WPS8059

Policy Research Working Paper 8059

Effects of Performance Incentives for Community Health Worker Cooperatives in Rwanda

Gil Shapira
Ina Kalisa
Jeanine Condo
James Humuza
Cathy Mugeni
Denis Nkunda
Jeanette Walldorf

WORLD BANK GROUP
Development Research Group
Human Development and Public Services Team
May 2017

Policy Research Working Paper 8059

Abstract

This paper presents the results of a randomized controlled trial set to evaluate the effects of a pay-for-performance scheme that rewarded community health worker cooperatives for the utilization of five targeted maternal and child health services by their communities. The experiment took place in 19 districts in Rwanda between 2010 and 2014. The analysis finds no impact of the performance payments on coverage of the targeted services, attitudes and behaviors of community health workers, or outcomes at the cooperative level. No synergies are found between the scheme and a demand-side, in-kind transfer intervention that was independently effective in increasing coverage rates of targeted services.

This paper is a product of the Human Development and Public Services Team, Development Research Group. It is part of a larger effort by the World Bank to provide open access to its research and make a contribution to development policy discussions around the world. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org.
The authors may be contacted at gshapira@worldbank.org.

Effects of Performance Incentives for Community Health Worker Cooperatives in Rwanda

Gil Shapira [a], Ina Kalisa [b], Jeanine Condo [c], James Humuza [b], Cathy Mugeni [d], Denis Nkunda [d], Jeanette Walldorf [a]

JEL classification codes: I12, O15, H51

Acknowledgements

The Community PBF program was implemented by the Ministry of Health, under the leadership of Dr. Agnes Binagwaho, Fidele Ngabo and Cathy Mugeni. The authors would like to acknowledge the contribution to the program and its evaluation made by Netsanet Walelign Workie, Jennifer Sturdy, Gayle Martin, Sebastian Martinez, Paul Gertler, Paulin Basinga, Patrick Mullen, Christel Vermeersch, Elisa Rothenbuhler, Vedaste Ndahindwa and Randy Wilson. The team benefited from comments made by participants of seminars at Erasmus University Rotterdam and Universitat Pompeu Fabra. The financial contributions of the Health Results Innovation Trust Fund are gratefully acknowledged. The findings, interpretations and conclusions expressed in this paper are entirely those of the author, and do not necessarily represent the views of the World Bank, its Executive Directors, or the governments of the countries they represent.

[a] Development Research Group, The World Bank
[b] School of Public Health, College of Medicine and Health Sciences, University of Rwanda
[c] Rwanda Biomedical Center
[d] Ministry of Health, Rwanda
[*] Corresponding author: Gil Shapira, gshapira@worldbank.org

Introduction

Pay-for-performance schemes have been increasingly introduced in the health care systems of Sub-Saharan African countries and low- and middle-income countries more generally (Miller and Babiarz 2013; Witters et al. 2012). The schemes are introduced with the aim of improving health outcomes through increasing both the coverage and quality of health services. In some African countries, such as Rwanda, Burundi, Sierra Leone, Cameroon and Benin, such schemes targeting maternal and child health services are implemented at scale and are part of the national health care delivery system. Many more countries are either piloting such schemes or have them implemented at a regional level (World Bank 2015). In the African context, these schemes have mostly focused on incentivizing formal health providers at the health facility level. However, some programs have also incentivized other agents, such as users of the health services, local governments, community bodies and community health workers.

This study evaluates the impact of an intervention that rewarded cooperatives of volunteer community health workers (CHWs) for utilization of five targeted maternal and child health services by the communities they serve. The intervention was introduced in the context of the Community Performance-Based Financing (CPBF) program at the end of 2010. When cooperatives received payments through the CPBF program, a maximum of 30 percent could be immediately distributed to cooperative members while the rest had to be invested in income-generating activities of the cooperatives' choosing. Revenues from these entrepreneurial activities, in turn, could be reinvested or distributed as dividends to the members.

The evaluation relies on an experimental design in which cooperatives in randomly selected sectors (sub-districts) received quarterly payments conditional on performance, defined by utilization rates in the catchment areas served by the cooperatives. Cooperatives in comparison sectors received quarterly payments that were not tied to performance. These payment amounts equaled the average amounts received by the cooperatives under the scheme. Data used in the analysis are from a baseline survey of households, CHWs and cooperatives conducted prior to the launch of the program, and from a follow-up survey conducted about three years after the launch of the scheme.

The results indicate no impact of the CHW cooperative performance payments on the targeted indicators of timely antenatal care, in-facility delivery and growth monitoring of children. Lack of impact on use of modern family planning methods cannot be rejected. Furthermore, no evidence was found that the intervention impacted the motivation, satisfaction or behaviors of CHWs, or the way

cooperatives were run. The outcomes of the performance payment scheme were found to be invariant with respect to whether it was implemented together with a demand-side in-kind incentives scheme that was found to be independently effective in increasing coverage of timely antenatal and postnatal care.

This study contributes to a growing body of literature on pay-for-performance programs in the health sector in developing countries. On the one hand, evidence suggests that these programs can be effective in increasing service utilization, quality of care and health outcomes (e.g. Basinga, Gertler et al. 2012; Gertler and Vermeersch 2012; and Bonfrer et al. 2014). On the other hand, these are complex interventions and some experiences have resulted in mixed or no improvements in targeted outcomes (e.g. Van de Poel et al. 2015; Huillery and Seban 2015; Engineer et al. 2015). The paper contributes to the growing literature analyzing the conditions under which these programs are effective and the design features that improve their effectiveness. Questions such as which indicators to pay for and who should be paid are of special interest. This paper relates more specifically to studies of programs that paid for health-related outcomes to agents who are not formal health providers. Examples of such programs include block grants to villages in Indonesia, incentives to school principals for reducing anemia among students in China, and payments to childcare workers in India for reducing malnutrition (Olken et al. 2014; Miller et al. 2012 and Singh 2015).

Background and the Intervention

Since June 2006, Rwanda has implemented a pay-for-performance scheme in health centers and hospitals.[1] The program, named Performance-Based Financing (PBF), provided financial rewards to health facilities to promote maternal, child and HIV/AIDS services. The rewards were conditional on the number of services provided as well as measures of quality of care. The program was phased-in to allow implementation of an impact evaluation that compared outcomes in treated districts to those in comparison districts receiving additional input-based financing equaling the average PBF payments made to facilities under the scheme. Studies have found that the PBF scheme increased utilization of services such as institutional deliveries, preventative care visits by children, and voluntary counseling and testing for HIV/AIDS by couples (Basinga, Gertler et al. 2012, de Walque, Gertler et al. 2015).

[1] Pilot PBF programs have been introduced as early as 2001 (Meesen et al. 2006; Soeters, Habineza and Peerenboom 2006; Rusa et al. 2009).

Positive impacts were also found on outcomes such as quality of prenatal care and anthropometric measures for children (Basinga, Gertler et al. 2102, Gertler and Vermeersch 2012).

Community health workers were integrated into the PBF scheme in 2009. Each village in Rwanda has three community health workers: one female in charge of maternal and neonatal health, and a male and a female that serve as multidisciplinary CHWs. The CHWs are volunteers elected by the village residents. The criteria for selection are the ability to read and write, being 20 to 50 years old, and residing in the village. CHWs within the catchment area of a health center are organized in a CHW cooperative. All CHWs must be members of the cooperatives and membership is closed to any other individual. When cooperatives receive transfers from the program, a minimum of 70 percent has to be invested in income-generating activities of the cooperatives' choosing. The other 30 percent, as well as revenues from the income-generating activities, can be allocated among the cooperative members. It is up to the cooperatives to decide how to allocate these funds among their members.

The objectives of the CHW incentives strategy were to improve the quality of data reported at the sector level, increase utilization of key maternal and child health services and improve the motivation and behavior of CHWs. Initially, payments to cooperatives depended on timely completion of quarterly reports of data the CHWS collected on their communities. With the introduction of the CPBF program, payments to cooperatives were also conditioned on utilization of targeted health services in their corresponding catchment areas. The cooperatives received quarterly payments based on utilization of five targeted maternal and child health services. The incentivized services, provided at the health centers, were growth monitoring of children 6-59 months old, antenatal care provided to women in the first four months of their pregnancy, in-facility deliveries, family planning consultations for new users, and family planning consultations for regular users.

In several ways, the CHW cooperative performance payments scheme is similar to the Rwanda PBF scheme at the health facility level and pay-for-performance schemes to health providers more generally. The basic concept is to use financial rewards to induce higher effort exerted towards achieving pre-specified targets. Unlike health providers, though, the CHWs do not actually provide the targeted services but serve as a link between the health centers and the communities by providing information on the services and encouraging utilization. Therefore, they do not have the ability to impact the availability and quality of health services. However, as community members themselves, they could employ local knowledge to encourage service utilization in ways that the formal health providers cannot.

The rewards to health facilities and to the cooperatives are both provided based on the collective performance of teams. Both facilities and cooperatives have some autonomy to decide how to distribute the performance rewards among the group members. Unlike the cooperatives, though, health facilities have hierarchical management structure and, at least at the health center level, a much smaller number of staff members. The facility management can continually observe the work of its staff. For the PBF program, for example, individual staff performance evaluations forms have been developed to track performance of individual staff members (Fritsche et al. 2014). While the cooperatives have presidents and accountants, their roles are primarily to coordinate with the health centers, and to manage the cooperative finances and income-generating activities. The health work of the CHWs is done in their respective villages and is unobservable to other members and the cooperative management team. Theoretically, incentivizing teams might lead to improved performance through cooperation between the members and creation of positive pressure to perform if effort exertion is observable to other members. However, the large number of cooperative members and the fact that individual effort is unobservable are more likely to induce free-riding in the community PBF model than in the health-facility PBF model.

The amounts allocated to each CHW depend not only on the effort exerted by all other cooperative members but also on the success of the cooperative enterprises. If the income-generating activities of the cooperative are profitable, that amplifies the return to effort exerted toward encouraging the communities to receive services at the health centers. However, uncertainty about profitability of the cooperative's enterprises can further weaken the link between individual effort and eventual financial return.

Another potentially important aspect to consider is the fact that community health workers are volunteers who only spend a portion of their time on providing health services in their communities. It could be that they are intrinsically motivated to serve their communities and therefore are less likely to respond to financial incentives. Previous studies have shown that pro-social preferences might lead health providers to exert effort even in the absence of supervision and extrinsic rewards (for example, Reinikka and Svensson 2010, Leonard and Masatu 2010). Nevertheless, a large body of literature, including the studies on pay-for-performance schemes mentioned above, have shown that monetary and non-monetary rewards, as well as career opportunities can improve provision of public services (for example Ashraf et al. 2014, Ashraf et al. 2014).

In the context of the CPBF program, a demand-side in-kind incentives scheme was also piloted with the objective of enhancing the demand for maternal health services in order to diagnose and treat preventable threats to maternal and neonatal health. Health centers received funding to endow women with gifts for receiving timely antenatal and postnatal care, as well as delivering in health facilities. Health centers in selected sectors received funds to procure gifts between October 2010 and February 2013. Value ceilings were set for the gifts provided for each service and suggestions for the gifts were provided. Although health centers experienced frequent stock-outs of the gifts, the scheme had a positive impact on rates of early antenatal and postnatal care (Kalisa, Shapira et al. 2016). While it is not the goal of this paper to evaluate the direct impact of the demand-side scheme, the overall design of the CPBF program allows the estimation of potential synergies between the CHW cooperative performance payments and the in-kind transfers to women. Timely antenatal care and in-facility deliveries were targeted by both interventions.

Methods

The estimation of the impacts of the CHW cooperative performance payments relies on the experimental design of the study, depicted in Figure 1. Sectors (sub-districts) in 19 districts were randomly assigned to different study arms.[2] The districts are in four of the five provinces of the country, excluding the province of the capital city Kigali. Sectors without a public or non-for-profit faith-based health center were excluded, as were 30 sectors where the demand-side in-kind transfers were piloted.[3] The remaining 198 sectors were blocked by district and poverty ranking defined by the country's Vision Umurenge social protection program.

The sectors were randomly assigned into four study arms. In all study arms, CHW cooperatives received funds conditional on submitting the routine reports on their communities. In the first study arm, the quarterly amounts paid to cooperatives depended on performance on the selected indicators. In the second study arm, payments to cooperatives were not linked to performance but health centers received funds to implement the demand-side in-kind transfers for timely antenatal care, in-facility

[2] The 19 districts include the 18 districts of the impact evaluation of the PBF at the health facility level in 2006-2008. An additional district was added to increase the statistical power of the study.

[3] A sector typically contains a single public or non-for-profit faith-based health center with the catchment area of the health center corresponding to the boundary of the sector. However, there are some sectors that do not contain a health center and others have more than one.

delivery and timely postnatal care. In the third study arm, both the CHW cooperative performance payments and demand-side transfers were implemented. The fourth study arm served as a control group, and pay-for-reporting was the only CPBF component implemented. In the two study arms in which payments were not linked to performance (the first and second), cooperatives received the average quarterly amounts given to cooperatives in the two study arms in which cooperatives were paid for performance (the third and fourth arms). This reflected the fact that the goal was to evaluate the impact of tying payments to performance and not the impact of different level of payments to the cooperatives. The percentage of the funds that had to be invested in the cooperatives' income-generating activities, as well as the autonomy to decide how to allocate the money among the members, were the same in all treatment arms.

A baseline survey was fielded from February to May 2010 to measure outcomes prior to the launch of the program, and to establish internal validity of the study. For a household-level survey, 12 households with a woman aged 15-49 with a recent pregnancy or birth were selected from the catchment area of each of the 198 health centers. First, three cells (groups of villages) were randomly selected, and four villages within each cell were randomly selected. In each village, a field supervisor consulted the village leader and/or community health workers in order to identify the household with the most recent birth in each village.[4] This resulted in a sample of 2,376 households. In each village, the CHW in charge of maternal and neonatal health was to be interviewed. Interviews were completed with 2,005 CHWs (about 84 percent of the target). In addition, interviews were conducted with 197 cooperative presidents.

Implementation of the cooperative performance payments and demand-side in-kind incentives started in October 2010. Table 1 presents the unit fees paid to the cooperatives in the different implementation years. Most unit fees were halved by the end of 2011 and reduced by an additional 25 percent the following year. Four additional indicators related to tuberculosis and HIV testing were added during the implementation of the program. These indicators were added nationally and are not discussed in this paper. While the cooperative performance payments were implemented continuously until after the follow-up survey, health centers received their last payments for the demand-side transfers on February 2013.

[4] During the fieldwork, the survey team learned that some villages, in five of the sectors, were served by health facilities different than the ones affiliated with the CHW cooperative selected for the sample. In these cases, additional households in the villages covered by the selected cooperatives were added to the sample.

A follow-up survey took place between November 2013 and June 2014. The survey teams returned to the same villages sampled for the baseline survey and identified (i) the women interviewed at baseline and (ii) women with the most recent birth or pregnancy in each village.[5] Interviews were completed with 2,157 of the baseline women and 2,343 women with recent pregnancies. Tracking of baseline women was attempted also outside the original districts in which they resided, which was the main driver of the longer duration of fieldwork. 2,200 CHWs in charge of maternal and neonatal health in the same villages were interviewed as well as 197 presidents of CHW cooperatives.

The outcome measures are constructed using data from the household, CHW and cooperative surveys. The household surveys are used to construct measures of health service utilization, use of modern family planning methods, fertility and interactions between women and CHWs. Data from the CHW survey are used to construct measures of CHW behavior, motivation and satisfaction. Lastly, data collected through the interviews with cooperative presidents are used to construct measures of cooperative dynamics.

Descriptive Analysis

Tables 2-4 present summary statistics of the baseline characteristics of the samples of women with recent pregnancies, CHWs in charge of maternal and neonatal health and CHW cooperatives. The tables report means by exposure to the CHW cooperative performance incentives treatment.[6] In addition, the tables report p-values of t-tests assessing the similarity between treatment and control groups. Overall, the randomization achieved balance between the two groups with respect to observable characteristics.

About 19 percent of the households are from the South Province, 28 percent from each of the East and West Provinces, and 25 percent from the North province. Households consisted of an average of five members and were located at an average distance of about 4.3 kilometers from the health center serving their village. The average age of the sample of women with recent pregnancy was 28.2 and 91 percent were married. Eighteen percent of the women have never attended school, 70 percent attended at least some primary school, and the rest have attended at least some secondary or higher

[5] The same procedure as in the baseline survey was implemented to identify the women with recent pregnancies.
[6] The two study arms in which CHW cooperatives were paid for performance are combined to define the treatment group for the purpose of this paper.

level education. Ninety percent were covered by *Mutuelle*, Rwanda's community-based health insurance program.

The average number of births given by women in the sample is three, and the women had on average 2.7 living children. Forty percent of the women reported ever using any modern method of family planning. Almost all women have received at least one antenatal consultation during their most recent pregnancy, but only 63 percent initiated antenatal care within the first four months of the pregnancy and 37 percent received four or more consultations (number of consultations recommended by WHO guidelines). Seventy-nine percent have delivered in a health facility, attended by a skilled health provider.

Table 3 presents the baseline characteristics of CHWs in charge of maternal and neonatal health. It is important to keep in mind that the community health program was going through a reorganization process at the time of the baseline survey. This is apparent in the CHW and cooperative surveys' results. For example, although all CHWs in charge of maternal and neonatal health were supposed to be female, about 14 percent of those who declared being such community health workers were men. About 54 percent of CHWs reported being in that role for a year or less. The average reported years of experience is 2.7. Average age was 39, and 87 percent were married. All CHWs had at least primary level education, and 38 percent had a higher level of education. They reported having visited an average of 28 households in the month preceding the survey and spending an average of 17 hours per week on their community health duties. Seventy-seven percent reported receiving any training in the 12 months preceding the survey. About 52 percent were ever trained on antenatal and postnatal care, 53 percent were trained on referral for delivery or for danger signs, 6 percent were trained on safe home delivery, and 40 percent on newborn care.

As can be seen in Table 4, 84 percent of cooperatives were based in the grounds of the health centers. The corresponding catchment area consisted of an average of 37 villages with a population of about 20,000. At the time of the baseline survey, most cooperatives had less than the target amount of members (three per village) while many cooperatives had more than three CHWs per village.[7] The average number of members was 105.4. In the 12 months preceding the survey, the cooperatives had recruited an average of 35 members, dismissed two members and had two members resign. The cooperative leaders reported having had an average of 7.5 meetings during the preceding year. Average

[7] Prior to the reorganization of the community health program many villages had CHWs in charge of social affairs or with HIV/AIDS specialization.

cooperative income for 2015 was about a million Rwandan Francs (RWF) with an average expenditure of 330,000 RWF.

The results of the follow-up survey show that during the implementation of the program, the cooperatives were indeed reorganized according to the guidelines. Most of the cooperatives (about 80 percent) reported their number of members to be exactly three times the number of villages they serve. In addition, the ratio of females to males was two to one, as expected.

Our data show overall increase in utilization of maternal and child health services between the baseline and follow-up surveys. These trends are best portrayed by focusing on the sectors that were not exposed to either of the two interventions. Although the rate of women attending at least one antenatal consultation was already almost universal in the baseline (98 percent), the rate of women who initiated antenatal care within the first four months of their pregnancies increased from 63 percent to 72 percent. The percentage of women who attended four or more consultations increased from 36 to 40. The in-facility delivery rate increased from 79 to 94 percent. The rate of children 6-59 months who have been measured for nutritional status in the six months preceding the survey has increased from 50 to 79 percent.

During the follow-up survey, the field teams managed to complete interviews with 99 percent of the target number of women with recent births and 93 percent of the target number of CHWs in charge of maternal and neonatal health. There are no statistically significant differences in these rates between the treatment arms. However, the attrition rate of 'baseline women' - those who were recently pregnant at baseline - is not balanced. As can be seen in Table A1 in the appendix, successful re-interviews were conducted at the follow-up round with almost 93 percent of the baseline women in the sectors that did not implement the CHW cooperative performance payments and with 89 percent of the women in the sectors that implemented the intervention. Exposure to the performance payments intervention is significantly correlated to higher attrition also when controlling for a range of baseline characteristics of the women.

Impact of the CHW Cooperative Performance Payments

Given the experimental design and the balance between the study arms, the effects of the CHW cooperative performance payments can be estimated simply by regressing outcomes from the follow-up survey on an indicator of exposure to the intervention. Our main empirical specification is therefore

$$y_i = \alpha + \beta Performance_i + \epsilon_i,$$

where the unit of observation i can represent a woman, a CHW or a cooperative. y is an outcome measured at the follow-up survey. $Performance_i$ is a dummy for belonging to a sector assigned to the CHW cooperative performance payments treatment. When the unit of observation is women or CHWs, the error term is clustered at the sector level.

Impact on targeted maternal and child health services

The first two columns of Table 5 report the results on the impact of the intervention on utilization of the targeted maternal health services: timely antenatal care and in-facility delivery. The sample used for the analysis is that of women with recent pregnancies that resulted in live births. There is no impact of the performance incentives on initiation of antenatal care within the first four months of pregnancy. There is also no impact found on the rate of women who deliver in health facilities. It is important to keep in mind, however, that by the time of the follow-up survey the rate of in-facility deliveries was 95 percent in the control group.

Results of the impact of the intervention on child growth monitoring are presented in the third column of Table 5. The indicator used is whether a child was measured in the 6 months preceding the survey to determine his or her nutritional status. We perform the analysis among children 6-59 months old of the sample of women with recent pregnancies. There is no statistically significant difference between the treatment arms with respect to the rate of children who received growth monitoring services. We report the results for children of women with recent pregnancies because, as discussed in the previous section, attrition was unbalanced for the other sample. Among 'baseline women,' attrition was higher for women residing in treatment sectors under the CHW cooperative performance payments scheme. We did however perform the analysis also for the larger sample of children of all women and found no evidence of impact of the program on rates of growth monitoring.

Impact on use of modern family planning methods

The sample used for estimating the impact of the CHW cooperative performance incentives on family planning is that of 'baseline women'. The two outcomes explored are an indicator for having had an additional pregnancy since the baseline interview and whether the women reported using modern

contraceptive methods at the time of the follow-up survey. Because of the difference in attrition rates between the treatment arms, we present results also of regressions including controls for characteristics of the women, their households and the CHWs in their villages.

Overall, 56 percent of the women reported having an additional pregnancy after 2010. As can be seen in Table 6, there is no statistically significant impact of the performance payments on the likelihood of having an additional pregnancy since baseline. There is also no significant effect detected on the likelihood of reporting the use of modern methods of contraception. Fifty percent of the women report using some modern contraceptive method while 58 percent reported using any method. As in the Rwanda DHS 2014-15, the most commonly used method is injectables, followed by contraceptive pills. Women in the sectors implementing the cooperative performance payments are less likely to be using modern contraceptive methods by 3 percentage points but the difference is not statistically significant.

Because the attrition rates were unbalanced between the treatment arms, rather than stating that there was no impact of the CHW cooperative performance payments on the use of modern family planning, we say we cannot reject that there is no impact. We can also reject big impacts of the performance payments on use of modern family planning. For example, under the extreme assumption that all missing women from the treatment sectors used modern family planning methods and those missing from the other sectors have not, the utilization rate would be higher among the treatment group by less than seven percentage points.

Another check we conducted to assess difference in fertility among the treatment arms is to compare the characteristics of women who were recently pregnant at the follow-up round (the 'recently pregnant' sample). If women respond to the intervention by increasing use of modern family planning methods, we would expect to see differences in characteristics such as age and number of previous births among pregnant women in the different treatment arms. As reported in Table A2 in the appendix, the women in the sectors exposed to the performance payments and in the other sectors are similar. Not only is the average age similar, but the 25, 50 and 75 age percentiles are identical. There is no statistically significant difference in the number of household members, whether the women are covered by health insurance, the number of lifetime births and the number of living children. The only statistically significant difference, at the 10 percent level, is in the share of women with at least some secondary education. These similarities also suggest there has been no impact of the CHW cooperative performance payments on use of modern family planning.

Impact on CHW behavior, satisfaction and motivation

The results presented above do not point to an impact of the CHW cooperative performance payments on the targeted outcome indicators. We performed further analysis to estimate whether having the cooperative payments conditional on the collective performance affects individual behavior by the community health workers. Theoretically, it could be that CHWs exerted greater efforts in response to the performance payments even if these efforts did not lead to increased utilization of targeted health services by the communities they served. We also test whether the different reward schemes impacted measures of motivation and satisfaction by the CHWs.

Panel A of Table 7 reports the impact of the intervention on four self-reported measures of CHW behavior. According to the CHWs, they spent an average of 10 hours providing health services in a typical week and visited an average of 33 households in the month preceding the survey.[8] There is no statistically significant difference between the treatment arms with respect to these measures. The CHWs were also asked whether they seek advice from other CHWs. Overall, about 75 percent of CHWs declared frequently seeking advice from other members of their village community health team and 60 percent reported seeking advice from CHWs outside the village. There is a small and statistically insignificant difference in these reports when CHWs belong to cooperatives paid for performance.

In Panel B of Table 7, results are presented on the impact of the interventions on reports of recently pregnant women regarding interactions with CHWs during their most recent pregnancies. A high percentage of women, 78, reported receiving information on antenatal care from a CHW. On the other hand, only 26 percent of women reported receiving information on postnatal care. When comparing the two arms that received the performance payments to the two that have not, there is no statistically significant difference in these rates. There is also no statistically significant impact on whether CHWs referred or accompanied the women for antenatal consultations. Surprisingly, the rate of women who were referred or accompanied to deliveries is lower when the performance payments are provided, although this is one of the paid indicators. Among the sectors that did not receive the performance payments, 54 percent of women reported being referred or accompanied by CHWs to delivery. The rate is lower by 4 percentage points among the sectors that did and significant at the 10 percent level. Given

[8] CHWs were asked differently in the baseline and follow-up surveys regarding the time they spent on health activities. In the baseline, they were asked how many hours per day and how many days per week they work as a CHW. In the follow-up survey, they were directly asked how many hours they spend providing health services in a typical week.

that this is the only significant difference found between the treatment arms, it could be a spurious effect.

Seventy-one percent of all women (those with recent pregnancies and 'baseline women') reported meeting with a CHW in the preceding three months either in their communities or at home. Forty-five percent reported having such meetings in their own home. As seen in Panel C of Table 7, there are small and statistically insignificant differences in these rates between the different treatment arms.[9]

The follow-up survey included a module in which the CHWs reported their satisfaction regarding different features of their role. Overall, high levels of satisfaction were reported as can be seen in Panel A of Table 8. Above 98 reported being satisfied or very satisfied with their role overall, with their relationship with the health center staff and with the respect they receive from their communities. High but slightly lower rates of satisfaction were recorded with respect to their ability to meet the needs of the communities and aspects related to the cooperative. About 80 percent were satisfied with the work ethics and knowledge of the other cooperative members while about three-quarters of CHWs were satisfied with the way decisions are being made by the cooperative and their ability to influence those decisions. About half of the CHWs were satisfied with the support (financial or other) they receive from the community. Only 21 percent reported being satisfied with their compensation. As seen in Table 8, there is no apparent relationship between satisfaction overall and the CHW cooperative performance payments. For only one of the 10 categories is there a statistically significant difference at the 10 percent level.

To assess the motivation of CHWs, the survey respondents were also asked to state whether they agree with a list of statements related to their work as community health workers. The outcome measure used in the regressions presented in Panel B of Table 8 is whether the respondents agreed or strongly agreed with each of the statements. There is very little variation in responses, with almost all CHWs agreeing with statements such that the role as CHW makes them feel good about themselves, that they are proud to serve their communities and that they are feeling motivated to work as hard as they can. There are negligible differences in responses of CHWs in the different treatment arms.

[9] Because of the unbalanced attrition of the baseline women, we also ran the regressions using only the sample of recently pregnant women. Also for that group there are no statistically significant differences between the groups.

Impact on cooperative dynamics

There are different ways in which the CHW cooperative performance payments could impact the interactions between cooperative members and the way the cooperatives are run. The performance determining the payments is measured at the cooperative level but the effort is exerted at the individual level in the different villages. On the one hand, this could lead to frictions if members are suspecting others are free-riding. On the other hand, it could lead to greater cooperation or positive pressure to perform if levels of effort exerted are observed by other members. Results of the analysis of the impacts of the program on different cooperative-level outcomes are presented in Table 9.

Cooperative presidents reported an average of 4.5 member meetings in the 12 months preceding the survey. Seventy-seven percent of cooperatives had between two and four annual meeting while 12 percent reported monthly meetings. There is no statistically significant difference between the treatment arms. The presidents also reported that the performance of cooperative members was internally evaluated on average eight times in the year preceding the survey.[10] Half of the cooperatives had monthly internal evaluations and 5 percent had zero. There is no evidence that the number of internal evaluations is impacted by tying CPBF payments to cooperative performance.

We also find no impact of the interventions on indicators related to recruitment and retention of CHWs. At the time of the interview, the presidents reported an average of 0.5 vacant positions in the cooperatives with 75 percent of cooperatives having no vacant position. In the 12 months preceding the survey, the cooperatives recruited on average about six members and about four have resigned. Thirty percent of the cooperatives have dismissed at least one member during that period and the overall average of members dismissed per cooperative is 1.1. As can be seen in Table 9, the CPBF interventions did not impact movements of members in and out of the cooperatives.

Because it is up to the cooperatives to decide how to distribute payments among their members, one way cooperatives can deal with potential free-riding is to distribute the payments according to personal performance. Most cooperatives distributed equal amounts to their members and 46 percent distributed amounts depending on performance. When comparing the two arms implementing the performance payments to the two that do not, there is no statistically significant difference in tying member payments to performance.

[10] Three cooperative presidents reported 40 or more annual internal evaluations of members. These observations were dropped as they seem unrealistic.

Synergies between the CHW cooperative performance incentives and the demand-side in-kind transfers

Lastly, we test whether there is a multiplicative effect when implementing both the CHW cooperative performance payments and the demand-side in-kind transfers. Timely antenatal care and in-facility deliveries were targeted by both interventions. To that end, we also estimate the following model:

$$y_i = \alpha + \beta_1 Performance_i + \beta_2 Demand_i + \beta_3 Performance_i \cdot Demand_i + \epsilon_i,$$

where $Demand_i$ is a dummy variable for belonging to a sector in which health centers received funding to endow women with gifts when they meet the eligibility criteria.

The results presented in Table 10 do not point to synergies between the two interventions. The rate of women who received timely antenatal care in the sectors implementing the demand-side intervention is higher by nine percentage points. The effect is statistically significant at the 1 percent level. In the sectors implementing both interventions, the rate is higher by eight percentage points relative to the control sectors implementing none of the programs. Neither of the interventions significantly impacted the rate of in-facility deliveries. For both targeted services, there is no significant difference in the impact of the demand-side intervention whether it is implemented in conjunction with the CHW cooperative performance payments or not.

Although the two interventions had only two common targeted indicators, the conditional in-kind transfers could theoretically increase overall engagement of women with the health care system in general and with the CHWs in particular. We ran the regressions on all outcomes presented in Tables 5-9 using the specification separating the four study arms and we did not find evidence of systematic synergies between the interventions.

Discussion

The CHW cooperative performance payment scheme is not found to have affected targeted outcomes. No impact was detected on the coverage rates of timely antenatal care, in-facility delivery or growth monitoring of children under 5. We cannot reject lack of impact on use of modern family planning methods. Furthermore, we find no evidence that the CHW incentives scheme affected the behavior, motivation and satisfaction of CHWS as well as outcomes at the cooperative level. We find no synergies between the CHW cooperative performance payments and the demand-side in-kind transfers. The

demand-side intervention, which was found to positively impact rates of timely antenatal and postnatal care, does not result in different outcomes when implemented in conjunction with the CHW incentives.

It could be that the financial rewards per service were not high enough. For the CHWs to increase effort towards a targeted service, the reward has to be perceived as at least equal to the cost incurred by exerting the additional effort. The cost, for example, can be in terms of the time the CHW will have to spend away from household tasks or income-generating activities. As shown Table 1, the per-service incentive amounts have been continuously reduced. In the follow-up survey, CHWs were asked to report the amount received in their last CPBF quarterly payment, excluding dividends from the cooperatives' income-generating activities. The average reported amount was only about 7.3 USD. For reference, the GNI per capita was estimated to be 690 USD in 2014. This means that for an average Rwandan the CPBF payments would represent a very small change in income. The PBF scheme at health facilities, for comparison, increased staff salaries by 38 percent (Basinga, Gertler, et al. 2011).

Another factor that could have further diminished the expected return to effort exertion is the transmission of the financial incentives through the cooperative structure. When CPBF payments were transferred to the cooperative, at least 70% of the payments had to be invested in the cooperatives' income-generating activities. It was up to the cooperatives to decide how to allocate the CPBF payments and dividends from the income-generating activities among an average of more than 100 members. Therefore, the reward for an individual CHW does not depend only on her effort but also on the efforts of the other cooperative members, the success of their income-generating activities and the cooperative's revenue allocation decisions. Moreover, focus group discussions conducted early during the implementation of the program revealed that CHWs were confused about the payment mechanisms of the CPBF program (Condo et al. 2014).

The study was not set up to evaluate the organization of community health workers in cooperatives and cannot identify their impact as the same organization was used in all study arms. There are ways in which the organization of CHWs in cooperatives is theorized to positively impact the performance of the CHWs. For example, the income received from the cooperatives might permit the CHWs to spend more time on health activities rather than on individual income-generating activities. The cooperatives might also enable sharing of health knowledge and collaboration. However, transferring the financial incentives through the cooperatives might not serve as an optimal platform for inducing individual effort by the CHWs in their perspective villages as it can weaken the link between efforts exerted and perceived rewards.

It is also important to keep in mind that the study compared outcomes between sectors in which cooperatives were paid for reporting health indicators and outcomes in sectors in which cooperatives were paid for performance on indicators (conditional on completed reports). The regular reporting by CHWs already orients CHWs towards the prioritized indicators. It could be that as volunteers they have pro-social preferences and they are more motivated by improving the community health indicators than by financial rewards. It could also be that given their health knowledge and available resources and time there is little scope for additional improvements in performance on these indicators.

Consistent with other data sources, such as the Rwanda DHS, the data collected for the CPBF impact evaluation show overall increase in utilization of maternal and child health services. Ongoing policies and newly introduced interventions were targeting the same outcomes. For example, in the duration of the study, the ministry of health introduced and scaled up a program of community-based provision of family planning methods directly by community health workers (Chin-Quee et al. 2016).[11] Given the other interventions, it might have been hard to achieve additional marginal improvements in utilization through the performance payments to cooperatives.

[11] The program was scaled up at the district level and therefore did not pose a threat to the internal validity of the experiment in which treatment was randomized at the sub-district level.

References

Ashraf, N., Bandiera, O., & Jack, B. K. (2014). No margin, no mission? A field experiment on incentives for public service delivery. *Journal of Public Economics*, *120*, 1-17.

Ashraf, N., Bandiera, O., & Lee, S. S. (2014). Do-gooders and go-getters: career incentives, selection, and performance in public service delivery. *STICERD-Economic Organisation and Public Policy Discussion Papers Series*, *54*.

Basinga, P., Gertler, P. J., Binagwaho, A., Soucat, A. L., Sturdy, J., & Vermeersch, C. M. (2011). Effect on maternal and child health services in Rwanda of payment to primary health-care providers for performance: an impact evaluation. *The Lancet*, *377*(9775), 1421-1428.

Bonfrer, I., Van de Poel, E., & Van Doorslaer, E. (2014). The effects of performance incentives on the utilization and quality of maternal and child care in Burundi. *Social Science & Medicine*, *123*, 96-104.

Chin-Quee, D., Mugeni, C., Nkunda, D., Uwizeye, M. R., Stockton, L. L., & Wesson, J. (2016). Balancing workload, motivation and job satisfaction in Rwanda: assessing the effect of adding family planning service provision to community health worker duties. *Reproductive health*, *13*(1), 1.

Condo, J., Mugeni, C., Naughton, B., Hall, K., Tuazon, M.A., Omwega, A., Nwaigwe, F., Drobac, P., Hyder, Z., Ngabo, F. and Binagwaho, A., 2014. Rwanda's evolving community health worker system: a qualitative assessment of client and provider perspectives. *Human resources for health*, *12*(1), p.1.

De Walque, D., Gertler, P. J., Bautista-Arredondo, S., Kwan, A., Vermeersch, C., de Dieu Bizimana, J., ... & Condo, J. (2015). Using provider performance incentives to increase HIV testing and counseling services in Rwanda. *Journal of health economics*, *40*, 1-9.

Engineer, C. Y., Dale, E., Agarwal, A., Agarwal, A., Alonge, O., Edward, A., ... & Peters, D. H. (2016). Effectiveness of a pay-for-performance intervention to improve maternal and child health services in Afghanistan: a cluster-randomized trial. *International journal of epidemiology*, dyv362.

Fritsche, G. B., Soeters, R., & Meessen, B. (2014). *Performance-based financing toolkit*. World Bank Publications.

Gertler, P. J., & Vermeersch, C. (2012). Using performance incentives to improve health outcomes. *World Bank Policy Research Working Paper*, (6100)

Huillery, E., & Seban, J. (2015). Financial incentives are counterproductive in non-profit sectors: evidence from a health experiment.

Kalisa, S. , Shapira, G, Condo, J., Humuza, J. & Walldorf J. (2016) *In-Kind Demand-Side Conditional Transfers for Improving Uptake of Maternal Health Services in Rwanda.*

Leonard, K. L., & Masatu, M. C. (2010). Professionalism and the know-do gap: Exploring intrinsic motivation among health workers in Tanzania. *Health economics*, *19*(12), 1461-1477.

Meessen, B., Musango, L., Kashala, J. P. I., & Lemlin, J. (2006). Reviewing institutions of rural health centres: the Performance Initiative in Butare, Rwanda. *Tropical Medicine & International Health*, *11*(8), 1303-1317.

Miller, G., & Babiarz, K. S. (2013). *Pay-for-performance incentives in low-and middle-income country health programs* (No. w18932). National Bureau of Economic Research.

Miller, G., Luo, R., Zhang, L., Sylvia, S., Shi, Y., Foo, P., ... & Rozelle, S. (2012). Effectiveness of Provider Incentives for Anaemia Reduction in Rural China: A Cluster Randomised Trial. *BMJ*, *345*, e4809.

Olken, B. A., Onishi, J., & Wong, S. (2014). Should Aid Reward Performance? Evidence from a field experiment on health and education in Indonesia. *American Economic Journal: Applied Economics*, *6*(4), 1-34.

Reinikka, R., & Svensson, J. (2010). Working for god? Evidence from a change in financing of nonprofit health care providers in Uganda. *Journal of the European Economic Association*, *8*(6), 1159-1178.

Rusa, L., Schneidman, M., Fritsche, G., & Musango, L. (2009). Rwanda: Performance-based financing in the public sector. *Performance incentives for global health: potential and pitfalls*

Singh, P. (2015). Performance pay and information: Reducing child undernutrition in India. *Journal of Economic Behavior & Organization*, *112*, 141-163.

Soeters, R., Habineza, C., & Peerenboom, P. B. (2006). Performance-based financing and changing the district health system: experience from Rwanda.*Bulletin of the World Health Organization*, *84*(11), 884-889.

Van de Poel, E., Flores, G., Ir, P., & O'Donnell, O. (2015). Impact of performance-based financing in a low-resource setting: a decade of experience in Cambodia. *Health economics*.

Witter, S., Fretheim, A., Kessy, F. L., & Lindahl, A. K. (2012). Paying for performance to improve the delivery of health interventions in low-and middle-income countries. *Cochrane Database Systematic Reviews*, *2*(2), CD007899.

World Bank (2015). *Achieving Results for Women's and Children's Health: Progress Report*

Figure 1: Experimental design

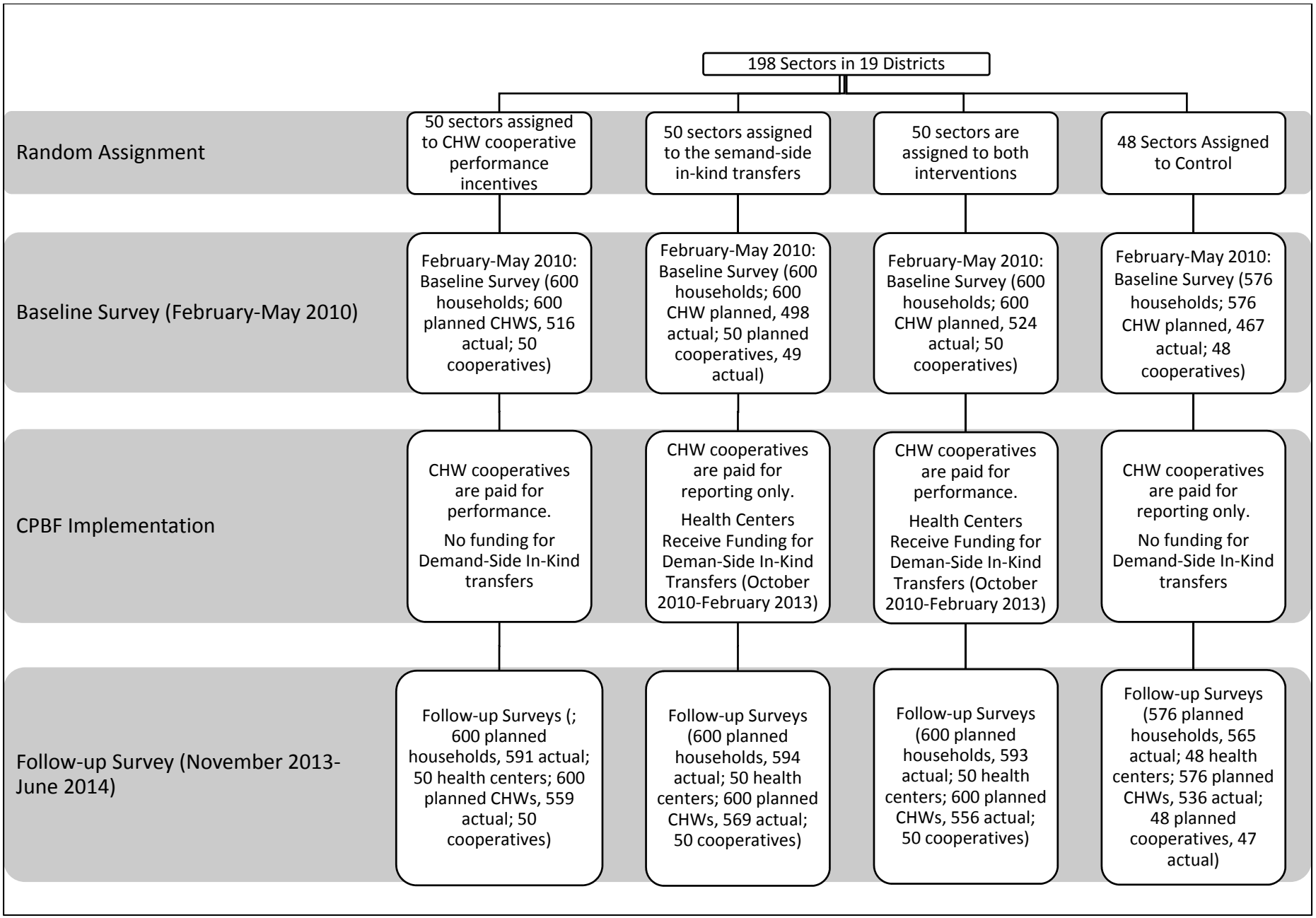

Table 1: Unit fees (in USD) of targeted indicators by year

Incentivized indicators	2010	2011	2012	2013	2014
Growth Monitoring: Children 6-59 months monitored for nutritional status	3.24	0.57	0.43	0.43	0.43
Timely Antenatal Care: women receiving first antenatal consultation within first 4 months of pregnancy	2.24	1.12	0.81	0.81	0.81
In-facility Delivery: assisted deliveries in health facilities	2.73	1.37	0.99	0.99	0.99
New Family Planning User: new users receiving consultation in health center	2.90	1.45	1.05	1.05	1.05
Regular Family Planning User: regular users of modern long-term methods of contraception	2.11	1.06	0.77	0.77	0.77

Table 2: Baseline Characteristics of the sample of Women with Recent Pregnancies by Treatment

	Sectors without Performance Payments		Performance Payments Sectors [a]			
	Mean	SD	Mean	SD	p-value [b]	Observations
Province						
South	0.184	0.387	0.190	0.392	0.909	2,376
East	0.276	0.447	0.290	0.454	0.822	2,376
West	0.276	0.447	0.290	0.454	0.822	2,376
Distance to facility [c]	4.356	5.354	4.116	4.197	0.355	2,360
Household members	5.020	1.893	5.000	1.898	0.825	2,376
Age	28.39	6.000	28.02	5.953	0.190	2,376
Married	0.910	0.286	0.910	0.286	0.989	2,329
Education Level						
No School	0.175	0.380	0.178	0.383	0.881	2,318
Primary	0.697	0.460	0.692	0.462	0.839	2,318
Secondary	0.128	0.335	0.130	0.336	0.929	2,318
Covered by Mutuelle	0.904	0.294	0.897	0.304	0.650	2,368
Ever used modern family planning method	0.402	0.491	0.391	0.488	0.657	2,376
Number of lifetime births	3.105	2.148	2.964	2.158	0.147	2,362
Number of living children	2.779	1.823	2.650	1.790	0.135	2,368
Care during most recent pregnancy						
At least one ANC visit	0.976	0.154	0.986	0.119	0.173	2,227
First ANC in first 4 months of pregnancy	0.619	0.486	0.635	0.482	0.617	2,203
Four or more ANC visits	0.358	0.479	0.374	0.484	0.583	2,216
In-facility skill attended delivery	0.776	0.417	0.801	0.399	0.255	2,219
Growth monitoring of children 6-59m in past 6 months	0.528	0.500	0.483	0.500	0.210	1,549

[a] Women residing in the sectors in which financial rewards to cooperatives of CHWs were conditional on performance.

[b] t-test for the difference between the treatment arms done by regressions with standard errors clustered at the sector level.

[c] Reported by the community health workers.

*significant at 10% level, ** significant at 5% level, *** significant at the 1% level.

Table 3: Baseline Characteristics of the sample of CHWs in charge of Maternal and Neonatal Health by Treatment

	Sectors without Performance Payments		Performance Payments Sectors [a]			
	Mean	**SD**	**Mean**	**SD**	**p-value[b]**	**Obs.**
Female	0.856	0.351	0.863	0.344	0.714	2,000
Age	38.45	8.598	39.62	9.384	0.028**	1,990
Married	0.873	0.330	0.867	0.339	0.595	2,002
Education above primary level	0.392	0.488	0.367	0.482	0.345	1,970
Years of experience as CHW	2.683	3.651	2.717	3.753	0.875	1,993
Households in charge of	110.6	67.63	117.7	72.20	0.212	1,849
Households visited in the past month	26.99	41.17	28.39	51.55	0.664	1,990
Hours per week spent on health activities	17.64	26.44	16.93	24.77	0.565	1,977
Training in the preceding 12 months	0.773	0.419	0.770	0.421	0.903	1,962
Topics of training						
Antenatal and postnatal care	0.512	0.500	0.521	0.500	0.787	1,978
Referral for delivery or danger signs	0.523	0.500	0.536	0.500	0.660	1,978
Safe home delivery	0.054	0.226	0.070	0.255	0.183	1,977
Newborn care	0.409	0.492	0.392	0.488	0.543	1,977

[a] CHWs residing in the sectors in which financial rewards to cooperatives of CHWs were conditional on performance

[b] t-test for the difference between the treatment arms done by regressions with standard errors clustered at the sector level.

*significant at 10% level, ** significant at 5% level, *** significant at the 1% level.

Table 4: Baseline Characteristics of the CHW Cooperatives by Treatment

	Sectors without Performance Payments		Performance Payments Sectors [a]			
	Mean	**SD**	**Mean**	**SD**	**p-value[b]**	**Obs.**
Cooperative located at the health center	0.845	0.363	0.838	0.370	0.894	196
Number of villages in catchment area	33.45	17.02	39.89	47.57	0.220	189
Population in catchment are	19,505	8647	20,458	11723	0.635	109
Active cooperative members	94.78	61.58	115.42	71.12	0.037**	183
Recruited members in past 12 months	32.97	36.74	37.64	41.07	0.439	167
Dismissed members in past 12 months	1.750	4.086	2.539	4.470	0.251	156
Resigned members in past 12 months	1.707	2.996	2.026	6.532	0.690	158
Cooperative meetings in past 12 months	7.750	4.370	7.290	4.461	0.467	196
Total income for 2009 (in 1000 RWF)	956	1,547	1,044	2,167	0.752	184
Total expenditure for 2009 (in 1000 RWF)	308	416	353	593	0.558	182

[a] Cooperatives in the sectors in which financial rewards to cooperatives of CHWs were conditional on performance

[b] t-test for the difference between the treatment arms done by regressions with standard errors clustered at the sector level.

* Significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Table 5: Impact of the performance incentives on utilization of targeted maternal and Child health indicators

	Timely ANC [a]	In-Facility Delivery [b]	Growth Monitoring [c]
CHW cooperative incentives	0.000	-0.001	-0.024
	(0.023)	(0.011)	(0.031)
Constant	0.770***	0.947***	0.767***
	(0.017)	(0.008)	(0.022)
Number of observations	2,334	2,334	1,195

Outcomes measured at the follow-up survey in 2013/4. Standard errors are clustered at the sector level and are reported in parentheses.

[a] Initiated antenatal care within first four months of pregnancy; sample of women with recent pregnancies that resulted in live births.

[b] Delivered in a health facility; sample of women with recent pregnancies that resulted in live births.

[c] Child was measured to assess his/her nutritional status in the preceding 6 months; sample of children 6-59 months of women with recent pregnancies.

* Significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Table 6: Impact of the performance incentives on use of modern family planning methods and fertility among baseline women

	Pregnancy since baseline		Currently using modern FP method	
	(1)	(2)	(3)	(4)
CHW cooperative incentives	0.032	0.025	-0.029	-0.021
	(0.024)	(0.022)	(0.025)	(0.025)
Age of woman		-0.009***		-0.012***
		(0.003)		(0.003)
Married		0.140***		0.117***
		(0.043)		(0.043)
No school		0.008		0.032
		(0.043)		(0.044)
Primary		0.030		0.012
		(0.036)		(0.039)
Number of births		-0.020*		0.025**
		(0.010)		(0.011)
Household members		-0.026***		0.010
		(0.010)		(0.010)
Health center more than 4km away		-0.014		0.019
		(0.021)		(0.024)
Age of CHW		0.000		0.003*
		(0.001)		(0.001)
CHW experience		-0.010*		-0.001
		(0.005)		(0.005)
Constant	0.540***	0.819***	0.515***	0.450***
	(0.017)	(0.129)	(0.017)	(0.133)
District Dummies	No	Yes	No	Yes
Number of observations	2,157	1,899	2,154	1,896

Outcomes measured at the follow-up survey in 2013/4. Women background characteristics are from the baseline survey in 2010. Standard errors are clustered at the sector level and are reported in parentheses.

* Significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Table 7: Impact of the performance incentives on CHW behavior and interaction with women

	CHW cooperative incentives		Constant		N
Panel A: Reports by CHWs in charge of maternal and child health					
Hours spent providing health services in a typical week	0.704	(0.706)	9.717***	(0.473)	2,201
Households visited in the past month	-0.53	(2.487)	33.40***	-1.659	2,198
Frequently seek advice from other CHWs in village	-0.036	(0.038)	0.753***	(0.025)	2,200
Frequently seek advice from other CHWs outside the village	-0.012	(0.043)	0.597***	(0.03)	2,201
Panel B: Reports by women with recent pregnancies					
Received information on antenatal care from CHW	-0.028	(0.021)	0.780***	(0.015)	2,325
Made the CHW aware of the pregnancy	0.008	(0.025)	0.408***	(0.019)	2,325
CHW refer or accompany to ANC	-0.007	(0.027)	0.581***	(0.019)	2,318
CHW refer or accompany to delivery	-0.042*	(0.025)	0.544***	(0.018)	2,202
Received information on postnatal care from CHW	0.000	(0.022)	0.261***	(0.016)	2,317
Panel C: reports by all women					
Met with a CHW in the past 3 months	-0.016	(0.022)	0.717***	(0.016)	3,459
Met with a CHW at home in the past 3 months	-0.018	(0.022)	0.459***	(0.016)	3,459

Outcomes measured at the follow-up survey in 2013/4. Standard errors are clustered at the sector level and are reported in parentheses.

[a] The question was only asked to women who received information on ANC from a CHW.

* Significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Table 8: Impact on satisfaction and motivation of CHWs

		CHW cooperative incentives		Constant		N
Panel A: satisfaction						
Satisfied or very satisfied with…	working relationship with health center staff	0.004	(0.015)	0.936***	(0.011)	2,197
	community support – financial and other [a]	-0.061	(0.060)	0.571***	(0.042)	811
	respect received from the community	-0.006	(0.014)	0.952***	(0.010)	2,196
	ability to meet community needs	-0.053	(0.033)	0.743***	(0.022)	2,199
	way decisions are being made in the cooperative	-0.064*	(0.039)	0.742***	(0.028)	2,185
	ability to influence cooperative decisions	-0.019	(0.038)	0.760***	(0.027)	2,188
	work ethics of other cooperative members	-0.010	(0.033)	0.819***	(0.024)	2,188
	health knowledge of other cooperative members	0.006	(0.032)	0.799***	(0.024)	2,195
	compensation	0.001	(0.029)	0.210***	(0.020)	2,178
	with role overall	0.006	(0.017)	0.951***	(0.013)	2,201
Panel B: Motivation						
Agree or strongly agree that…	role as CHW makes you feel good about yourself	0.001	(0.003)	0.996***	(0.002)	2,202
	you are proud to be working for this community	0.000	(0.004)	0.995***	(0.003)	2,201
	you always complete your tasks efficiently and effectively	-0.004	(0.007)	0.988***	(0.004)	2,201
	you are a hard worker	0.003	(0.006)	0.987***	(0.004)	2,201
	you are punctual about you CHW activities	0.001	(0.006)	0.991***	(0.004)	2,201
	you feel motivated to work as hard as you can	-0.002	(0.008)	0.989***	(0.005)	2,201

[a] 63% of the CHWs replied that community support is not applicable and therefore their responses are excluded.

Outcomes measured at the follow-up survey in 2013/4. Standard errors are clustered at the sector level and are reported in parentheses.

*Significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Table 9: Impact on cooperative dynamics

	CHW cooperative incentives		Constant		N
Number of cooperative meetings in the past 12 months	0.163	(0.479)	4.454***	(0.340)	196
Times performance was internally assessed in past 12 months	1.821	(1.930)	8.299***	(1.375)	197
Vacant positions	-0.148	(0.177)	0.598***	(0.126)	197
Members recruited in past 12 months	0.663	(0.729)	5.458***	(0.520)	195
Members dismissed in past 12 months	-0.699	(0.505)	1.479***	(0.360)	196
Any member dismissed in past 12 months	-0.091	(0.066)	0.351***	(0.047)	197
Members resigned in past 12 months	0.424	(0.678)	3.958***	(0.473)	140[a]
Cooperative distributes payments to members according to performance	-0.040	(0.072)	0.485***	(0.051)	196

Outcomes measured at the follow-up surevy in 2013/4. Standard errors are clustered at the sector level and are reported in parentheses.

[a] The outcome variable is missing for some health centers because of skip pattern error in the questionnaire.

* Significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Table 10: Impact of the performance incentives and in-kind transfers on utilization of targeted maternal and Child health indicators

	Timely ANC [a]	In-Facility Delivery [b]
CHW cooperative incentives	0.015	0.020
	(0.036)	(0.016)
Demand-side incentives	0.091***	0.012
	(0.033)	(0.016)
CHW and demand-side incentives	-0.027	-0.042*
	(0.045)	(0.022)
Constant	0.723***	0.941***
	(0.026)	(0.013)
Impact of combined intervention	0.079**	-0.010
	(0.032)	(0.018)
Number of observations	2,334	2,334

Outcomes measured at the follow-up survey in 2013/4. Standard errors are clustered at the sector level and are reported in parentheses.

[a] Initiated antenatal care within first four months of pregnancy; sample of women with recent pregnancies that resulted in live births.

[b] Delivered in a health facility; sample of women with recent pregnancies that resulted in live births.

* Significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Appendix

Table A1: Attrition of baseline women

	Re-interview of Baseline Women [a]			
	(1)	(2)	(3)	(4)
CHW cooperative incentives	-0.034***	-0.042**	-0.046***	-0.037***
	(0.013)	(0.017)	(0.016)	(0.012)
Demand-side incentives		-0.021	-0.016	
		(0.015)	(0.014)	
CHW and demand-side incentives		0.016	0.017	
		(0.026)	(0.024)	
Age of woman			0.003*	0.003*
			(0.002)	(0.002)
Married			0.056*	0.056*
			(0.029)	(0.029)
Household members			-0.005	-0.005
			(0.006)	(0.006)
No school			0.007	0.007
			(0.023)	(0.023)
Primary			0.004	0.004
			(0.018)	(0.018)
Number of births			0.004	0.004
			(0.006)	(0.005)
Mutuelle (community based health Insurance)			-0.046**	-0.045*
			(0.023)	(0.023)
Constant	0.925***	0.936***	0.913***	0.901***
	(0.008)	(0.010)	(0.063)	(0.062)
District Dummies	No	No	Yes	Yes
Number of observations	2,376	2,376	2,259	2,259

Standard errors are clustered at the sector level and are reported in parentheses.

[a] Women that gave birth shortly before the baseline survey.

* Significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Table A2: Follow-up Characteristics of the Women with Recent Pregnancies by exposure to the CHW cooperative performance payments intervention

	Control		Performance Payment Sectors [a]		
	Mean	**SD**	**Mean**	**SD**	**p-value [b]**
Household members	5.148	1.846	5.157	1.900	0.925
Age	28.97	6.409	28.90	6.462	0.810
Married	0.896	0.306	0.889	0.315	0.634
Education Level					
No School	0.133	0.340	0.132	0.339	0.952
Primary	0.741	0.438	0.715	0.452	0.179
Secondary	0.125	0.331	0.153	0.360	0.067*
Covered by health insurance	0.957	0.203	0.947	0.225	0.307
Number of lifetime births	3.081	2.042	3.079	2.116	0.986
Number of living children	2.828	1.787	2.837	1.835	0.919
Number	1,159		1,184		

[a] Women residing in the sectors in which financial rewards to cooperatives of CHWs were conditional on performance.

[b] Regressions are clustered at the sector level.

*significant at 10% level, ** significant at 5% level, *** significant at the 1% level.