# The Impact of NGO-Provided Aid on Government Capacity: Evidence from Uganda*

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**Abstract**

This paper investigates whether NGO-provided basic healthcare crowds out or crowds in similar services provided by the government in rural Uganda. We find that NGO entry reduces the number of government workers, which leads to a reduction in government-provided health services. The results are driven by the NGO often hiring the government worker in places where skilled labor is scarce. In places where skilled labor is relatively abundant, the NGO hires a second person and complements government healthcare. Thus, the effects of NGO entry on government capacity are nuanced.

**Keywords:** Aid efficacy, Government capacity, Labor crowd out, Skilled labor scarcity

**JEL**: O02, J01

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# 1   Introduction

In the past twenty years, NGOs have become one of the main delivery agents of foreign aid to poor countries.[1] Many poor populations in sub-Saharan African countries today rely on NGOs as the main source of basic community services. The rise in the importance of NGOs has been accompanied by a rise in scrutiny and criticism. A central concern is that despite good intentions, NGOs compete with the government over scarce resources (Easterly, 2003).[2]

The concern has been very salient in public health, a sector that experienced a large rise in investment as the economies of sub-Saharan African countries grew during the 1990s and early 2000s.[3] Observers worry that government efforts may be hindered by NGOs that offer higher wages and attract ("poach") the limited number of skilled workers away from the public sector. In the health sector of sub-Saharan Africa, NGOs often offer salaries that are five to twenty times higher than those provided by the government, along with superior non-wage benefits such as access to vehicles and improved working conditions (Pfeiffer et al., 2008; Koch and Schulpen, 2018). Farmer (2008) states that "The NGOs that fight for the right to healthcare by serving the African poor directly frequently do so at the expense of the public sector by luring nurses, doctors, and other professionals from the public hospitals to 'NGO land', where salaries are better."[4] Public health experts have called for NGOs in sub-Saharan Africa to "Limit hiring of public systems", "Limit pay inequity between the public and private sectors" and "Commit to joint planning [with the recipient

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[1]The amount of aid delivered by NGOs has quadrupled in the past twenty years (e.g., Aldashev and Navarra, 2018; Werker and Ahmed, 2008). OECD Development Assistance Committee (DAC) member countries delivered 21 billion dollars (measured as 2018 USD) each year through NGOs during 2018 and 2019. See the DAC Enabling Effective Development Report on *Aid for Civil Society Organizations* [NGOs] published by the OECD (April 2021): p. 6.

[2]Since NGOs were initially designed to work where there are no other providers, they typically do not coordinate with government (or other non-government) organizations when they choose whether to enter (Barr and Fafchamps, 2006).

[3]According to the World Health Organization Global Health Expenditure database, domestic general government health expenditure per capita (PPP) for sub-Saharan Africa doubled between 2000 and 2018, during which time it has remained at a constant 2% of GDP.

[4]In an article in *The Lancet*, Kassaye (2006) points out that "There is growing recognition of the danger posed by indiscriminate recruitment by foreign agencies of skilled health professionals from the public sector in developing countries. (...) This 'local' brain drain is potentially damaging to the effective delivery of health services in a country, where it constitutes a huge financial loss and could hurt the economy." Pfeiffer et al. (2008) expresses similar concerns: "This internal 'brain drain' has had a more severe impact on the local health system than has the more widely recognized international migration of health workers."

government]" (Pfeiffer et al., 2008). In their highly critical analysis of foreign aid, Moyo (2009) argues that the crowding out of the public sector in its infancy undermines long-run development of the public sector and, therefore, the self-sustainability of African countries.[5]

In principle, NGOs can crowd *out* as well as crowd *in* government capacity. On the one hand, NGOs may poach the government worker when the supply of skilled workers is limited because they offer higher wages. On the other hand, when the supply of skilled workers is abundant and poaching does not take place, the entry of NGOs can increase the supply of willing government workers as well as the demand for government services by educating the local population about the benefits of these services.[6] Thus, the average effect of NGO entry is an empirical question and likely to depend on the underlying supply of skilled labor.

Understanding whether NGOs crowd out or crowd in government capacity is a question of first-order importance for development economists and policymakers. Existing arguments are mostly anecdotal or impressionistic. There is little empirical evidence from any context.

We aim to make progress on this agenda by providing rigorous empirical evidence from a policy-relevant context. The main questions of this paper are: Does NGO entry crowd out or crowd in government-provided services? If there is crowd out, is the poaching of government workers an important underlying mechanism?

The main empirical challenge is establishing causality. For example, if the NGO enters places with low government provision of public goods, then a negative association between aid and public services will capture reverse-causal effects. Public services and NGO entry may also be jointly determined by a third factor, such as a history of armed conflict. A second challenge is data limitation. There are no systematic records of NGO operations across developing countries.[7] This prevents rigorous cross-country analyses of NGO-provided aid on public sector development.

We address these difficulties by exploiting randomized NGO entry across very

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[5]In discussing hypothetical cases of aid crowd-out, Moyo (2009) speculates that "A short-term efficacious intervention [...] can unintentionally undermine whatever fragile change for sustainable development may already be in play."

[6]The presence of an NGO worker can also increase the effort exerted by the government worker if the latter is motivated by the presence of another worker in the community or by increased competition. There may also be complementarities from information sharing. For example, the NGO and government worker can work together to better identify households that need their services.

[7]In the Conclusion, we discuss some recent efforts to improve data.

poor communities in rural Uganda, and by leveraging detailed micro data on the presence and utilization of government services and NGO services before and after NGO entry. The NGO and the government are the only sources of modern medical care in the communities we study. Both organizations hire workers from the very communities they serve to make home visits to households with young children or expecting mothers, where they offer health advice and medicines. Agents are amongst the most educated in the village and work part-time, while maintaining their main occupations. As typical of many decentralized development programs, the government workers are unpaid volunteers.[8] NGO workers are paid and thus earn more than the government workers. By studying one of the most highly acclaimed and well-run NGOs, our context also minimizes concerns that findings of negative effects are due to NGO incompetence and are not generalizable to other decentralized development programs.

The main analysis examines the effect of NGO entry on the labor supply of health workers and healthcare coverage across households. At the time of the NGO entry, around half of the villages in our sample had a government health worker from the universal rollout of the government program one year earlier. The government had attempted to recruit health workers for all rural areas nationwide, but was unable to find or retain workers in many locations because of the limited supply of willing and able workers. There were no subsequent efforts to hire new workers or replace exiting workers after the initial rollout because of limited government capacity. In villages with a government worker at baseline, the NGO can crowd out or crowd in government services. In villages without a government worker at baseline, the NGO cannot crowd out, but can crowd in government services. We study the impact of NGO entry in both types of villages.

We find that the NGO is able to recruit one worker in each village that it enters. In villages with a government health worker at baseline, the NGO hires (poaches) the government worker in approximately half of the villages and hires a second worker who is not the government worker in the other half. To understand the downstream consequences of poaching and to address the possibility that health worker information may be reported with error, we examine healthcare (coverage). The estimates for healthcare parallel those for health workers. In villages with a government health

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[8]See Section 2.1 for a detailed discussion on the prevalence of government volunteers in decentralized development programs.

worker at baseline, NGO entry reduces the probability that households report receiving care from government health workers. These results provide strong evidence for the concern that NGOs sometimes poach government workers and that this leads to reduced government services.

Motivated by the anecdotal evidence, we explore the mechanisms underlying poaching by estimating heterogeneous treatment effects of NGO entry according to the baseline local supply of skilled labor. We find that poaching is more likely to occur in villages with scarce skilled labor at baseline. In contrast, in places where skilled labor is abundant, the NGO has more success in finding another person to work for it.

Importantly, we find that in villages where skilled labor is scarce, NGO entry causes health coverage from any worker (government or NGO) to decline, thus the reduction in government health coverage more than offsets the increase in NGO health coverage. These results are consistent with concerns that NGOs may crowd out government capacity by competing for limited resources. Meanwhile, in villages where skilled labor is abundant at baseline and where the NGO hires a second worker, we find that NGO entry causes health coverage from both the government and the NGO to increase. The estimates imply positive spillover effects from NGO entry and complementarities between NGO and government operations when skilled labor is not as binding of a constraint.

We acknowledge that our measure for health care – whether households receive care from any health provider – is crude and does not fully capture changes in the quantity of healthcare (e.g., the number of health visits) or quality of healthcare. To counteract this, we examine downstream outcomes, namely infant mortality and health behavior (for instance, sleeping under a bed net, drinking treated water, washing hands, giving birth in a clinic). The results regarding health outcomes align with those for healthcare, but they are less precise. We find that NGO presence improves health outcomes when it enters a village with a government worker and an abundance of skilled labor. However, when skilled labor is scarce (and the NGO is likely to poach the government worker), health outcomes worsen upon the NGO's entry.

We provide anecdotal evidence suggesting that this occurrence is a byproduct of the NGO's incentive structure, which compensates health workers on a per-item basis for selling health commodities like fortified oil and salt – a compensation structure

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not offered to government workers.[9] When a worker transitions from government to NGO employment, she dedicates more time to selling commodities (for which she is paid) at the expense of providing health services. Demand-side explanations – e.g., that community members might be less inclined to accept health services from foreign NGOs due to diminished trust – seem unlikely as causes for the potential adverse effect on health outcomes. This is because the reduction in health coverage and outcomes occurs in villages where the *same* worker switches from one employer to another, a situation where trust in the worker is unlikely to have diminished significantly.

In this paper, our primary focus is to evaluate the impact of NGO entry into villages that are already served by government workers, with a specific emphasis on analyzing how its effect depends on the scarcity or abundance of skilled labor supply. As a secondary dimension of our analysis, we also explore the effects of NGO entry into villages with no government workers at baseline – i.e., where the government was unable to recruit a willing and able worker. We find that, unlike the government, the NGO is always able to recruit a worker in these communities, most likely because it pays much more than the government; healthcare coverage increases, but there is no positive spillover to government services. In addition, we find that NGO entry increases the probability of the closure of the local primary school and reduces attendance. This suggests that the NGO sometimes hires the village school teacher, the most important other public employee in our context.

Taken together, the results indicate that the effects of NGOs are nuanced, and there is truth to both sides of the intensely controversial debate. They support both the view that NGOs can crowd out government services, as well as the view that NGOs can have positive spillover effects on government services. They also highlight the local supply of skilled labor as an important underlying factor.

The estimates should be cautiously interpreted as specific to the context, though the insights about crowding out and crowding in are generalizable to other poor developing contexts where public service delivery is decentralized, and the supply of skilled labor is limited. The results should be interpreted as medium-run effects because long-run effects can be different, especially if the NGO invests more in capacity building to expand the local skilled labor supply or if the government reallocates public resources from the health program to another program. See the Conclusion

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[9]Many of today's largest NGOs, in addition to smaller ones, employ this model in community-based programs. For further details on the incentive structure, please refer to Section 2.2.

for more discussion.

This is the first paper to document positive or negative effects of NGO entry on government capacity and adds to several literatures. The finding that NGO entry crowds out government-provided services complements recent working papers which find that African governments allocate financial resources away from regions that receive project aid and downstream outcomes in these regions worsen (Baldwin et al., 2023; Cruzatti, Dreher, and Matzat, 2020). Our paper shows that, in contexts like ours, where the government does not reallocate resources, another way in which aid can crowd out government services is by poaching government workers when skilled labor supply is limited.[10]

The finding that, when the supply of skilled workers is abundant and poaching does not take place, NGO entry crowds in government-provided services is consistent with a number of descriptive studies. For example, Alam, Tasneem, and Oliveras (2012) shows that the retention of NGO health workers increases in villages where a government health provider is present through increased collaboration. Gopalan, Mohanty, and Das (2012) shows that peer support and healthy competition among the community health workers in India enhanced their enthusiasm to perform well. There may also be complementarities from information sharing. Zafar Ullah et al. (2006) and El Arifeen et al. (2013) show that a strong NGO-government collaboration increases demand for health services and that governments and NGOs can be complementary in achieving national health goals.

We also add to the large empirical literature about aid efficacy, which has mostly focused on political economic factors as underlying determinants. Our results broaden the scope of the literature by showing that the presence of similar government services and underlying labor constraints are also important baseline factors to take into account. In using detailed micro data and exploiting within-country variation to identify the impact of aid in a literature that has mostly comprised of cross-country analyses, we are similar to recent studies by Crost, Felter, and Johnston (2014), which studies the effect of project aid on conflict in the Philippines, and Dube and Naidu (2015), which studies the effect of bilateral aid on conflict in Columbia.[11] Within the

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[10]In our context, the government cannot systematically reallocate its resources because it lacks information about the location of government and NGO workers.

[11]The debate about the political economic determinants of aid efficacy goes back to Burnside and Dollar (2000) and Easterly, Levine, and Roodman (2004b). Other examples include studies have found that aid efficacy varies with factors such as institutional quality (e.g., Svensson, 1999) and

foreign aid literature, we are also relevant to studies that argue that large exogenous windfalls from aid can have unintended adverse economic consequences (i.e., the *Dutch disease*) due to reasons like reduced political accountability.[12]

The paper is organized as follows. Section 2 describes the background. Section 3 describes the empirical design and the data. Section 4 presents the results. Section 5 concludes.

# 2 Background

## 2.1 The Government Health Program

Since 2004, Ugandan GDP has grown from 6.2% to 10.8% per year, and tax revenues are 14% of total GDP (World Bank Indicators). With this increase in national revenues, the government has begun to build basic public health services in rural areas, where they have been heretofore absent. Despite this positive development, the levels of income, living standards, and overall service provision are still very low in Uganda. The average per capita gross income was $560 in 2010 (World Bank National Accounts Data). Neonatal, infant, and under-five mortality rates in 2011 were estimated to be 30, 66, and 111 per 1,000 live births, respectively – among the highest in the world (Ugandan DHS 2011 Data).

Our study takes place in rural areas of Uganda, where income, living standards and government services are lower than in urban areas and the national average. Broadly speaking, modern healthcare was unavailable in rural areas. To address this, the Ugandan government founded the Village Health Team (VHT) program in 2001. However, in many rural areas, the government did not have the capacity to implement it until nearly ten years later.[13]

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regime stability (Nunn and Qian, 2014). Other studies that have examined the effect of aid on government performance have focused on aggregate outcomes such as corruption (e.g., Andersen, Johannesen, and Rijkers, 2020; Svensson, 1999), democracy (e.g., Kersting and Kilby, 2014; Knack, 2004), institutional quality (e.g., Jones and Tarp, 2016; Werker, 2012) and conflict (Crost, Felter, and Johnston, 2014; Dube and Naidu, 2015; Nunn and Qian, 2014). See the literature overviews by Easterly (2009) and Qian (2015).

[12]For examples of studies that discuss the Dutch Disease in different contexts, see Corden and Neary (1982); Easterly, Levine, and Roodman (2004a); Caselli and Michaels (2013); Roodman (2008, 2007); Rajan and Subramanian (2011); Easterly (2003).

[13]A 2014 survey of government workers indicates that 87% of them were hired by the VHT program between 2009 and 2010 (Kimbugwe et al., 2014). See also the "Ugandan Annual Health Sector Performance Report 2008/2009" and the "Village Health Team, Strategy and Operational

The main goal of the VHT program is to improve health outcomes and reduce mortality, especially among young children. To accomplish this, health workers make home visits to poor households with expecting mothers or young children, during which they provide the following services: (i) health education (e.g., about good health practices), (ii) pre and post-natal check-ups, and accompanying pregnant women to health facilities for delivery, (iii) basic medical care and referrals to health clinics that are usually located in more urban areas. Health workers also provide basic medicines to their community when available, such as oral rehydration solution, zinc, antibiotics, and deworming tablets free of charge, as well as distribute free bed nets during national malaria campaigns. They wear a uniform that makes them easily identifiable (i.e., a t-shirt with the official logo).

**Part-time volunteering position**    Workers dedicate around ten hours per week to their VHT work (Mays et al., 2017) while maintaining their main occupations (such as farming or small shop-keeping). They are not required to have medical or high levels of formal education, but they are usually among the most educated in rural communities since they need to be literate and be able to understand the basic medical knowledge provided to them during the training they receive from the government upon being hired and the subsequent monthly meetings.[14]

The VHT program hires workers from the local community, who work as volunteers. This is similar to other community-based positions, such as community-based health workers and agricultural extension workers, which account for roughly 71% of the total government workforce in Uganda.[15] More generally, decentralized government programs often employ unpaid "last-mile" workers in rural, remote areas. The sheer size and decentralized nature of the community-based workforce usually also means that the government cannot monitor the workers. Instead, governments rely on the workers having sufficient income from other activities so that they can provide part-time volunteer services, and being driven by altruism or career aspirations (Francois, 2000; Mansuri and Rao, 2012; Bandiera et al., 2022). The VHT program

Guidelines" (Uganda Ministry of Health, 2010).

[14]The initial training lasts five days and covers key health topics, including diagnosing, treating and recognizing danger signs for referral to urban clinics.

[15]This figure is calculated by summing the number of community-based workers (e.g., health workers, agriculture extension workers) and dividing it by the total the number of workers in the Ugandan public administration (World Health Organization, 2023; International Labour Organization, 2023; Uganda Media Centre, 2023; New Vision, 2023).

employs more than 200,000 workers spread across remote parts of Uganda who are not paid for their VHT work. They are incentivized by altruism and the potential opportunity to transition into more formal government roles, such as working in a government clinic. More generally, data for 34 sub-Saharan African countries on 322,199 community health workers show that 46% do not receive any type of monetary compensation and that 69% of these workers do not receive a regular salary (Fracchia, Molina-Millán, and Vicente, 2023).[16]

**Program roll-out, recruitment and personnel records**   The government VHT program was rolled out nationwide and aimed to employ a worker in all villages. Only half of the villages of our study areas had an active government worker at baseline in May 2010. In interviews that the authors of this paper conducted, all of the government program recruiters named the limited supply of skilled workers as the reason they could not recruit government workers in some villages. Specifically, they were often unable to find individuals who were able and willing to become government volunteers. They also noted significant variation in the supply of skilled labor across villages where they were able to recruit a government worker. In the empirical analysis, we exploit this variation to identify the importance of skilled labor scarcity.

Each health worker is affiliated with a nearby health facility, where 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 interviewed by the authors of this paper 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 neither keep track of community health workers nor replace those that drop out of the program. Also, the government lacked the resources to recruit after the initial rollout. Thus, exiting government workers are rarely replaced.

There is no aggregation of district-level personnel records at higher regional or national levels in Uganda. Part of the problem has been attributed to the lack of digital

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[16]The provision of local public services by volunteers is not exclusive to developing countries. In wealthier nations such as the United States, volunteers fill roles as election poll workers, police auxiliaries, firefighters, recreation program staff, library aides, teachers and senior citizen center assistants (Duncombe, 1985). In the United States, national service programs such the AmeriCorps, Peace Corps, Volunteers in Service to America and Senior Crops recruit volunteer government workers.

record-keeping and the difficulty to centralize staff information (which could otherwise be shared with NGOs or other organizations).[17] The data deficit is consistent with the low overall administrative capacity in Uganda and means that higher-level policy-makers do not know where health workers are, whether they are poached, and cannot reallocate government resources in response to NGO presence. For the same reason, NGOs cannot avoid entering locations with government workers in a centralized or systematic way.

## 2.2  The NGO

Foreign NGOs are important providers of basic services in rural Uganda (Barr and Fafchamps, 2006). The NGO we study is one of the largest in the world. Its aims, services and recruitment strategies are similar to the government VHT program. Aid workers are recruited locally and provide free basic health services to the community. They all work part-time and are easily identifiable from wearing NGO uniforms. They receive similar training about health services as government workers.

**The dual-task model**  The NGO we study uses the dual-task model, which pays health workers a piece rate for the health commodities they sell and no piece rate for healthcare services.[18] Several of today's largest NGOs, along with smaller ones, utilize this "dual-task" model in community-based programs.[19]

The dual-task model has received tremendous positive press coverage and numer-

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[17]Limited personnel records is common in developing countries (World Bank, 2000). Cain and Thurston (1998), for example, 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.

[18]Specifically, NGO workers purchase products from the NGO at a slightly higher rate than the wholesale price and then sell these to households at a retail price, which is set by the NGO to be equivalent to the market price in that location. The difference between the wholesale price and the buying price contributes to the NGO's revenues, whereas the difference between the buying price and the retail price constitutes the worker's income.

[19]This includes InVenture, SWAP, VisionSpring, SolarSister, HealthStore Foundation, Accesso Chakipi (a Clinton Foundation Program), Marie Stopes Kenya (a branch of the U.K.'s Women's Health Organization), HoneyCare Africa, Population Services International, PSI-Ethiopia, PSI-Myanmar Marie Stopes International, Healthy Entrepreneurs, Réseau Confiance, LifeNet International, One Family Health, BlueStar Healthcare Network, Project Muso, GSN, AMUA, World Health Partners, K-MET Post Abortion Care Network, Partners in Health, Alive and Thrive, Happy Mothers Network, Society for Family Health, Living Goods, HealthRight International, DKT International, and HealthKeepers. See http://healthmarketinnovations.org/ for a more extensive list.

ous awards.[20] It has several perceived advantages. First, it increases the NGO's financial independence from large institutional donors, an important disadvantage of traditional foreign aid. Second, the ability to earn income attracts individuals who were too poor to volunteer part-time as government health workers. Third, the prospect of making sales can incentivize the health worker to visit more households. Fourth, providing high-quality products at local market prices can benefit rural households by reducing their search costs.[21] The main disadvantage of this business model is that it incentivizes workers to spend more time selling health products and less time providing core health services such as pre- and post-natal checks. Particularly problematic is the fact that the health products on which NGO workers make the highest profits are typically those that are less related to the most concerning health outcomes – i.e., fortified oil, cotton, soap, fortified flour, and toothpaste. Other more relevant health products that NGO workers can also sell – e.g., antimalarials, pain relievers, cold capsules, deworming tablets, oral rehydration salts – are often distributed free of charge by government workers and are available for free in public clinics. As a result, these products are typically sold at very low retail prices by the NGO worker and provide negligible profits to the NGO worker.[22]

**Pay gap between NGO and government workers**   As we discussed in the Introduction, a main concern from the aid community is that NGOs frequently pay higher wages than the public sector. Our context is emblematic in this sense. In our sample, NGO workers dedicate an average of thirteen hours per week to their health worker job and are paid an average of $19 (52 thousand UGX) per month through product sales.[23] The amount they earn in thirteen hours equates to what the average

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[20]For example, "The 'Avon Ladies' of Africa" published in the *New York Times* (2012), "How one social enterprise is leading the fight against malaria" published by *The Guardian* (2013), "East Africa's healthcare 'Avon ladies' help to keep children alive" published by *Reuters* (2017), "How BRAC, the world's biggest charity, made Bangladesh richer" or "Selling sisters" published in the *Economist* (2019 and 2012) explain the advantages of this model as a self-sustainable way to aid the poor.

[21]Rural households in our context often have to travel to more urban areas to obtain high-quality health products, especially when there is no drug store in the village.

[22]One cycle of antimalarials, one sachet of oral rehydration solution or 15 tabs of zinc are all sold for 200 UGX (1.3% of the average daily household income in Uganda). As a comparison, 500mg of soap is sold for 4,000 UGX (26% of the average daily household income). In an interview that the authors conducted with one of the NGO directors, she explains that: "The provision of the products which have a less direct impact on health was meant to serve as an [financial] incentive [for the health worker] and also ensure the sustainability of the health program operations."

[23]We use the December 2012 exchange rate: 1 USD = 2,691 UGX (Ugandan Shillings).

Ugandan household earns in half a week of full-time work.[24] Importantly, these NGO workers earn significantly more than their government-employed counterparts who volunteer their services. Such a pay differential is prevalent in rural villages, especially where community-based government programs employ unpaid volunteers (see previous section). This pay differential also extends to more centrally located jobs. As Pfeiffer et al. (2008) points out, NGO salaries are often five to twenty times higher than government salaries in sub-Saharan Africa. Additionally, NGOs typically offer superior non-wage benefits such as better working conditions and vehicles. Koch and Schulpen (2018) examines salaries in the D.R.C. and documents that the entry-level national civil servant salary (e.g., janitorial staff) is approximately $78 per month, while lower-skilled workers employed by the United Nations in the same location earn $1,164 per month. A financial assistant earns $87 working for the government, $80 to $592 per month working for local NGOs, $583 working for an American NGO and $709 working for a European NGO.[25] Interestingly, the pay gap is often the largest in places where the necessary skilled labor is the most scarce. Carnahan, Durch, and Gilmore (2006) documents that pay for similar workers from the United Nations is higher than from the government by approximately 2 times in Timor-Leste, 3 times in Kosovo and Haiti, 10 times in Sierra Leone, 11 times in Burundi, 25 times in Liberia and forty times in the D.R.C.

For our study, the pay gap is important for understanding why government workers may want to switch employers when NGOs enter. The fact that government workers are unpaid (versus a scenario where they have some very low pay) is not conceptually important.[26,27] The fact that NGO workers earn piece rates from selling health

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[24]$19 was 51% of the average weekly household income in Uganda in 2013. Average rural income will be lower.

[25]Similar observations have been made outside of Africa. For example, Dost and Khan (2015) documents that, in Afghanistan, a driver earns $40 per month from the government, $110 from a small local NGO, $500 from a large international NGO and over $800 from the United Nations or other multinational donor agencies. Ammitzbøll and Tychsen (2007) notes that "In Kosovo [...] local UN staff salary levels are about 300% higher than most government salaries."

[26]In our context – as in many others – the government rarely replaces community-based workers, owing to insufficient data on which workers are poached and where the NGO operates (refer to the previous section for more details). However, should the government be able to promptly and efficiently replace workers, the magnitude of the poaching effect would hinge on the degree to which the government can replace a poached worker with another worker of the same quality. This likelihood may increase if the government offers a positive wage.

[27]Note that in very poor places, the returns to income may be non-linear such that there are very poor workers who are willing but unable to work until the wage reaches a certain threshold. In such contexts, a higher government wage could moderate the negative effect of NGO entry on the

commodities during household healthcare visits is not important for understanding the main results on poaching and government services, but it will be important to understand the results on health outcomes.

**Poaching of government workers**  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 skilled workers in rural Uganda and the incentive for applicants to hide their role as government workers. In a similar context, data from Deserranno (2019) show that 45% of government workers apply to work for the NGO when it enters the village and 60% of these applicants are hired by the NGO. Interestingly, 29% of the government worker applicants were the only applicant in the village, which is consistent with the belief that the supply of skilled workers is limited. That NGO health workers are highly skilled relative to the rest of the population is true for most community health worker programs in rural Uganda. For example, Bjorkman-Nyqvist et al. (2019) finds that the average NGO worker (who is always a woman) has 9.5 years of education, while the average woman in the communities they study has 6.1 years of education.

# 3 Data and Balance

## 3.1 NGO Rollout and Survey Timing

The NGO entered our study area of 127 villages in twelve districts (henceforth "areas") of Uganda in June 2010, five in the Central Region and seven in the Northern Region. It rolled out its program in a random subsample of 66 villages, of which 36 already had the government program in place for at least six months. The randomization was stratified at the area level, and the villages were geographically dispersed to avoid contamination.[28]

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presence of a government worker by increasing the pool of able workers. But in our case, where the government only had the capacity to implement the initial rollout, but no capacity for any follow-up actions, a slightly higher wage will have limited moderating effects as long as it is below the NGO wage.

[28]Only villages situated between two and six kilometers from an NGO branch office were included in the sampling frame. Villages within a two-kilometer radius of the branch office were excluded to prevent potential contamination issues due to their proximity. Additionally, villages located more than six kilometers away were deemed impractical for program operations and were therefore eliminated. The purpose of the original randomization was to assess the causal effect of NGO entry

The main analysis uses baseline survey data collected in May 2010, prior to the NGO rollout, and endline survey collected in December 2012, two years and seven months after the NGO rollout.[29] Each wave includes a household-level survey about health services obtained by the household as well as health outcomes. It covers a random sample of 20% of village households that had a child below the age of five in 2010. The respondent is the female household head, who is presumably the most knowledgeable about the topics of inquiry. We also have access to village-level survey data that includes information about the presence of health workers and is answered by the village chief.

We supplement the surveys with census data collected before the baseline in 2010. These data are aggregated at the village level and include information about household size, mortality and occupation for all households in each village.

In addition to the data used in the empirical analysis, the NGO conducted an internal survey for its workers in January 2012, eighteen months after the NGO rolled out. Government health workers appear in this survey if they had switched to becoming aid workers.

## 3.2 Descriptive Statistics

In the baseline survey, one year after the government program had been rolled out, 57% of the villages (73 villages) had a government worker and 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). This is consistent with the perception of the limited labor supply of those who are both qualified and willing to work as volunteer health workers. Data for government workers from similar contexts as ours show that they work on average ten hours per week (Mays et al., 2017).

Table 1 presents self-reported data from NGO workers. Panel A shows that they are amongst the most educated in the rural communities where they live and work: 67% of health workers have completed primary school vs. the 38% village mean (Table 2). Even amongst the NGO workers, only 24% have completed secondary education. Panel B shows that in villages with a government health worker at baseline, 39% of

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on access to health services and health outcomes.

[29]The randomization was conducted by one of the authors as part of an internal evaluation of the NGO. The data were collected in-the-field by independent enumerators, not employed by the NGO.

NGO workers used to work for the government as a health worker. In villages that had a government health worker at baseline but lost that worker at endline, 82% of NGO workers report previously having worked for the government. These descriptive facts are consistent with the concern that the NGO employs government health workers. The fact that the new NGO worker is often the same person as the one who used to work for the government is important to keep in mind for interpreting our results on health outcomes later in the paper.

Table 2 Panels A and B, columns (1) and (2) present village-level summary statistics. Government and aid workers are the only source of modern medicine in the villages. Other medical services are provided by traditional healers and drug stores, which dispense basic advice with drug sales. Traditional healers are present in 48% of villages and drug stores are present in 68% of villages. In urban areas, modern medical services are available from government clinics and private clinics.[30] 56% of villages have a government clinic within a ten-kilometer radius, and 84% of villages have a private clinic within a ten-kilometer radius.

On average, 182 households reside in a village. Fertility is high in our sample. There was one birth per every three or four households in the year prior to the survey (the number of infants per household is 0.29). Mortality is also high with approximately one infant death in the past year per every twenty households with an infant (the average number of infants that died per household is 0.04). The overall level of education is low, with only 38% of household heads having completed primary education. 57% of the households are involved in farming as their main activity.

Table 2 Panel C, columns (1) and (2) present household-level summary statistics for access to health services at baseline. Consistent with the VHT program being implemented years after its initial creation, only 3.7% of the households report having received medical care from a government health worker in the year preceding the baseline. One-fourth of households report having received care from a government clinic in the year preceding the endline, and 39% received care from a private clinic.

Appendix Table A.1 presents additional important household-level variables (e.g., wealth, health behavior), except for household-level mortality which is not available in the baseline survey.[31]

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[30]Government clinics and private clinics typically 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.

[31]Also not available at baseline (but available at endline) is information on whether children below

## 3.3 Balance Checks

To check that the randomization of NGO entry is balanced, we regress the characteristics stated in each row heading of Table 2 on an indicator for NGO entry, controlling for area fixed effects (the stratification variable). Column (3) examines the full sample of 127 villages. Consistent with balance, the coefficients are small in magnitude and statistically imprecise.

Since the randomization was not stratified according to the presence of a government worker at baseline, we also check for balance within the subsample of 73 villages with a government worker at baseline (column 4) and the subsample of 54 villages without a government worker at baseline (column 5). These checks are important because our study conceptually estimates the impact of randomly assigned NGO entry for each type of village. We find that amongst the 34 characteristics, two variables statistically differ between control and treatment for one of the subsamples: the number of households in the village and having a private clinic within 10km of the village differ at the 5% and 10% levels. All estimates in the paper control for these unbalanced variables.

Table A.2 tests for balance in the subsamples with and without government workers using the same interacted model that we later use in the results section (equation 1). We do not detect any additional signs of unbalance in the randomization. Table A.3 presents the coefficients of Table 2 Panel B, standardized by the standard deviation of the row variable.

Next, we examine the differences between villages with and without a government worker at baseline. Table 2 column (6) shows that the presence of a government worker at baseline, which is not randomly assigned, is statistically correlated with none of the baseline village- and household-level characteristics. Random government placement is not important for the main research question: whether NGO entry crowds out government capacity (i.e., the impact of randomly assigned NGO entry on government workers and services in villages with a government worker at baseline). It is only relevant for the comparison of the impact of NGO entry between villages with and without government workers at baseline, which is not the key focus of our paper (refer to the next section for details).

Finally, we examine differential attrition. One-fourth of the households attrit

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five years old in the household are fully immunized. Consequently, our measure of the child health behavior index at baseline does not consider immunization.

between the baseline and endline. Appendix Table A.4 (Panel A, columns 2-4) shows that the attrition rate is balanced across groups. It also shows that there is no differential attrition by household baseline characteristics (Panel B, columns 3, 6 and 9). In Appendix Table A.5, we show that the effect of NGO entry – which we discuss in the next section – is robust to bounding the estimates using the trimming procedure proposed by Lee (2009).[32]

# 4  Results

## 4.1  Baseline Equation

As we discussed earlier, NGO entry can affect government service provision in different ways depending on whether a government health worker is present at baseline. One way to estimate heterogeneous treatment effects is to divide the data into villages with and without government workers at baseline and examine the impact of NGO entry in each subsample. The randomized NGO entry has a causal interpretation in both subsamples. Alternatively, we can pool the data and estimate the interaction specification below. The two approaches are conceptually identical. We choose to pool the estimates to maximize statistical power. We estimate

$$y_{hi} = \alpha + \beta(NGO_i \times Gov_i) + \gamma(NGO_i \times No\,Gov_i) + \delta Gov_i + \eta X_i + \lambda_a + \varepsilon_{hi}, \quad (1)$$

where $y_{hi}$ represents the provision of government or NGO health services to household $h$ in village $i$ in 2012, $NGO_i$ is a dummy variable that equals one if the village is randomly assigned to participate in the NGO program in 2010, $Gov_i$ ($No\,Gov_i$) is a dummy variable that equals one if a government worker was present (absent) in the village in 2010, $\lambda_a$ are the stratification variables (area fixed effects). We estimate Huber-White robust standard errors to address heteroskedasticity for village-level regressions, and cluster the standard errors at the village level for the household-level regressions.

The main goal of the empirical analysis is to estimate *(i)* the net of crowding-in and crowding-out effects from NGO entry on government capacity for health services

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[32]The procedure trims observations from above (below) the group with lower attrition to equalize the number of observations across groups, and re-estimates the effect of NGO entry in the trimmed sample to deliver the lower (upper) bounds for the true treatment effect.

in villages with a government health worker at baseline, $\beta$, and *(ii)* the crowding-in effects from NGO entry in villages with no government worker at baseline, $\gamma$. (In the latter villages, the NGO cannot crowd out the government worker since one is not present to begin with.)

It is important to keep in mind that we are interested in the impact of NGO entry *within* each type of village. We do not focus on the differential effect of NGO entry *across* the two types of villages ($\beta - \gamma$) which would require considering the non-random placement of government workers. Thus, the baseline only controls for the two variables that are not balanced in the subsample with or without a government worker at baseline (village size and presence of a private clinic within 10km), and their interactions with the presence of a government worker at baseline. We do not control for the correlates of government presence interacted with NGO entry in our main specification. However, the results are very similar if we expand the list of controls to all the baseline variables interacted with NGO entry and these same variables interacted with the presence of a government worker at baseline (Appendix Table A.6). The results are also robust to not adding any interacted controls (Table A.7).

For all specifications with interacted controls, $\beta$ and $\gamma$ are evaluated at the sample mean values of the controls by de-meaning all controls.

## 4.2   Health Workers

We begin by examining the effect of NGO entry on the supply of health workers. The results are presented in Table 3. Column (1) examines the number of government workers, which can take the values of zero or one in our sample. The coefficient for $NGO_i \times Gov_i$ shows that NGO entry in villages with a government worker at baseline reduces the number of government workers by 0.470, i.e., by approximately one per every other village. This is consistent with the descriptive statistics discussed earlier, which indicate that when the NGO enters a village with a government health worker, the government worker switches to work for the NGO in approximately 40% of cases. In villages with no pre-existing government worker, the coefficient for $NGO_i \times NoGov_i$ shows that NGO entry has no effect on the number of government workers at endline.

Column (2) examines the number of NGO workers. We find that NGO entry increases the number of NGO workers by almost one in every village that it enters, even those where the government could not recruit a worker. This is most likely

because there were qualified individuals who could not afford to work for free for the government, and the higher pay offered by the NGO relaxed this constraint.

Column (3) examines the total number of workers from the NGO and government, which can take the values of zero, one or two. There is a mechanical relationship between the results on total workers and those for government and NGO workers in columns (1) and (2). In villages with a government worker at baseline, NGO entry increases total workers by approximately one per every two villages. In villages without a government worker at baseline, NGO entry increases the total number of workers by almost one.

A concern for interpreting the results is that the number of health workers of each type may be mismeasured. These variables are reported by the village chief, who may be unaware of a change in employer for a former government worker who moves to the NGO (or that she now works for both). This is unlikely to be a problem in practice for several reasons. First, the importance and scarcity of health workers and the small size of the communities that we study means that the village chief is unlikely to not know of the change. Second, the village chief has little incentive to respond strategically to the survey enumerators, who are independent and not officially connected to the NGO or the government. Most importantly, the results on the number of health workers are similar to those on services reported by households presented in the next subsection.

The main evidence for poaching is the finding that NGO entry causes the government worker to move to the NGO in approximately half of the villages with a pre-existing government worker. The large magnitude of poaching is consistent with a large pay difference between the NGO and the government health worker. The fact that government health workers are volunteers in our context is not important for understanding the signs of the estimates, which only requires that the NGO provides higher pay relative to the government. A decline in the NGO-government pay-gap will likely reduce the magnitude of our findings, but the sign should not change.

In the other half of villages with a government worker at baseline, we find that the NGO hires a second worker when it enters. This can reflect "spillover poaching" if the NGO hired government workers not only from the treatment villages, but also from neighboring villages outside of our sample. Later, we show that the NGO's decision to hire a second worker is driven by the availability of skilled labor *within* the treatment village. Thus, spillover poaching is unlikely to drive these results.

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## 4.3 Health Services

Table 3 columns (4)-(6) examine health services provided by the government and NGO. Column (4) examines a dummy variable that equals one if the household answers "yes" to the question on whether it "received medical care" from a government worker in the past year. The binary response was designed to minimize reporting error (as opposed to a question about the number of visits). The main disadvantage of this measure is that it does not capture changes in the quantity or the quality of services on the intensive margin.[33] The results on health outcomes presented later address this issue.

Column (5) examines the analogous response to whether the household receives care from an NGO worker. Column (6) examines all healthcare coverage across households: the probability that a household reports getting medical care from *any* (NGO or government) health worker.

Column (4) shows that NGO entry *reduces* the probability that a household obtains services from the government health worker by 26.2 percentage-points in villages with a government health worker at baseline. The estimate is statistically significant at the 1% level. For villages with no government health worker at baseline, the interaction coefficient is much smaller in magnitude and statistically insignificant. These results parallel those for the presence of a government health worker at endline in column (1), which goes against the concern that the earlier results were driven by misreporting from the village chief or other mismeasurement.

The uninteracted coefficient for the government worker dummy, $Gov_i$, shows that households in villages with a government worker at baseline and where the NGO did not enter are 42 percentage-points more likely to obtain healthcare from a government worker than a village with no health worker at baseline. This association is interesting because it is consistent with the view that government workers in our context are not in name only and actually provide services to the community.

Column (5) shows that NGO entry increases the probability of obtaining services from an NGO worker by 29.7 percentage-points in villages with a government worker at baseline, and 30 percentage-points in villages without a government worker at baseline. They parallel those for labor supply.

Column (6) shows that NGO entry *reduces* healthcare coverage – i.e., the proba-

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[33]The questionnaire does not ask about the number of visits per health worker and the quality of the visits.

bility of obtaining medical care from *any* (government or NGO) health worker by 12.9 percentage-points in villages with a government worker at baseline.[34] Since NGO entry reduces the number of government workers by one in every other village (column 1) and increases the number of NGO workers by one per every village (column 2), the former result implies that NGO workers visit fewer households than government workers on average. The interpretation of this extensive margin result is ambiguous. The result could reflect worse healthcare from the NGO. It could also reflect better care if the NGO worker targeted households better, visited fewer households on the extensive margin, but provided better care on those visits on the intensive margin. We address this in Section 4.5 when we examine health outcomes. Finally, in villages without a government worker at baseline, NGO entry is found to increase total coverage by 27.6 percentage-points.

The estimates on service delivery in Table 3 columns (4)-(6) examine dummy outcome variables with a Linear Probability Model. In Appendix Table A.8, we alternatively use a (nonlinear) Logit Model. The results are very similar.[35]

## 4.4 Skilled Labor Supply

This section provides evidence on the mechanism behind poaching. Motivated by the anecdotal evidence, we hypothesize that a key driver of the effects of NGO entry on government capacity is the baseline local supply of skilled labor. In places where skilled labor is scarce, the NGO will be more likely to poach the government worker because of the scarcity of other skilled job candidates. In places where skilled labor is abundant, the NGO should have better success in finding a different person to employ.

To test this hypothesis, we estimate the heterogeneous effects of NGO entry with

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[34]Note that the estimated effects for government health care in column (4) and for NGO health care in column (5) do not add up to the estimated effect for any coverage in column (6) because of the overlap in households visited by the two types of health workers.

[35]One difference is that the "Government" coefficient in Table A.8, column (2), is now close to zero and not statistically significant anymore. This makes sense because NGO workers do not visit households outside their own village (and indeed the share of households in non-NGO village who receive a service from the NGO is close to zero).

respect to the scarcity of skilled labor at baseline:

$$y_{hi} = \alpha + \beta(NGO_i \times Gov_i \times Scarcity_i) + \gamma(NGO_i \times Gov_i \times Abundance_i) \quad (2)$$
$$+ \delta(NGO_i \times No\,Gov_i) + \eta Gov_i + \mu X_i + \lambda_a + \varepsilon_{hi},$$

where $\beta$ ($\gamma$) is the association between the outcome variables and the NGO entering a village with a government worker and with *scarcity* (*abundance*) of skilled labor at baseline. Following standard convention, we consider a worker to be "high skilled" if she has a public sector job (e.g., teachers, doctors, agriculture extension workers) or a private sector job (e.g., business owners), and "low skilled" if she is involved in subsistence farming. We define a village to have *abundant* skilled labor supply if the share of skilled workers is in the top quartile of the village distribution, and *scarce* skilled labor supply otherwise. We use the top quartile because the distribution of skilled laborers is skewed.[36]

The causal interpretation of the interaction coefficients for $\beta$ and $\gamma$ follows from the randomization of NGO entry. The difficulty in interpreting the interaction coefficients lies in isolating the influence of skilled labor scarcity on NGO entry. Skilled labor scarcity is likely correlated with other factors that affect health services.

To address this, we use data from the baseline survey to examine the correlates of skilled labor scarcity in our sample. Table 2 column (7) shows that relative to villages with abundant skilled labor, villages where there is scarcity are less likely to have a government worker at baseline or a government clinic nearby, are smaller in size, have more households who are involved in farming, and are poorer. To address the concern that the correlates may confound the interpretation of the triple interaction estimates, equation (2) controls for the correlates of scarcity and their interactions with $NGO_i \times Gov_i$ and $NGO_i \times No\,Gov_i$.[37]

Table 4 presents the results. The interaction coefficient for $NGO_i \times Gov_i \times Scarcity_i$ in column (1) shows that in villages with a pre-existing government worker and where skilled labor is scarce, the NGO poaches one government health worker in every two villages that it enters. The coefficient is -0.563 and it is statistically

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[36]The village-level distribution of the fraction of skilled workers is as follows: p10=3%, p25=6%, p50=25%, p75=71%, p90=95%. The share of skilled labor is measured using the 2010 Census data normalized by village size.

[37]The one exception is that we do not control for "farming is the main household occupation" or its interactions because this variable is highly correlated with our scarcity measure.

significant at the 1% level. The interaction coefficient for $NGO_i \times Gov_i \times Abundance_i$ shows that the NGO does not poach if skilled labor is abundant. The coefficient is small in magnitude, positive and statistically insignificant. The other variables have similar interpretations and coefficients as in the earlier results. We do not discuss them for brevity.

Column (2) shows that skilled labor supply does not influence the effect of NGO entry on the number of NGO workers. NGO entry always increases the number of NGO workers by approximately one. Column (3) shows the analogous results for the total number of workers.

In columns (4)-(6), we examine healthcare provision. We expect that NGO entry would reduce services provided by the government in villages with a government worker at baseline and where skilled labor is scarce, as poaching is likely to occur. In villages with a government worker at baseline and where skilled labor is abundant, the NGO often hires a second worker and its effect on government services is unclear ex ante. If NGO and government services are substitutes – i.e., a household that obtains care from the NGO no longer needs to see the government worker, then the effect can be negative. If NGO and government services are complements, then the effect can be positive. As discussed in the Introduction, complementarities can be driven by increased competition, collaboration or information sharing between the government and NGO worker.

Column (4) shows that in villages with a pre-existing government worker where skilled labor is scarce, NGO entry *reduces* government healthcare coverage by 30.6 percentage-points. However, in villages with a government worker at baseline and where skilled labor is abundant, NGO entry *increases* government healthcare coverage by 35.1 percentage-points. The estimates are statistically significant at the 1% level. Thus, the results are strong evidence that NGO entry crowds out government services where skilled labor is scarce and it poaches the government worker, and that there are strong positive spillovers to government services when skilled labor is abundant, and it hires a second worker.

Table 4 column (5) examines NGO healthcare coverage as the outcome. We find that in villages with a government worker where skilled labor is scarce, NGO entry increases NGO healthcare coverage by 26.8 percentage-points. In villages with a government worker at baseline and where skilled labor is abundant, NGO entry increases NGO healthcare coverage by 52.7 percentage-points. The p-value at the

bottom of the table shows that the difference in the two interaction coefficients is statistically significant at the 1% level. Thus, NGO entry increases services provided by the NGO regardless of skilled labor supply, but the increase is larger in villages where skilled labor is abundant and where the NGO hired someone in addition to the government worker. This is again consistent with the NGO and government services being complements.

Column (6) examines *any* healthcare coverage – i.e., obtaining medical care from any (government or NGO) health worker. The first triple interaction shows that in villages with a government worker where skilled labor is scarce, NGO entry *reduces* any coverage by 14.3 percentage-points. Thus, the reduction in any healthcare shown earlier in Table 3 column (6) is entirely driven by villages with labor scarcity. As with the earlier results, recall that this measure of healthcare does not fully capture changes in the quantity and quality of healthcare and we examine health outcomes in the next section to address this issue. The second triple interaction shows that in villages with a government worker at baseline and where skilled labor is abundant, NGO entry *increases* any healthcare coverage by 28.3 percentage-points.

We find similar results when we decompose the estimates according to whether the NGO hired the government worker or a second person (Table A.9). We do not present these as the main results because the NGO hiring decision is endogenous. We get similar results than those by labor scarcity because poaching and skilled labor scarcity are highly positively related.

## 4.5   Health Outcomes

As we discussed earlier, an important drawback of our measure of healthcare – i.e., the probability that a household receives any care from a given provider – is that it does not capture changes in the quantity or quality of care from the provider. We address this limitation by examining two measures of health outcomes, which reflect both the quantity but also the quality of healthcare, as dependent variables.

The first health outcome that we examine is infant mortality, the reduction of which is a focal point for both the government and the NGO, as well as international agencies such as the World Health Organization.[38] We measure this as the probability

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[38]In our context, 46% of the overall under-five mortality takes place in the first month, 18% in the first 24 hours of life and 15% in the first six hours of life (Baqui et al., 2016). The government and the NGO also aim to reduce in-utero, neonatal and under-age-five mortality. However, we do

that any infants died in the household, as well as the number of infant deaths per 1,000 births in each village between the baseline and endline surveys.[39] The second outcome is child health behavior, which the government and the NGO also aim to improve, and one that can be more readily influenced by NGO entry during the span of our experiment. Our household survey reports whether children below five years old are fully immunized, sleep under a bed net, drink treated water, or wash their hands before eating and after using the toilet. For brevity, we examine a standardized index of these measures in the paper. Each measure is reported separately in Appendix Table A.10.

Table 5 presents the baseline estimates from equation (1). The signs of the estimates are consistent with those for healthcare, but are less statistically precise. In villages with a government worker, NGO entry is associated with an increase in mortality and a worsening in child health behavior.[40] In villages without a government worker, the coefficients for NGO entry have the opposite signs. We note that the magnitudes of some of the coefficients for mortality in this table and later tables are large despite being imprecise.[41] Thus, the estimates on NGO entry capture the return of basic interventions when baseline health services are extremely limited and baseline mortality is high.

**Effects by skilled labor scarcity**   Given that the earlier finding on healthcare varied by skilled labor scarcity, we also examine the heterogeneous effects of NGO entry on health outcomes according to baseline labor scarcity from equation (2). The estimates on health outcomes presented in Table 6 are consistent with the estimates on healthcare in Table 4. The coefficients suggest that in villages with a government worker and where skilled labor is scarce, NGO entry increases mortality and worsens child health, but the coefficients are statistically insignificant. In villages with a

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not have reliable measures of these other outcomes.

[39]See the Appendix Section A for a discussion of the construction of these mortality variables.

[40]The examination of any deaths in the household is restricted to the sample that experienced at least one birth since the baseline survey. There is no evidence of differential fertility by NGO entry across a number of proxies for health risk (e.g., mother's age and education) or access to healthcare (e.g., household wealth, distance to a clinic, baseline mortality rates): see Appendix Table A.11. The results on mortality are thus unlikely affected by differential fertility.

[41]To interpret them, note that the constants in columns (1) and (2) show that baseline infant mortality in villages without health workers is very high: 9.3% of households experienced at least one infant death since baseline and infant mortality rate is 97 per 1,000 births. For comparison purposes, note that in the 2011 Ugandan DHS, which includes rural areas with and without NGO and government health workers, 88 per 1,000 infants died within twelve months after birth.

government worker and where skilled labor is abundant, NGO entry reduces mortality and increases child health. The latter estimate is statistically significant at the 5% level. In villages without a government worker, NGO entry reduces mortality and increases child health. These estimates are statistically significant at the 5% and 10% levels.[42]

**Mechanisms for why poaching worsens health outcomes**   We now provide suggestive evidence that the decline in health outcomes, observed when an NGO recruits government workers, is likely due to the NGO's incentive structure. This structure pays health workers per item sold of health commodities, but does not pay them for delivering healthcare services (for an in-depth analysis of the advantages and disadvantages of this common incentive structure, see Section 2.2).

We utilize data from two studies of the same NGO operating in rural Uganda: one examining who applies and who is hired for the NGO work (Deserranno, 2019), and the other focusing on the time allocation of NGO workers once hired (Reichenbach and Shimul, 2011). The results, discussed in detail in Appendix Sections B.1 and B.2, suggest that the negative effect of poaching on downstream health outcomes aligns with: (i) the most financially motivated government workers opting to become aid workers upon the NGO's arrival, and being selected due to the limited availability of other potential candidates, and (ii) these workers dedicating more time to selling commodities (for which they are compensated) after changing jobs, compared to health services. Despite NGO workers investing more hours into the job, the cumulative amount of time they allocate to providing free health services only amounts to 27 to 48% of that expended by government workers.

Alternative explanations for why poaching may have reduced health outcomes – such as increased drug prices due to NGO entry, or diminished coordination with government clinics – are not supported by our data (refer to Appendix Section B.3). We also dismiss a demand-side explanation: that community members trust foreign NGOs less than government workers, and that this mistrust negatively impacts the acceptance of services provided by NGO workers (Alsan and Wanamaker, 2017; Lowes and Montero, 2021; Martinez-Bravo and Stegmann, 2022). Since government capacity and health outcomes only worsen in places where the same health worker switches

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[42]Table A.9 columns (4) to (6) decompose the estimates according to whether the NGO hired the government worker or a second person (Table A.9). We get similar results than those by labor scarcity.

employers, trust would play a role only if the change in employer identity outweighs the trust established between the health worker and the community during their government employment.

Overall, we believe that the decline in health outcomes when poaching occurs is likely due to the NGO's incentive structure. Alternative incentive structures, which put more weight on health services or health outcomes, might mitigate the negative effects of poaching government workers. However, their implementation could be challenging and costly as they necessitate precise measurement of healthcare services or outcomes for workers in remote areas, which are difficult to monitor. Further research is required to identify the type of NGO incentives that are both cost-effective and capable of mitigating the negative effects of poaching government workers.

## 4.6 Spillovers to Other Sectors

Aid watchers have observed that the negative effect of NGOs on government capacity can spillover to sectors beyond the narrow focus of the NGO. For urban areas, Kassaye (2006) states that "(...) most university professors spend much of their time acting as consultants for international NGOs, and not teaching their students. It is time to develop a guideline on the appropriate human resources employed by NGOs on the basis of local professional availability." In our rural context, the main concern is that there are negative spillovers to schools, the other public good that requires local skilled labor, if the NGO hires the teachers as part-time employees and teacher absenteeism increases. Since government health workers are presumably better candidates for the NGO than teachers, the concern of negative spillovers to schools is especially pronounced in villages with no government worker at baseline.

In our context, teachers are government employees and among the lowest-paid public-sector workers.[43] They are known to subsidize their incomes with other employment, which leads to high levels of absenteeism. Chaudhury et al. (2006) estimates that the average teacher absenteeism rate in rural and urban Uganda is 27%, the highest among the six developing countries analyzed in the study. Absenteeism is widely believed to be higher in rural areas than in urban areas. There is approximately one primary school per three villages in our context. Schools are small and

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[43]The national average wage for primary school teachers in urban and rural areas is $93 (250 thousand UGX) per month. See news article by Reuters (2013), "Ugandan teachers go on strike to demand 20 percent pay rise" (https://www.reuters.com/article/uganda-strike-idUSL5N0HC17L20130916).

are likely to be closed on days when the teacher is otherwise employed.

We do not observe teachers. Thus, we proxy for teacher absenteeism with school closure and the downstream outcome of school attendance. The first variable takes a value of one if the school was open at least one day in the past week and zero if the school was closed the entire week. The second variable is the number of children of primary school age (six to twelve years old) in the household who attended school at least one day in the past week. These data are reported in the household survey. We estimate the baseline equation (1) with these dependent variables.

The coefficient for $NGO_i \times No\ Gov_i$ in Table A.12 column (1) suggests that in villages without a pre-existing government worker, NGO entry reduces the probability that the local school was open at least one day last week by 4.7 percentage-points (significant at the 10% level). Column (2) shows that NGO entry reduces the number of children who attended school by approximately 0.164 relative to the baseline (constant) of 1.520 in villages with no baseline health worker (significant at the 5% level). These results are consistent with the NGO providing part-time employment to teachers.

The coefficients for $NGO_i \times Gov_i$ show that NGO entry had no effect on school closures and school attendance in villages with a government health worker at baseline. This is consistent with the belief that government health workers are more attractive to the NGO than teachers because they have more similar skills to those required by the NGO.

The finding that NGO entry has a negative effect on schools supports the concern that limited skilled labor may undermine NGO effectiveness. In villages with a government worker at baseline, the NGO often poaches the government worker. In villages with no government health worker, the NGO successfully recruits a worker, who is sometimes the village teacher. Note that teachers are included as skilled labor according to how we define the variable. Thus, we do not examine the heterogeneous effects of NGO on schools according to the supply of skilled labor.

## 5    Conclusion

The results of this paper piece together a nuanced picture of how NGO-delivered aid can both help and hinder the development of public services in poor countries where the government has begun to develop its own capacity, but where government capacity

is new or fragile and the skilled labor for providing government and NGO services is scarce. In places with a government worker at baseline and too few skilled workers, NGOs can reduce government capacity by poaching the government worker. At the same time, we find evidence that the NGO can complement government services in places where skilled labor is abundant. In these contexts, the NGO often hires a second worker and both the new NGO worker and the government worker provide more healthcare to households in their community when the other is present.

Our findings emphasize the importance of better understanding the nature of the complementarities between NGOs and government, which can help provide a more detailed guide to policymakers who wish to increase NGO efficacy. They support the concerns of aid workers that NGOs, despite good intentions, inadvertently crowd out the infant government public sector because they usually pay higher wages in places where skilled labor is scarce. This suggests that there is likely to be high returns from better coordination between the government and NGO in resource allocation and wage setting. If NGOs need to enter places where skilled labor is scarce, it would be useful to invest more in training and other capacity-building activities that increase the skilled labor supply at the same time. These points have been made by groups such as Project FAIR (Fairness in Aid Remuneration), which advocate that NGOs should set wages at the same level as the local labor market. The governments of Uganda, Tanzania, Kenya, Sierra Leone are in the process of creating databases for all the NGOs that work in their countries. Our results imply that these efforts can yield large benefits.

Our findings on how an NGO can either enhance or undermine government capacity depending on the availability of skilled labor point towards several directions for future research. First, it would be useful to examine the long-term effects, which can be similar or differ from the medium-run effects we study. The supply of skilled labor could change over time in response to NGO entry. It may increase if the NGO invests in human capital building programs, or if the community invests more in schooling in response to the increase in the returns to human capital caused by NGO entry. It could also decline in cases where the NGO hires teachers and reduces school provision.

In the long run, NGO health care provision can also relieve the burden on state health resources. For instance, the government could systematically shift public resources away from regions with NGO workers – a reallocation that we do not observe in our medium-term study. But this would require the government to keep track

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of NGO presence and coordinate, which has not yet happened in the Ugandan context. In the long run, direct provision of public goods by NGOs might also hinder an accountability mechanism, where citizens hold political leaders responsible for inadequate delivery of public services.

Second, it would be useful to investigate the degree to which NGOs might either amplify or undercut government capacity in scenarios of centralized public service delivery, where NGO and government workers are both paid and where their incentive structure is typically more comparable. This is particularly relevant for salaried doctors/nurses in government hospitals who, despite their government wages, may or may not be attracted by higher-paying job offers from NGOs.

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**Table 1:** NGO Workers' Characteristics

|  | Mean | SD |
|---|---|---|
|  | (1) | (2) |
| Observations (# NGO health workers) | 66 |  |
|  |  |  |
| **A. Socio-Economic Background [NGO Worker Survey 2012]** |  |  |
| Number of hours worked for the NGO | 13.106 | 8.891 |
| Earnings from NGO work in the past month (in thousand UGX) | 51.710 | 66.911 |
| Age | 33.576 | 10.133 |
| Completed primary education = {0, 1} | 0.667 | 0.475 |
| Completed secondary education = {0, 1} | 0.242 | 0.432 |
| Married = {0, 1} | 0.833 | 0.376 |
|  |  |  |
| **B. Poaching [NGO Worker Survey 2012]** |  |  |
| Was working as a government health worker = {0, 1} | 0.212 | 0.412 |
| ..among villages with a government health worker in 2010 | 0.389 | 0.494 |
| ..among villages with a government health worker in 2010 and none in 2012 | 0.824 | 0.393 |

*Notes*: Observations are at the NGO health worker level. Villages restricted to those with NGO entry. Each row states the sample mean and standard deviation of a variable.

# Table 2: Summary Statistics and Balance Checks

| Sample of villages: | All | | All | Gov in 2010 | No Gov in 2010 | All | All |
|---|---|---|---|---|---|---|---|
| | Mean | SD | NGO | NGO | NGO | Gov in 2010 | Scarcity of Skilled Labor |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| **A. Presence of a Health Care Provider in 2010 [Village Chief Survey]** | | | | | | | |
| Observations (# villages) | 127 | | 127 | 73 | 54 | 127 | 127 |
| Government health worker in the village = {0, 1} | 0.575 | 0.496 | -0.085 | - | - | - | -0.497*** |
| | | | (0.072) | - | - | - | (0.129) |
| Traditional healer in the village = {0, 1} | 0.480 | 0.502 | -0.016 | 0.069 | -0.031 | -0.027 | -0.063 |
| | | | (0.088) | (0.129) | (0.134) | (0.125) | (0.204) |
| Drug store in the village = {0, 1} | 0.677 | 0.469 | 0.030 | 0.076 | 0.000 | -0.023 | 0.000 |
| | | | (0.039) | (0.071) | (0.000) | (0.044) | (0.000) |
| Government clinic within 10 km of the village = {0, 1} | 0.559 | 0.498 | -0.052 | -0.022 | -0.003 | -0.054 | -0.366*** |
| | | | (0.078) | (0.118) | (0.108) | (0.108) | (0.136) |
| Private clinic within 10km of the village = {0, 1} | 0.835 | 0.373 | 0.047 | 0.127* | -0.019 | 0.006 | 0.012 |
| | | | (0.045) | (0.073) | (0.057) | (0.047) | (0.016) |
| **B. Village Size, Infant Mortality and Socio-Economic Background in 2010 [Census Data Aggregated to Village Level]** | | | | | | | |
| Observations (# villages) | 127 | | 127 | 73 | 54 | 127 | 127 |
| Number of households in the village | 182.1 | 125.5 | -13.339 | 17.600 | -77.696** | -45.290 | -98.562** |
| | | | (22.191) | (18.330) | (44.669) | (29.111) | (43.229) |
| Number of infants per household | 0.291 | 0.091 | -0.004 | -0.026 | 0.009 | -0.024 | -0.015 |
| | | | (0.014) | (0.022) | (0.019) | (0.019) | (0.022) |
| Number of infants who died in the past year per household | 0.041 | 0.060 | -0.004 | -0.005 | -0.008 | -0.007 | 0.003 |
| | | | (0.009) | (0.016) | (0.006) | (0.006) | (0.005) |
| % households involved in farming | 0.568 | 0.383 | 0.031 | 0.016 | 0.059 | 0.025 | 0.182*** |
| | | | (0.023) | (0.036) | (0.036) | (0.027) | (0.049) |
| % household heads who completed primary education | 0.376 | 0.260 | 0.004 | 0.057 | -0.033 | -0.016 | -0.071 |
| | | | (0.030) | (0.047) | (0.042) | (0.035) | (0.068) |
| Standardized index of wealth | 0.000 | 0.927 | 0.027 | 0.088 | -0.015 | -0.006 | -0.230** |
| | | | (0.053) | (0.063) | (0.099) | (0.070) | (0.108) |
| **C. Medical Care in 2010 [Household Survey]** | | | | | | | |
| Observations (# households) | 3,745 | | 3,745 | 2,131 | 1,614 | 3,745 | 3,745 |
| Received medical care from a government health worker in the past year = {0, 1} | 0.037 | 0.189 | -0.008 | -0.015 | 0.001 | 0.004 | 0.004 |
| | | | (0.006) | (0.010) | (0.008) | (0.005) | (0.006) |
| Received medical care from a traditional healer in the past year = {0, 1} | 0.024 | 0.154 | -0.002 | -0.001 | 0.004 | 0.005 | -0.009 |
| | | | (0.005) | (0.008) | (0.006) | (0.005) | (0.011) |
| Received medical care from a drug store in the past year = {0, 1} | 0.151 | 0.358 | -0.002 | -0.016 | 0.003 | -0.017 | -0.032 |
| | | | (0.019) | (0.016) | (0.037) | (0.025) | (0.047) |
| Received medical care from a government clinic in the past year = {0, 1} | 0.251 | 0.434 | -0.016 | -0.034 | 0.022 | 0.009 | 0.091*** |
| | | | (0.021) | (0.033) | (0.029) | (0.027) | (0.030) |
| Received medical care from a private clinic in the past year = {0, 1} | 0.391 | 0.488 | -0.013 | -0.023 | 0.010 | -0.035 | -0.061 |
| | | | (0.020) | (0.024) | (0.030) | (0.030) | (0.037) |
| Child health behavior index | 0.000 | 0.627 | -0.023 | -0.042 | -0.018 | -0.006 | -0.065 |
| | | | (0.030) | (0.048) | (0.045) | (0.035) | (0.051) |

*Notes:* Observations in Panels A-B are at the village level, and those in Panel C are at the household level. Sample restrictions are stated in the column headings. Cols. (1)-(2) state the sample mean and standard deviation of the variable named in the row heading. Cols. (3)-(7) show the estimates from regressions of the row variable on NGO entry (cols. 3-5), government presence in 2010 (col. 6), scarcity of labor supply (col. 7), controlling for area fixed effects. In parentheses, we present robust standard errors in Panels A-B and standard errors clustered at the village level in Panel C. "Scarcity of skilled labor" is a dummy variable that takes value zero if the share of public or private sector workers (non-farmers) is in the top quartile, and value one if it is in the bottom three quartiles. In Panel B, the standardized index of wealth is an equally weighted average of z-scores of five variables: average number of assets owned by a household, average food security, % households with high quality home wall material, % households with high quality home floor material, % households with high quality home roof material. In Panel C, the child health behavior index is the average standardized effect of three variables: whether children sleep under bednet, drink treated water, or wash hands before food and after toilet. *** p<0.01, ** p<0.05, * p<0.1.

**Table 3:** Health Workers and Health Services

| | Dependent Variable | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | Presence of Health Workers in the Village in 2012 | | | Household Received Medical Care from the Following in the Past Year (2012) | | |
| | Gov = {0,1} | NGO = {0,1} | Total = {0,1,2} | Gov = {0,1} | NGO = {0,1} | Any = {0,1} |
| **Mean Dep.Var.** | **0.425** | **0.504** | **0.929** | **0.313** | **0.235** | **0.457** |
| NGO × Gov in 2010 | -0.470*** | 0.984*** | 0.514*** | -0.262*** | 0.297*** | -0.129*** |
| | (0.092) | (0.023) | (0.093) | (0.062) | (0.033) | (0.048) |
| NGO × No Gov in 2010 | -0.017 | 0.931*** | 0.914*** | -0.017 | 0.300*** | 0.276*** |
| | (0.031) | (0.060) | (0.070) | (0.023) | (0.045) | (0.048) |
| Gov in 2010 | 0.759*** | -0.085 | 0.674*** | 0.420*** | -0.112*** | 0.345*** |
| | (0.085) | (0.058) | (0.108) | (0.050) | (0.038) | (0.059) |
| Constant | 0.104** | 0.051 | 0.155** | 0.154*** | 0.147*** | 0.238*** |
| | (0.049) | (0.038) | (0.064) | (0.026) | (0.031) | (0.039) |
| Observations | 127 | 127 | 127 | 2,747 | 2,747 | 2,747 |
| R-squared | 0.747 | 0.949 | 0.791 | 0.422 | 0.197 | 0.273 |
| Mean Dep.Var. if NGO = 0 & Gov = 0 | 0.000 | 0.000 | 0.000 | 0.053 | 0.051 | 0.099 |

*Notes:* Observations are at the village level in cols. (1)-(3) and at the household level in cols. (4)-(6). Data source is the village chief survey in cols. (1)-(3) and the household survey in cols. (4)-(6). In parentheses, we present standard errors clustered at the village level for household-level regressions and robust standard errors for village-level regressions. All regressions include area fixed effects, and the following controls (measured in 2010 and de-meaned) and their interactions with government presence in 2010: private clinic within 10km and the number of households in the village. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

## Table 4: Health Services by Skilled Labor Scarcity

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | | Presence of Health Workers in the Village in 2012 | | Household Received Medical Care from the Following in the Past Year (2012) | | |
| | Gov = {0, 1} | NGO = {0, 1} | Total = {0, 1, 2} | Gov = {0, 1} | NGO = {0, 1} | Any = {0, 1} |
| **Mean Dep.Var.** | **0.425** | **0.504** | **0.929** | **0.313** | **0.235** | **0.457** |
| NGO × Gov in 2010 × Scarcity of Skilled Labor | -0.554*** | 0.961*** | 0.407*** | -0.315*** | 0.253*** | -0.164*** |
| | (0.091) | (0.045) | (0.100) | (0.053) | (0.027) | (0.046) |
| NGO × Gov in 2010 × Abundancy of Skilled Labor | 0.173 | 1.048*** | 1.221*** | 0.358*** | 0.554*** | 0.326*** |
| | (0.135) | (0.051) | (0.149) | (0.070) | (0.034) | (0.056) |
| NGO × No Gov in 2010 | -0.056 | 0.948*** | 0.892*** | -0.021 | 0.360*** | 0.310*** |
| | (0.050) | (0.045) | (0.071) | (0.029) | (0.041) | (0.044) |
| Gov in 2010 | 0.787*** | -0.058 | 0.729*** | 0.423*** | -0.030 | 0.382*** |
| | (0.098) | (0.041) | (0.110) | (0.054) | (0.036) | (0.064) |
| Constant | 0.118*** | 0.033 | 0.151** | 0.158*** | 0.086*** | 0.207*** |
| | (0.054) | (0.027) | (0.065) | (0.028) | (0.028) | (0.036) |
| Observations | 127 | 127 | 127 | 2,735 | 2,735 | 2,735 |
| R-squared | 0.770 | 0.953 | 0.816 | 0.449 | 0.217 | 0.291 |
| $H_0$: NGO × Gov × Scarcity = NGO × Gov × Abund. (p-value) | <0.001 | 0.364 | <0.001 | <0.001 | <0.001 | <0.001 |

*Notes:* Observations are at the village level in cols. (1)-(3) and at the household level in cols. (4)-(6). Data source is the village chief survey in cols. (1)-(3) and the household survey in cols. (4)-(6). In parentheses, we present standard errors clustered at the village level for household-level regressions and robust standard errors for village-level regressions. All regressions include area fixed effects and the following village-level controls (measured in 2010 and de-meaned) and their interactions with "NGO × Gov in 2010" and "NGO × No Gov in 2010": government clinic within 10km, the number of households in the village, average standardized index of wealth. All household-level regressions additionally control for whether the household received medical care from a government clinic in the past year (measured in 2010 and de-meaned) and its interaction with "NGO × Gov in 2010" and "NGO × No Gov in 2010". We define a village to have abundant (resp., scarce) skilled labor supply if the share of public or private sector workers (non-farmers) is in the top quartile (resp., in the bottom three quartiles). *** p<0.01, ** p<0.05, * p<0.1.

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**Table 5:** Health Outcomes

| | Infant Mortality (2010-12) | | Child Health Behavior Index in 2012 |
|---|---|---|---|
| | (1) | (2) | (3) |
| | ≥ 1 died = {0, 1} | Deaths/1,000 births | |
| Sample: | HHs with a birth since 2010 | All villages | HHs with a child below age 5 |
| **Mean Dep.Var.** | **0.073** | **65.004** | **0.045** |
| NGO × Gov in 2010 | 0.017 | 3.103 | -0.065 |
| | (0.024) | (21.389) | (0.055) |
| NGO × No Gov in 2010 | -0.022 | -30.124 | 0.035 |
| | (0.019) | (20.085) | (0.039) |
| Gov in 2010 | -0.031 | -39.868* | 0.100* |
| | (0.024) | (23.709) | (0.051) |
| Constant | 0.093*** | 96.665*** | 0.013 |
| | (0.019) | (17.063) | (0.034) |
| Observations | 1,402 | 127 | 2,045 |
| R-squared | 0.030 | 0.232 | 0.156 |

At top, spanning columns (1) and (2): "Dependent Variable"

*Notes*: Sample restrictions are stated in the column headings. Observations are at the household level in all columns except col. (2) in which they are at the village level. Data source is the household survey. In parentheses, we present standard errors clustered at the village level for household-level regressions and robust standard errors for village-level regressions. All regressions include area fixed effects, and the following controls (measured in 2010 and de-meaned) and their interactions with government presence in 2010: private clinic within 10km and the number of households in the village. The child health behavior index is the average standardized effect of four variables: whether children are fully immunized, sleep under bednet, drink treated water, or wash hands before food and after toilet. *** p<0.01, ** p<0.05, * p<0.1.

**Table 6:** Health Outcomes by Skilled Labor Scarcity

| | Dependent Variable | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| | Infant Mortality (2010-12) | | Child Health Behavior Index in 2012 |
| | $\geq 1$ died = {0, 1} | Deaths/1,000 births | |
| Sample: | HHs with a birth since 2010 | All villages | HHs with a child below age 5 |
| **Mean Dep.Var.** | **0.073** | **65.004** | **0.045** |
| NGO × Gov in 2010 × Scarcity of Skilled Labor | 0.027 (0.022) | 12.338 (22.755) | -0.065 (0.059) |
| NGO × Gov in 2010 × Abundancy of Skilled Labor | -0.018 (0.024) | -30.956 (23.215) | 0.133** (0.064) |
| NGO × No Gov in 2010 | -0.042* (0.021) | -48.257** (24.034) | 0.065 (0.042) |
| Gov in 2010 | -0.051** (0.025) | -56.826** (26.273) | 0.120* (0.060) |
| Constant | 0.105*** (0.017) | 103.493*** (17.955) | -0.019 (0.039) |
| Observations | 1,394 | 127 | 2,036 |
| R-squared | 0.039 | 0.288 | 0.168 |
| $H_0$: NGO × Gov × Scarcity = NGO × Gov × Abund. (p-value) | 0.155 | 0.147 | 0.017 |

*Notes:* Sample restrictions are stated in the column headings. Observations are at the household level in all columns except col. (2) in which they are at the village level. Data source is the household survey. In parentheses, we present standard errors clustered at the village level for household-level regressions and robust standard errors for village-level regressions. All regressions include area fixed effects and the following village-level controls (measured in 2010 and de-meaned) and their interactions with "NGO × Gov in 2010" and "NGO × No Gov in 2010": government clinic within 10km, the number of households in the village, and average standardized index of wealth. All household-level regressions additionally control for whether the household received medical care from a government clinic in the past year (measured in 2010 and de-meaned) and its interaction with "NGO × Gov in 2010" and "NGO × No Gov in 2010". The child health behavior index is the average standardized effect of 4 variables: whether children are fully immunized, sleep under bednet, drink treated water, or wash hands before food and after toilet. We define a village to have abundant (resp., scarce) skilled labor supply if the share of public or private sector workers (non-farmers) is in the top quartile (resp., in the bottom three quartiles). *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

# Appendix

## A    Mortality Measurement

Household-level data on mortality are collected in the 2012 endline survey. For each household, we know the total number of children who were born and who died between the two waves of surveys in May 2010 and December 2012. We observe the age in years at death but do not know the exact date of birth or death. Thus, we cannot calculate under-one-month mortality or under-five mortality.

We calculate the village-level infant mortality ratio as the number of children in the village who were born *and* who died below age one between the two waves of surveys divided by the number of children who were born between the two waves of surveys times one thousand. Any child born before the endline survey *and* who died before the age of one after the endline survey will increase the denominator of our mortality ratio without increasing the numerator. This causes our mortality ratio to understate infant mortality.

## B    Mechanisms

### B.1    Selection of Health Workers

Deserranno (2019) studies the recruitment process of health workers. Her data contain information on 241 government health workers from the same program that we study. There is no overlap between our main dataset and these data, which are from a different region.[44] Before the NGO position was advertised, all 241 government health workers were asked to complete a brief questionnaire about their socioeconomic background, education, experience and prosocial motivation. They, along with other eligible candidates, could later apply to be an NGO community health worker.

Appendix Table A.13 (row 1) 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

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[44]One difference between our context and the one in Deserranno (2019) is that the latter focuses on government health workers who are also members of the NGO micro-finance program. Unlike our health-worker-level data, which only include NGO workers, these data include all applicants to the NGO, regardless of whether they are hired or not, and all non-applicants.

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 apply to work for the NGO are 14 percentage-points more likely to self-report that "earning money" is the most important feature in a new job, and 14 percentage-points less likely to say that "earning respect" is the most important feature in a new job relative to the non-applicants. This suggests that the government health workers who try to switch are 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.

## B.2    Time Allocation of Health Workers

Negative selection on time-invariant individual characteristics (such as altruism and prosocial motivation) cannot explain the worsening of health outcomes without other changes since it is the *same* person who switches from working for the government to working for the NGO. A complementary mechanism is a reallocation of effort away from health services caused by the "dual-task" pay structure used by the NGO. This highly acclaimed business model increases the financial independence from institutional donors by paying community workers with commissions from selling health-related household products (e.g., soap, condoms, fortified oil). Since health workers are not paid for health services, the worker could reallocate time away from health services into selling products after moving to the NGO (Wagnerly, Asiimwe, and Levine, 2020; Deserranno, 2019).

Appendix Table A.14 presents self-reported time use data collected by Reichen-bach and Shimul (2011) for 660 workers hired by the NGO. The data indicate that only 21-37% of total time is allocated towards delivering free health services.[45] To-gether with the fact that aid workers in our sample work thirteen hours per week, this means that they spend approximately 2.73 to 4.81 hours per week providing free health services. This is lower than the ten hours per week of health services provided by government workers reported by Mays et al. (2017).

In summary, negative selection and effort reallocation together appear to drive

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[45]The range depends on whether time attending refresher trainings, which include visits to the branch office to resupply products for selling, is counted as a health or commercial activity.

the negative effect of poaching on downstream health outcomes. The same worker will not reduce effort when switching to the NGO unless if the incentive structure differs. The change in incentive structure reduces the health services of an altruistic worker less than a commercially motivated one. Given the NGO incentive structure, an altruistic worker reallocates less effort away from providing health services after switching from the government to the NGO. Negative selection occurs as long as the NGO offers higher pay than the government, and is not specific to the dual-task model. The reallocation of effort is an outcome of the dual-task incentive structure.

## B.3 Alternative Mechanisms: Worse Coordination with Government Clinics or Higher Drug Prices

One way that health workers reduce infant mortality is to coordinate with the staff of health clinics in urban areas to ensure the presence of a health professional for an assisted delivery when the woman arrives at the clinic. When a government health worker shifts to the NGO, she may reallocate time away from the presumably costly effort of coordination. This is similar to the reallocation of effort discussed earlier. A related, but distinct, change that could occur when the health worker switches to the NGO is that the staff of government clinics may be less willing to coordinate with her than when she was working for the same government employer. This would make NGO workers less effective in reducing infant mortality. However, it cannot explain why child health behavior in villages with poaching is worse than villages with only a government worker since changing child health behavior does not require the coordination between the health worker and the staff of government clinics.

Another explanation for the increase in infant mortality is that the price of the drugs that the government worker distributed for free (e.g., antimalarials, oral rehydration solution, zinc, pain relievers) may have increased when she moves to the NGO. However, this cannot explain why child health behavior in villages with poaching is worse than villages with only a government worker. Moreover, the low price levels charged by the NGO goes against this playing a major role.[46]

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[46]The drugs that the government dispenses for free are sold for very low prices by the NGO. One cycle of antimalarials, one sachet of oral rehydration solution or 15 tabs of zinc are all sold for 200 UGX (1.3% of the average daily household income in Uganda), while pain relievers are essentially free. As a comparison, 500mg of soap is sold for 4,000 UGX (26% of the average daily household income).

Table A.1: Summary Statistics and Balance Checks (Additional Variables)

| Sample of villages: | All | | All | Gov in 2010 | No Gov in 2010 | All | All |
|---|---|---|---|---|---|---|---|
| | Mean | SD | NGO | NGO | NGO | Gov in 2010 | Scarcity of Skilled Labor |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| **Baseline Household Characteristics [Household Survey]** | | | | | | | |
| Observations (# households) | 3,745 | | 3,745 | 2,131 | 1,614 | 3,745 | 3745 |
| Involved in farming = {0, 1} | 0.519 | 0.500 | -0.034* | -0.056* | -0.008 | 0.013 | 0.021 |
| | | | (0.018) | (0.031) | (0.022) | (0.024) | (0.014) |
| Mother's age | 31.22 | 10.167 | -0.098 | -0.223 | -0.128 | -0.074 | 0.866* |
| | | | (0.395) | (0.620) | (0.431) | (0.538) | (0.488) |
| Mother completed primary education = {0, 1} | 0.383 | 0.486 | -0.005 | 0.037 | -0.048 | -0.052* | -0.075 |
| | | | (0.024) | (0.033) | (0.037) | (0.028) | (0.061) |
| Number of infants | 0.283 | 0.485 | 0.023 | 0.017 | 0.047** | 0.015 | -0.017 |
| | | | (0.018) | (0.028) | (0.022) | (0.021) | (0.032) |
| Children sleep under bednet = {0, 1} | 0.669 | 0.471 | -0.020 | -0.023 | -0.017 | -0.004 | -0.031 |
| | | | (0.022) | (0.032) | (0.033) | (0.023) | (0.041) |
| Children drink treated water = {0, 1} | 0.722 | 0.448 | -0.003 | -0.008 | -0.003 | 0.027 | -0.035* |
| | | | (0.023) | (0.037) | (0.036) | (0.024) | (0.020) |
| Children wash hands before food & after toilet = {0, 1} | 0.923 | 0.266 | -0.005 | -0.015 | -0.003 | -0.019 | -0.013 |
| | | | (0.011) | (0.017) | (0.014) | (0.017) | (0.020) |
| School was open at least 1 day in the past week = {0, 1} | 0.714 | 0.452 | -0.025 | -0.023 | -0.020 | 0.021 | 0.005 |
| | | | (0.017) | (0.025) | (0.026) | (0.021) | (0.028) |
| Number of children who attended school at least 1 day in the past week | 1.139 | 1.211 | -0.073 | 0.000 | -0.134** | 0.056 | 0.108* |
| | | | (0.048) | (0.075) | (0.065) | (0.064) | (0.061) |

*Notes*: Observations are at the household level. Data source is the household survey. Sample restrictions are stated in the column headings. Cols. (1)-(2) state the sample mean and standard deviation of the variable named in the row heading. Cols. (3)-(7) show the estimates from regressions of the row variable on NGO entry (cols. 3-5), government presence in 2010 (col. 6), scarcity of labor suply (col.7), controlling for area fixed effects. In parentheses, we present standard errors clustered at the village level. "Scarcity of skilled labor" is a dummy variable that takes value zero if the share of public or private sector workers (non-farmers) is in the top quartile, and value one if it is in the bottom three quartiles. *** p<0.01, ** p<0.05, * p<0.1.

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## Table A.2: Balance Check – Interacted Model

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A. Presence of a Health Care Provider in 2010 [Village Chief Survey]** | | | | **B. Village Size, Infant Mortality and Socio-Economic Background in 2010 [Census Data Aggregated to Village Level]** | | | | | | | **C. Received Medical Care in 2010 [Household Survey]** | | | | | |
| | Traditional healer in the village = [0, 1] | Drug store in the village = [0, 1] | Government clinic within 10 km of the village = [0, 1] | Private clinic within 10km of the village = [0, 1] | Number of HHs in the village | Number of infants per HH | Number of infants who died in the past year per HH | % HHs involved in farming | % HHs involved in a private or public sector job | % HH heads who completed primary education | Standardized index of wealth | ... from a government health worker in the past year = [0, 1] | ... from a traditional healer in the past year = [0, 1] | ... from a drug store in the past year = [0, 1] | ... from a government clinic in the past year = [0, 1] | ... from a private clinic in the past year = [0, 1] | Child health behavior index |
| **Mean Dep.Var.** | **0.480** | **0.677** | **0.559** | **0.835** | **182.071** | **0.291** | **0.041** | **0.568** | **0.377** | **0.376** | **0.000** | **0.037** | **0.024** | **0.151** | **0.251** | **0.391** | **0.000** |
| NGO × Gov in 2010 | 0.024 | 0.067 | -0.067 | 0.114* | 24.283 | -0.022 | -0.004 | 0.014 | -0.037 | 0.042 | 0.068 | -0.014 | -0.004 | -0.008 | -0.041 | -0.031 | -0.035 |
| | (0.125) | (0.066) | (0.114) | (0.068) | (20.144) | (0.021) | (0.015) | (0.034) | (0.034) | (0.044) | (0.064) | (0.010) | (0.007) | (0.019) | (0.032) | (0.026) | (0.047) |
| NGO × No Gov in 2010 | -0.076 | -0.022 | -0.044 | -0.041 | -73.314 | 0.013 | -0.007 | 0.059* | -0.044 | -0.051 | -0.028 | 0.001 | 0.001 | 0.003 | 0.019 | 0.003 | -0.009 |
| | (0.132) | (0.020) | (0.108) | (0.056) | (44.874) | (0.018) | (0.007) | (0.035) | (0.036) | (0.041) | (0.094) | (0.008) | (0.006) | (0.037) | (0.028) | (0.030) | (0.045) |
| Gov in 2010 | -0.082 | -0.064 | -0.051 | -0.066 | -98.536** | -0.007 | -0.010 | 0.054 | -0.062 | -0.064 | -0.051 | 0.010 | 0.007 | -0.011 | 0.038 | -0.020 | 0.003 |
| | (0.155) | (0.053) | (0.141) | (0.046) | (43.473) | (0.019) | (0.010) | (0.040) | (0.045) | (0.045) | (0.085) | (0.008) | (0.007) | (0.034) | (0.039) | (0.035) | (0.047) |
| Constant | 0.539*** | 0.701*** | 0.618*** | 0.850*** | 249.145*** | 0.298*** | 0.050*** | 0.519*** | 0.433*** | 0.413*** | 0.017 | 0.035*** | 0.021*** | 0.159*** | 0.236*** | 0.411*** | 0.010 |
| | (0.110) | (0.022) | (0.092) | (0.031) | (35.254) | (0.012) | (0.007) | (0.029) | (0.035) | (0.034) | (0.063) | (0.006) | (0.005) | (0.027) | (0.027) | (0.025) | (0.034) |
| Observations | 127 | 127 | 127 | 127 | 127 | 127 | 127 | 127 | 127 | 127 | 127 | 3,727 | 3,727 | 3,727 | 3,727 | 3,727 | 3,745 |
| R-squared | 0.217 | 0.786 | 0.364 | 0.557 | 0.374 | 0.387 | 0.424 | 0.906 | 0.880 | 0.634 | 0.920 | 0.119 | 0.023 | 0.201 | 0.172 | 0.094 | 0.104 |
| H₀: NGO × Gov = NGO × No Gov (p-value) | 0.590 | 0.188 | 0.883 | 0.086 | 0.058 | 0.208 | 0.880 | 0.375 | 0.886 | 0.130 | 0.404 | 0.245 | 0.597 | 0.796 | 0.172 | 0.387 | 0.707 |

*Notes:* Observations are at the village level in cols. (1)-(11) and at the household level in cols. (12)-(17). All dependent variables are measured at baseline. In parentheses, we present standard errors clustered at the village level for household-level regressions and robust standard errors for village-level regressions. All regressions include area fixed effects. *** p<0.01, ** p<0.05, * p<0.1.

**Table A.3:** Balance Check – Standardized

| Sample of villages: | All | Gov in 2010 | No Gov in 2010 | All | All |
|---|---|---|---|---|---|
| | NGO | NGO | NGO | Gov in 2010 | Scarcity of Skilled Labor |
| | (1) | (2) | (3) | (4) | (5) |

**Village Size, Infant Mortality and Socio-Economic Background in 2010 [Census Data Aggregated to Village Level]**

| | | | | | |
|---|---|---|---|---|---|
| Number of households in the village | -0.091 | 0.237 | -0.397* | -0.284 | -0.617** |
| | (0.151) | (0.247) | (0.228) | (0.182) | (0.271) |
| Number of infants per household | -0.055 | -0.289 | 0.134 | -0.289 | -0.179 |
| | (0.167) | (0.241) | (0.266) | (0.227) | (0.265) |
| Number of infants who died in the past year per | -0.065 | -0.062 | -0.223 | -0.204 | 0.085 |
| | (0.128) | (0.212) | (0.183) | (0.170) | (0.140) |
| % households involved in farming | 0.083 | 0.059 | 0.166 | 0.063 | 0.455*** |
| | (0.062) | (0.131) | (0.102) | (0.068) | (0.123) |
| % household heads who completed primary education | 0.014 | 0.266 | -0.140 | -0.064 | -0.276 |
| | (0.121) | (0.222) | (0.178) | (0.137) | (0.264) |
| Standardized index of wealth | 0.029 | 0.106 | -0.021 | -0.007 | -0.273** |
| | (0.057) | (0.076) | (0.136) | (0.082) | (0.128) |

*Notes*: Observations are at the village level. Sample restrictions are stated in the column headings. We show the estimates from regressions of the row variable divided by its standard deviation on NGO entry (cols. 1-3), government presence in 2010 (col. 4), scarcity of labor suply (col. 5), controlling for area fixed effects. In parentheses, we present robust standard errors. *** p<0.01, ** p<0.05, * p<0.1.

## Table A.4: Attrition

**Panel A: Attrition Rate**

| Sample of villages: | All | All | Gov in 2010 | All |
|---|---|---|---|---|
| | Mean | NGO | NGO | Gov in 2010 |
| | (1) | (2) | (3) | (4) |
| Household attrited between baseline and endline = {0, 1} | 0.266 | 0.019 (0.023) | 0.051 (0.036) | -0.048 (0.032) |

*Notes:* Observations are at the household level. Sample restrictions are stated in the column headings. Col. (1) states the attrition rate. Cols. (2)-(4) show the estimates from regressions of attrition on NGO entry (cols. 2-3), and government presence in 2010 (col. 4), controlling for area fixed effects. In parentheses, we present standard errors clustered at the village level.

**Panel B: Testing for Differential Attrition with and without NGO Entry**

| | Dependent Variable: Household Attrited B = {0, 1} | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sample of villages: | All | | | Gov in 2010 | | | No Gov in 2010 | | |
| | NGO | $\mathbf{X^*}$ | NGO × $\mathbf{X^*}$ | NGO | $\mathbf{X^*}$ | NGO × $\mathbf{X^*}$ | NGO | $\mathbf{X^*}$ | NGO × $\mathbf{X^*}$ |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| List of $\mathbf{X^*}$: | | | | | | | | | |
| Received medical care from a government health worker in the past year = {0, 1} | 0.017 (0.023) | -0.066 (0.095) | 0.062 (0.120) | 0.048 (0.034) | -0.058 (0.114) | 0.058 (0.143) | -0.048 (0.032) | -0.024 (0.095) | -0.012 (0.133) |
| Received medical care from a traditional healer in the past year = {0, 1} | 0.019 (0.023) | -0.046 (0.052) | 0.002 (0.085) | 0.054 (0.035) | 0.006 (0.068) | -0.088 (0.104) | -0.050 (0.032) | -0.132*** (0.036) | 0.167 (0.144) |
| Received medical care from a drug store in the past year = {0, 1} | 0.024 (0.024) | 0.006 (0.034) | -0.036 (0.056) | 0.052 (0.037) | -0.014 (0.033) | -0.013 (0.065) | -0.032 (0.030) | 0.030 (0.056) | -0.082 (0.076) |
| Received medical care from a government clinic in the past year = {0, 1} | 0.011 (0.023) | -0.054 (0.022) | 0.030 (0.042) | 0.030 (0.036) | -0.092*** (0.030) | 0.089* (0.050) | -0.028 (0.031) | 0.013 (0.033) | -0.073 (0.061) |
| Received medical care from a private clinic in the past year = {0, 1} | 0.037 (0.026) | 0.024 (0.026) | -0.044 (0.036) | 0.054 (0.040) | 0.011 (0.034) | -0.006 (0.048) | -0.015 (0.032) | 0.026 (0.038) | -0.072 (0.047) |
| Involved in farming = {0, 1} | -0.018 (0.026) | -0.086*** (0.031) | 0.068* (0.039) | 0.010 (0.053) | -0.087* (0.046) | 0.051 (0.059) | -0.038 (0.030) | 0.010 (0.040) | -0.039 (0.065) |
| Mother's age | -0.019 (0.055) | -0.005*** (0.001) | 0.001 (0.002) | 0.011 (0.078) | -0.006*** (0.001) | 0.001 (0.002) | -0.032 (0.066) | -0.001 (0.001) | -0.001 (0.002) |
| Mother completed primary education = {0, 1} | 0.028 (0.029) | 0.049* (0.025) | -0.024 (0.035) | 0.051 (0.042) | 0.025 (0.034) | -0.003 (0.051) | -0.043 (0.040) | 0.051* (0.027) | -0.004 (0.042) |
| Number of infants | 0.007 (0.026) | -0.051** (0.019) | 0.044 (0.029) | 0.041 (0.039) | -0.032 (0.026) | 0.036 (0.043) | -0.063* (0.034) | -0.080*** (0.026) | 0.060* (0.036) |
| Standardized index of wealth | 0.017 (0.023) | 0.073 (0.050) | 0.004 (0.022) | 0.040 (0.036) | 0.167** (0.066) | 0.010 (0.033) | -0.100** (0.049) | -0.081 (0.064) | 0.093* (0.049) |
| Children sleep under bednet = {0, 1} | 0.016 (0.032) | -0.018 (0.018) | 0.004 (0.031) | 0.069 (0.047) | -0.009 (0.025) | -0.028 (0.039) | -0.071* (0.041) | -0.026 (0.026) | 0.035 (0.048) |
| Children drink treated water = {0, 1} | 0.042 (0.044) | 0.054 (0.039) | -0.032 (0.045) | 0.075 (0.050) | 0.052 (0.047) | -0.038 (0.055) | -0.113 (0.075) | 0.001 (0.051) | 0.081 (0.071) |
| Children wash hands before food & after toilet = {0, 1} | 0.091* (0.051) | 0.087** (0.035) | -0.077 (0.048) | 0.166*** (0.061) | 0.114*** (0.037) | -0.124** (0.061) | -0.054 (0.086) | 0.031 (0.063) | 0.007 (0.076) |
| School was open at least 1 day in the past week = {0, 1} | -0.008 (0.033) | -0.046 (0.030) | 0.037 (0.037) | 0.004 (0.054) | -0.090*** (0.031) | 0.061 (0.049) | -0.035 (0.037) | 0.021 (0.054) | -0.019 (0.059) |
| Number of children who attended school at least 1 day in the past week | 0.008 (0.025) | -0.020* (0.011) | 0.009 (0.013) | 0.031 (0.045) | -0.035*** (0.012) | 0.015 (0.017) | -0.032 (0.028) | 0.008 (0.020) | -0.016 (0.024) |
| Observations (# households) | 3,745 | | | 2,131 | | | 1,614 | | |

*Notes:* Observations are at the household level. Data source is the household survey. Sample restrictions are stated in the column headings. Each row presents the estimates from a regression of attrition onto NGO entry, X*, NGO entry × X*, where X* is a household characteristic measured at baseline, and listed in the raw column. All regressions include area fixed effects. In parentheses, we present standard errors clustered at the village level. *** p<0.01, ** p<0.05, * p<0.1.

**Table A.5:** Health Services with Lee Bounds

| | | Dependent Variable | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | Household Received Medical Care from the Following in the Past Year (2012) | | | Household Received Medical Care from the Following in the Past Year (2012) | | |
| | Gov = {0, 1} | NGO = {0, 1} | Any = {0, 1} | Gov = {0, 1} | NGO = {0, 1} | Any = {0, 1} |
| Sample of villages: | Gov in 2010 | | | No Gov in 2010 | | |
| **Mean Dep.Var.** | **0.546** | **0.238** | **0.623** | **0.045** | **0.231** | **0.265** |
| NGO - Lower Bound | -0.261*** | 0.296*** | -0.154*** | -0.025 | 0.317*** | 0.292*** |
| | (0.030) | (0.021) | (0.036) | (0.017) | (0.025) | (0.022) |
| NGO - Upper Bound | -0.172*** | 0.385*** | -0.064** | -0.014 | 0.328*** | 0.303*** |
| | (0.028) | (0.034) | (0.026) | (0.012) | (0.021) | (0.023) |
| Observations | 2,132 | 2,132 | 2,132 | 1,613 | 1,613 | 1,613 |

*Notes*: This table presents Lee Bounds (2009). Sample restrictions are stated in the column headings. Observations are at the household level. Data source is the household survey. In parentheses, we present bootstrapped standard errors.

Table A.6: Main Results with More Controls

|  | | Dependent Variable | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| | Presence of Health Workers in the Village 2012 | | | Household Received Medical Care from the Following in the Past Year (2012) | | | Infant Mortality (2010-12) | | Child Health Behavior Index in 2012 |
| | Gov ={0,1} | NGO ={0,1} | Total ={0,1,2} | Gov ={0,1} | NGO ={0,1} | Any ={0,1} | ≥1 died. ={0,1} | Deaths/ 1,000 births | |
| **Mean Dep.Var.** | **0.425** | **0.504** | **0.929** | **0.313** | **0.235** | **0.457** | **0.073** | **65.004** | **0.045** |
| NGO × Gov in 2010 | -0.463*** | 0.986*** | 0.523*** | -0.257*** | 0.291*** | -0.120** | 0.019 | 4.419 | -0.072 |
| | (0.103) | (0.026) | (0.103) | (0.064) | (0.032) | (0.050) | (0.024) | (22.575) | (0.053) |
| NGO × No Gov in 2010 | -0.027 | 0.942*** | 0.915*** | -0.021 | 0.309*** | 0.286*** | -0.023 | -29.635 | 0.071* |
| | (0.033) | (0.050) | (0.061) | (0.021) | (0.047) | (0.048) | (0.020) | (18.160) | (0.041) |
| Gov in 2010 | 0.760*** | -0.073 | 0.688*** | 0.402*** | -0.117*** | 0.336*** | -0.032 | -25.491 | 0.160*** |
| | (0.081) | (0.050) | (0.093) | (0.044) | (0.041) | (0.054) | (0.028) | (27.879) | (0.049) |
| Constant | 0.070 | 0.020 | 0.090 | 0.144*** | 0.148*** | 0.223*** | 0.102*** | 80.446*** | -0.036 |
| | (0.054) | (0.027) | (0.061) | (0.025) | (0.036) | (0.039) | (0.025) | (21.451) | (0.039) |
| Observations | 127 | 127 | 127 | 2,735 | 2,735 | 2,735 | 1,394 | 127 | 2,036 |
| R-squared | 0.769 | 0.958 | 0.822 | 0.437 | 0.208 | 0.283 | 0.049 | 0.334 | 0.186 |

*Notes:* Observations are at the village level in cols. (1)-(3), (8) and at the household level in the other columns. Data source is the village chief survey in cols. (1)-(3) and the household survey in cols. (4)-(9). In parentheses, we present standard errors clustered at the village level for household-level regressions and robust standard errors for village-level regressions. All regressions include area fixed effects and the following village-level controls (measured in 2010 and de-meaned) and their interactions with government presence in 2010: presence of health providers in the village (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, average number of infants per household in the village), infant mortality (average number of infants who died per household in the village), average household characteristics (farming as main occupation, completed primary education, standardized index of wealth). All household-level regressions also include the following household-level controls (measured in 2010 and de-meaned) and their interactions with government presence in 2010: household access to care from health providers (traditional healer, drug store, government clinic, private clinic), number of infants, child health behavior index. *** p<0.01, ** p<0.05, * p<0.1.

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**Table A.7:** Main Results without Controls

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| | Presence of Health Workers in the Village 2012 | | | Household Received Medical Care from the Following in the Past Year (2012) | | | Infant Mortality (2010-12) | | Child Health Behavior Index in 2012 |
| | Gov ={0,1} | NGO ={0,1} | Total ={0,1,2} | Gov ={0,1} | NGO ={0,1} | Any ={0,1} | ≥1 died. ={0,1} | Deaths/ 1,000 births | |
| **Mean Dep.Var.** | **0.425** | **0.504** | **0.929** | **0.313** | **0.235** | **0.457** | **0.073** | **65.004** | **0.045** |
| NGO × Gov in 2010 | -0.466*** | 0.976*** | 0.510*** | -0.259*** | 0.299*** | -0.127*** | 0.014 | 4.641 | -0.031 |
| | (0.092) | (0.027) | (0.097) | (0.061) | (0.033) | (0.047) | (0.021) | (19.716) | (0.057) |
| NGO × No Gov in 2010 | -0.020 | 0.939*** | 0.919*** | -0.019 | 0.315*** | 0.288*** | -0.019 | -26.793 | 0.021 |
| | (0.027) | (0.050) | (0.059) | (0.020) | (0.043) | (0.046) | (0.020) | (19.526) | (0.041) |
| Gov in 2010 | 0.791*** | -0.070 | 0.720*** | 0.428*** | -0.093** | 0.361*** | -0.028 | -39.935* | 0.058 |
| | (0.074) | (0.050) | (0.095) | (0.049) | (0.038) | (0.057) | (0.023) | (22.034) | (0.050) |
| Constant | 0.107*** | 0.046 | 0.153*** | 0.154*** | 0.128*** | 0.221*** | 0.090*** | 92.973*** | 0.016 |
| | (0.040) | (0.034) | (0.058) | (0.023) | (0.028) | (0.034) | (0.018) | (15.520) | (0.032) |
| Observations | 127 | 127 | 127 | 2,747 | 2,747 | 2,747 | 1,402 | 127 | 2,045 |
| R-squared | 0.709 | 0.948 | 0.760 | 0.418 | 0.193 | 0.270 | 0.029 | 0.224 | 0.147 |

*Notes*: Observations are at the village level in cols. (1), (2), (3), (8) and at the household level in the other columns. Data source is the village chief survey in cols. (1)-(3) and the household survey in cols. (4)-(9). In parentheses, we present standard errors clustered at the village level for household-level regressions and robust standard errors for village-level regressions. All regressions include area fixed effects and no other controls. The child health behavior index is the average standardized effect of 4 variables: whether children are fully immunized, sleep under bednet, drink treated water, or wash hands before food and after toilet.  *** p<0.01, ** p<0.05, * p<0.1.

**Table A.8:** Main Results (Using Dummy Variables as Dependent Variables) with Logit Regressions

| | Dependent Variable | | | |
| --- | --- | --- | --- | --- |
| | (1) | (2) | (3) | (4) |
| | Household Received Medical Care from the Following in the Past Year (2012) | | | Infant Mortality (2010-12) |
| | Gov = {0, 1} | NGO = {0, 1} | Any = {0, 1} | $\geq 1$ died = {0, 1} |
| **Mean Dep.Var.** | **0.313** | **0.235** | **0.457** | **0.073** |
| NGO × Gov in 2010 | -1.270*** | 1.846*** | -0.610** | 0.208 |
| | (0.339) | (0.220) | (0.245) | (0.297) |
| NGO × No Gov in 2010 | -0.354 | 2.432*** | 1.745*** | -0.466 |
| | (0.322) | (0.299) | (0.255) | (0.338) |
| Gov in 2010 | 2.634*** | -0.221 | 1.980*** | -0.580 |
| | (0.304) | (0.323) | (0.302) | (0.356) |
| Constant | -2.330*** | -2.537*** | -1.442*** | -1.614*** |
| | (0.465) | (0.389) | (0.359) | (0.553) |
| Observations | 2,747 | 2,747 | 2,747 | 1,402 |
| $H_0$: NGO × Gov = NGO × No Gov (p-value) | 0.058 | 0.113 | 0.000 | 0.146 |

*Notes:* Logit regressions. Observations are at the household level. Data source is the household survey. In parentheses, we present standard errors clustered at the village level. All regressions include area fixed effects, and the following controls (measured in 2010 and de-meaned) and their interactions with government presence in 2010: private clinic within 10km and the number of households in the village. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

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Table **A.9**: Main Results by Poaching

| | Dependent Variable | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | Household Received Medical Care from the Following in the Past Year (2012) | | | Infant Mortality (2010-12) | | Child Health Behavior Index in 2012 |
| | Gov = {0,1} | NGO = {0,1} | Any = {0,1} | ≥ 1 died = {0,1} | Deaths / 1,000 births | |
| **Mean Dep.Var.** | **0.313** | **0.235** | **0.457** | **0.073** | **65.004** | **0.045** |
| NGO × Gov in 2010 × NGO Hired Gov in 2012 | -0.493*** | 0.239*** | -0.231*** | 0.090** | 68.341** | -0.125** |
| | (0.050) | (0.029) | (0.048) | (0.037) | (31.389) | (0.062) |
| NGO × Gov in 2010 × NGO Hired $2^{nd}$ Worker in 2012 | 0.015 | 0.331*** | 0.015 | -0.044* | -45.701** | 0.019 |
| | (0.068) | (0.050) | (0.061) | (0.026) | (23.021) | (0.068) |
| NGO × No Gov in 2010 | -0.018 | 0.359*** | 0.319*** | -0.046** | -57.712* | 0.099** |
| | (0.031) | (0.041) | (0.046) | (0.021) | (22.702) | (0.043) |
| Gov in 2010 | 0.457*** | -0.027 | 0.400*** | -0.069*** | -74.641*** | 0.169*** |
| | (0.059) | (0.038) | (0.070) | (0.024) | (24.323) | (0.059) |
| Constant | 0.132*** | 0.085*** | 0.193*** | 0.119*** | 116.574*** | -0.056 |
| | (0.032) | (0.029) | (0.041) | (0.018) | (17.153) | (0.044) |
| Observations | 2,735 | 2,735 | 2,735 | 1,394 | 127 | 2,036 |
| R-squared | 0.477 | 0.216 | 0.295 | 0.047 | 0.362 | 0.172 |
| $H_0$: NGO × Gov × Hired Gov = NGO × Gov × Hired $2^{nd}$ (p-value) | 0.000 | 0.092 | 0.000 | 0.010 | 0.009 | 0.068 |

*Notes*: Sample restrictions are stated in the column headings. Observations are at the household level in all columns except col. (5) which is at the village level. Data source is the household survey. In parentheses, we present standard errors clustered at the village level for household-level regressions and robust standard errors for village-level regressions. All regressions include area fixed effects and the following village-level controls (measured in 2010 and de-meaned) and their interactions with "NGO × Gov in 2010" and "NGO × No Gov in 2010": government clinic within 10km, the number of households in the village, the share of households involved in farming, average standardized index of wealth. All household-level regressions additionally control for whether the household received medical care from a government clinic in the past year (measured in 2010 and de-meaned) and its interaction with "NGO × Gov in 2010" and "NGO × No Gov in 2010". The child health behavior index is the average standardized effect of 4 variables: whether children are fully immunized, sleep under bednet, drink treated water, or wash hands before food and after toilet. "NGO Hired Gov in 2012" is a dummy variable that indicates whether the NGO hired the government worker (vs. hired a second person who is not the government worker). *** p<0.01, ** p<0.05, * p<0.1.

**Table A.10:** Child Health Behavior

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | | Dependent Variable | | |
| | | Child Health Behavior in 2012 | | |
| | Children are fully immunized = {0, 1} | Children sleep under bednet = {0, 1} | Children drink treated water = {0, 1} | Children wash hands before food & after toilet = {0, 1} |
| | | Sample = HHs with a child below age 5 | | |
| **Mean Dep.Var.** | **0.905** | **0.725** | **0.722** | **0.878** |
| NGO × Gov in 2010 | -0.006 | -0.083** | -0.011 | -0.066** |
| | (0.017) | (0.033) | (0.047) | (0.033) |
| NGO × No Gov in 2010 | 0.023 | 0.007 | 0.012 | -0.005 |
| | (0.022) | (0.030) | (0.026) | (0.018) |
| Gov in 2010 | 0.012 | 0.094*** | 0.045 | 0.036 |
| | (0.029) | (0.028) | (0.035) | (0.023) |
| Constant | 0.891*** | 0.704*** | 0.702*** | 0.889*** |
| | (0.020) | (0.022) | (0.023) | (0.015) |
| Observations | 2,045 | 2,747 | 2,747 | 2,747 |
| R-squared | 0.236 | 0.090 | 0.212 | 0.094 |

*Notes*: Observations are at the household level. Data source is the household survey. In parentheses, we present standard errors clustered at the village level. All regressions include area fixed effects, and the following controls (measured in 2010 and de-meaned) and their interactions with government presence in 2010: private clinic within 10km and the number of households in the village. *** p<0.01, ** p<0.05, * p<0.1.

**Table A.11:** Fertility

|  | Dependent Variable | | | |
|---|---|---|---|---|
|  | (1) | (2) | (3) | (4) |
|  | | Child Health Behavior in 2012 | | |
|  | Children are fully immunized ={0, 1} | Children sleep under bednet ={0, 1} | Children drink treated water ={0, 1} | Children wash hands before food & after toilet ={0, 1} |
|  | | Sample = HHs with a child below age 5 | | |
| **Mean Dep.Var.** | **0.905** | **0.725** | **0.722** | **0.878** |
| NGO × Gov in 2010 | -0.006 | -0.083** | -0.011 | -0.066** |
|  | (0.017) | (0.033) | (0.047) | (0.033) |
| NGO × No Gov in 2010 | 0.023 | 0.007 | 0.012 | -0.005 |
|  | (0.022) | (0.030) | (0.026) | (0.018) |
| Gov in 2010 | 0.012 | 0.094*** | 0.045 | 0.036 |
|  | (0.029) | (0.028) | (0.035) | (0.023) |
| Constant | 0.891*** | 0.704*** | 0.702*** | 0.889*** |
|  | (0.020) | (0.022) | (0.023) | (0.015) |
| Observations | 2,045 | 2,747 | 2,747 | 2,747 |
| R-squared | 0.236 | 0.090 | 0.212 | 0.094 |

*Notes*: Observations are at the household level. Data source is the household survey. In parentheses, we present standard errors clustered at the village level. All regressions include area fixed effects, and the following controls (measured in 2010 and de-meaned) and their interactions with government presence in 2010: private clinic within 10km and the number of households in the village. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

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**Table A.12:** School Closures

| | Dependent Variable | |
| --- | --- | --- |
| | (1) | (2) |
| | School was open at least 1 day in the past week = {0, 1} | Number of children who attended school at least 1 day in the past week |
| | School Closures in 2012 | |
| **Mean Dep.Var.** | **0.853** | **1.475** |
| NGO × Gov in 2010 | -0.038 | -0.043 |
| | (0.023) | (0.101) |
| NGO × No Gov in 2010 | -0.047* | -0.164** |
| | (0.024) | (0.079) |
| Gov in 2010 | 0.001 | 0.004 |
| | (0.031) | (0.110) |
| Constant | 0.883*** | 1.520*** |
| | (0.023) | (0.073) |
| Observations | 2,747 | 2,747 |
| R-squared | 0.019 | 0.068 |

*Notes:* Observations are at the household level. Data source is the household survey. In parentheses, we present standard errors clustered at the village level. All regressions include area fixed effects, and the following controls (measured in 2010 and de-meaned) and their interactions with government presence in 2010: private clinic within 10km and the number of households in the village. *** p<0.01, ** p<0.05, * p<0.1.

Table A.13: Selection of Government Workers (Deserranno, 2019)

| Definition of X*: | Baseline | Household-Level Characteristics | | | | | Village-Level Characteristics | | | |
| | - | Mother's age | Mother completed primary education = {0, 1} | Standardized index of wealth | Child health behavior index | Involved in farming = {0, 1} | Private or public clinic within 10 km = {0, 1} | Traditional healer in the village = {0, 1} | Drug store in the village = {0, 1} | Number of households / 1,000 |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| **Mean Dep.Var.** | **0.501** | **0.501** | **0.501** | **0.501** | **0.501** | **0.501** | **0.501** | **0.501** | **0.501** | **0.501** |
| NGO × Gov in 2010 | -0.046* | 0.002 | -0.052* | -0.041 | -0.045* | -0.103** | -0.175*** | -0.050 | -0.057 | -0.012 |
| | (0.025) | (0.079) | (0.028) | (0.027) | (0.025) | (0.050) | (0.054) | (0.037) | (0.041) | (0.060) |
| NGO × No Gov in 2010 | 0.047 | 0.046 | 0.095** | 0.065 | 0.048 | 0.041 | 0.106 | 0.070 | 0.119 | 0.120* |
| | (0.033) | (0.097) | (0.045) | (0.062) | (0.034) | (0.034) | (0.199) | (0.044) | (0.199) | (0.069) |
| Gov in 2010 | 0.055 | 0.130 | 0.090** | 0.049 | 0.055 | 0.065 | 0.242 | 0.068 | 0.078 | 0.021 |
| | (0.038) | (0.097) | (0.041) | -0.064 | (0.038) | (0.052) | (0.208) | (0.045) | (0.205) | (0.064) |
| NGO × Gov in 2010 × X* | | -0.001 | 0.023 | 0.018 | 0.023 | 0.082 | 0.149** | 0.006 | 0.022 | -0.231 |
| | | (0.002) | (0.062) | -0.03 | (0.038) | (0.065) | (0.059) | (0.058) | (0.053) | (0.388) |
| NGO × No Gov in 2010 × X* | | -0.000 | -0.094 | -0.037 | -0.019 | 0.024 | -0.066 | -0.056 | -0.082 | -0.315 |
| | | (0.003) | (0.058) | (0.065) | (0.052) | (0.082) | (0.201) | (0.058) | (0.202) | (0.220) |
| Gov in 2010 × X* | | -0.002 | -0.072 | 0.013 | 0.007 | 0.014 | -0.209 | -0.028 | -0.027 | 0.282 |
| | | (0.003) | (0.058) | (0.069) | (0.051) | (0.081) | (0.212) | (0.058) | (0.210) | (0.326) |
| X* | | -0.007*** | 0.065* | -0.110* | 0.012 | -0.092 | 0.061 | 0.034 | -0.018 | 0.024 |
| | | (0.002) | (0.038) | (0.064) | (0.041) | (0.068) | (0.207) | (0.041) | (0.207) | (0.116) |
| Constant | 0.484*** | 0.726*** | 0.450*** | 0.503*** | 0.484*** | 0.520*** | 0.430** | 0.469*** | 0.490** | 0.469*** |
| | (0.027) | (0.074) | (0.033) | -0.058 | (0.028) | (0.032) | (0.203) | (0.034) | (0.203) | (0.043) |
| Observations | 2,747 | 2,598 | 2,747 | 2,747 | 2,747 | 2,747 | 2,747 | 2,747 | 2,747 | 2,747 |
| R-squared | 0.078 | 0.118 | 0.080 | 0.081 | 0.079 | 0.080 | 0.080 | 0.079 | 0.079 | 0.080 |

*Notes:* Observations are at the household level. Data source is the household survey. In parentheses, we present standard errors clustered at the village level. X* is defined in the column heading. All regressions include area fixed effects, and the following controls (measured in 2010 and de-meaned) and their interactions with government presence in 2010: private clinic within 10km and the number of households in the village. *** p<0.01, ** p<0.05, * p<0.1.

**Table A.14:** NGO Time Allocation Across Tasks (Reichenbach and Shimul, 2011).

| Sample: | Government workers who applied to the NGO | | Government workers who did not apply to the NGO | | p-value (1)=(3) |
|---|---|---|---|---|---|
| | Mean (1) | SD (2) | Mean (3) | SD (4) | (5) |
| Observations | 109 | | 132 | | 241 |
| Most important job characteristic is [...] | | | | | |
| Money = {0, 1} | 0.398 | 0.492 | 0.256 | 0.438 | 0.019 |
| Respect = {0, 1} | 0.241 | 0.430 | 0.380 | 0.487 | 0.022 |
| Helping community = {0, 1} | 0.361 | 0.483 | 0.364 | 0.483 | 0.959 |
| Frequency of free services to community (0=never, 1=rarely, 2=often) | 1.519 | 0.634 | 1.773 | 0.655 | 0.003 |
| Age | 37.312 | 8.495 | 37.362 | 7.778 | 0.962 |
| Married = {0, 1} | 0.752 | 0.434 | 0.710 | 0.456 | 0.464 |
| Years of schooling | 8.422 | 2.692 | 7.053 | 3.306 | 0.001 |
| Main occupation is agriculture | 0.196 | 0.399 | 0.140 | 0.348 | 0.245 |
| Number of months as a health worker | 34.276 | 38.588 | 26.452 | 32.916 | 0.105 |

*Notes:* Data source is Deserranno (2019). The sample comprises of 241 government health workers in Western Uganda. Before the NGO position was advertised, these workers were asked to complete a brief questionnaire about their socio-economic background, experience and prosocial motivation. We compare government workers who applied to the NGO position and those who did not.

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