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ABSTRACT

We document that in poor rural communities where government workers provide basic health services, the entry of an NGO that aims to provide similar services reduces the supply of government workers and total services. This is consistent with the NGO providing the combination of higher pay and stronger incentives for commercial activities. The decline in health services is most pronounced in villages where the NGO hires the government worker, where there is also an increase in infant mortality. In villages without any health worker beforehand, NGO entry unambiguously increases health services and reduces infant mortality.

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1 Introduction

The ultimate goal of foreign aid is to create self-sustainable development in countries that are otherwise poor. In response to the numerous criticisms about traditional aid, such as aid being tied to the strategic objectives of donor countries (e.g., Alesina and Dollar, 2000; Kuziemko and Werker, 2006), policy makers have given increasing support to non-government organizations, or NGOs (e.g., Dreher, Molders, and Nunnenkamp, 2007; Buthe, Major, and Souza, 2012). Such foreign NGOs typically operate in poor countries to fill the gap between provision and need as the native capacity to serve the population improves, and have more than quadrupled in number and overall aid administered for major donors, such as USAID and European bilateral agencies, in the past twenty years (e.g., Pfeiffer, Johnson, Fort, Shakow, Hagopian, Gloyd, and Gimbel-Sherr, 2008; Werker and Ahmed, 2008). In a further effort to operate independently from the strategic objectives of large donors, NGOs have innovated new business models for generating revenues to facilitate financially self-sustainable operations. Amongst these, one of the most widely acclaimed models used by many of the world's largest NGOs is the parallel-task model. NGO workers simultaneously deliver free services and sell high-quality useful commodities to poor households (e.g., soap). Profits from sales fund free-of-charge services, such as basic health care.[1] This model allows the NGO to leverage its size and distributional network for numerous advantages including lower wholesale prices, higher quality products and lower distribution costs – all the while generating revenues to support pro-bono services to the poor.

Perhaps unsurprisingly, the rising prominence of NGOs has raised concerns in the foreign aid community. NGOs are largely unregulated and, for the most part, do not coordinate with each other or with recipient-country governments.[2] NGOs often pay workers much

[1] This business model is used by NGOs such as Living Goods, Grameen, BRAC, and other, smaller NGOs such as SWAP, VisionSpring, SolarSister, HealthStore Foundation and HoneyCare Africa. It has received positive press coverage and numerous awards. For example, "The 'Avon Ladies' of Africa" published in the *New York Times* (2012), "How BRAC, the world's biggest charity, made Bangladesh richer" published in the *Economist* (2019) and "East Africa's healthcare 'Avon ladies' help to keep children alive" published by Reuters (2017) explain the advantages of the parallel-task model as a self-sustainable way to aid the poor. Living Goods, one of the pioneers of this model, has received multiple prizes, such as the Glaxo Smith Kline–Save the Children Healthcare Innovation Award, the Enterprising Social Innovation Award, the BNP Paribas Prize Special Jury Prize for Individual Philanthropy, and the Schwab Foundation Social Entrepreneur of the Year Award.

[2] For example, see Rahman (2003) for a discussion of NGOs in South Asian countries and Pfeiffer, Johnson, Fort, Shakow, Hagopian, Gloyd, and Gimbel-Sherr (2008) for a discussion of NGOs in sub-Saharan Africa.

more than local market wages.[3] This could create inefficiencies by replicating services and even harming the development of indigenous capacity by competing with the latter for resources, which could *increase* the country's future reliance on foreign assistance. These negative effects may be exacerbated by the increasingly popular parallel-task model if the latter shifts workers' effort away from pro-bono services for the poor and towards monetarily incentivized activities (Wagnerly, Asiimwe, and Levine, 2020).[4]

In the context of health services, concerns over the efficacy of NGOs have been articulated by medical doctors and public health experts, who call for NGOs to "Limit hiring of public systems", "Limit pay inequity between the public and private sectors" and "Commit to joint planning [with the recipient government]" (Pfeiffer, Johnson, Fort, Shakow, Hagopian, Gloyd, and Gimbel-Sherr, 2008). Farmer (2008) stated that "The NGOs that fight for the right to health care by serving the African poor directly frequently do so at the expense of the public sector. Their efforts too often create a local brain drain by luring nurses, doctors, and other professionals from the public hospitals to "NGO land," where salaries are better." In discussing its parallel-task model, BRAC, the world's largest NGO, acknowledges: "Clearly there is a potential programmatic trade-off here between increasing her sales and monthly income, while still ensuring that the preventative and health education aspects of the program are being sufficiently addressed" (Reichenbach and Shimul, 2011).[5]

Given the vital role of NGOs in providing aid and the increased use of the parallel-task model, understanding the effects of NGOs that implement this business model on indigenously provided services in poor countries is an issue of first-order importance. To the best of our knowledge, we are the first to address this question with rigorous empirical analysis.

We focus on basic health services in rural Uganda, where the population is very poor, access to modern medical care is limited, and infant mortality rates are among the highest in the world. The government has been attempting to expand basic public health care. Like many local public-sector workers, government community health workers are volunteers.[6] Approximately one year after the government introduced its program, a large NGO

[3]For example, see Koch and Schulpen (2018) and Hjort, Li, and Sarsons (2019).

[4]Wagnerly, Asiimwe, and Levine (2020) finds that community health workers in Uganda who are randomly instructed by BRAC to sell health products (rather than distribute them free of charge) provide health services to fewer households.

[5]Another example of NGO awareness can be seen in Project FAIR's (Fairness in Aid Remuneration) joint effort with 25 NGOs to reduce the pay gap with native firms (see http://project-fair.org for more information).

[6]In both poor and rich countries, local public services are often delivered by volunteers. For example,

randomly rolled out a similar program. As is often the case, the rollout did not take into account existing public infrastructure.[7] At this time, nearly half of the villages that were assigned an NGO worker had an existing government worker. NGO workers provide similar free-of-charge health care services as the government and, in addition, sell products to the households that they visit. The NGO workers earn a piece rate from sales. These features make the context an ideal one for our research question.

In principle, NGOs can crowd in and/or crowd out government workers and health care. On the one hand, there are the reasons for crowding out discussed earlier. On the other hand, NGOs can educate the local population about the benefits of health interventions, which can increase the supply of willing health workers as well as the demand for health services. Thus, the effect of NGO entry is an empirical question.[8]

The main analysis investigates the effect of NGO entry on government health workers (labor) and health care provision. Using a subsample of villages that has a pre-existing government program, we show that random assignment of NGO entry increases the number of NGO workers by one per village. Thus, we interchangeably refer to random assignment as NGO entry. NGO entry *reduces* the number of government workers by one per every other village, *reduces* the probability that a household receives health care from a government health worker by 25 percentage-points, and *reduces* the probability of receiving health care from *any* health worker by twelve percentage-points. These results show that NGO entry crowds out government labor supply and health services, as well as total health services. We also provide consistent correlational evidence that NGO workers are more likely to target richer households than government workers. The empirical findings support the concerns over NGOs expressed by public health experts.

The main caveat for interpretation is that the presence of a pre-existing government worker, which is non-random, could be correlated with village-specific factors that cause her to prefer to work for the NGO and to provide fewer health services. We address this by carefully controlling for a large number of potentially important base-year characteristics

consider volunteer tax collectors in Pakistan (Khan, Khwaja, and Olken, 2015); or U.S. election poll workers, police auxiliary, firefighters, recreation program staff, library aides, and senior citizen center assistants are often volunteers (Duncombe, 1985). Community-based health workers, village health committees, traditional birth attendants, community-based distributing agents, or agriculture extension workers in developing countries are rarely given explicit monetary incentives (Bhutta, Lassi, Pariyo, and Huicho, 2010; Gilmore and McAuliffe, 2013; Leon, Sanders, Van Damme, Besada, Daviaud, Oliphant, Berzal, Mason, and Doherty, 2015).

[7] A large body of evidence documents that NGOs often operate in the same place as the government or other NGOs (see Barr and Fafchamps (2006) for detailed discussion on NGOs location).

[8] In our context, there are no indigenous private-sector providers of similar health services.

(e.g., proxies for village-level or household-level socio-economic status, access to other medical assistance, mortality) and their interactions with NGO entry. The results are very robust. See the paper for a more detailed discussion of these and other robustness checks and alternative mechanisms.

We also find that the reduction in total health care is most pronounced in villages where the NGO hires the government worker. In villages where the NGO recruits a second health worker, NGO entry is uncorrelated with services. Note that this decomposition should be cautiously interpreted as descriptive since whether the NGO hires the government worker is an outcome variable.

Consistent with the reduction in government health workers and total health care, we find suggestive evidence that infant mortality increases when the NGO enters a village with a government worker.[9] As with health care, the increase is most pronounced in villages where the NGO hires the worker away from the government. Since reducing infant mortality is the main objective of both the NGO and the government, our results show that the crowding out effects can lead to important and unintended real-world consequences.

The results are driven by two complementary but conceptually distinct mechanisms. The first is that the NGO pays workers more than the government. The second is that NGO workers are incentivized towards commercial activities. Only the first is needed to explain our findings for the crowding out of government health workers. Both are needed to explain the results on the total reduction of services and the increase in mortality. It is beyond the scope of our paper to separately quantify the contributions of each mechanism. To help shed light on this question and guide future research, we provide some interesting descriptive patterns after the main results.

For policy makers, it is important to note that for villages without any pre-existing health worker, NGO entry has unambiguously positive effects on service provision and reduces mortality. Thus, not taking heterogeneity into account can obfuscate both the achievements as well as the pitfalls of NGOs.[10] We discuss policy implications and generalizable insights in more detail in the Conclusion.

Our study contributes to the literature about the effectiveness of foreign aid and NGOs. Olken, Onishi, and Wong (2014) finds that incentives provide limited long-term benefits for

[9] We find that in such villages, NGO entry had either no effect on or worsened other health outcomes. See the paper for more details.

[10] Consistent with the importance of accounting for heterogeneity, if we examine the average effect of NGO entry on all villages (with and without a government program), we find no effect on mortality. See the paper for details.

aid effectiveness in Indonesia. Faye and Niehaus (2012) documents that donors use bilateral aid to influence elections in developing countries, but that this strategic behavior is not present for aid administered by NGOs. Our results add to this earlier work by pointing to coordination with recipient governments as an important dimension for further improving NGO-administered aid. Existing studies that argue for better coordination have typically focused on donor coordination (e.g., Bigsten and Tengstam, 2015) or on coordination between NGOs (Barr and Fafchamps, 2006). More broadly, we contribute to recent studies attempting to provide rigorous empirical evidence on the effect of aid (e.g., Crost, Felter, and Johnston, 2014; Nunn and Qian, 2014).[11]

Recent studies have produced mixed findings when evaluating the effect of NGO-provided community health services on mortality.[12] In terms of context, we are most closely related to Bjorkman Nyqvist, Guariso, Svensson, and Yanagizawa-Drott (2019), which documents that the entry of a NGO program similar to ours increased NGO services and reduced mortality in another part of rural Uganda; and consistent with our findings, reduced government-provided health services.[13] These earlier studies do not explore heterogeneous effects based on the pre-existence of government health workers or consider the crowd-out mechanism. In this sense, we are closely connected to a study by Baldwin, Karlan, Udry, and Appiah (2019), which finds that a participatory development program launched by an NGO decreased investments in local public goods through pre-existing institutions.[14]

The paper is organized as follows. Section 2 describes the context. Section 3 describes the data and descriptive statistics. Section 4 presents the main results on labor supply and health service delivery. Section 5 presents the results on mortality. Section 6 presents additional descriptive statistics. Section 7 concludes.

[11] See Easterly (2009) and Qian (2015) for literature overviews.

[12] See, for example, Baqui, El-Arifeen, Darmstadt, Ahmed, Williams, Seraji, Mannan, Rahman, Shah, Saha, et al. (2008) and Darmstadt, Choi, Arifeen, Bari, Rahman, Mannan, Seraji, Winch, Saha, Ahmed, et al. (2010). Both papers document a zero effect of community health programs on health.

[13] See the Appendix for a direct comparison with Bjorkman Nyqvist, Guariso, Svensson, and Yanagizawa-Drott (2019).

[14] The notion that higher wages from foreign aid or NGOs can distort local labor markets has been raised in theoretical studies (e.g., Knack and Rahman, 2004; Koch and Schulpen, 2018), case studies and descriptive studies (e.g., Dollar and Pritchett, 1998; Harris, 2006).

2 Background

2.1 Government Health Service Provision

Rural Uganda is one of the poorest regions in the world, where average per capita gross income was $560 in 2010 (World Bank National Accounts Data) and where neonatal, infant and under-5 mortality rates were estimated in 2011 at 30, 66 and 111 per 1,000 live births, respectively – among the highest in the world (DHS, 2011). 46% of the overall under-5 mortality takes place in the first month, 18% in the first 24 hours of life and 15% in the first 6 hours of life (Baqui, Mitra, Begum, Hurt, Soremekun, Edmond, Kirkwood, Bhandari, Taneja, Mazumder, et al., 2016).[15]

To respond to the scarcity of public health services and the shortage of health workers, the Ugandan government founded the Village Health Team (VHT) program which hires community health workers to provide health services to their own community. While the program was founded in 2001, it was not implemented for many years and in many areas in Uganda because of the lack of funding. In the North and Central Ugandan regions that we study, government workers were hired around mid-2009.[16]

Government health workers are part-time employees who typically maintain other daily occupations such as farming or small shop-keeping. Their main job as a government health worker is to provide the following health services during home visits to members of their community: (i) health education (e.g., benefits of a hospital delivery), (ii) post-natal check-ups, (iii) basic medical care and referrals to health clinics that are usually located in more urban areas. The latter include helping patients decide when it is useful to travel to urban areas for medical attention, as well as coordinating the visit to ensure that professional medical staff is on-site during the visit.[17] The latter is important because of the high level of absenteeism in Ugandan public health facilities. For example, the Uganda Na-

[15]The main causes of neonatal mortality in Uganda are birth asphyxia/trauma (28.6%), prematurity (27.9%), sepsis (18.2%), congenital anomalies (11.7%), acute respiratory infections (6.3%) and other causes (6.5%) (World Health Organization, 2012).

[16]See the "Ugandan Annual Health Sector Performance Report 2008/2009" and the "Village Health Team, Strategy and Operational Guidelines" (Uganda Ministry of Health, 2010). A survey of government workers in Northern Uganda indicates that 87% of them were hired between 2009 and 2010 (Kimbugwe, Mshilla, Oluka, Nalikka, Kyangwa, Zalwango, Kilizza, Turyasiima, Ntambazi, Walugembe, et al., 2014).

[17]The Ugandan Ministry of Health states that "VHTs are responsible for serving the first link between the community and formal health providers" (Uganda Ministry of Health (2011)). Within Uganda's tiered national health system, the VHTs hold the position of Health Centre I, followed by Health Centres II-IV, which are local clinics, each with sequentially higher levels of capacity and larger catchment areas (Mays, O'Neil, Mworozi, Lough, Tabb, Whitlock, Mutimba, and Talib, 2017).

tional Health Organization documents a 48% average rate of staff absenteeism in Ugandan public health facilities, with more highly trained workers (doctors, clinical officers) being more likely absent than less trained workers (Nyamweya, Yekka, Mubutu, Kasozi, and Muhindo, 2017; Mukasa, Sensoy Bahar, Ssewamala, KirkBride, Kivumbi, Namuwonge, and Damulira, 2019). This creates excessively long lines, which, for pregnant women, increases the risk of having to deliver in the health facilities without assistance from a health professional. Consistent with this, 31% of the households we survey in our study report staff absenteeism in public health facilities as a major constraint to the access of health services (while 76% report that medical services are too expensive and 51% report that health facilities are too far).

Government workers also provide basic medicines, such as ACT (artemisinin combination therapy for malaria), ORS (oral rehydration solution), zinc, antibiotics, and deworming tablets free of charge, as well as distribute free bed nets during national malaria campaigns.

The government recruits workers locally. To be eligible for the community health worker position, a person must be an adult and satisfy two conditions: village residence and be able to read and write. Among the eligible candidates, the government prioritizes those who are good community mobilizers and communicators, trustworthy and willing to work for the community, and who have experience in the health sector (Turinawe, Rwemisisi, Musinguzi, de Groot, Muhangi, de Vries, Mafigiri, and Pool, 2015).[18] Once hired, government workers are given five days of basic training, a uniform that makes them easily identifiable (e.g., a t-shirt with the official logo), and free medical products to disperse to the community. They are not paid or given any monetary incentives and are usually considered to be motivated by altruism, along with what they may gain in terms of reputation or warm glow from helping their community (e.g., Ludwick, Brenner, Kyomuhangi, Wotton, and Kabakyenga, 2013; Wagnerly, Asiimwe, and Levine, 2020).

The government program was rolled out in all villages. It aimed to employ two workers per village. However, in our study area, only 57% of the villages (73 villages) had a government worker in 2010, one year after the government program was rolled out; and

[18]The exact selection procedure varies from one village to another. In some villages, the worker is appointed by a government official. In others, the worker is appointed by the community members, either by the village chief (LC1) or through a popular votes (Turinawe, Rwemisisi, Musinguzi, de Groot, Muhangi, de Vries, Mafigiri, and Pool, 2015; Kimbugwe, Mshilla, Oluka, Nalikka, Kyangwa, Zalwango, Kilizza, Turyasiima, Ntambazi, Walugembe, et al., 2014). In Northern Uganda, 78% of the hired government workers had prior experience working as a volunteer in the health sector as a Community Drug Distributor or a Condom Distributor (Kimbugwe, Mshilla, Oluka, Nalikka, Kyangwa, Zalwango, Kilizza, Turyasiima, Ntambazi, Walugembe, et al., 2014).

no village had more than one worker. In the other 54 villages, the government was either unable to recruit or retain a health worker (i.e., the recruited worker had stopped delivering health services by 2010). To understand the recruitment and staffing of government workers, we conducted in-depth interviews with government workers in our study areas at all levels of the bureaucracy. The presence of a government worker in 2010 is not random. According to higher-level government officials as well as community health workers, the key limitation is the labor supply of those who are both qualified and willing to work as volunteer workers.

Each government worker is affiliated with a nearby health facility: she refills her stock of health products, attends occasional meetings, and reports to the person in charge of the health facility. District-level health officials that we interviewed stated that each health facility is responsible for keeping track of resignations of affiliated community health workers and finding a replacement, but most health facilities are severely under-staffed, and in practice, neither keep track of community health workers nor replace those that drop out of the program. In other words, there is no accurate record of government workers at a given point in time. Note that the lack of personnel records is not only specific to our context but is present in many other developing countries (Cain and Thurston, 1997; World Bank, 2000).[19] Such lack of records is very problematic for NGOs when the latter attempts to avoid hiring government workers. We discuss this more in the next section.

2.2 The NGO

The NGO we study has the same aims and provides the same services as the government program. It entered our study area of 127 villages in June of 2010 by rolling out its program in a random sub-sample of 66 villages, of which 36 already had the government program in place for at least six months.[20]

NGO workers, like government ones, are recruited locally and tasked to provide similar free basic health services to the community. Like government workers, they work part-time

[19]Cain and Thurston (1997) documents serious discrepancies in Uganda, Ghana and Zimbabwe between the numbers of staff recorded on the nominal rolls (maintained by the ministries) and the numbers of staff actually working. Part of the problem has been attributed to the lack of digital record-keeping in those countries and the difficulty to centralize staff information (which could otherwise be shared with NGOs or other organizations).

[20]Our study focuses on 127 villages: 36 villages are randomly assigned to NGO entry and have a government worker in 2010, 37 villages are randomly assigned to NGO entry and have no government worker, 30 villages have the government only, and 24 have neither.

and are easily identifiable from wearing their NGO uniforms. They mainly differ from government ones in that they also sell household products from which they receive a piece-rate (whereas government workers earn no income). As we discussed in the introduction, the motivation of the "parallel-task" model is to provide financial sustainability for the NGO and increase its independence from donors. This model is used by several of the largest NGOs today, including Living Goods, Grameen, BRAC, and other smaller NGOs such as SWAP, VisionSpring, SolarSister, HealthStore Foundation and HoneyCare Africa.[21]

For the NGO of our study, the parallel-task model works as follows: NGO workers buy products from the NGO at a price that is slightly above the wholesale price and then sell to households at a retail price that is set by the NGO to be equivalent to or slightly below the market price in that location. The difference between the wholesale price and the buying price for the health worker goes towards the revenues of the NGO at large. The difference between the buying price and the retail price constitutes the income of the health worker.

The NGO and government programs differ in two other ways. First, the government workers distribute drugs for free, while the NGO workers sell similar drugs for a small fee. Past studies have noted that NGOs may provide higher quality products (Bjorkman-Nyqvist, Svensson, and Yanagizawa-Drott, 2018; Bjorkman Nyqvist, Guariso, Svensson, and Yanagizawa-Drott, 2019). Second, the NGO provides more training than the government: NGO workers receive twelve days of initial training (vs. five for the government). The content of the NGO and government trainings are similar – they cover key health topics, including diagnosing, treating and recognizing danger signs for referral – with the difference that NGO workers are also trained on best practice sales skills, counseling, and communication. Moreover, NGO workers attend a monthly one-day refresher training session, where they receive further training, discuss the gaps in coverage and the quality of care, and are allowed to restock health products. This could ostensibly result in the NGO providing higher quality care than the government.

In our study area, the NGO was able to successfully recruit in all the villages it entered, whereas the government was only able to do so in half of the villages. Since the NGO looks for individuals with the same skills and follows the same hiring criteria as the government,

[21] Other NGOs that use similar parallel models include Population Services International, Marie Stopes International, Healthy Entrepreneurs, Réseau Confiance, LifeNet International, One Family Health, BlueStar Healthcare Network, Project Muso, Gold Star Network Kenya (GSN), AMUA, World Health Partners (WHP), K-MET Post Abortion Care Network, Partners in Health, Alive and Thrive, Happy Mothers Network, HealthKeepers. See http://healthmarketinnovations.org/ for a more extensive list of NGOs using the parallel-task model or other similar social marketing approaches.

government workers who apply to work for the NGO are typically more competitive than other applicants. Based on the interviews that we conducted with NGO recruiters, the NGO attempts to avoid hiring government workers. However, this is difficult to implement because of the lack of information on government workers and the incentives for applicants to hide their role as government workers when hired. There are also cases where the NGO knows that the applicant works for the government and still hires her because she is the best candidate.

The medicines that are distributed free of charge by government workers (oral rehydration salts, pain reliever, zinc, antimalarials, cold capsules, deworming tablets) are sold at very low retail prices and provide negligible profits to the NGO agent.[22] This suggests that NGO entry should only slightly affect the price of these medicines and should play a small role in understanding the trade-offs of government and NGO workers.[23]

The products that provide the highest profits to the NGO workers are, on average, less related to the most concerning health outcomes: fortified oil, cotton, soap, fortified flour, and toothpaste. In an interview with one of the NGO directors, she says that the "Provision of these products which have a less direct impact on health was meant to serve as an [financial] incentive [for the health worker] and also ensure sustainability of the health program operations". This means that the NGO worker is mostly monetarily incentivized to sell products that have less of a direct impact on health than those provided by the government worker.

2.3 Time Allocation of Government and NGO workers

Government workers work on average ten hours per week delivering health services, including the dispersal of free drugs (Mays, O'Neil, Mworozi, Lough, Tabb, Whitlock, Mutimba, and Talib, 2017). To the best of our knowledge, there are no disaggregated time allocation data for government health workers.

For NGO workers, Deserranno (2019) finds that the average labor supply is approximately fourteen hours per week, with around seven hours devoted to health services. This implies that NGO workers provide 30% fewer hours of health services than government workers. More disaggregated time allocation data are provided by Reichenbach and Shimul (2011), which interviews 660 NGO workers. Table 1 shows that over one month, NGO

[22] Appendix Figure A.1 documents the retail price (what households pay) and the profit margin for the NGO worker for the products they sell.

[23] We provide evidence of this in Section 5.5.

workers supply a total of 49 hours, where 37% is spent on providing health services (which includes attending refresher training) and 63% is spent on selling medicines or health commodities. Because the time allocated for refresher training includes visits to the branch office to resupply the products they sell, 37% is the upper bound of health-related activities. The lower bound can be obtained if we attribute the time attending refresher training to market activities. When we do this, we find that NGO workers spend 21% of their total effort on health-related activities and 79% of their time on market activities.

The time allocation data should be interpreted as merely suggestive and can under- or over-state the true time spent providing health services. On the one hand, we assume that dispensing free medicines is a health service for government workers, while we assume that selling medicines is a commercial activity for NGO workers. One could argue that part of the effort towards selling medicines should be counted as health services for NGO workers. This will not overturn the point that NGO workers are likely to provide fewer hours of health services than government workers.[24] On the other hand, the self-reported NGO allocation of time to health services is probably an upper bound of actual service delivery because patient visits are also used to sell products and monthly training visits are also used to refill stocks.

NGOs are aware of the problem that the parallel-task model shifts effort away from "altruistically" motivated tasks towards commercially motivated tasks. For example, BRAC, the world's largest NGO, which uses the parallel-task model, said in an evaluation of the community health program in 2011 that "There is a perception among the NGO staff that women are more commercial-minded and very much motivated by financial incentives as opposed to non-financial incentives" (Reichenbach and Shimul, 2011).

3 Data and Randomization

3.1 Data Sources

Data on mortality and access to health services were collected from households in May 2010, approximately six months to a year after the government program was rolled out and one month before the NGO program rolled out, and again in December 2012. The paper will sometimes refer to 2010 as the base year and 2012 as the end year. These data were

[24] We make this assumption because we lack disaggregated data for time allocation for government health workers.

collected by the NGO from a random 10% of the households, chosen randomly within the sample of households that had a child below age of five in 2010. The respondent of the household survey is the female household head, who is presumably the most knowledgeable about the topics of inquiry. The survey questions change slightly over time. We will discuss this when relevant. We supplement the household-level survey data with a village-level survey collected from village heads on the presence of health workers and other health providers in the village. We also supplement the household-level with census data collected from February to April 2010, which include information on household size, mortality and occupation for all households in each village.[25] Finally, we also have access to an internal survey conducted by the NGO for its community health workers in January 2012, eighteen months after the NGO rolled out. Government health workers only appear in this survey if they have switched to working for the NGO.

3.2 Randomization

The data collection and randomization used in this study were conducted by one of the authors of this paper as part of an internal evaluation of the NGO.[26] The main analysis uses survey data that cover 127 rural villages in twelve geographical areas of Uganda.[27] The randomization was stratified at the area level. We will demonstrate balance between villages that were randomly assigned to the NGO and those that were not. We will additionally show that there is little observable difference between villages with a government health worker at baseline (which is not random) versus those without a government health worker, both in the entire sample of villages as well as in the subset of villages randomly assigned the NGO.

3.3 Descriptive Statistics

3.3.1 Household Well-being, Access to Health Services and Balance

Table 2 presents village-level summary statistics and balance checks. Government health workers are present in 57.5% of villages, traditional healers are present in 48% of villages, drug stores are present in 68% of villages, 56% of villages have a government clinic within

[25]The census data cannot be merged with the household-level survey data. We will thus alway collapse the census data at the village level.

[26]We are extremely grateful to the NGO for sharing their data.

[27]We do not reveal the names of the 127 villages to preserve the anonymity of the NGO.

a ten kilometer radius, and 83.5% of villages have a private clinic within a ten kilometer radius.[28] On average, a village in our sample contains 182 households, with an average of 0.3 infants per household. Infant mortality is high: the number of infants who died in the year prior to the survey as a share of birth is 4%. 57% of the households are involved in farming as their main activity and only 38% of the household heads have completed primary education. Households are poor. The average household owns half of a list of "essential" household items (e.g., clothes, pair of shoes, cooking pots). Average food security is two, measured on a scale from one to four. Approximately half of the households live in homes with low-quality construction material.

Baseline observable characteristics are balanced between villages that are randomly assigned to treatment and those that are randomly assigned to control. They are balanced both within the entire sample of 127 villages (column 3) but also within the subsample of 73 villages with a government worker in 2010 (column 5). This is important for us because part of our analysis will compare treatment and control villages in the subsample of villages with a government worker in 2010 (on which the randomization was not stratified). See Data Appendix A.1 for more discussion on the balance tests at the village and household level.

3.3.2 NGO Personnel

Several interesting facts emerge from the self-reported data from health workers (Appendix Table A.1). NGO workers self-report earning 19 USD per week,[29] or 51% of the average weekly income in Uganda in 2013. Demographic characteristics (age, education, marital status) and earnings are similar between NGO workers in villages with a pre-existing government and those in villages without a pre-existing government worker.

21% of all NGO workers report that they formerly worked for the government as health workers. When we focus on villages with pre-existing government workers, we find that 39% had switched from the government to the NGO. Even more strikingly, if we examine villages with a government worker in 2010, but no government worker in 2012, we find that 82% of pre-existing government workers switched to the NGO after the latter entered the community. This is consistent with the concern that government health workers are likely

[28] Government clinics and private clinics provide the same type of health services (e.g., assist women during a delivery, child vaccination, disease diagnosis and treatment). The former provide these services for free while the latter provide these for pay.

[29] We use the December 2012 exchange rate: one US Dollar for 2,691 Ugandan Shillings.

to move to the higher paying NGO.

NGO health workers sell more household commodities than medicines. They report that the fraction of households who bought a health product from them in the past week (6%) is three times larger than the fraction of households to whom they gave medical advice (2%). This is consistent with the household survey data collected in 2012, which show that for villages with an NGO worker, 28% of households purchased commodities (soap, oil, salt) from the NGO, while only 9% purchased any medical products. See Appendix Table A.1.

4 Main Results

4.1 Labor Supply

To investigate how NGO entry affects the labor supply of government health workers, we restrict our attention to the 73 villages that had a government worker when the NGO entered in 2010 and estimate the following specification:

$$y_i = \alpha + \beta NGO_i + \lambda_a + \varepsilon_i. \quad (1)$$

The number of health workers in village i in 2012, y_i, is a function of: a dummy variable that takes a value of 1 if it is randomly assigned to participate in the NGO program in 2010, NGO_i; and area fixed effects, λ_a (the randomization is stratified at the area level). We estimate Newey-West robust standard errors for village-level regressions.

Since NGO entry is randomly assigned, β can be interpreted as a causal effect.[30] Table 3 Panel A presents the results for labor supply. Column (1) shows that NGO entry increases the number of NGO health workers by one (i.e., the NGO recruits one worker in every village that is randomly assigned to the program). Column (2) shows that NGO entry reduces the number of government health workers by approximately one per every other village. The coefficient is -0.430. These estimates are consistent with the descriptive statistics discussed earlier, which indicate that when the NGO enters a village with a government health worker, in approximately 40% of cases, the government worker switches to working for the NGO. Column (3) examines the number of all government health workers (government or

[30]Recall that we demonstrate balance between treatment and control villages in the subsample with a government worker in 2010.

NGO). This variable can take the values of zero, one or two. We find that NGO entry increases total health workers by around one per every two villages. The coefficient is 0.570. All three coefficients are statistically significant at the 1% level. At the bottom of the table, we also present randomization inference p-values against the null hypothesis. We do not discuss them in the text since they are always consistent with the standard errors presented in the tables.

The main caveat for interpreting the results is mismeasurement of the number of health workers. This is a concern for two reasons. First, a health worker can in principle work for both the NGO and the government. This means that the survey responses could, in principle, double-count one health worker as two, and overstate the number of total health workers, NGO health workers or government health workers at endline. Second, the village chief, who answers the village-level survey, may under-report the presence of a government health worker relative to the presence of an NGO worker (e.g., because the NGO rollout is newer, or because the survey is conducted by the NGO, which makes NGO presence more salient). Later in this section, we address both of these concerns by examining service provision from NGO and government health workers reported from a household-level survey.

In columns (4) and (5), we examine the presence of a traditional healer and drug store as outcomes. Traditional healers are a source of health care, but unlike NGO and government health workers, they do not provide modern health services. Drug stores sell basic commodities and drugs similar to the NGO, and dispense advice along with the products, but do not provide other health services such as post-natal check ups or hospital referrals. There is no reason to believe that a traditional healer or a worker at the drug store would be the best candidate to work for the NGO. Thus, it is not surprising that we find that NGO entry has no effect on the number of traditional healers and drug stores.

In columns (6) and (7), we examine the presence of a government clinic or a private clinic within a 10 kilometers radius as placebo outcomes, since these facilities are in urban areas and unlikely to respond to changes in the supply or demand for health services in one of the many nearby rural communities. Reassuringly, we find that NGO entry has no effect.

4.2 Health Services

Recall from the earlier discussion that the self-reported time allocation data suggest that NGO workers are likely to spend fewer hours in total delivering health services than gov-

ernment workers. Nevertheless, the supply of services need not decline if NGO workers are more efficient than government workers. Table 3 Panel B examines this using a question in the household survey about whether a household has "received medical care" from a community health worker in the past year and the identity of the service provider. The number of observations is much larger than the earlier analysis which used village-level data. To address the possibility that the error terms are correlated with villages, we cluster the standard errors at the village level for all household-level regressions.

Column (1) shows that NGO entry increases the probability that a household will obtain services from a NGO worker by 31.5 percentage-points. In contrast, column (2) shows that it reduces the probability of obtaining services from the government health worker by 25.1 percentage-points. The estimates are statistically significant at the 1% level.

These results are consistent with earlier findings that NGO entry increases the number of NGO workers while reducing the number of government workers. As we discussed earlier, one caveat for interpreting the results is that the same person can work for both the NGO and the government. From the perspective of the well-being of patients, it may not be very important whether the worker is identified as working for the NGO or the government. In other words, we are also interested in total health care provision. In column (3), we examine a dummy variable that equals one if a household receives medical care from any health worker. We find that NGO entry reduces the probability of obtaining services from either the NGO *or* the government health worker by 11.6 percentage-points. The estimate is statistically significant at the 5% level. Thus, NGO entry reduces the likelihood that a household receives medical care from any health worker. Since the constant is 0.678 (67.8% of households in villages with a government health worker and no NGO worker receive health care on average), the estimate implies that NGO entry reduces total health care by 16.9% ($.116/.687 = .171$). We find this to be a sizable, but plausible, magnitude.

The negative impact on total health care is consistent with the concern that NGO entry crowds out government health workers and health services. It is also interesting to note that the estimated effect of NGO entry on services from the NGO health worker and the government health worker in columns (1) and (2) do not add up to the estimated effect of NGO entry on obtaining services from either health worker in column (3). This reflects the fact that the NGO worker often visits the same households visited by the government worker.[31]

[31] Note that we cannot examine the total number of times a household obtains health care from both health workers because the survey only asks whether a household every obtained *any* care from a given worker.

We find that the probability of obtaining medical care from a traditional healer or a drug store is unaffected by NGO entry (columns 4 and 5).

Importantly, column (6) shows that NGO entry reduces the probability that a household will obtain care from a government clinic by 5.7 percentage-points. This is consistent with a reduction in total medical care since one of main jobs of health care workers is to refer patients to the government clinic. Column (7) shows that NGO entry has no effect on obtaining health services with private clinics, which are not known to coordinate with either NGO or government health workers.

4.3 Targeting

In addition to a change in overall service delivery, NGO entry can also affect the targeting of services. The main targets for the basic health services for NGO and government health workers are the most vulnerable households, i.e., households with a pregnant woman or a woman who has recently delivered (more exposed to infant mortality) and poor households (cannot afford private clinics and have more limited access to care). Table 4 examines whether NGO and government workers target differently along these two dimensions. We divide the sample of villages that had a government worker in 2010 into those where the NGO entered and those where the NGO did not enter in columns (1) and (2). We then regress whether a household received medical care from any community health worker during the year prior to the endline survey on whether there is a woman in the household who was either pregnant or delivered in the past year. Column (1) shows that in villages with a government health worker in 2010 and NGO entry, the correlation between having such a woman in the household and obtaining services is -0.023. Column (2) shows that the correlation in villages with a government health worker in 2010 and no NGO entry is 0.047. However, neither estimate is precisely estimated. The bottom of the table shows that the p-value for the difference between the two coefficients is 0.168. The imprecision is most likely due to the fact that there are relatively few households with someone who was pregnant or who delivered in the past year.

Columns (3) and (4) examine poor households in similarly divided samples. The estimates are more precise, most likely because there is more variation in poverty than in delivery. We define a dummy variable for poor to take a value of one if the household wealth index—an equally weighted average of z-scores of food security, number of assets owned, high quality roof/floor/wall material—is in the bottom quartile of the within-village

distribution. Column (3) shows that in villages with a government health worker in 2010 and NGO entry, being poor is negatively associated with obtaining health care. The coefficient is -0.136. In contrast, column (4) shows that the correlation in villages with a government health worker in 2010 and no NGO entry is positive, 0.152. Both coefficients are statistically significant at the 5% level. The p-value at the bottom of the table for the difference in the two coefficients is 0.001.

Consistent with the fact that NGO workers are strongly incentivized to sell products relative to government health workers, the results suggest that NGO workers are less likely to provide medical care to households with pregnant or recently delivered women and poor households.

4.4 Decomposition by the Labor Supply of Health Workers

Our earlier findings that NGO entry increases the number of NGO workers by one in all villages and the total number of health workers by around one per every two villages imply the following: there is one NGO worker in 2012 in half of the villages where the NGO enters, and there are two health workers (one government worker and one NGO worker) in the other half of villages. In the first set of villages, where there is one worker in total at endline, the NGO worker is most likely the former government worker. (Recall from the descriptive statistics that in villages that start with one government health worker in 2010 and only has one NGO worker by 2012, 82% of government workers shifted to work for the NGO).

This raises the question of whether our findings for services differ between villages where the NGO hired the government worker (i.e., the government worker shifted to work for the NGO, leaving the total number of workers unchanged) and those where the NGO hired a new worker (i.e., the total number of workers increased from one to two). Table 5 investigates this possibility by decomposing the effects according to whether the NGO hired the government worker or a new worker. Note that since the total number of workers is an outcome variable, these estimates are not causal.[32]

Column (1) shows that NGO entry is associated with similar increases in medical care from NGO workers regardless of whether the NGO hired the government worker or not. Column (2) shows that in villages in which the NGO hired the government worker, NGO

[32]Column (7) of Table 2 presents the summary statistics for villages in which the NGO hired the government worker vs. someone new. We find little evidence of difference in observables between the two types of villages.

entry is associated with a 52.6 percentage-point reduction in the probability of getting care from the government health worker. The estimate is significant at the 1% level. NGO entry is not associated with any change in obtaining care from government health workers in villages where the NGO hired a new worker. This is interesting because it goes against the possibility that the expansion of the total number of health care providers due to NGO entry will cause the existing government health worker to reduce effort.

Column (3) examines care from any health worker (government or NGO). It shows that in villages where the NGO hired the government worker, NGO entry is associated with a 22.9 percentage-point reduction in the probability of getting care from any health worker. The estimate is significant at the 1% level. In contrast, NGO entry is not associated with any change in obtaining care in villages where the NGO hired someone new.

These results together show that the reduction in services occurs in villages where the government health worker moves to work for the NGO. In villages where the NGO hires an additional worker, NGO entry is not associated with any change in the probability of obtaining any health care. Note that our dependent variable measures the extensive margin of whether a household obtains any health advice. It could be that in villages with both types of workers, there is a change on the intensive margin in the quantity and quality of services, which our survey does not measure. Later, we will address this by examining mortality, which reflects the quality as well as the quantity of medical care.

4.5 NGOs in Villages without a Government Worker in 2010

4.5.1 Treatment Effect in Villages with an NGO worker

Thus far, to understand the interplay between NGO entry and infant public services provided by the government, we have focused on the effect of NGO entry in villages where there was a government health worker in 2010. In this section, we investigate the effect of NGO entry in villages without a government health worker for comparison. This is interesting because the effect of NGO entry on services can be heterogeneous—i.e., moving from no health worker to an NGO health worker may be very different from moving from a government health worker to an NGO health worker or to two health workers. To fully understand the role that NGO health workers play in our context, it is important to examine both scenarios.

Table 6 Panel A estimates equation (1) for the subsample of villages with no government workers in 2010. Columns (1)-(3) show that NGO entry increased the number of

NGO workers by one, had no effect on government health workers, and increased the total number of workers by one. Columns (4)-(5) show that NGO entry increased services from the NGO by 31.5 percentage-points, slightly reduced services from the government by 1.9 percentage-points, and increased services from either the government or the NGO by 28.6 percentage-points.[33] Thus, NGO entry had a positive effect on labor supply and health services in villages with no government worker to begin with.

4.5.2 Heterogeneous Treatment Effects

Panel B compares the estimates of the heterogeneous treatment effect of NGO entry in villages with and without a government worker in 2010. This is essentially the second difference in the coefficients from Table 3 and Table 6 Panel A. We do this by estimating

$$y_i = \alpha + \beta(Gov_i \times NGO_i) + \delta Gov_i + \gamma NGO_i + \lambda_a + \varepsilon_i. \quad (2)$$

The number of health workers or the probability of obtaining services in village i in 2012, y_i, is a function of: the interaction of a dummy that takes a value of 1 if the village has a government health worker in 2010, Gov_i, and a dummy that takes a value of 1 if it is designated to participate in the NGO program, NGO_i; the uninteracted dummy variables; and area fixed effects, λ_a. β is the differential effect of NGO entry in the two types of villages. $\beta + \gamma$ is the effect of NGO entry in villages with a pre-existing government worker and analogous to the NGO coefficient shown in Table 3 for villages with a government worker. γ is the effect of NGO entry in villages without a government worker and analogous to the estimates presented in Table 6 Panel A.

The interaction coefficients in Table 6 Panel B show that NGO entry has similar effects on the number of NGO workers and services from NGO workers (columns 1 and 4) in the two types of villages. However, it reduces the number of government and total health workers, and government and total services in villages with a government health worker relative to those without. The interaction coefficients are negative and statistically significant at the 1% level in columns (2)-(3) and (5)-(6).

We present the second difference specification henceforth in the paper.

[33] The finding in column (5) that NGO entry reduces the probability of health care from a government health worker reflects the fact that a very small number of households (in villages with no government health worker) will travel to nearby villages to obtain care from a government health worker. Note that these nearby villages are unlikely to be in our sample because of the large geographic distances between our villages. Thus, this does not necessarily raise concerns about spatial contamination in our experiment.

4.5.3 Additional Controls

Since the presence of a government worker is not randomly assigned, a natural question to ask is whether the differential effect of NGO entry between villages with and without a government worker is due to other factors that are correlated with the presence of a government worker, which may influence the effect of NGO entry on services, or a government worker's decision to move to the NGO. We can investigate this concern by comparing the characteristics of villages with and without a government health worker in 2010. Table 2 column (4) shows that these two types of villages are similar in observable characteristics.

Nevertheless, to be cautious, we include four categories of additional controls that can potentially influence the effect of NGO entry. The first comprises of variables that can influence the demand for a community health worker: distance to the nearest government clinic, distance to the nearest private clinic, the presence of a drug store in the village and the presence of a traditional healer. The second comprises of demographic variables: the number of households and the average number of infants per household. These variables could affect the labor supply of and demand for health services relative to household products sold by the NGO. For example, the demand for services may be larger in more populous villages or villages with more young children. Third, we consider base year morbidity: the number of infants who died in the past year. This variable could be correlated to the demand for health services, and reflect underlying well-being of the population. For example, a village with a higher mortality rate may be poorer, where there is a lower supply of community health workers or where government workers are more motivated to work for higher pay with the NGO. Finally, we consider household-level demographic variables: the percent of households involved in farming as the main activity, the share of household heads who completed primary education, and a standardized index of household wealth. These factors may affect the availability of health workers for the government and the NGO.

All control variables are measured in the base year of 2010. We include them and their interactions with NGO entry. Since the uninteracted NGO term becomes difficult to interpret, we present the NGO coefficient evaluated at the mean of all the controls. The results, which are presented in Table 6 Panel C, are robust to the inclusion of these additional controls.

4.6 Drug Stores

We interpret the main results on labor supply and the reduction of total health service delivery as being consistent with NGO entry crowding out government workers because it provides better pay and more incentives to workers to allocate time away from providing health services. An alternative explanation is that the demand for health services relative to the products sold by the NGO is lower in villages with a government program. The robustness exercises discussed earlier address this by controlling for variables that are likely to be correlated with the demand for health services, such as child mortality rates and access to health services in the base year, interacted with NGO entry.

We can also address this concern by dividing the sample into villages that had a drug store in 2010 with those that did not. Drug stores sell many of the same products as the NGO. Thus, if the main results are driven by differential demand for goods (relative to health services), then we should find a smaller effect in villages that had a drug store. We examine the total number of health workers and total health care delivery as outcome variables and estimate the second difference specification for villages with and without a drug store in 2010. The triple interaction of the pre-existing presence of a government worker, NGO entry and the pre-existing presence of a drug store is statistically zero and does not provide evidence for differential demand as an important driver of the results (see Appendix Table A.2).

5 Mortality

To understand whether the crowding-out has real-world consequences, we examine infant (under one year of age) mortality, the reduction of which is a focal point for both government workers and the NGO workers.[34] This will also help us understand the extent to which improvements in health care quality offset the reduction in health care quantity.

This section begins by examining the primary services that the WHO and UNICEF focus on to reduce infant mortality: assisted hospital delivery and whether a mother received a visit soon after the delivery (e.g., UNICEF, 2009; World Health Organization, 2014).[35]

[34] Our focus on infant mortality is motivated by the policy objectives of the government and NGO. These two organizations also focus on reducing neonatal and under-age-five mortality. However, we do not have reliable data on neonatal and under-five mortality. See the Data Appendix 5.7 for a detailed discussion.

[35] The WHO and UNICEF focus on three services for reducing infant mortality: assisted hospital delivery, post-natal visit and "receiving at least four ante-natal care visits". We do not have data for the last measure.

The WHO estimates that if routine post-natal and curative care in the postnatal period reached ninety percent of newborns and their mothers, two-third of newborn deaths could be averted (Warren, Daly, Toure, and Mongi, 2006). These findings will help motivate the results on mortality which we present at the end of this Section.

5.1 Natal and Post-Natal Services

The data on post-natal care are only available for households which have given birth during the year preceding the 2012 survey, for whom such care is most relevant. Since giving birth is potentially an outcome of the provision of NGO and government health workers, we first investigate if fertility is affected by the presence of government and/or NGO workers. Table 7 column (1) examines the presence in the household of a woman who delivered in the past year as the outcome variable. We find no relationship between this proxy for fertility and our main right-hand-side variables. Therefore, in columns (2)-(4), we restrict our sample to households with at least one woman who delivered in the past year. This results in the sample size decreasing from 2,747 to 407 households.[36]

To maximize statistical power, we present the second difference specification. We include additional controls that are likely to be correlated with the two main outcomes we examine: obtaining an assisted hospital delivery and infant mortality. We control for the presence of a clinic (either private or public) within ten kilometer radius and baseline infant mortality, and their interactions with NGO entry. We also control for the number of households in a village, which is likely to affect the amount of health care the average household can receive from the health worker.[37] As before, we present the estimates evaluated at the mean value of the controls.

Table 7 column (2) shows that NGO entry has no effect on the probability of delivering in a health clinic (versus at home). This may partly be due to the high rate of delivering in clinics in our context (the mean is 74%). Assisted deliveries—i.e., deliveries assisted by a health professional (i.e., a doctor or a nurse)—are much less common (the mean is 53%). We find that the presence of an NGO worker increases the probability that the delivery is assisted by 20.1 percentage-points in villages with no government health worker. The joint coefficient at the bottom of the table shows that NGO entry in villages with a

[36] We can alternatively estimate a multinomial logit model with the full sample of households. See Appendix Table A.3. The results are similar. In 0.2% of the households, more than one woman delivered in the past year. In these cases, we aggregate the woman-level data to the household level.

[37] In Appendix Table A.4, we control for all of the additional variables in the robustness tests shown earlier for labor supply and service delivery. The results are very similar.

government worker reduces the probability of a health delivery by 10.4 percentage-points. The estimate is statistically significant at the 10% level. This result is consistent with concerns of absenteeism in such facilities and the fact that NGO workers do not coordinate with clinic staff as well as government workers.[38]

In column (4), we examine the probability of receiving a post-natal visit within two months of delivery (typically provided by the community health worker herself). The presence of an NGO worker increases the probability of a post-natal visit by 19.4 percentage-points in villages with no government health worker. The joint coefficient at the bottom of the table shows that NGO entry in villages with a government worker reduces the probability of a post-natal visit by 21.6 percentage-points. The estimate is statistically significant at the 1% level.[39]

To connect the results on natal and post-natal services and mortality, we note that medical studies have consistently found that these services can have large effects on mortality. For example, Wondemagegn, Alebel, Tesema, and Abie (2018) presents a systematic review of the medical literature on the effect of assisted deliveries and post-natal visits on infant mortality in developing countries and argues that these reduce the risk of child mortality by 34%. The effectiveness of such health services in reducing mortality is consistent with the fact that half of all neonatal deaths in sub-Saharan Africa take place during the first 24 hours of life and 30% within the first six hours (Baqui, Mitra, Begum, Hurt, Soremekun, Edmond, Kirkwood, Bhandari, Taneja, Mazumder, et al., 2016). In line with this, our data indicate that receiving medical care from a health worker is associated with 10.2 percentage-point lower infant mortality and that receiving a post-natal visit is associated with 7.7 percentage-points reduction in infant mortality.[40] The large magnitude of these correlations together with the existing medical evidence suggest that the effects of NGO entry on mortality, through its reduction in service provision, may be sizable.

[38] In line with our results, existing studies suggest that health services improve and mortality declines when there is someone in the community who is in close contact with the doctor/nurse of the urban health facility and who can coordinate patient visits with them (Mogensen, 2005; Sodemann, Biai, Jakobsen, and Aaby, 2006).

[39] The means of these outcome variables are in line with data from rural areas in the 2011 Uganda DHS. The fraction of women who deliver in a hospital is 74% in our study and 68% in the DHS. The faction of women who were assisted by a health professional during the delivery is 53% in our data and 50% in the DHS. The fraction of women who receive a post-natal check-up within 2 months of birth is 26% in our study and 31% in the DHS.

[40] This is comparable to the correlation between receiving post-natal care and infant mortality in the 2011 Uganda DHS data.

5.2 Infant Mortality

In Table 8 columns (1)-(2), we examine infant mortality using different measures. Column (1) uses the household-level survey and examines a dummy variable that equals one if at least one infant died within the household since 2010.[41] The sample comprises of households with at least one infant born since the baseline survey (2010).[42] In column (2), we aggregate infant mortality at the village-level and normalize it by the number of births. See the Data Appendix Section A.2 for a detailed discussion about these mortality measures. Column (1) shows that the introduction of the NGO in a village with no government worker reduces the share of households with at least one infant death by 3.3 percentage-points. While this is a large effect it is not statistically significant.[43] The interaction coefficient is 0.064 and statistically significant at the 5% level. The sum of the uninteracted NGO coefficient and the interaction coefficient shown at the bottom of the table is three percentage-points, which suggests that NGO entry into a village with a government worker and control variables with the values of the sample means experience a 3 percentage-point increase in infant mortality. However, the estimate is not statistically significant at conventional levels (the p-value is 0.139).

In column (2), the coefficients have the same signs as in column (1). However, the effect of NGO entry in villages without a pre-existing government worker is statistically significant at the 10% level. In such villages, NGO entry reduces infant mortality by 37 per 1,000 births, which is a 37% reduction relative to the constant of around 102 deaths per 1,000 births.[44]

[41] The results are similar when we examine the continuous measure for the number of infants who died in the household, since only 7% of the households experienced more than one infant death.

[42] Recall that we demonstrate that NGO entry does not affect fertility.

[43] Note that the presence of government workers in a village with no NGO is associated with a 5.1 percentage-point reduction in infant mortality relative to villages with no health worker of any type. The estimate is statistically significant at the 5% level. The magnitude of the reduction is comparable to other studies, such as Brenner, Kabakyenga, Kyomuhangi, Wotton, Pim, Ntaro, Bagenda, Gad, Godel, Kayizzi, et al. (2011), which uses a randomized experiment in 116 villages of Southwest Uganda to show that the same government program we study causes a 53.2% decline in mortality.

[44] The large magnitude of the findings are consistent with the notion that this is an environment with very low baseline medical care, and mortality is therefore very sensitive to basic interventions. Comparable magnitudes have been found in other contexts that are similar in this sense. For example, Friedman and Keats (2019) finds that health worker strikes increase infant mortality by 54% in Kenya. Bjorkman Nyqvist, Guariso, Svensson, and Yanagizawa-Drott (2019) find that a similar NGO health program reduces infant mortality by 33% in a different rural region of Uganda. We discuss this study more in the Appendix.

5.3 Decomposition by the Labor Supply of Health Workers

Given our earlier finding that the reduction in health services caused by the NGO is concentrated in villages where the NGO hired the government worker, we conduct a similar descriptive decomposition with mortality. Columns (3)-(4) of Table 8 estimate the triple interaction effect of NGO entry, the presence of a government worker before it entered, and whether the NGO hired the government worker or a new worker. As with the earlier decomposition, whether the NGO hired the government worker or not is an outcome and the triple interaction should not be interpreted as causal. We examine the same two measures of mortality as before, with the same parsimonious set of controls as before: presence of a clinic within ten kilometer radius, number of infants who died in the past year and number of households in the village. We control for these variables, their interactions with NGO entry, and their triple interactions with the presence of a government health worker and NGO entry.[45] As before, we evaluate all coefficients at the mean of the control variables.

For brevity, we focus on the joint estimates shown at the bottom of Table 8, columns (3)-(4). The pattern of the results is similar for both mortality measures. We find that NGO entry is associated with *increased* infant mortality in villages where there was already a government worker and in which the government worker switched to the NGO. The estimates are statistically significant at the 5% in columns (3) and almost significant at the 10% level in column (4). In villages where the NGO was able to recruit a second worker, NGO entry is negatively associated with infant mortality. The estimates are imprecise.

5.4 Other Health Outcomes

In our investigation of the possible health outcomes of the crowding out of labor and health services, we focus on infant mortality, which is the focal point of both the NGO and government programs. However, health workers also provide advice and medicines for many other health conditions (e.g., malaria, basic hygiene, etc.). We investigate whether NGO workers in villages with the government program improved these other outcomes: variables that capture better preventive healthcare for children (e.g., immunization, sleep under a bed net, drink treated water, wash hands), disease incidence for children (cough, diarrhea, worms, tuberculosis, malaria), and health behavior for adults (breastfeeding, contraceptive usage). These variables are self-reported. We expect there to be more measurement error

[45] In Appendix Table A.5, we control for all of the additional variables in the robustness tests shown earlier for labor supply and service delivery. The results are very similar.

than for mortality because many households may not know if someone has a given disease. In contrast, mortality is an observable and salient event.

We find that the presence of the government health worker is correlated with better preventive healthcare and health behavior for children, NGO entry in villages without a government health worker in 2010 has either negligible or small positive effects on the outcomes, and NGO entry in villages with a government health worker either has no effect or reduced (made worse) preventive healthcare and health behavior for children. See Appendix Table A.6. Thus, there is no evidence that the increase in mortality in such villages were caused by a reallocation of effort to improve other health outcomes. As with our results on services and mortality, we find that these negative effects seem to be driven by villages in which the NGO hired the government worker. See Appendix Table A.7.

5.5 Drug Prices

The results so far indicate that in villages with a government health worker, NGO entry reduced total health services, which increased mortality, especially in villages where the government worker shifted to the NGO. Since the government community health workers give out the drugs for free, while the NGO workers sell the same drugs at a low price, the crowding out of the government worker can also increase drug prices. This could be an additional channel through which the shift of workers away from the government towards the NGO could increase mortality.

Our data allow us to examine the cost of disease treatment (drug prices, the cost of transportation to obtain treatment, and the cost of diagnostic medical tests) for the most relevant diseases for our contexts. Using these measures as dependent variables in our baseline, we find no evidence that this alternative mechanism plays a major role. See Appendix Table A.8.

5.6 Non-Linear Estimation

The main results are estimated with a Linear Probability Model. We can alternatively use a Logistic Model for the dummy variable outcomes of whether a household received medical care from the NGO or government worker, for post-natal care and for mortality (measured as a dummy for at least one infant died in the household). The estimates are shown in Appendix Table A.9. They are consistent with those from the main regressions.

5.7 Average Effect of NGO Entry

Appendix Table A.10 presents the average effects of NGO entry, where we regress the main outcomes of interest on the uninteracted NGO dummy variable, controlling for area fixed effects, for the full sample of villages (those with and without a pre-existing government health worker). NGO entry increases medical care from NGO health workers by 31.5 percentage-points and reduces medical care from government health workers by 17.2 percentage-points. Both estimates are statistically significant at the 1% level. There is no effect on mortality: the estimates are small in magnitude and statistically imprecise.[46] These results add to the main heterogeneous treatment effects presented earlier by showing that the latter are important for understanding the benefits of NGO entry in our context (as well as its unintended consequences).

6 Additional Descriptive Evidence

In our context, the incentives offered by the NGO pay scheme can affect health care provision in two ways. First, for a given worker, it may shift efforts away from health care activities towards income generating ones. Second, it may select health workers who are more motivated by money and who spend more time on the income generating activity once hired. The finding that the reduction in services and increase in mortality are most pronounced in villages where the NGO hired the former government worker — i.e., it is the same person with a different employer — implies that the first channel of worker effort plays a role. In this section, we provide descriptive evidence to shed light on the likely importance of the second channel of worker selection.

Our main worker-level data that we discussed earlier only include NGO workers and do not observe government workers who do not switch to the NGO. Thus, we rely on another survey taken from Deserranno (2019), which studies the same NGO in a broadly similar context. It contains information on 241 government health workers from the same government program that we study. There is no overlap between our main dataset and these data, which are from a different region.[47] Before the NGO position was advertised, all 241

[46] We compare our results with those of Bjorkman Nyqvist, Guariso, Svensson, and Yanagizawa-Drott (2019) in Appendix Section A.3.

[47] Note that one difference between our context and Deserranno (2019) is that the latter focuses on government health workers who are also members of the NGO micro-finance program. In the context of our study, there is no micro-finance program.

government health workers were asked to complete a brief questionnaire about their socio-economic background, education, experience and prosocial motivation. They, along with other eligible candidates, could later apply to be an NGO community health worker. The NGO hired one applicant in each village.

Table 9 shows that in this sample of government workers, 45% apply to work for the NGO when it enters the village. Consistent with the belief that government workers are competitive relative to other applicants, 60% of these applicants are hired by the NGO. At the same time, 29% of government health worker applicants faced no competition, which is consistent with the belief that the supply of such workers is generally limited.

Comparing columns (1) and (3) shows that government workers who applied for the job have 1.36 extra years of education, eight months more of work experience as a health worker, and are fourteen percentage-points more likely to report that "earning money" is the most important feature in a new job. In contrast, they are less likely to say that "earning respect" is the most important feature in a new job.[48] This suggests that the government health workers who try to switch are more qualified on observables, but also more commercially motivated. Consistent with this, we see that those who apply to be NGO workers self report that they were less likely to provide free-of-charge health services when working as government health workers.

When comparing those who are ultimately chosen by the NGO to those who applied and were not accepted in columns (6) and (8), we see that the only statistically significant difference is in work experience. The NGO chooses more experienced workers. There are several additional interesting facts. First, the NGO seems to prefer workers who care about earning respect. However, this difference is only significant at the 15% level. Second, the NGO does not screen on whether the applicant is motivated by money. Finally, it is more likely to hire workers who delivered fewer free health services.

These patterns are consistent with the belief that the NGO targets workers with pro-social tendencies, but also suggest that there is potential room for improvement, even with the existing information. For example, they could target workers who are less motivated by money and provide more social services.

[48] Ashraf, Bandiera, and Jack (2014) and Deserranno (2019) use similar measures of self-motivation.

7 Conclusion

This paper presents novel and rigorous empirical evidence that NGOs can crowd out government-provided community health care and reduce total health care. When the NGO arrives to villages with volunteer government health workers, government workers shift to working for the NGO in approximately half of the cases. In the other half of the cases, the NGO is able to recruit a new person. In the former group of villages, the supply of health services declines and infant mortality increases. When we examine other health outcomes in such villages, we either find that NGO entry had no effect or adverse effects.

These results piece together a nuanced picture of heterogeneous effects: NGO entry can increase service provision in places where no government-provided services were available, but can have unintended consequences that contradict its mission in places where the government has started to build infrastructure for provision. Our findings validate the concerns of public health workers that NGOs can hinder the development of infant public services. The magnitude of our findings should be cautiously interpreted as specific to our context. The results are agnostic about welfare.

For policy makers, our findings support the call for aid-recipient governments and NGOs to coordinate their efforts, which is currently not the usual practice.[49] This will become increasingly relevant as poor countries begin to build domestic capacity for providing public goods, a necessary step towards self-sustainable development. For example, creating a register of NGOs and improving record-keeping of the location of government workers and NGOs could have high returns.[50] The descriptive patterns from Section 6 suggest that the NGOs may be able to improve screening when hiring workers. Our results also support recent initiatives by NGOs to improve the parallel-task model. For example, BRAC and Living Goods have begun to experiment with providing monetary incentives for health services, or spending more on monitoring health workers. The comparative effects of the different compensation schemes is an important topic for future research.

This study suggests two other avenues for future research. The first is about the long-run effects of NGO entry, which can be similar or quite different from the short-run effects. For example, if NGOs duplicate government efforts, they can ease the pressure on state health resources (i.e., in the long run, the government can systematically reallocate public

[49] A large body of evidence documents that NGOs often operate in the same place as the government or other NGOs (see Barr and Fafchamps (2006) for detailed discussion on NGOs' location).

[50] Some governments, such as Uganda, is in the process of creating a digital database of workers. See https://www.intrahealth.org/news/uganda-takes-major-steps-professionalize-community-health-workforce.

resources away from the regions with NGO workers). Such reallocation does not occur in the context of our short-run study.[51] The long-run effects can also be negative if the NGO undermines state capacity and worsens health outcomes as it does in the short run. The positive and negative forces are not mutually exclusive and the net effect is ultimately, an empirical question. A second question is whether foreign aid crowds out or crowds in the development of native capacity in other contexts. For example, policymakers and aid workers have expressed much concern that food aid, if not thoughtfully targeted, can reduce farm-gate food prices and crowd out local agricultural production (Janzen, 2015; Levinsohn and McMillan, 2005). This is an important topic for future inquiry.

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[51] In principle, the government could have, for example, hired health workers in villages where the NGO did not enter. In practice, this did not happen in our context.

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Table 1: NGO Time Allocation Across Tasks (Reichenbach et al., 2011)

	Self-reported Activity for the Past Month				
	(1)	(2)	(3)	(4)	(5)
	% health workers who provided this activity	Time (minutes) per activity	# of activities provided	Total time per activity = (2) x (3)	Total time per activity as % of total time = (4)/2920 x 100
Pregnancy identification	98%	25	7	175	6%
Attending delivery and providing newborn care	97%	28	7	196	7%
Referral to hospitals or clinics	88%	21	11	231	8%
Attending refresher training	94%	231	2	462	16%
Selling medicines	99%	23	46	1058	36%
Selling health commodities	97%	21	38	798	27%
Total per worker across activities		349	111	2920	100%

Notes: The sample comprises of 660 NGO community health workers interviewed by the NGO throughout Uganda in 2009. Workers were asked (a) which activities they performed as a health worker in the last month, (b) how much time was dedicated to each of these activities. Refresher trainings are organized on a monthly basis in the NGO branch office and are aimed to "refresh" workers' health knowledge and to allow workers to replenish their stock of health products.

Table 2: Village-Level Summary Statistics and Balance Checks

Sample of villages:	All		All		Gov Worker in 2010	No Gov Worker in 2010	NGO Entry and Gov Worker in 2010
	Mean	SD	NGO	Gov	NGO	NGO	NGO Hired Gov
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Observations	127		127		73	54	36
A. Presence of a Health Care Provider in 2010 = {0, 1}							
Gov health worker in the village	0.575	0.496	-0.061	-	-	-	-
			(0.088)				
Traditional healer in the village	0.480	0.502	-0.016	-0.027	0.069	-0.031	-0.187
			(0.088)	(0.125)	(0.129)	(0.134)	(0.206)
Drug store in the village	0.677	0.469	0.030	-0.023	0.076	0.000	0.203*
			(0.039)	(0.044)	(0.071)	(0.000)	(0.116)
Government clinic within 10 km	0.559	0.498	-0.052	-0.054	-0.022	-0.003	-0.312
			(0.078)	(0.108)	(0.118)	(0.108)	(0.261)
Private clinic within 10km	0.835	0.373	0.047	0.006	0.127*	-0.019	0.120
			(0.045)	(0.047)	(0.073)	(0.057)	(0.095)
B. Village Size and Infant Mortality in 2010							
# of HHs in the village	182.071	125.452	-13.339	-45.290	17.600	-77.696*	-76.953**
			(22.191)	(29.111)	(18.330)	(44.669)	(31.802)
# of infants per HH	0.291	0.091	-0.004	-0.024	-0.026	0.009	-0.001
			(0.014)	(0.019)	(0.022)	(0.019)	(0.043)
# of infants who died in the past year per HH	0.041	0.060	-0.004	-0.007	-0.005	-0.008	-0.037
			(0.009)	(0.006)	(0.016)	(0.006)	(0.024)
C. Household (HH) Socio-Economic Background in 2010							
% HHs involved in farming as main activity	0.568	0.383	0.031	0.025	0.016	0.059	0.018
			(0.023)	(0.027)	(0.036)	(0.036)	(0.049)
% HH heads who completed primary education	0.376	0.260	0.004	-0.016	0.057	-0.033	0.050
			(0.030)	(0.035)	(0.047)	(0.042)	(0.104)
# of assets owned (out of 11)	5.625	1.956	0.032	0.133	0.202	0.000	0.608
			(0.164)	(0.177)	(0.266)	(0.193)	(0.677)
Food security (1 to 4)	2.225	0.619	0.032	0.024	0.066	0.012	-0.077
			(0.039)	(0.041)	(0.060)	(0.058)	(0.137)
% HHs with high quality house wall material	0.410	0.411	0.009	-0.027	0.024	0.000	0.053
			(0.028)	(0.044)	(0.025)	(0.058)	(0.050)
% HHs with high quality house floor material	0.424	0.410	0.004	-0.028	0.034	-0.020	0.057
			(0.031)	(0.045)	(0.029)	(0.064)	(0.063)
% HHs with high quality house roof material	0.584	0.406	0.015	-0.001	0.037	-0.020	0.046
			(0.027)	(0.031)	(0.034)	(0.053)	(0.057)
Standardized index of wealth	0.000	0.927	0.027	-0.006	0.088	-0.015	0.113
			(0.053)	(0.070)	(0.063)	(0.099)	(0.156)

Notes: Observations are at the village level. Sample restrictions are stated in the column headings. Each row states the sample mean and standard deviation of a variable, as well as the estimates from four separate regressions, where the variable is regressed on an indicator for NGO entry (col. 3, 5, 6), an indicator for presence of a gov health worker in 2010 (col. 4), and an indicator for whether the NGO hired the gov health worker after its arrival (col. 7). All regressions include area fixed effects. Robust Newey-West standard errors are presented in parentheses. In Panel C, the standardized index of wealth is an equally weighted average of z-scores of 5 variables: average number of assets owned by a HH (out of a list of 11 essential household assets), average food security (1="deficit of food the whole year", 2="occasional deficit", 3="neither deficit nor surplus, 4="surplus"), % HHs with high quality wall material, % HHs with high quality floor material, % HHs with high quality roof material. *** p<0.01, ** p<0.05, * p<0.1.

Table 3: Labor Supply and Health Services

	Dependent Variable						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	A. Presence of Health Providers in the Village in 2012						
	# Health Workers			# Other Medical Service Providers		Urban Clinic within 10 km	
	NGO = {0, 1}	Gov = {0, 1}	Total = {0, 1, 2}	Traditional Healer = {0, 1}	Drug Store = {0, 1}	Government = {0,1}	Private = {0, 1}
Mean Dep.Var.	**0.479**	**0.740**	**1.219**	**0.205**	**0.356**	**0.260**	**0.630**
NGO	1.000***	-0.430***	0.570***	-0.074	-0.016	0.109	0.082
	(0.000)	(0.098)	(0.098)	(0.103)	(0.072)	(0.093)	(0.087)
Constant	-0.014	0.952***	0.938***	0.242***	0.364***	0.206***	0.590***
	(0.011)	(0.041)	(0.042)	(0.069)	(0.050)	(0.058)	(0.055)
Observations	73	73	73	73	73	73	73
R-squared	0.973	0.432	0.542	0.272	0.637	0.485	0.541
NGO p-value (RI)	<0.001	<0.001	<0.001	0.518	1.000	0.304	0.522
	B. Household Received Medical Care from the Following in the Past Year (2012) = {0, 1}						
	Health Workers			Other Medical Service Providers		Urban Clinic	
	NGO	Gov	Any (NGO or Gov)	Traditional Healer	Drug Store	Government Clinic	Private Clinic
Mean Dep.Var.	**0.238**	**0.546**	**0.623**	**0.022**	**0.192**	**0.180**	**0.367**
NGO	0.315***	-0.251***	-0.116**	0.015	-0.017	-0.057**	0.009
	(0.033)	(0.064)	(0.049)	(0.010)	(0.028)	(0.024)	(0.038)
Constant	0.090***	0.664***	0.678***	0.015***	0.200***	0.207***	0.363***
	(0.018)	(0.026)	(0.025)	(0.005)	(0.021)	(0.016)	(0.018)
Observations	1,473	1,473	1,473	1,473	1,473	1,473	1,473
R-squared	0.173	0.235	0.165	0.030	0.108	0.094	0.185
NGO p-value (RI)	<0.001	<0.001	0.014	0.152	0.598	0.050	0.822

Notes: The sample comprises of villages with a gov health worker in 2010. Observations are at the village level in Panel A and at the household level in Panel B. In parentheses, we present robust Newey-West standard errors in Panel A and standard errors clustered at the village level in Panel B. All regressions include area fixed effects. P-values from randomization inference using 500 random permutations are presented at the bottom of each panel.
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Targeting

	Dependent Variable: Household Received Medical Care from the NGO or Gov Health Worker in the Past Year (2012) = {0, 1}			
	(1)	(2)	(3)	(4)
Sample of villages:	NGO	No NGO	NGO	No NGO
Mean Dep.Var.	**0.573**	**0.668**	**0.573**	**0.668**
Household with a pregnant woman or infant [1]	-0.023	0.047		
	(0.037)	(0.034)		
Poor household [2]			-0.136**	0.152**
			(0.055)	(0.066)
Constant	0.583***	0.649***	0.615***	0.625***
	(0.030)	-0.021	(0.034)	(0.028)
Observations	694	779	694	779
R-squared	0.181	0.197	0.187	0.203
NGO = No NGO p-value (SUR)	0.168		0.001	
[1] p-value (RI)	0.534	0.510		
[2] p-value (RI)			0.030	0.022

Notes: The sample comprises of villages with a gov health worker in 2010. Additional restriction are stated in column headings. Observations are at the household level and standard errors are clustered at the village level. All regressions include area fixed effects. "Poor household" is an indicator for whether the household standardized index of wealth is in the bottom quartile of the within-village distribution. The p-value "NGO=No NGO" is the p-value of the coefficient X*NGO (where X is an indicator for whether the household comprises of a pregnant woman/infant or whether the household is poor) in a regression where the dependent variable is regressed on NGO, X, X*NGO, area fixed effects, area fixed effects*NGO and standard errors clustered at the village level. P-values from randomization inference using 500 random permutations are presented at the bottom of the table.*** p<0.01, ** p<0.05, * p<0.1

Table 5: Labor Supply and Health Services — Decomposition

	Dependent Variable: Household Received Medical Care from the Following Health Worker in the Past Year (2012) = {0, 1}		
	(1)	(2)	(3)
	NGO	Gov	Any (NGO or Gov)
Mean Dep.Var.	**0.238**	**0.546**	**0.623**
NGO × NGO hired Gov worker [1]	0.274***	-0.526***	-0.229***
	(0.029)	(0.053)	(0.055)
NGO × NGO hired new worker [2]	0.343***	-0.066	-0.040
	(0.047)	(0.069)	(0.056)
Constant	0.090***	0.664***	0.678***
	(0.018)	(0.026)	(0.026)
Observations	1,473	1,473	1,473
R-squared	0.175	0.302	0.177
Hired Gov = Hired new p-value (SUR)	0.174	<0.001	0.006
[1] p-value (RI)	<0.001	<0.001	<0.001
[2] p-value (RI)	<0.001	0.266	0.402

Notes: The sample comprises of villages with a gov health worker in 2010. Observations are at the household level and standard errors are clustered at the village level. All regressions include area fixed effects. P-values from randomization inference using 500 random permutations are presented at the bottom of the table. *** p<0.01, ** p<0.05, * p<0.1

Table 6: Labor Supply and Health Services – Heterogeneous Effects

	Dependent Variable					
	Presence of Health Workers in the Village in 2012			Household Received Medical Care from the Following in the Past Year (2012) = {0, 1}		
	(1)	(2)	(3)	(4)	(5)	(6)
	NGO = {0, 1}	Gov = {0, 1}	Total = {0, 1, 2}	NGO	Gov	Any (NGO or Gov)
	A. Villages with No Gov Worker in 2010					
Mean Dep.Var.	**0.504**	**0.425**	**0.929**	**0.231**	**0.045**	**0.265**
NGO	0.948***	0.000	0.948***	0.315***	-0.019*	0.286***
	(0.053)	(0.000)	(0.053)	(0.046)	(0.011)	(0.046)
Constant	0.010	0.000	0.010	0.056**	0.055***	0.106***
	(0.014)	(0.000)	(0.014)	(0.028)	(0.008)	(0.028)
Observations	54	54	54	1,274	1,274	1,274
R-squared	0.934	-	0.934	0.233	0.006	0.185
NGO p-value (RI)	<0.001	1.000	<0.001	<0.001	0.114	<0.001
	B. All Villages					
Mean Dep.Var.	**0.504**	**0.425**	**0.929**	**0.235**	**0.313**	**0.457**
Gov	-0.070	0.791***	0.720***	-0.093**	0.428***	0.361***
	(0.050)	(0.074)	(0.095)	(0.038)	(0.049)	(0.057)
NGO [1]	0.939***	-0.020	0.919***	0.315***	-0.019	0.288***
	(0.050)	(0.027)	(0.059)	(0.043)	(0.020)	(0.046)
Gov × NGO [2]	0.038	-0.446***	-0.409***	-0.016	-0.240***	-0.415***
	(0.056)	(0.099)	(0.114)	(0.055)	(0.065)	(0.069)
Constant	0.046	0.107***	0.153***	0.128***	0.154***	0.221***
	(0.034)	(0.040)	(0.058)	(0.028)	(0.023)	(0.034)
Observations	127	127	127	2,747	2,747	2,747
R-squared	0.948	0.709	0.760	0.193	0.418	0.270
Gov × NGO + NGO p-value	0.976 <0.001	-0.466 <0.001	0.510 <0.001	0.299 <0.001	-0.259 <0.001	-0.127 0.007
[1] p-value (RI)	<0.001	0.224	<0.001	<0.001	0.242	<0.001
[2] p-value (RI)	0.818	<0.001	0.028	0.848	<0.001	<0.001
	C. All Villages – Additional Controls					
Mean Dep.Var.	**0.504**	**0.425**	**0.929**	**0.235**	**0.313**	**0.457**
Gov	-0.051	0.717***	0.666***	-0.031	0.394***	0.387***
	(0.038)	(0.111)	(0.125)	(0.041)	(0.060)	(0.072)
NGO [1]	0.966***	-0.093	0.874***	0.371***	-0.051	0.311***
	(0.044)	(0.068)	(0.085)	(0.045)	(0.038)	(0.049)
Gov × NGO [2]	-0.007	-0.375**	-0.382**	-0.108*	-0.201**	-0.449***
	(0.070)	(0.143)	(0.167)	(0.061)	(0.084)	(0.087)
Constant	0.029	0.171***	0.200***	0.085***	0.177***	0.201***
	(0.025)	(0.064)	(0.074)	(0.030)	(0.034)	(0.043)
Observations	127	127	127	2,747	2,747	2,747
R-squared	0.954	0.755	0.797	0.216	0.437	0.288
Gov × NGO + NGO p-value	0.959 <0.001	-0.468 <0.001	0.491 <0.001	0.264 <0.001	-0.252 <0.001	-0.138 0.010
[1] p-value (RI)	<0.001	0.052	<0.001	<0.001	0.098	<0.001
[2] p-value (RI)	0.962	<0.001	0.058	0.224	0.016	<0.001

Notes: Sample restrictions are stated in the Panel headings. Observations are at the village level in col. (1)-(3) and at the household level in col. (4)-(6). We present robust Newey-West standard errors in village-level regressions and standard errors clustered at the village level in household-level regressions in parentheses. All regressions include area fixed effects. Panel C also include the following controls (measured in 2010) and their interactions with NGO entry: access to health providers (government clinic within 10km, private clinic within 10km, drug store in the village, traditional healer in the village), village size (number of households in the village, number of infants per household), infant mortality (number of infants who died), household characteristics (farming is the main HH occupation, HH head completed primary education, standardized index of wealth). P-values from randomization inference using 500 random permutations are presented at the bottom of the table.*** p<0.01, ** p<0.05, * p<0.1.

Table 7: Natal and Post-Natal Services

	Dependent Variable			
	Fertility	Delivery and Post-Natal Care		
	(1)	(2)	(3)	(4)
	Birth in the past year (2012) = {0, 1}	Delivery in a clinic = {0, 1}	Delivery assisted by a health professional = {0, 1}	Post-natal visit within two months of birth = {0, 1}
Sample:	All HHs	HHs with a birth in the past year (2012)		
Mean Dep.Var.	**0.148**	**0.744**	**0.533**	**0.265**
Gov	0.029	-0.006	0.392***	0.379***
	(0.027)	(0.076)	(0.106)	(0.081)
NGO [1]	0.012	0.051	0.201*	0.194***
	(0.020)	(0.070)	(0.104)	(0.060)
Gov × NGO [2]	-0.052	-0.135	-0.304**	-0.410***
	(0.037)	(0.095)	(0.119)	(0.088)
Constant	0.140***	0.783***	0.260***	0.060
	(0.017)	(0.072)	(0.096)	(0.059)
Observations	2,747	407	407	407
R-squared	0.100	0.164	0.118	0.243
Gov × NGO + NGO	-0.039	-0.084	-0.104	-0.216
p-value	0.187	0.200	0.094	0.001
[1] p-value (RI)	0.492	0.390	0.058	0.000
[2] p-value (RI)	0.184	0.114	0.018	0.000

Notes: The sample comprises of all villages. Observations are at the household level and standard errors are clustered at the village level. All regressions include area fixed effects and the following controls (measured in 2010) and their interactions with NGO entry: presence of a clinic within 10km of the village, number of households in the village, number of infants who died in the past year. P-values from randomization inference using 500 random permutations are presented at the bottom of the table.*** p<0.01, ** p<0.05, * p<0.1.

Table 8: Infant Mortality

	Dependent Variable: Infant Mortality (2010-2012)			
	(1)	(2)	(3)	(4)
	≥ 1 infant died = {0, 1}	# infants died /1,000 births	≥ 1 infant died = {0, 1}	# infants died /1,000 births
Sample:	HHs with a birth since 2010	All villages	HHs with a birth since 2010	All villages
Mean Dep.Var.	**0.073**	**65.004**	**0.073**	**65.004**
Gov	-0.051**	-54.322**	-0.068***	-63.305**
	(0.023)	(24.705)	(0.024)	(25.464)
NGO [1]	-0.033	-37.714*	-0.050**	-56.473**
	(0.021)	(22.415)	(0.020)	(23.676)
Gov × NGO [2]	0.064**	51.653		
	(0.032)	(31.767)		
Gov × NGO × NGO hired Gov worker [3]			0.132***	110.073**
			(0.044)	(42.996)
Gov × NGO × NGO hired new worker [4]			0.023	26.667
			(0.030)	(32.670)
Constant	0.103***	101.926***	0.114***	107.558***
	(0.017)	(16.836)	(0.017)	(16.853)
Observations	1,402	127	1,402	127
R-squared	0.033	0.252	0.047	0.357
Gov × NGO + NGO	0.030	13.939		
p-value	0.139	0.491		
Gov × NGO × Hired Gov + NGO			0.082	53.600
p-value			0.022	0.101
Gov × NGO × Hired new + NGO			-0.027	-29.807
p-value			0.215	0.183
[1] p-value (RI)	0.134	0.068	<0.001	<0.001
[2] p-value (RI)	0.040	0.090		
[3] p-value (RI)			<0.001	<0.001
[4] p-value (RI)			0.986	0.982

Notes: The sample comprises of all villages. Observations are at the household level in col. (1) and (3) and at the village level in col. (2) and (4). In parentheses, we present standard errors clustered at the village level for household-level regressions and robust Newey-West standard errors for village-level regressions. All regressions include area fixed effects and the following controls (measured in 2010) and their interactions with NGO entry: presence of a clinic within 10km of the village, number of households in the village, number of infants who died in the past year. Col. (3)-(4) also include the controls interacted with Gov × NGO. P-values from randomization inference using 500 random permutations are presented at the bottom of the table.*** p<0.01, ** p<0.05, * p<0.1.

Table 9: Selection into the NGO Position (Source: Deserranno et al., 2019)

	Full Sample					Gov workers who applied				
	Gov workers who applied to the NGO		Gov workers who did not applied to the NGO		*p-value*	Hired by the NGO		Gov workers who applied and were not hired by the NGO		*p-value*
	Mean	SD	Mean	SD	*(1)=(3)*	Mean	SD	Mean	SD	*(6)=(8)*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Observations	109		132		241	65		44		109
A. Socio-Economic Background										
Age	37.31	8.49	37.36	7.78	0.96	38.05	7.73	36.23	9.51	0.27
Married = {0, 1}	0.75	0.43	0.71	0.46	0.46	0.77	0.42	0.73	0.45	0.62
Years of schooling	8.42	2.69	7.05	3.31	0.00	8.54	2.62	8.25	2.82	0.59
Number of children	5.11	2.60	4.82	2.35	0.36	5.20	2.52	4.98	2.74	0.66
Electricity at home = {0, 1}	0.14	0.34	0.11	0.32	0.60	0.13	0.34	0.14	0.35	0.93
Number of rooms in the house	3.63	1.95	3.64	1.81	0.98	3.80	2.18	3.40	1.56	0.30
Home owner = {0, 1}	0.76	0.43	0.76	0.43	0.94	0.76	0.43	0.75	0.44	0.89
B. Experience										
Number of months as a health worker	34.28	38.59	26.45	32.92	0.10	41.46	44.39	24.29	26.01	0.03
C. Prosocial Motivation										
Most important job characteristic is […] = {0, 1}										
Money	0.40	0.49	0.26	0.44	0.02	0.37	0.49	0.44	0.50	0.46
Respect	0.24	0.43	0.38	0.49	0.02	0.29	0.46	0.16	0.37	0.13
Helping community	0.36	0.48	0.36	0.48	0.96	0.34	0.48	0.40	0.49	0.55
Frequency of free services to community (0=never, 1=rarely, 2=often)	1.52	0.63	1.77	0.65	0.00	1.45	0.59	1.63	0.69	0.15

Notes: The sample comprises of 241 gov health workers in Western Uganda (see Deserranno 2019 for more information on the sample). Before the NGO position was advertised, all 241 government health workers were asked to complete a brief questionnaire about their socio-economic background, experience and prosocial motivation. In columns (1)-(5), we compare gov workers who applied to the NGO position and those who did not. In columns (6-(8), we compare workers who applied and were hired by the NGO to workers who applied but were not hired.

Online Appendix – Not for Publication

A Data Appendix

A.1 Balance

Table 2 Column (3) compares the subsample of villages with and without NGO entry. To do so, we regress each base year village characteristic of Table 2 on a dummy for NGO entry, with area fixed effects and Newey-West robust standard errors. The coefficient of the NGO dummy captures the difference across the two subsamples. Consistent with randomization, none of the differences are statistically different from zero. Column (4) shows that villages with and without a government health worker at baseline do not differ systematically, even though this variable was not randomly assigned. Since the randomization was not stratified on the presence of a government health worker, we examine the balance of the randomization of NGO within the subsample of villages with a pre-existing government worker (column 5) and the subsample of villages without a pre-existing government worker (column 6). We find that the characteristics are balanced in each subsample. For villages with a pre-existing government worker, only the "presence of a private clinic within 10km" is statistically significant at the 10% level. Villages with NGOs are more likely to have a clinic nearby. For villages without a government health worker at baseline, only the coefficient for the number of households is statistically significant at the 10% level. It shows that villages with NGO entry are on average smaller.

Appendix Table A.11 reports household-level summary statistics and balance checks using the base year household survey. Note that we do not have reliable information on household-level infant mortality at the base year. Also note that 26% of households attrit between the baseline and endline. The attrition rate is balanced across groups. See Panel A of Appendix Table A.12. Baseline characteristics are similar between those who attrit and those who remain in the sample. As a result, differences between treatment and control households are comparable when estimated in the full sample of households (attrit or not attrit, as in Appendix Table A.11) or when estimated in the sample who did not attrit (Panel B of Appendix Table A.12).

A.2 Infant Mortality

Data on infant mortality are collected in the 2012 endline survey. Each household is asked: (1) the current age of each living child, and (2) the age at death of each child born after May 2010 (baseline) and who died before endline. We define infant mortality as any child born after baseline who died before endline. We are unable to examine neonatal (under one month of age) mortality because we only observe the age of the child at the time of the survey or at the time of death in years (not in months). We are also unable to examine under-five mortality because we only have precise information about mortality for children born between the baseline and endline surveys.

We calculate the village-level infant mortality ratio as the number of children in the village who were born between the two waves of surveys *and* who died below age of one during this period divided by the number of children who were born during this period. The latter is measured as the sum of (a) the number of children who were born during this period and who died below age of one during this period, and (b) the number of children who were born during this period and who did *not* die during the trial period. Finally, we multiply the denominator by 1,000.

One caveat to the way that we measure mortality is that any child born *before* 2012 and dead before the age of one *after* 2012 increases the infant mortality ratio denominator by one without increasing the nominator, thus causing us to underestimate infant mortality. Bjorkman Nyqvist, Guariso, Svensson, and Yanagizawa-Drott (2019) addresses this by expressing the infant-mortality ratio in terms of the "infant-years of exposure to the risk of dying under the age of one" (e.g., a child who is 3 months old in 2012 is exposed 1/4 [3/4] of a year while a child born after 2010 and who is more than one in 2012 is exposed a full year). We are unable to replicate this approach because we do not observe a child's age in months. An alternative approach is to exclude from the analysis any child who is less than one year old in 2012 or who would have been less than one in 2012 had he/she not died. This further exacerbates the sample selection problem. But our main results are unaltered. The results are available upon request.

A.3 Comparison with Bjorkman et al. (2019)

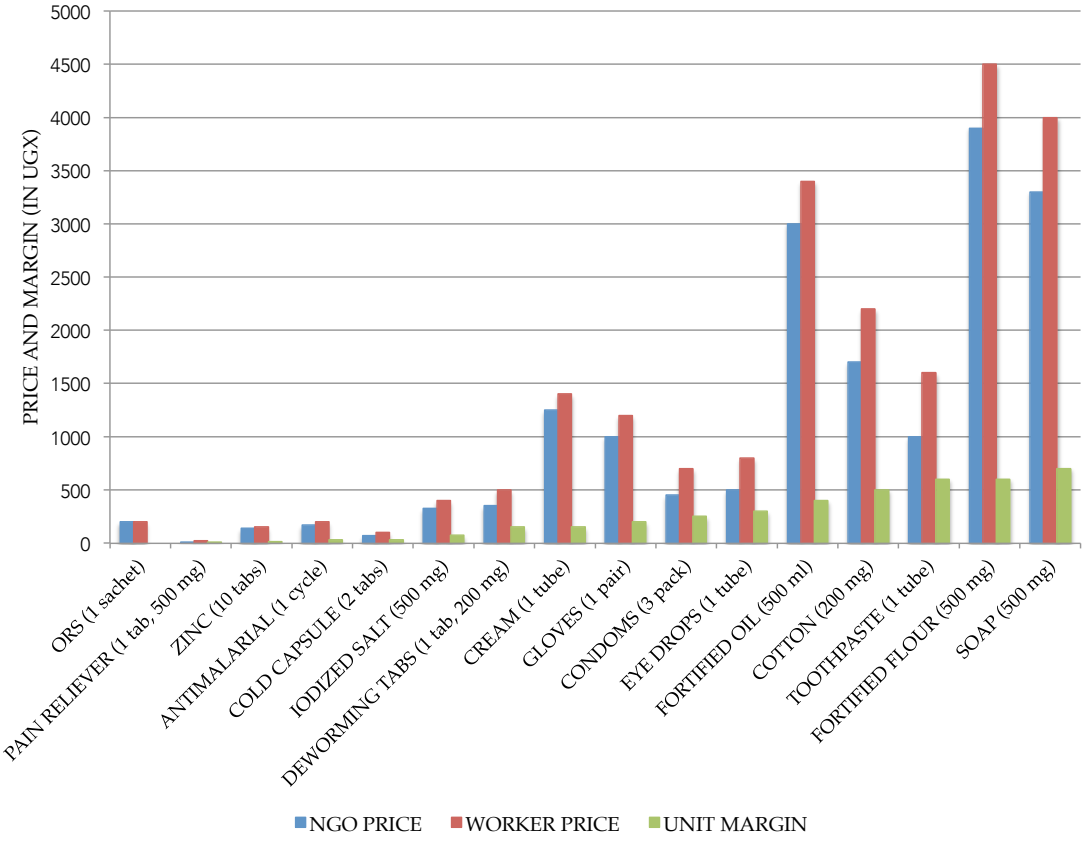
The results in Appendix Table A.10 can be directly compared to Bjorkman Nyqvist, Guariso, Svensson, and Yanagizawa-Drott (2019), which examines the average effect of NGO entry for a similar program implemented by two NGOs in another part of rural Uganda.

They find that NGO entry increases the probability of obtaining health advice from the NGO health worker by 21.5 percentage-points, and reduces it from the government health worker by 3.2 percentage-points.[52] The smaller magnitude for reduced advice from the government health worker could reflect, for example, if their sample contains fewer villages with pre-existing government workers and/or government workers who are more motivated towards health care. This is consistent with them finding a 33% reduction in infant mortality from NGO entry, while we find a smaller and statistically insignificant reduction.[53] At the same time, our earlier finding that NGO entry reduces mortality by 37% in villages with no government health worker (Table 8 column 2) shows that the two contexts are broadly consistent in the sensitivity of infant mortality to interventions.

[52] See Bjorkman Nyqvist, Guariso, Svensson, and Yanagizawa-Drott (2019) Appendix Table A.6 columns (9) and (10).

[53] See Bjorkman Nyqvist, Guariso, Svensson, and Yanagizawa-Drott (2019) Table 3 column (8), and Appendix Table A.10 column (5) of this paper. Another reason for their finding a larger average reduction in mortality could be that one of the NGOs they study compensates workers for health services in addition to the piece rate they earn for sales (the other NGO offers the same compensation scheme as the NGO in our context). Bjorkman Nyqvist, Guariso, Svensson, and Yanagizawa-Drott (2019) examines other mortality variables (e.g., under five, neonatal), which our data do not allow us to accurately measure. See Appendix Section A.2.

Figure A.1: Unit Price & Margin per Product Sold by the NGO



Notes: This figure presents the list of products sold by the NGO workers, ranked from lowest to highest unit margin. The unit margin equals the price at which the health worker sells the products in her community ("worker price") minus the price at which she buys the products from the NGO ("NGO price"). Prices are expressed in Ugandan Shillings (1$=3,691 UGX in December 2012).

Table A.1: NGO Workers Characteristics

	All		All	All	Gov Worker in 2010
	Mean	SD	Gov Worker in 2010	NGO Hired Gov	NGO Hired Gov
	(1)	(2)	(3)	(4)	(5)
Observations	66		66	66	36
A. Socio-Economic Background (Self-Reported by NGO Worker)					
Age	33.545	10.218	-4.055	-3.542	-2.531
			(2.910)	(2.810)	(4.749)
Completed primary education = {0, 1}	0.652	0.480	0.150	0.412***	0.490***
			(0.160)	(0.114)	(0.151)
Completed secondary education = {0, 1}	0.258	0.441	0.161	0.141	0.038
			(0.172)	(0.131)	(0.211)
Married = {0, 1}	0.833	0.376	0.119	-0.075	-0.215
			(0.128)	(0.118)	(0.185)
B. Experience and Motivation (Self-Reported by NGO Worker)					
Was working as Gov health worker = {0, 1}	0.212	0.412	0.716***	1.000	1.000
			(0.118)	(0.000)	(0.000)
..among villages with Gov health worker in 2010	0.389	0.494	-	-	-
			-	-	-
..among villages with Gov health worker in 2010 and none in 2012	0.824	0.393	-	-	-
			-	-	-
Main reason for doing the job is money (vs help community)	0.167	0.376	-0.092	-0.075	-0.034
			(0.110)	(0.082)	(0.048)
Knows how to treat malaria (knows the exact doses of ACT)	0.682	0.469	0.299**	0.056	-0.118
			(0.141)	(0.153)	(0.240)
Knows how to treat diarrhea (ORS+Zinc)	0.758	0.432	0.237*	0.108	-0.081
			(0.134)	(0.123)	(0.163)
C. Earnings, Hours and Activities (Self-Reported by NGO Worker)					
# of working hours as a health worker in the past week	13.106	8.891	-1.304	-2.348	-2.440
			(2.429)	(2.234)	(2.811)
Health worker earnings in the past month (in thousand UGX)	52.335	66.986	-13.975	-5.913	3.369
			(9.920)	(9.344)	(13.580)
# of pregnant women identified by the health worker in the past month	4.136	3.620	1.927	1.437	0.405
			(1.162)	(1.178)	(1.545)
% HHs who received medical care from health worker in the past week	0.023	0.036	0.031	0.009	-0.029
			(0.056)	(0.045)	(0.018)
% HHs who bought products from the health worker in the past week	0.064	0.095	0.009	-0.009	-0.035
			(0.015)	(0.011)	(0.027)
D. Health Products Purchases (Household Survey in Villages with NGO)					
% HHs who have ever purchased/received anti-malarials from NGO	0.085	0.214	-0.129	-0.048	0.310
			(0.164)	(0.141)	(0.185)
% HHs who have ever purchased/received ORS or zinc from NGO	0.032	0.093	-0.045	-0.043	0.000
			(0.043)	(0.041)	(0.000)
% HHs who have ever purchased/received soap, salt or oil from NGO	0.278	0.346	-0.090	-0.081	0.048
			(0.146)	(0.140)	(0.056)

Notes: Observations are at the NGO health worker level. Sample restrictions are stated in the column headings. Each row states the sample mean and standard deviation of a variable, as well as the estimates from four separate regressions, where the variable is regressed on an indicator for the presence of a gov worker in 2010 entry (col. 3), and an indicator for whether the NGO hired the gov worker (col. 5, 6). All regressions include area fixed effects. Robust Newey-West standard errors are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Panels A-C show variables self-reported by NGO health workers in 2012. Panel D shows data from the household-level survey in 2012, aggregated at the village level.

Table A.2: Labor Supply and Health Services – Heterogeneous Effects by Drug Store

	Dependent Variable	
	(1)	(2)
	Total # of Health Workers (NGO or Gov) = {0, 1, 2}	Household Received Medical Care from the NGO or Gov Health Worker in the Past Year (2012) = {0, 1}
Gov × NGO × Drug Store	-0.016	0.227
	(0.210)	(0.142)
Observations	127	2,747
R-squared	0.763	0.274

Notes: The sample comprises of all villages. Observations are at the village level in col. (1) and at the household level in col. (2). In the parentheses, we present robust Newey-West standard errors in col. (1) and standard errors clustered at the village level in col. (2). All regressions include area fixed effects and the full set of interaction terms and uninteracted terms: Gov, NGO, Drug Store, Gov × Drug Store, NGO × Drug Store, Gov × NGO. *** p<0.01, ** p<0.05, * p<0.1

Table A.3: Multinomial Logit Estimation for Natal and Post-Natal Services

	(1)	(2)	(3)	(4)
	Multinomial Logit (0 to 4)			
	0 = No delivery 1 = Delivery, not assisted by a health professional, without post-natal care 2 = Delivery, assisted by a health professional, without post-natal care 3 = Delivery, not assisted by a health professional, with post-natal care 4 = Delivery, assisted by a health professional, with post-natal care			
	1	2	3	4
Mean Dep.Var.		**0.306**		
Gov	-0.390	0.393	1.193	1.887*
	(0.307)	(0.400)	(0.889)	(1.076)
NGO	-1.129**	0.530	1.869**	3.197***
	(0.442)	(0.475)	(0.869)	(0.964)
Gov × NGO	0.787	-0.626	-2.248**	-3.433***
	(0.500)	(0.512)	(0.881)	(1.118)
Constant	-1.682***	-2.885***	-5.000***	-6.903***
	(0.456)	(0.508)	(1.060)	(1.217)
Observations		2,747		

Notes: The sample comprises of all villages. Observations are at the household level and standard errors are clustered at village level. All regressions include area fixed effects and the following controls (measured in 2010) and their interactions with NGO entry: presence of a clinic within 10km of the village, number of households in the village, number of infants who died in the past year. *** p<0.01, ** p<0.05, * p<0.1.

Table A.4: Natal and Post-Natal Services with Full List of Controls

	Dependent Variable			
	Fertility	Delivery and Post-Natal Care		
	(1)	(2)	(3)	(4)
	Birth in the past year (2012) = {0, 1}	Delivery in a clinic = {0, 1}	Delivery assisted by a health professional = {0, 1}	Post-natal visit within two months of birth = {0, 1}
Sample:	All HHs	HHs with a birth in the past year (2012)		
Mean Dep.Var.	**0.148**	**0.744**	**0.533**	**0.265**
Gov	0.028	0.056	0.439***	0.374***
	(0.028)	(0.082)	(0.096)	(0.108)
NGO	0.008	0.034	0.189**	0.191**
	(0.022)	(0.068)	(0.092)	(0.074)
Gov × NGO	-0.043	-0.155*	-0.394***	-0.454***
	(0.041)	(0.093)	(0.110)	(0.119)
Constant	0.143***	0.874***	0.357***	0.109
	(0.019)	(0.087)	(0.127)	(0.097)
Observations	2,747	407	407	407
R-squared	0.107	0.229	0.158	0.293
Gov × NGO + NGO	-0.035	-0.122	-0.205	-0.263
p-value	0.240	0.043	0.003	0.000

Notes: The sample comprises of all villages. Observations are at the household level and standard errors are clustered at the village level. All regressions include area fixed effects and the following controls (measured in 2010) and their interactions with NGO entry: access to health providers (government clinic within 10km, private clinic within 10km, drug store in the village, traditional healer in the village), village size (number of households in the village, number of infants per household), infant mortality (number of infants who died), household characteristics (farming is the main HH occupation, HH head completed primary education, standardized index of wealth).*** p<0.01, ** p<0.05, * p<0.1.

Table A.5: Infant Mortality with Full List of Controls

	Dependent Variable: Infant Mortality (2010-2012)			
	(1)	(2)	(3)	(4)
	≥ 1 infant died = {0, 1}	# infants died /1,000 births	≥ 1 infant died = {0, 1}	# infants died /1,000 births
Sample:	HHs with a birth since 2010	All villages	HHs with a birth since 2010	All villages
Mean Dep.Var.	**0.073**	**65.004**	**0.073**	**65.004**
Gov	-0.054**	-63.993**	-0.070***	-75.899***
	(0.025)	(26.888)	(0.023)	(27.956)
NGO [1]	-0.034	-46.037*	-0.061***	-77.826***
	(0.024)	(27.031)	(0.019)	(25.065)
Gov × NGO [2]	0.062*	56.218		
	(0.035)	(37.130)		
Gov × NGO × NGO hired Gov worker [3]			0.164***	151.888***
			(0.039)	(43.413)
Gov × NGO × NGO hired new worker [4]			-0.008	16.103
			(0.034)	(38.791)
Constant	0.108***	110.227***	0.128***	117.143***
	(0.019)	(20.115)	(0.018)	(19.469)
Observations	1,402	127	1,402	127
R-squared	0.039	0.315	0.063	0.481
Gov × NGO + NGO	0.028	10.181		
p-value	0.197	0.627		
Gov × NGO × Hired Gov + NGO			0.103	74.062
p-value			0.002	0.029
Gov × NGO × Hired new + NGO			-0.069	-61.722
p-value			0.011	0.033

Notes: The sample comprises of all villages. Observations are at the household level in col. (1) and (3) and at the village level in col. (2) and (4). In parentheses, we present standard errors clustered at the village level for household-level regressions and robust Newey-West standard errors for village-level regressions. All regressions include area fixed effects and the following controls (measured in 2010) and their interactions with NGO entry: access to health providers (government clinic within 10km, private clinic within 10km, drug store in the village, traditional healer in the village), village size (number of households in the village, number of infants per household), infant mortality (number of infants who died), household characteristics (farming is the main HH occupation, HH head completed primary education, standardized index of wealth). Col. (3)-(4) also include the same set of controls interacted with Gov × NGO. *** p<0.01, ** p<0.05, * p<0.1.

Table A.6: Other Health Outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
	Mean Dep.	Gov		NGO [1]		Gov × NGO [2]		Constant				Gov × NGO + NGO		p-values (RI)	
Dependent Variables	**Var.**	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Obs.	R^2	Coef.	p-value	[1]	[2]
A. Child Health Behavior = {0, 1}															
Children are fully immunized	**0.905**	0.028	(0.033)	0.031	(0.023)	-0.047	(0.032)	0.885***	(0.022)	2,045	0.238	-0.016	0.367	0.168	0.096
Children sleep under bednet	**0.725**	0.090***	(0.031)	0.020	(0.033)	-0.096**	(0.048)	0.692***	(0.024)	2,747	0.091	-0.076	0.020	0.606	0.076
Children drink treated water	**0.722**	0.045	(0.040)	0.018	(0.028)	-0.024	(0.048)	0.694***	(0.024)	2,747	0.213	-0.006	0.887	0.768	0.696
Children wash hands before food & after toilet	**0.878**	0.049*	(0.027)	0.016	(0.020)	-0.072**	(0.034)	0.862***	(0.019)	2,747	0.091	-0.057	0.060	0.698	0.122
Avg. standardized effect of outcomes above	**0.045**	0.131**	(0.055)	0.076*	(0.043)	-0.143**	(0.068)	-0.030	(0.037)	2,045	0.157	-0.067	0.197	0.200	0.080
B. Disease Incidence for Children Under Age of 5 in the Past Year (Data Available for Children Under-5 Only)															
% Children under-5 who had cough	**0.593**	-0.028	(0.048)	0.008	(0.035)	0.015	(0.055)	0.602***	(0.032)	1,783	0.205	0.023	0.537	0.786	0.774
% Children under-5 who had diarrhea	**0.284**	-0.026	(0.047)	0.001	(0.036)	0.002	(0.056)	0.296***	(0.032)	1,783	0.185	0.002	0.944	0.976	0.982
% Children under-5 who had worms	**0.348**	-0.012	(0.044)	-0.015	(0.039)	-0.001	(0.060)	0.361***	(0.031)	1,783	0.277	-0.016	0.659	0.702	0.978
% Children under-5 who had TB	**0.038**	-0.005	(0.036)	0.016	(0.019)	-0.022	(0.039)	0.038**	(0.018)	1,783	0.112	-0.006	0.818	0.286	0.414
% Children under-5 who had malaria	**0.471**	-0.025	(0.042)	-0.014	(0.041)	0.023	(0.053)	0.487***	(0.033)	1,783	0.123	0.009	0.739	0.714	0.630
Avg. standardized effect of outcomes above	**0.000**	-0.045	(0.086)	0.009	(0.057)	-0.007	(0.098)	0.022	(0.053)	1,783	0.160	0.001	0.982	0.850	0.932
C. Couple and Other Behavior = {0, 1}															
Infant born in the past year is breastfed	**0.995**	-0.003	(0.007)	-0.013	(0.013)	0.013	(0.012)	0.996***	(0.006)	407	0.079	0.000	0.987	0.658	0.622
Couple uses contraceptives	**0.469**	-0.079	(0.054)	-0.030	(0.040)	0.059	(0.066)	0.513***	(0.034)	2,510	0.037	0.029	0.545	0.514	0.424

Notes: The sample comprises of all villages. Observations are at the household level and standard errors are clustered at village level. All regressions include area fixed effects and the following controls (measured in 2010) and their interactions with NGO entry: presence of a clinic within 10km of the village, number of households in the village, number of infants who died in the past year. P-values from randomization inference using 500 random permutations are presented in col. (14)-(15). *** p<0.01, ** p<0.05, * p<0.1

Table A.7: Other Health Outcomes — Decomposition

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
		Gov		NGO		Gov × NGO × NGO Hired Gov		Gov × NGO × NGO Hired New		Constant				Gov × NGO × Hired Gov + NGO		Gov × NGO × Hired New + NGO	
Dependent Variables	Mean Dep. Var.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Obs.	R^2	Coef.	p-value	Coef.	p-value
A. Child Health Behavior = {0, 1}																	
Children are fully immunized	**0.905**	0.032	(0.034)	0.032	(0.023)	-0.064*	(0.036)	-0.033	(0.031)	0.882***	(0.022)	2,045	0.238	-0.032	0.156	-0.001	0.955
Children sleep under bednet	**0.725**	0.087***	(0.032)	0.030	(0.031)	-0.101*	(0.058)	-0.098*	(0.050)	0.695***	(0.024)	2,747	0.093	-0.071	0.116	-0.068	0.099
Children drink treated water	**0.722**	0.039	(0.043)	0.004	(0.028)	0.004	(0.055)	-0.011	(0.063)	0.698***	(0.026)	2,747	0.215	0.008	0.864	-0.007	0.894
Children wash hands before food & after toilet	**0.878**	0.059**	(0.027)	0.017	(0.020)	-0.125***	(0.040)	0.001	(0.043)	0.855***	(0.020)	2,747	0.104	-0.108	0.002	0.018	0.642
Avg. standardized effect of outcomes above	**0.045**	0.147**	(0.057)	0.070	(0.043)	-0.207**	(0.082)	-0.039	(0.076)	-0.041	(0.039)	2,045	0.165	-0.137	0.038	0.030	0.631
B. Disease Incidence for Children Under Age of 5 in the Past Year (Data Available for Children Under-5 Only)																	
% Children under-5 who had cough	**0.593**	-0.016	(0.048)	0.009	(0.036)	-0.026	(0.060)	0.047	(0.061)	0.594***	(0.033)	1,783	0.208	-0.017	0.685	0.055	0.259
% Children under-5 who had diarrhea	**0.284**	-0.022	(0.048)	0.004	(0.036)	-0.013	(0.064)	-0.003	(0.058)	0.293***	(0.033)	1,783	0.186	-0.009	0.844	0.001	0.975
% Children under-5 who had worms	**0.348**	-0.004	(0.047)	-0.025	(0.039)	-0.018	(0.062)	0.026	(0.076)	0.356***	(0.033)	1,783	0.278	-0.043	0.266	0.000	0.994
% Children under-5 who had TB	**0.038**	0.006	(0.038)	0.015	(0.019)	-0.060	(0.045)	0.013	(0.037)	0.031	(0.019)	1,783	0.119	-0.046	0.163	0.027	0.297
% Children under-5 who had malaria	**0.471**	-0.020	(0.042)	-0.027	(0.044)	0.026	(0.057)	0.019	(0.058)	0.484***	(0.033)	1,783	0.126	-0.001	0.964	-0.008	0.813
Avg. standardized effect of outcomes above	**0.000**	-0.021	(0.090)	-0.001	(0.059)	-0.079	(0.106)	0.052	(0.107)	0.005	(0.055)	1,783	0.166	-0.080	0.247	0.051	0.526
C. Couple and Other Behavior = {0, 1}																	
Infant born in the past year is breastfed	**0.995**	0.002	-0.005	-0.01	-0.01	0.009	-0.011	0.029	-0.02	0.991***	-0.007	407	0.108	-0	0.629	0.016	0.273
Couple uses contraceptives	**0.469**	-0.079	-0.055	-0.02	-0.04	0.047	-0.083	0.067	-0.07	0.513***	-0.035	2510	0.039	0.027	0.682	0.048	0.391

Notes: The sample comprises of all villages. Observations are at the household level and standard errors are clustered at village level. All regressions include area fixed effects and the following controls (measured in 2010) and their interactions with NGO entry: presence of a clinic within 10km of the village, number of households in the village, number of infants who died in the past year.*** p<0.01, ** p<0.05, * p<0.1

Table A.8: Prices

	Dependent Variable: Price of Treatment (Medication and Tests)					
	(1) Malaria	(2) Diarrhea	(3) Pneumonia	(4) Malaria	(5) Diarrhea	(6) Pneumonia
Mean Dep.Var.	**5.643**	**3.418**	**3.357**	**5.643**	**3.418**	**3.357**
Gov	-1.299	-0.588	-0.877	-1.534	-0.609	-0.924
	(1.173)	(0.976)	(0.857)	(1.210)	(0.984)	(0.871)
NGO	0.332	-0.464	-0.149	-0.411	0.018	0.119
	(1.160)	(1.214)	(0.960)	(1.007)	(1.337)	(0.987)
Gov × NGO	0.561	-0.319	0.092			
	(1.530)	(1.304)	(1.106)			
Gov × NGO × NGO hired Gov worker				1.880	-0.272	0.253
				(1.596)	(1.398)	(1.118)
Gov × NGO × NGO hired new worker				1.454	-1.560	-0.579
				(1.537)	(1.592)	(1.277)
Constant	6.148***	4.143***	3.822***	6.274***	4.144***	3.840***
	(0.884)	(0.714)	(0.646)	(0.899)	(0.729)	(0.653)
Observations	2,236	1,977	1,819	2,236	1,977	1,819
R-squared	0.112	0.091	0.111	0.115	0.093	0.111
Gov × NGO + NGO	0.893	-0.783	-0.057			
p-value	0.352	0.161	0.902			
Gov × NGO × Hired Gov + NGO				1.469	-0.254	0.372
p-value				0.172	0.693	0.480
Gov × NGO × Hired new + NGO				1.043	-1.542	-0.460
p-value				0.359	0.023	0.480

Notes: The sample comprises of all villages. Observations are at the household level and standard errors are clustered at village level. Prices are measured in 1,000 Ugandan Shillings. All regressions include area fixed effects and the following controls (measured in 2010) and their interactions with NGO entry: presence of a clinic within 10km of the village, number of households in the village, number of infants who died in the past year. Col. (4)-(6) also include the controls interacted with Gov × NGO. *** p<0.01, ** p<0.05, * p<0.1

Table A.9: Logit Estimation for Health Services, Delivery and Post-Natal Care, Mortality

	Dependent Variable						
	Household Received Medical Care from the Following Health Worker in the Past Year (2012) = {0, 1}			Delivery and Post-Natal Care = {0, 1}			Mortality = {0, 1}
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	NGO	Gov	Any (NGO or Gov)	Delivery in a clinic	Delivery assisted by a health professional	Post-natal visit within two months of birth	≥ 1 infant died
Mean Dep.Var.	**0.235**	**0.313**	**0.457**	**0.744**	**0.533**	**0.265**	**0.073**
Gov	0.072	2.744***	2.187***	-0.166	1.734***	4.041***	-0.706**
	(0.385)	(0.357)	(0.323)	(0.505)	(0.501)	(0.870)	(0.330)
NGO	2.631***	-0.446	1.838***	0.239	0.865*	2.307***	-0.464
	(0.359)	(0.369)	(0.269)	(0.547)	(0.476)	(0.813)	(0.337)
Gov × NGO	-0.859**	-0.926*	-2.509***	-0.635	-1.308**	-3.991***	0.856*
	(0.437)	(0.559)	(0.392)	(0.602)	(0.550)	(0.936)	(0.443)
Observations	2,747	2,747	2,747	393	407	357	2,747
Gov × NGO + NGO	1.771	-1.372	-0.671	-0.396	-0.443	-1.684	0.393
p-value	<0.001	<0.001	0.006	0.277	0.096	<0.001	0.160

Notes: This table presents coefficients from a logistical regression. The sample comprises of all villages. Observations are at the household level in col. (1)-(6) and at the village level in col. (7). In parentheses, we present standard errors clustered at the village level for household-level regressions and robust Newey-West standard errors for village-level regressions. All regressions include area fixed effects and the following controls (measured in 2010) and their interactions with NGO entry: presence of a clinic within 10km of the village, number of households in the village, number of infants who died in the past year. *** p<0.01, ** p<0.05, * p<0.1.

Table A.10: Average Effect of NGO Entry

	Dependent Variable				
	Household Received Medical Care from the Following Health Worker in the Past Year (2012) = {0, 1}			Infant Mortality (2010-2012)	
	(1)	(2)	(3)	(4)	(5)
	NGO	Gov	Any (NGO or Gov)	≥ 1 infant died = {0, 1}	# infants died /1,000 births
NGO	0.315***	-0.172***	0.054	0.001	-6.777
	(0.027)	(0.040)	(0.037)	(0.014)	(13.797)
Constant	0.074***	0.401***	0.429***	0.073***	68.526***
	(0.015)	(0.028)	(0.028)	(0.009)	(9.435)
Observations	2,747	2,747	2,747	1,402	127
R-squared	0.185	0.345	0.220	0.028	0.206

Notes: The sample comprises of all villages. Observations are at the household level in col. (1)-(4) and at the village level in col. (5). In the parentheses, we present standard errors clustered at the village level in household-level regressions and Newey-West standard errors in village-level regressions. All regressions include area fixed effects. *** p<0.01, ** p<0.05, * p<0.1

Table A.11: Household-Level Summary Statistics and Balance Checks

Sample of Villages:	All		All				Gov Worker in 2010		No Gov Worker in 2010	
	Mean	SD	NGO	Obs.	Gov	Obs.	NGO	Obs.	NGO	Obs.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
A. Household Received Medical Care from […] in the Past Year (2010) = {0, 1}										
Gov health worker	0.037	0.189	-0.008	3,727	0.004	3,727	-0.015	2,119	0.001	1,608
			(0.006)		(0.005)		(0.010)		(0.008)	
Traditional healer	0.024	0.154	-0.002	3,727	0.005	3,727	-0.001	2,119	0.004	1,608
			(0.005)		(0.005)		(0.008)		(0.006)	
Drug store	0.151	0.358	-0.002	3,727	-0.017	3,727	-0.016	2,119	0.003	1,608
			(0.019)		(0.025)		(0.016)		(0.037)	
Government clinic	0.251	0.434	-0.016	3,727	0.009	3,727	-0.034	2,119	0.022	1,608
			(0.021)		(0.027)		(0.033)		(0.029)	
Private clinic	0.391	0.488	-0.013	3,727	-0.035	3,727	-0.023	2,119	0.010	1,608
			(0.020)		(0.030)		(0.024)		(0.030)	
B. Socio-Economic Background in 2010										
# of infants	0.283	0.485	0.023	3,745	0.015	3,745	0.017	2,131	0.047**	1,614
			(0.018)		(0.021)		(0.028)		(0.022)	
Involved in farming as main activity = {0, 1}	0.519	0.500	-0.034*	3,745	0.013	3,745	-0.056*	2,131	-0.008	1,614
			(0.018)		(0.024)		(0.031)		(0.022)	
HH head completed primary education = {0, 1}	0.383	0.486	-0.005	3,745	-0.052*	3,745	0.037	2,131	-0.048	1,614
			(0.024)		(0.028)		(0.033)		(0.037)	
# of assets owned (out of 11)	5.600	2.838	-0.022	3,745	0.073	3,745	0.098	2,131	-0.007	1,614
			(0.125)		(0.139)		(0.201)		(0.155)	
Food security (1 to 4)	2.223	0.876	0.029	3,727	-0.024	3,727	0.031	2,119	0.026	1,608
			(0.028)		(0.034)		(0.037)		(0.050)	
High quality house wall material = {0, 1}	0.413	0.492	-0.005	3,745	-0.035	3,745	0.018	2,131	-0.035	1,614
			(0.025)		(0.039)		(0.021)		(0.051)	
High quality house floor material = {0, 1}	0.427	0.495	-0.007	3,745	-0.041	3,745	0.024	2,131	-0.044	1,614
			(0.027)		(0.040)		(0.021)		(0.056)	
High quality house roof material = {0, 1}	0.593	0.491	-0.003	3,745	-0.020	3,745	0.019	2,131	-0.056	1,614
			(0.024)		(0.024)		(0.029)		(0.046)	
Standardized index of wealth	0.000	0.802	-0.001	3,745	-0.039	3,745	0.039	2,131	-0.049	1,614
			(0.035)		(0.046)		(0.035)		(0.069)	
C. Health Outcomes and Behavior in 2010										
Children sleep under bednet = {0, 1}	0.687	0.464	-0.020	3,745	-0.004	3,745	-0.023	2,131	-0.017	1,614
			(0.022)		(0.023)		(0.032)		(0.033)	
Children drink treated water = {0, 1}	0.684	0.465	-0.003	3,745	0.027	3,745	-0.008	2,131	-0.003	1,614
			(0.023)		(0.024)		(0.037)		(0.036)	
Children wash hands before food & after toilet = {0, 1}	0.928	0.259	-0.005	3,745	-0.019	3,745	-0.015	2,131	-0.003	1,614
			(0.011)		(0.017)		(0.017)		(0.014)	
% Children under-5 who had cough in past year	0.533	0.456	0.008	3,650	-0.000	3,650	0.016	2,064	-0.012	1,586
			(0.019)		(0.025)		(0.024)		(0.032)	
% Children under-5 who had diarrhea in past year	0.325	0.429	0.002	3,650	0.005	3,650	0.006	2,064	0.012	1,586
			(0.016)		(0.019)		(0.026)		(0.023)	
% Children under-5 who had worms in past year	0.297	0.431	0.001	3,650	0.008	3,650	-0.028	2,064	0.043	1,586
			(0.018)		(0.029)		(0.024)		(0.028)	
% Children under-5 who had TB in past year	0.015	0.107	-0.003	3,650	0.001	3,650	-0.004	2,064	-0.002	1,586
			(0.004)		(0.005)		(0.005)		(0.005)	
% Children under-5 who had malaria in past year	0.620	0.437	0.014	3,650	0.023	3,650	-0.022	2,064	0.054***	1,586
			(0.014)		(0.018)		(0.021)		(0.016)	
Infant born in the past year is breastfed = {0, 1}	0.991	0.097	-0.000	1,074	0.002	1,074	-0.000	614	-0.002	460
			(0.004)		(0.002)		(0.005)		(0.007)	
Couple uses contraceptives = {0, 1}	0.332	0.471	-0.004	3,549	0.001	3,549	0.005	2,017	-0.009	1,532
			(0.019)		(0.020)		(0.027)		(0.030)	

Notes: Observations are at the household level. Sample restrictions are stated in the column headings. Each row states the sample mean and standard deviation of a variable, as well as the estimates from four separate regressions, where the variable is regressed on an indicator for NGO entry (col. 3, 5, 6), an indicator for presence of a gov health worker in 2010 (col. 4). All regressions include area fixed effects. Standard errors clustered at the village level are presented in parentheses. In Panel B, the standardized index of wealth is an equally weighted average of z-scores of 5 variables: number of assets owned by a HH (out of a list of 11 essential household assets), food security (1="deficit of food the whole year", 2="occasional deficit", 3="neither deficit nor surplus, 4="surplus"), high quality wall material (cement blocks/stone/burnt bricks with cement), high quality floor material (parquet/polished wood/ mosaic/tiles/ bricks/cement/stones), high quality roof material (wood/planks/bamboo/iron sheets/tim/cement/tiles). *** p<0.01, ** p<0.05, * p<0.1.

Table A.12: Household-Level Attrition

Sample of Villages:	All		All				Gov Worker in 2010		No Gov Worker in 2010	
	Mean	SD	NGO	Obs.	Gov	Obs.	NGO	Obs.	NGO	Obs.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	A. All Housheolds									
Attrition = {0, 1}	0.266	0.442	0.019	3,745	-0.032	3,745	0.051	2,131	-0.048	1,614
			(0.023)		(0.032)		(0.036)		(0.032)	
	B. Households Interviewed at Baseline and Endline (Attrition=0)									
B1. Household Received Medical Care from […] in the Past Year (2010) = {0, 1}										
Gov health worker	0.032	0.176	-0.006	2,735	-0.004	2,735	-0.011	1,467	-0.005	1,268
			(0.006)		(0.005)		(0.011)		(0.006)	
Traditional healer	0.023	0.149	-0.001	2,735	0.003	2,735	0.003	1,467	0.001	1,268
			(0.005)		(0.005)		(0.008)		(0.006)	
Drug store	0.148	0.355	-0.008	2,735	-0.005	2,735	-0.013	1,467	-0.001	1,268
			(0.022)		(0.030)		(0.020)		(0.042)	
Government clinic	0.249	0.433	-0.028	2,735	0.018	2,735	-0.050	1,467	0.013	1,268
			(0.023)		(0.033)		(0.035)		(0.033)	
Private clinic	0.387	0.487	-0.001	2,735	-0.019	2,735	-0.006	1,467	0.041	1,268
			(0.022)		(0.036)		(0.026)		(0.031)	
B2. Socio-Economic Background in 2010										
# of infants	0.291	0.494	0.008	2,747	0.003	2,747	0.011	1,473	0.015	1,274
			(0.019)		(0.023)		(0.032)		(0.022)	
Involved in farming as main activity = {0, 1}	0.477	0.500	-0.047***	2,747	0.009	2,747	-0.064**	1,473	-0.035	1,274
			(0.018)		(0.025)		(0.031)		(0.022)	
HH head completed primary education = {0, 1}	0.391	0.259	-0.008	2,747	-0.025	2,747	0.043	1,473	-0.039	1,274
			(0.026)		(0.033)		(0.037)		(0.038)	
# of assets owned (out of 11)	5.873	1.918	-0.031	2,747	0.136	2,747	0.125	1,473	-0.012	1,274
			(0.131)		(0.162)		(0.195)		(0.175)	
Food security (1 to 4)	2.316	0.612	0.028	2,747	-0.001	2,747	0.047	1,473	0.018	1,269
			(0.033)		(0.038)		(0.047)		(0.052)	
High quality house wall material = {0, 1}	0.473	0.410	0.000	2,747	-0.024	2,747	0.020	1,473	-0.006	1,274
			(0.028)		(0.043)		(0.023)		(0.053)	
High quality house floor material = {0, 1}	0.481	0.411	-0.007	2,747	-0.024	2,747	0.028	1,473	-0.029	1,274
			(0.030)		(0.044)		(0.026)		(0.057)	
High quality house roof material = {0, 1}	0.642	0.398	0.006	2,747	-0.001	2,747	0.035	1,473	-0.034	1,274
			(0.021)		(0.019)		(0.025)		(0.043)	
Standardized index of wealth	0.000	1.682	0.009	2,747	-0.020	2,747	0.122	1,473	-0.054	1,274
			(0.083)		(0.112)		(0.082)		(0.157)	
B3. Health Outcomes and Behavior in 2010										
Children sleep under bednet = {0, 1}	0.687	0.464	-0.028	2,747	0.008	2,747	0.002	1,473	-0.050	1,274
			(0.021)		(0.026)		(0.028)		(0.035)	
Children drink treated water = {0, 1}	0.684	0.465	-0.002	2,747	0.026	2,747	0.001	1,473	-0.016	1,274
			(0.022)		(0.028)		(0.034)		(0.035)	
Children wash hands before food & after toilet = {0, 1}	0.928	0.259	-0.001	2,747	-0.025	2,747	-0.006	1,473	-0.011	1,274
			(0.012)		(0.018)		(0.020)		(0.017)	
% Children under-5 who had cough in past year	0.533	0.456	0.012	2,685	0.005	2,685	0.021	1,434	0.006	1,251
			(0.019)		(0.021)		(0.022)		(0.033)	
% Children under-5 who had diarrhea in past year	0.325	0.429	-0.008	2,685	0.012	2,685	0.007	1,434	-0.004	1,251
			(0.018)		(0.023)		(0.028)		(0.026)	
% Children under-5 who had worms in past year	0.297	0.431	0.013	2,685	0.016	2,685	-0.017	1,434	0.065**	1,251
			(0.020)		(0.033)		(0.023)		(0.030)	
% Children under-5 who had TB in past year	0.015	0.107	-0.005	2,685	0.007*	2,685	-0.002	1,434	-0.006	1,251
			(0.003)		(0.004)		(0.005)		(0.004)	
% Children under-5 who had malaria in past year	0.620	0.437	0.017	2,685	0.012	2,685	-0.023	1,434	0.058***	1,251
			(0.016)		(0.020)		(0.023)		(0.019)	
Infant born in the past year is breastfed = {0, 1}	0.991	0.097	-0.005	800	0.003	800	-0.010	431	-0.002	369
			(0.005)		(0.002)		(0.007)		(0.009)	
Couple uses contraceptives = {0, 1}	0.332	0.471	-0.013	2,613	0.014	2,613	0.014	1,406	-0.014	1,207
			(0.020)		(0.025)		(0.027)		(0.032)	

Notes: Observations are at the household level. Sample restrictions are stated in the column and Panel headings. Each row states the sample mean and standard deviation of a variable, as well as the estimates from four separate regressions, where the variable is regressed on an indicator for NGO entry (col. 3, 5, 6), an indicator for presence of a gov health worker in 2010 (col. 4). All regressions include area fixed effects. Standard errors clustered at the village level are presented in parentheses. *** p<0.01, ** p<0.05, * p<0.1.