.

It should be emphasized that this score is collected by external health care workers who do not work in the facility and is not equal to the score calculated by the local regulatory office and used for performance-based financing payments. The score collected by external health care workers is a condensed version of the one collected by the local regulatory office because of time and budget constraints. The items in the quality score for the study were defined before the program started and capture the essentials of the longer quality checklist used for the calculation of the bonus.

While we provide information on eight sub-categories of this quality score for additional

EXHIBIT 1

Performance-Based Financing (PBF) Status At Time Of Survey Across Provinces In Burundi, Selected Years 2006–10

Province	Phase	2006		2008		2010	
		PBF	N	PBF	N	PBF	N
Bubanza	I	0	125	1	125	1	125
Cankuzo	I	0	100	1	100	1	100
Karuzi	II	0	150	0	150	1	150
Makamba	II	0	125	0	125	1	125
Gitega I	I	0	— ^a	1	75	1	100
Bururi I	II	0	— ^a	0	100	1	100
Bururi II	II	0	— ^a	0	50	1	50
Gitega II	II	0	— ^a	0	225	1	200
Muramvya	II	0	— ^a	0	150	1	150
Rutana	II	0	— ^a	0	125	1	125
Ruyigi	II	0	— ^a	0	125	1	125

SOURCE Burundi Ministry of Public Health, 2011. **NOTES** Sample sizes (N) shown are the number of households interviewed. Gitega province was split into two similar-size areas, the area where performance-based financing was implemented first (Gitega I) and the remaining area (Gitega II). For data collection, Bururi was split into two areas (Bururi I and Bururi II). Implementation of performance-based financing took place at the same moment in time for both areas. An entry of 0 in the “PBF” columns indicates that PBF was not in place; an entry of 1 indicates that PBF was in place. ^aNo data collected.

insight, they are not part of our set of main outcomes. Additional outcomes were used that relate only indirectly to the general performance-based financing aim of increasing accessibility and quality of care: health care use in case of illness, self-reported patient satisfaction, and childbirth in the past twelve months. The childbirth measure is expected to decrease via the effect of performance-based financing on modern family planning. Health care use in case of illness is expected to increase because of the performance-based financing incentives to raise outpatient and inpatient consultation rates. Reported patient satisfaction is also expected to increase in response to the quality incentives connected to performance-based financing. All relevant indirect outcomes that were collected are included in the study. Appendix 4²¹ describes all main and additional outcome measures and their sample means by survey year for phase I and phase II provinces.

ANALYSIS AND EXPLANATORY VARIABLES We identified the effects of performance-based financing by comparing how changes in outcomes of interest (use and quality) correspond to the staggered rollout of performance-based financing in Burundi. We identified the phase I performance-based financing effect by comparing the change in outcomes in the phase I provinces between 2006 and 2008, before versus after the introduction of performance-based financing, relative to the change in the control provinces (those that experienced performance-based financing rollout in phase II). Thereafter, the phase II performance-based financing effect was obtained by comparing the change in outcomes between 2008 and 2010 in phase II provinces with that in the phase I provinces over the same period. Detailed information on sample sizes for phases I and II is provided in Appendix 2.²¹

We identified the effect of performance-based financing in phase I by restricting the sample to data from 2006 and 2008. The provinces Karuzi and Makamba acted as controls for Bubanza and Cankuzo. Thereafter, the effect of performance-based financing in phase II was identified by only using data from after 2006 and by using Bubanza, Cankuzo, and Gitega I as controls for the other provinces.

Finally, we estimated the average effect of performance-based financing on the pooled sample using both the phase I and phase II regions and the full period of data. This gave us the average performance-based financing effect across all phases of implementation. We verified the robustness of the findings by estimating the effects for phases I and II using interaction effects on the full sample. We also allowed for a differential

performance-based financing effect on poor (bottom tertile) and nonpoor households (top two tertiles) by including an interaction term between the performance-based financing indicator and an indicator for the lower-wealth tertile. Household wealth is proxied by total monthly household consumption expenditures, based on a list of eighteen items; weekly and yearly expenditure reports were converted to monthly values.

Because performance-based financing introduction was not randomized, we controlled for other factors that may have influenced the use and quality of health care and may have correlated with the introduction of performance-based financing. All models include year indicators to capture the time trend in outcomes common to treated and control provinces; a full set of province effects to capture time-invariant differences; and a set of time-varying household-level characteristics: household size, income tertile of the household, age and sex of household members, number of illness episodes in the household in the past thirty days, indicators for all girls and boys in school, durable housing material, access to clean water, ownership of fertile land, health insurance, female income earner, married, polygamous, and farmer. Given the availability of panel data for facilities, we used facility fixed effects rather than province fixed effects to correct for differences across facilities.

The identifying assumption of such a difference-in-differences approach is that, conditional upon observable characteristics, in the absence of performance-based financing there would have been no differential changes in the outcomes across these provinces (the parallel trend assumption). We discuss the plausibility of this assumption in the results section. See Appendix 5²¹ for the formal description of the models.

Least squares regression was used for all outcomes, and robustness of results was confirmed using fixed-effect logit models for all binary outcomes. Standard errors were adjusted for clustering at the province level to allow for the possibility of serially correlated province-level shocks.^{23,24} We accounted for the small number of clusters²⁵ and for the possible type I error arising from multiple hypothesis testing.^{26–28} (See Appendix 5 for details.)²¹ The software STATA 13 was used to perform all statistical analyses.

LIMITATIONS There were some limitations to our study. First, as performance-based financing is rolled out at the provincial level in a non-randomized way, it is possible for unobservable characteristics to violate the common trend assumption necessary to claim causality.

Second, because performance-based financ-

ing became a nationwide program in 2010, we have no “pure” control provinces left for the phase II period. To the extent that performance-based financing not only causes a shift in levels of health care use and quality but also causes an upward change in their trends, this could bias our results from the second implementation period downward. The inevitable assumption that phase I districts represent a reliable control for phase II districts is a limitation of the analysis.

Third, we could not distinguish between the *incentive* and *resource* effects of the performance-based financing scheme, because control provinces—unlike intervention provinces—were not given additional resources.¹² However, we do know that the average revenues for health facilities per person per year increased from US\$0.53 to US\$2.49 between 2006 and 2010 in Burundi—an almost fivefold increase. This increase is larger than was reported for Rwanda, where the revenue increase for health facilities was about threefold.¹²

Fourth, our study could examine only a subset of six out of twenty-three performance-based financing output indicators. Fifth, quality could be measured only by process indicators such as the availability of basic medical equipment, infrastructure, correct and up-to-date registries, prescription behavior, and routine.

Study Results

DESCRIPTIVE STATISTICS For most outcomes, phase I and phase II provinces were similar at baseline (see Appendix 4).²¹ The one exception is that institutional deliveries were less common in the phase I provinces (48 percent in phase I versus 73 percent in phase II). Further evidence supporting comparability of phase I, phase II, and provinces not surveyed is provided in Appendix 6,²¹ which does not reveal any systematic differences in terms of child mortality, poverty, education, and health care infrastructure (obtained from other data sources). Between 2006 and 2008, health care use and quality seem to have improved for phase I provinces, while some deterioration was observed in the other provinces. This deterioration could be related to nationwide clashes between government forces and national liberation forces. The positive trend in the phase I provinces might be an indication of the effect of performance-based financing being stronger than the negative effect nationwide of political instability. The government and the liberation forces signed a ceasefire in May 2008.²⁹

It was not possible to formally test the parallel trends assumption that in the absence of performance-based financing there would have been

no differential changes in the trends of the outcomes of these provinces. However, we further assessed the credibility of the parallel trends assumption by comparing pre-intervention trends in maternal and child health care across phase I and phase II provinces using data from the Multiple Indicator Cluster Surveys (MICS) collected in Burundi in 2000 and 2005, which provide information on births from 1996 to 2004, the period prior to performance-based financing introduction. Appendix 7²¹ confirms that pre-intervention trends in the relevant indicators available in the MICS (child's vaccination card, one BCG vaccination at or close to birth, three or more doses of polio vaccination, three doses of diphtheria-tetanus-pertussis [DTP] vaccination, and at least one dose of measles vaccination) were very similar across the two groups of provinces.

EFFECTS ON USE AND QUALITY OF HEALTH CARE

Exhibit 2 shows the estimated effects of performance-based financing on both incentivized and indirect outcomes. Performance-based financing in phase I significantly increased the proportion of women delivering their babies in an institution by 38 percentage points, which reflects a relative increase of 79 percent. (See Appendix 4 for baseline means.)²¹ The share of pregnant women reporting more than one antenatal care visit increased significantly by 10 percentage points, a relative increase of 11 percent. The proportion of households reporting the use of at least one bed net increased by 14 percentage points, a relative increase of 26 percent. The average quality score constructed from the external audits increased by 23 points, compared to the baseline average of 35 under performance-based financing. Subcomponent quality scores are presented in Appendix 9.²¹ No effect was found of performance-based financing in the phase I provinces on vaccinations and the use of modern family planning.

The lower half of Exhibit 2 shows the estimated effects of performance-based financing on indirect outcomes. Though no significant effect was found on the use of family planning, performance-based financing was found to significantly decrease the proportion of households in which a child was born in the past twelve months by 5 percentage points, a relative decrease of 19 percent. We found no evidence of a performance-based financing effect on the number of times that health care was used in the case of an illness episode or on quality as reported by patients. The share of patients who reported the quality of care and the drug availability to be sufficient, the personnel to be respectful, or the waiting time to be reasonable did not change significantly. There was also no change in the

EXHIBIT 2

Effects Of Performance-Based Financing On Incentivized And Indirect Outcomes In Burundi, Selected Years 2006–10

Outcome	Phase I			Phase II			Pooled		
	Percentage-point change	p value	N	Percentage-point change	p value	N	Percentage-point change	p value	N
INCENTIVIZED OUTCOMES									
Women who delivered in preceding year ($p = 0.19$) ^a									
Institutional delivery	38	0.000	274	14	0.034	715	22	0.000	845
More than one antenatal care visit	10	0.000	274	1	0.764	715	2	0.316	845
More than one tetanus vaccination	6	0.786	274	13	0.294	715	11	0.314	845
Infants ($p = 0.049$) ^a									
At least one vaccination	4	0.260	265	1	0.748	712	1	0.818	835
BCG vaccination	3	0.716	265	0	0.916	712	–1	0.932	835
Modern family planning among women ages 15–49	2	0.798	1,329	6	0.046	3,690	5	0.050	4,341
Households' use of at least one bed net	14	0.000	1,000	–6	0.672	2,700	0	0.950	3,200
Total quality scores in health care facilities	22.92 ^b	0.000	49	15.88 ^b	0.062	130	17.24 ^b	0.062	159
INDIRECT OUTCOMES									
Households child birth in past twelve months	–5	0.002	1,000	–1	0.018	2,700	–2	0.040	3,200
Illness episodes, health care used when ill	6	0.396	1,440	–1	0.960	3,770	2	0.750	4,555
Illness episodes for which care was used ($p = 0.014$) ^a									
Quality of care sufficient	–2	0.540	1,291	3	0.406	3,237	0	0.924	3,928
Drug availability sufficient	2	0.850	1,295	6	0.436	3,250	4	0.492	3,941
Personnel respectful	0	0.920	1,300	–3	0.534	3,256	–2	0.718	3,947
Waiting time reasonable	–3	0.666	1,299	–13	0.276	3,259	–12	0.318	3,950
Felt cured	2	0.476	1,294	11	0.048	3,241	9	0.012	3,932

SOURCE Authors' calculations. **NOTES** Results of ordinary least squares estimation. All models include province and time controls and the control variables as listed in Appendix 8 (see Note 21 in text). The phase II and pooled models for quality scores in health care facilities contain facility fixed effects. *p* values were adjusted for multiple outcomes testing and calculated using the bootstrapping method proposed in Cameron AC, et al., Bootstrap-based improvements for inference with clustered errors (see Note 25 in text). Statistical significance based on *p* values adjusted for multiple outcomes testing. ^aFamily-wise adjusted *p* value for an alpha of 5 percent based on Bonferroni correction with intervariable correlation adjustment. ^bCoefficient of the ordinary least squares estimation.

share of patients who felt cured.

Estimated performance-based financing effects in phase II were generally smaller compared to those in phase I (Exhibit 2). Performance-based financing increased the share of institutional deliveries by 14 percentage points, a relative increase of 19 percent, which is less than half of the increase found in phase I. No effect was found on the use of antenatal care in phase II. However, the use of modern family planning did significantly increase by 6 percentage points, a relative increase of 67 percent. No performance-based financing effect was found on bed-net use in phase II, unlike the effect found in phase I. The quality score increased by 16 percentage points, or 38 percent, which is a considerably smaller effect than found in phase I. Appendix 9²¹ shows that the effect on the total quality score is mainly driven by improvements in infrastructure and communication, in addition to the increased availability of family planning and drugs. We found no significant change in any of the five

measures for patient satisfaction.

Pooling the data shows that the overall effect of performance-based financing between 2006 and 2010 (Exhibit 2) implies a significant improvement in about half of the studied incentivized services. Effects on indirect outcomes are generally smaller than on the directly incentivized ones. Performance-based financing increased the share of women delivering in an institution by 22 percentage points, a relative increase of 36 percent, and the use of modern family planning services by 5 percentage points, a relative change of 55 percent. The overall facility quality score increased by 17 percentage points (relative change of 45 percent), and the share of patients reporting they felt cured increased by 9 percentage points (relative change of 12 percent). No significant effect was found on the other aspects related to the quality of care as reported by patients. We found no effects of performance-based financing on vaccination rates, the reported use of at least one bed net, or on the use of care when

ill. For most outcomes, there is no indication of heterogeneity of effects by poverty status (results available on request). Only for the use of health care when ill did we find the performance-based financing effect to be smaller for the poor.

Moving Forward

The experience in the first two phases of performance-based financing implementation in Burundi led the Ministry of Health to gradually introduce further alterations to the performance-based financing scheme, following the nationwide rollout. The main aims were to improve the verification of reported results; foster a more equitable distribution of outcomes; and enhance the quality of care. Below, we discuss these three changes as well as funding and sustainability of the scheme.

ALTERATIONS In the initial phase of the performance-based financing rollout, independent agencies (staffed by international nongovernmental organizations, or NGOs) were responsible for the contracting of health facilities and the verification of reported results and payments. The payment function has now been taken over by the national government. So-called *Comités Provincial de Vérification et de Validation* (Provincial Verification and Validation Committees) were developed to perform the contracting and verification functions. These committees are public-private partnerships comprising members from local government but also from civil society, provincial and district health management staff, international NGOs, and partners with technical expertise.

A second change relates to enhancing equity in health care use via two routes. First, so-called isolation bonuses are paid to health care facilities in rural, remote areas or with a relatively large share of their target population living below the poverty line. The higher per capita budgets should reduce staff shortages by attracting health workers from urban areas. Second, additional funding is provided to health facility managers for the provision of care to the poorest part of their target population.

A third modification relates to the measurement of quality, which initially focused on structure and process quality. The Ministry of Health noted satisfactory improvements in these quality measures. The ministry's subsequent aim is to strengthen other aspects of the quality of health care services. Beginning in 2014 the items on the quality checklist focus more on health outcomes and clinical aspects, aiming to move toward a full quality accreditation system, which is currently not in place.

FUNDING AND SUSTAINABILITY The initial im-

plementation of performance-based financing in phase I, inspired by earlier programs in Cambodia and Rwanda,^{30,31} was funded by aid agencies and international NGOs (including the Dutch NGO Cordaid). The Ministry of Health of Burundi is now providing the majority of funding for the national performance-based financing program, though reliance on funding from outside the country remains considerable. Performance-based financing sustainability seems secured because it is now recognized as a national strategy. The national government committed to allocate 1.4 percent of its budget to performance-based financing and related health financing strategies each year.

Discussion

The introduction of performance-based financing in Burundi improved the use of maternal care services and the quality of health care services during the period 2006–10. Examining the effect of performance-based financing on six of the twenty-three incentivized services, we found a positive effect on four of the six services in at least one of the implementation phases, as well as on the total quality score for health services. We found significant increases in institutional deliveries, antenatal care use (in phase I), modern family planning, and bed-net use (in phase I). The improvement in the total quality score in health care facilities based on external audits was large and significant but not confirmed by patient reports. The share of patients who felt cured after using health care increased significantly, though this outcome may be prone to reporting bias. No significant effects were found on the quantity of general health care used or on vaccinations in infants and pregnant women. We could not test for a performance-based financing effect on the seventeen other incentivized services that mostly relate to care for HIV, tuberculosis, and sexually transmittable diseases.

While some positive performance-based financing effects were obtained across the entire study period, effects were considerably larger in the early-adopting than the later-adopting provinces. The reasons for the lower effectiveness in the later period are unclear. Since institutional deliveries were lower at baseline for the early-adopting provinces, there may have been more room for improvement, but this does not explain the larger effects on other outcome measures. It could also be related to performance-based financing causing a steeper upward trend in phase I outcomes, creating a downward bias in our phase II estimates.

We did not find strong evidence of differential effects of performance-based financing across

socioeconomic groups, and the performance-based financing effects on the probability of using care when ill were even smaller for the poor. This suggests that a supply-side intervention such as performance-based financing without accompanying access incentives aimed at the poor is unlikely to improve equity. Outcomes that were not directly incentivized by performance-based financing payments showed less improvement compared to those directly incentivized.

RWANDA'S EXPERIENCE Our study findings can be compared to those of Paulin Basinga and colleagues,¹² who exploited the staggered rollout of performance-based financing in Rwanda to estimate its impact using difference-in-differences analysis. Rwanda is one of the few African countries with nationwide performance-based financing, and its neighboring location to Burundi makes it a suitable comparator. The Rwanda performance-based financing setup was similar, though subsidies to health care providers were slightly lower. The main design difference was that the control provinces received additional funding in Rwanda. The supply-side financing system also differed: Rwanda introduced performance-based financing within a system of community-based health insurance, while in Burundi user fees for deliveries and care for children younger than age five were removed. Basinga and colleagues¹² found a 23-percent-age-point increase in the number of institutional deliveries in Rwanda—close to the 22-percent-age-point increase we found in Burundi. They reported no significant impact of performance-based financing on tetanus vaccination or child immunization, in line with our findings. Neither study found a consistent effect on antenatal care use. The quality score in the Rwandese study is not directly comparable to ours, as it relates to

antenatal care, while the Burundi study evaluates a broad range of quality in health service delivery. However, both studies found the quality score to be the outcome measure showing the largest improvement.

The observed improvements in some of the incentivized services are likely to contribute to achieving the targets set by Millennium Development Goals 5 and 4 of reducing maternal and child mortality.³² World Bank Group President Jim Yong Kim recently announced that an additional \$700 million will be devoted to enhancing women and children's health through results-based financing, to help reach these Millennium Development Goal targets by 2015.³³

REMAINING QUESTIONS While our findings are encouraging, they also leave some remaining questions. The observed differences in effects between implementation waves call for further exploration of the relative contributions of the subcomponents of performance-based financing programs, such as the targeting of the vulnerable and the engagement of the community. We also cannot offer a conclusion on the effect of performance-based financing on the nonincentivized services, as that could not be studied with our data. Future research should also aim to identify effects of performance-based financing on health outcome measures such as maternal and child mortality. Also, further clarification is required on the issue of whether performance-based financing mainly affects health care use and quality through expanded facility resources or through a change in provider incentives. This would be essential to answer the questions of whether performance-based financing is a cost-effective intervention and whether its effects outweigh its additional administrative burden. ■

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NOTES

- 1 RBF Health. Projects [Internet]. Washington (DC): World Bank Group; 2013 [cited 2014 Nov 3]. Available from: <http://www.rbfhealth.org/project/our-projects>
- 2 SINA Health. PBF per country [Internet]. The Hague: SINA Health; 2013 [cited 2014 Nov 3]. Available from: http://www.sina-health.com/?page_id=85
- 3 Eijkenaar F. Key issues in the design of pay for performance programs. *Eur J Health Econ*. 2013;14(1): 117–31.
- 4 Meessen B, Soucat A, Sekabaraga C. Performance-based financing: just a donor fad or a catalyst towards comprehensive health-care reform? *Bull World Health Organ*. 2011; 89(2):153–6.
- 5 Meessen B, Musango L, Kashala JP, Lemlin J. Reviewing institutions of rural health centres: the Performance Initiative in Butare, Rwanda. *Trop Med Int Health*. 2006;11(8): 1303–17.
- 6 Soeters R, Vroeg P. Why there is so much enthusiasm for performance-based financing, particularly in developing countries. *Bull World Health Organ*. 2011;89(9):700.
- 7 Ireland M, Paul E, Dujardin B. Can performance-based financing be used to reform health systems in developing countries? *Bull World Health Organ*. 2011;89(9):695–8.
- 8 Kalk A, Paul FA, Grabosch E. “Paying for performance” in Rwanda: does it pay off? *Trop Med Int Health*. 2010; 15(2):182–90.
- 9 Eldridge C, Palmer N. Performance-based payment: some reflections on the discourse, evidence, and unanswered questions. *Health Policy Plan*. 2009;24(3):160–6.
- 10 Witter S, Fretheim A, Kessy FL, Lindahl AK. Paying for performance to improve the delivery of health interventions in low- and middle-income countries. *Cochrane Database Syst Rev*. 2012;2:1–81.
- 11 Peabody J, Shimkhada R, Quimbo S, Florentino J, Bacate M, McCulloch CE, et al. Financial incentives and measurement improved physicians’ quality of care in the Philippines. *Health Aff (Millwood)*. 2011;30(4): 773–81.
- 12 Basinga P, Gertler PJ, Binagwaho A, Soucat AL, Sturdy J, Vermeersch CM. Effect on maternal and child health services in Rwanda of payment to primary health-care providers for performance: an impact evaluation. *Lancet*. 2011;377(9775):1421–8.
- 13 Soeters R, Peerenboom PB, Mushagalusa P, Kimanuka C. Performance-based financing experiment improved health care in the Democratic Republic of Congo. *Health Aff (Millwood)*. 2011;30(8): 1518–27.
- 14 Yip W, Powell-Jackson T, Chen W, Hu M, Fe E, Hu M, et al. Capitation combined with pay-for-performance improves antibiotic prescribing practices in rural China. *Health Aff (Millwood)*. 2014;33(3):502–10.
- 15 Ministère de la Santé Publique, République du Burundi. Rapport de la mise en oeuvre du financement basé sur la performance au Burundi (Report on the implementation of performance-based financing in Burundi). Bujumbura: The Ministry; 2011.
- 16 Nimpagaritse M, Bertone MP. The sudden removal of user fees: the perspective of a frontline manager in Burundi. *Health Policy Plan*. 2011; 26(Suppl 2):ii63–71.
- 17 Kamana J. Selective free health care and performance based financing in Burundi: an opportunity to improve the provision of health services, especially for reproductive health care. Bujumbura: Ministry of Public Health and Fight against HIV/AIDS, Performance Based Financing National Technical Cell; 2012.
- 18 Musango L, Basenya O, Elovainio R. Une approche novatrice pour progresser vers la couverture universelle au Burundi: intégration du financement basé sur la performance et de la gratuité des soins (An innovative approach toward universal health coverage in Burundi: integration of performance-based financing and free health care). *African Health Monitor*. 2013;(17):25–9.
- 19 Bertone MP, Meessen B. Studying the link between institutions and health system performance: a framework and an illustration with the analysis of two performance-based financing schemes in Burundi. *Health Policy Plan*. 2013;28(8): 847–57.
- 20 Ministère de la Santé Publique République du Burundi. Manuel des procédures pour la mise en oeuvre du financement basé sur la performance au Burundi (Manual for the implementation of performance-based financing in Burundi). Bujumbura: The Ministry; 2010.
- 21 To access the Appendix, click on the Appendix link in the box to the right of the article online.
- 22 Morgan L. Brand new day: newly launched nationwide performance-based financing (PBF) scheme in Burundi reflects the hopes of a nation. Washington (DC): World Bank; 2010 May.
- 23 Bertrand M, Duflo E, Mullainathan S. How much should we trust differences-in-differences estimates? *Quarterly J Econ*. 2004;119(1): 249–75.
- 24 Angrist JD, Pischke J-S. Mostly harmless econometrics: an empiricist’s companion. Princeton (NJ): Princeton University Press; 2008.
- 25 Cameron AC, Gelbach JB, Miller DL. Bootstrap-based improvements for inference with clustered errors. *Rev Econ Stat*. 2008;90(3):414–27.
- 26 Aker JC, Boumniel R, McClelland A, Treiney N. Zap it to me: the impacts of a mobile cash transfer program. Medford (MA): Tufts University; 2012.
- 27 Sankoh A, Huque MF, Dubey SD. Some comments on frequently used multiple endpoint adjustment methods in clinical trials. *Stat Med*. 1997;16(22):2529–42.
- 28 McKenzie D. Tools of the trade: a quick adjustment for multiple hypothesis testing [Internet]. Washington (DC): World Bank; 2012 Oct 21 [cited 2014 Nov 3]. Available from: <http://blogs.worldbank.org/impactevaluations/tools-of-the-trade-a-quick-adjustment-for-multiple-hypothesis-testing>
- 29 BBC News. Africa: Burundi profile [Internet]. London (England): BBC; 2014. Available from: <http://www.bbc.co.uk/news/world-africa-13087604>
- 30 Soeters R, Griffiths F. Improving government health services through contract management: a case from Cambodia. *Health Policy Plan*. 2003;18(1):74–83.
- 31 Soeters R, Habineza C, Peerenboom PB. Performance-based financing and changing the district health system: experience from Rwanda. *Bull World Health Organ*. 2006; 84(11):884–9.
- 32 Lozano R, Naghavi M, Foreman K, Lim S, Shibuya K, Aboyans V, et al. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet*. 2013; 380(9859):2095–128.
- 33 Kim J. World Bank Group President Jim Yong Kim’s speech at World Health Assembly: poverty, health, and the human future [Internet]. Geneva: World Bank; 2013 May 21 [cited 2014 Nov 3]. Available from: <http://www.worldbank.org/en/news/speech/2013/05/21/world-bank-group-president-jim-yong-kim-speech-at-world-health-assembly>