Governance and Effectiveness of Public Health Subsidies

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Abstract

Heavily subsidizing essential health products through existing health infrastructure has the potential to substantially decrease child mortality in sub-Saharan Africa. There is, however, widespread concern that poor governance and, in particular, limited accountability among health workers may considerably undermine the effectiveness of such programs. This paper uses audit data from bed net distribution programs in three countries (Ghana, Kenya and Uganda) to investigate local agency problems in the allocation of targeted subsidies. Overall, agency concerns appear limited. Around 80% of the eligible receive the subsidy as intended and leakage to the ineligible appears negligible, even when the ineligible have a high willingness to pay. We provide survey evidence that pro-social motivation, job satisfaction and perceived accountability are on average higher among health workers than among other workers (e.g. teachers), and that levels of both intrinsic and (to a lesser extent) extrinsic motivation correlate with performance within our sample.

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1 Introduction

It has been estimated that up to 63 percent of child mortality could be averted through targeted coverage of inexpensive health products such as iron fortification, point-of-use water treatment, and insecticide-treated bed nets (Bryce, et al., 2005). While the health returns to these products are very large both *in utero* and in childhood, growing evidence suggests that demand for such products is limited at even low prices among poor, credit-constrained parents (Dupas, 2009; Cohen and Dupas, 2010; Meredith et al., 2013; Tarozzi et al., 2013). Thus, free or highly-subsidized distribution is often advocated as a necessary strategy for rapidly increasing coverage.

To implement such subsidies, government agencies and other major players must be able to identify eligible beneficiaries and effectively deliver products to them. The potentially most cost-effective way to do this is through the existing health infrastructure. This is particularly true for products for which medical diagnosis is necessary to identify who is eligible (for example, ARVs or anti-malarials), but substantial cost-savings have also been documented for other products, like bed nets, where diagnosis is not required (De Allegri et al., 2010).[1]

However, a potentially major problem with implementing subsidies through the existing service delivery infrastructure is that many public service providers are paid a fixed wage and are hard to fire, and thus likely have little direct incentive to exert the effort needed to effectively deliver services or products (World Development Report, 2004). Indeed, a number of studies show that service provision in developing countries can be quite poor. For example, akin to the literature on absence among teachers in public schools, a large proportion of health workers are often simply absent from work (Chaudhury et al., 2006; Chaudhury and Hammer, 2004; Banerjee, Deaton and Duflo, 2004; Muralidharan et al. 2011). Doctors often spend just a few minutes with patients, providing lower quality care than they know how to provide, and simultaneously over- and under-treating patients (see Das and Hammer 2013 and Das et al. 2008 for reviews).[2] Such low effort provision may have important health implications. Banerjee et al. (2010) show that simply increasing the reliability of immunization services in rural Udaipur, India, sufficed to double immunization rates. In Rwanda, performance incentives for health providers led to large increases in health care utilization rates and, in turn, child health (Gertler and Vermeersch, 2012).

Petty corruption is another important concern. In a 2011 report, Transparency International writes: "*Across Sub-Saharan Africa, corruption is believed to be one of the major*

[1] Even existing efforts to use the private sector for distribution often take a hybrid public-private approach, for example with the public sector distributing vouchers for redemption at private stores (Sexton, 2011).

[2] In fact, Das and Hammer (2005) present evidence that doctors' treatment choices actually harm patients.

barriers to achieving progress on the [Millennium Development Goals] MDGs. Petty corruption reduces service quality and access, serving as a tax on the poorest. For example, findings from a seven-country study in Africa – Ghana, Madagascar, Morocco, Niger, Senegal, Sierra Leone and Uganda – have shown that 44 per cent of the parents surveyed had paid illegal fees for schools that were legally free for their children" (Azeem et al., 2011).

While there is anecdotal evidence that these types of agency issues also affect subsidized distribution schemes, causing many governments and international donors to be reluctant to even try to set them up, it is unclear what the magnitudes of these problems truly are in the context of subsidies targeted to populations widely recognized as vulnerable (pregnant women, young children). For instance, it could be that health workers have sufficient non-financial incentives to be honest and exert effort, such as altruism towards those targeted by the subsidy. Evidence on this issue is lacking because measuring levels of leakage and extortion is challenging (Olken and Pande, 2012).

The specific contributions of this paper are to (1) estimate the extent to which agency problems undermine the effectiveness and cost-effectiveness of targeted subsisides for preventative health products in sub-Saharan Africa; and (2) understand which governance features matter for agency quality and hence the effectiveness of such subsidies. We do so by auditing a program recommended by the WHO but currently in place in only a limited number of countries due to governance concerns: providing free antimalarial bed nets to those most vulnerable to malaria, pregnant women and their unborn children, through antenatal care clinics. Our audit study took place in three countries, Ghana, Kenya, and Uganda, which vary in perceived corruption levels – out of 178 countries in the 2012 Transparency International Corruptions Index, where the least corrupt country is Denmark at rank 1 and Somalia, Afghanistan and North Korea tie for the worst place, Ghana was ranked 64th, Uganda 130th, and Kenya 139th. At the time of data collection, both the Kenya and Uganda governments were implementing free bed net distribution schemes for pregnant women enrolling for prenatal care. In Ghana, there was no such government program, but we set one up, and in the process could randomize several features in order to test specific hypotheses regarding the factors in the governance structure that may exacerbate or mitigate agency problems.

There are three main ways that health workers may undermine the type of subsidy programs we consider. First, they may demand under-the-counter payments from eligible clients – *extortion*. Second, they may provide the product to ineligible people – *leakage*. Leakage can have financial costs (if it implies subsidies are given to a larger pool of people than intended), and possibly more importantly, if the total number of subsidies is limited by a budget constraint, leakage may crowd out eligible recipients (who presumably have higher health returns from the subsidy). Third, health workers may provide poor effort generally,

by for example failing to attend work or failing to prevent stockouts – *shirking*.

Our first contribution is to document how prevalent these three behaviors are and to estimate the extent to which they limit the pass-through of subsidies to their intended beneficiaries. A key challenge in quantifying extortion, leakage and shirking is measurement – agents who engage in petty corruption of this type typically do not readily report doing so. To overcome this challenge, we devised a suite of measures that include audits on health center registers, back-check surveys with prenatal clients, and decoy visits to communities and health centers. Together, these measures enable us to get a full picture of the performance of health workers in our three study sites.

Overall, and compared to the bleak picture that the previous literature had painted about service provision in developing countries, we find relatively high performance levels across all three countries. Close to 80% of eligible subsidy recipients received the subsidy at the clinic (and 76% of them at their first prenatal visit, as they should have). Only 1.4% of eligible subsidy recipients were asked to pay bribes, and in only 4.7% of their visits did our "mystery clients" (ineligible men making decoy visits) obtain a subsidized net from the health facility (in most cases, for free). Finally, when asked informally where bed nets could be procured, less than 10% of community members thought an ineligible person could obtain a bed net at the local prenatal center.

We do see some differences across countries, however. Coverage among the eligible is lowest in Uganda, due in part to high stockout rates towards the end of the sample period (the Uganda government appeared to be phasing out the program). Bribe requests from mystery clients is highest in Ghana, at 5% (interestingly, the least corrupt of the three countries according to the Transparency International index). On the other hand, benevolent leakage (free bed nets to the ineligible) is larger in Kenya and Uganda, at 9% and 8% respectively, than in Ghana (2%).

In all cases, though, the levels of leakage and coverage we estimate imply that agency problems only marginally undermine the cost-effectiveness of free distribution schemes such as the one we study. Accounting exercises comparing the total number of nets delivered with the estimated total number of nets received by eligible recipients suggest that total leakage (including leakage higher up in the health system chain, e.g before subsidized products reach health facilities) is limited enough that free distribution of bed nets remains highly cost-effective per international standards.

Our second contribution is to examine whether interventions which affect the costs of corruption affect behavior. Since the research team was behind the implementation of the program in Ghana, we were able to randomly vary four aspects of the distribution scheme: whether health workers received bonus pay for implementing the program, whether health

centers were threatened with audits, how large the initial stock of bed nets received was, and whether health workers were asked to distribute nets directly or, instead, vouchers redeemable against free nets at local shops. The purpose of the voucher scheme was to change the health worker's ability to charge a markup, under the assumption that clients would be less likely to pay for a voucher than for a physical net. Unsurprisingly given the high overall levels of performance observed in their absence, we find that neither the bonus compensation, nor the threat of audits, nor the stock size had any meaningful impact on performance. However, the voucher scheme worsened performance on several measures. Eligible women were less likely to get a net and mystery clients were more likely to get a net. This seems due to, first, the fact that health workers' intrinsic job motivation is undermined by what they perceive as a lack of "trust" (i.e., the fact that they are not given responsibility for the subsidized bed nets themselves); and, second, lower community awareness of the (less visible) voucher scheme. The result that vouchers decrease performance is similar to Rasul and Rogger (2013), who find that bureaucrats in Nigeria with less autonomy are less likely to complete projects.

Our audit study overall reveals that agency problems among frontline providers are much less relevant than commonly believed among practitioners and international agencies (at least in our study context). Why are public health providers in Ghana, Kenya and to some extent Uganda performing much better than expected? One possible reason might be that distributing bed nets to prenatal clients requires little effort other than identifying a woman and handing her a net. However, health workers in our sample performed well on other measures unrelated to the bed net distribution program. For example, the clinics were almost never closed and nurses in our sample spent an average of 18 minutes with a patient during her visit (in contrast to, for example, the 3 minutes doctors spent with patients in Das et al. 2013 or Das and Hammer 2007).

Our data suggests three more likely explanations: compared to other professions (such as teachers), health workers in all three countries are positively selected with respect to pro-social motivation, have higher levels of intrinsic job motivation, and feel more accountable. Within our sample, we find positive correlations between these traits and performance levels. Uganda, where performance was lowest, appears to have the least motivated health workers.[3] It is an open question why selection, intrinsic job motivation, and accountability would differ in our context than the contexts studied by the previous literature (e.g., the teachers in Chaudhury et al. 2006 or the doctors studied by Das et al. 2013 or Das and Hammer 2007),

[3]This is consistent with the results of Björkman and Svensson (2009), in which a community monitoring program in Uganda reduced health care worker absenteeism, improved child weight, and reduced child mortality.

but we offer several potential (speculative) explanations.[4]

The remainder of the paper is organized as follows. Section 2 presents the conceptual framework that guided our study design, itself discussed in Section 3. Section 4 describes the innovative data collection protocols used. Section 5 presents performance results from the three audit studies and discusses their implication for the cost-effectiveness of free distribution schemes. Section 6 presents the experimental results from Ghana. Section 7 provides evidence on motivation levels of health workers and how those correlate with performance. Finally, Section 8 concludes and discusses our contribution to the literature.

2 Conceptual Framework

The conceptual framework underlying our study and experiment is based on Becker and Stigler (1974) and Banerjee (1997). We consider three types of agents: the government, a health worker, and the clients of a health clinic. The government has a set of publicly provided private health products that the clients need (in our case, insecticide-treated bed nets). The goal of the government is to allocate these health products in a way that maximizes social welfare. We assume that the health products are scarce in the sense that the number of people who need them exceeds the number of products the government can afford. Individuals vary in their need for the products: we assume that there is a group of people that value the products more highly, and thus have a higher willingness to pay for the product (for example, in the case of bed nets, the private health returns to using a bed net are higher for pregnant women than for the rest of the population).

In a frictionless environment, the market would deliver the efficient outcome that those who value the product most would get them. However, this is not true if there exist credit constraints, which could create a wedge between willingness and ability to pay for the credit-constrained (Cohen and Dupas 2010, Tarozzi et al. 2014). In this case, in environments where loans are infeasible because enforcing repayment is difficult and costly, a benevolent government must subsidize the product for individuals for whom the returns to obtaining the subsidized product are higher. In our bed net case, the efficient targeting rule would thus target the credit-constrained subset of pregnant women. Since targeting based on credit-constraints is infeasible and/or costly, however, the practical rule would be to target pregnant women.

The allocation of the health products is the responsibility of the health worker at a health

[4]For example, comparing nurses and teachers in our study areas, nurses are paid more, which could cause them to be more positively selected, as in Dal Bo, Finan and Rossi (2013). For nurses vs. doctors, performance quality may be more easily observable for nurses, which could increase the effective monitoring that they face.

facility. The health worker has to expend effort to deliver the product, and effort is costly. Assume that the health worker can observe the eligibility of the person who comes to the facility (e.g. the health worker can observe if the person is a pregnant woman or not). However, the government cannot monitor the health worker's behavior: in particular, the government observes neither the actual price charged by the health worker for the product, nor the eligibility of the people to whom the health worker offers (or not) the products.

The health worker's payoff has two components. The first is the monetary payoff she gets from the job, that is, her salary plus any income she may obtain from being corrupt on the job. The second is the non-monetary payoff she gets from helping clients achieving higher health outcomes. The *weight* the health worker puts on the non-monetary payoff is a function of her level of pro-social motivation. The *magnitude* of the non-monetary payoff itself depends on her beliefs with regards to the health impact of the tasks she has to perform, what we call her "intrinsic job motivation". The overall importance of the non-monetary payoff in the health worker's overall utility is thus a function of both pro-social motivation and intrinsic job motivation.

In this set-up, the health worker can engage in three forms of corruption, defined broadly as "incidents where a public employee breaks a rule for private gain" (Olken and Pande, 2013):

- *Extortion—extracting rents from the eligible*: having market power over the supply of the product (since other health facilities distributing the product are far away), the health worker can charge eligible people a price larger than the official subsidized price and pocket the difference. This will tend to reduce social welfare in two ways: (1) if demand is price-sensitive, fewer targeted people will access the product than if there were no extortion; and (2) part of the government subsidy is captured by theh health worker, for whom the marginal utility of cash is likely lower than for the poor, towards whom the subsidy was targeted. Extortion will happen if the resulting increase in the health worker's monetary payoff outweighs the reduction in her non-monetary payoff.

- *Leakage—diverting the subsidized product to the ineligible*: the health worker may give or sell some of the products to ineligible people. In particular, if some ineligible people have a higher willingness to pay than some eligible people (due for example to credit constraints), and if the health worker can price discriminate, then the health worker could allocate the product to the ineligible person and pocket the difference. If the total number of subsidies is limited, this leakage may crowd out the receipt of the subsidy among the eligible. This might lead to inefficient allocation of the products (from a public health perspective) if those who would benefit most from the product are not

able to pay a higher price because they are liquidity constrained, or, conversely, those willing to pay the higher price for it have lower health returns. Leakage will happen if the resulting increase in the health worker's monetary payoff outweighs the reduction in her non-monetary payoff.

- *Shirking—not implementing the program*: the health worker does not pay the effort cost associated with delivering the subsidy to eligible clients, even though it is part of her job description. This will happen if the health worker's utility gain from lower effort outweighs the utility loss coming from the lower non-monetary payoff associated with lower effort.

On the other hand, the health worker could break the targeting rule *for public gain* – namely, if she has private information on the ability to pay of the clients that visit the health facility, as well as on the likely health returns of product use for these clients, the health worker may be able to implement a more efficient targeting rule than the blunt government rule. For example, health workers may deny the free bed net to pregnant women that are wealthy enough to already have one; or grant a free bed net to poor ineligible men who have an unprotected child.

The first contribution of this paper is to quantify the importance of these four forms of "rule-breaking" and their associated impact on the targeting and resulting cost-effectiveness of subsidies.

The second contribution of the paper is to estimate the effectiveness of various anti-corruption programs that, if extortion and/or leakage are indeed important, could be put in place by governments. We test four hypotheses:

1. Clients are less willing to pay a bribe for a voucher (i.e., a piece of paper that can be redeemed elsewhere for the product) than for the product itself. Therefore, the government can reduce corruption by introducing a voucher scheme in which vouchers must be redeemed at a third party rather than by implementing direct distribution through health workers.

2. Increasing existing health workers' compensation can reduce corruption if pro-social motivation and effort have positive income elasticities, or if payments increase health workers' pro-social motivation as a form of gift exchange.

3. Threatening to shut down the program if a top-down audit reveals foul play can reduce corruption if health workers are sufficiently pro-socially motivated to not want to deprive the community of the program, or are concerned that their jobs (and corresponding monetary payoff) would be threatened if they are caught breaking program

rules, or if it is profit-maximizing for health workers to decrease corruption when the threat of being caught increases.

4. Health workers know for whom the returns to using the subsidized product is higher and are sufficiently pro-socially motivated to care whether those people receive the subsidy. Thus increasing the tightness of the budget constraint by giving out fewer nets to the clinic (such that providing a net to any given individual will more likely crowd out a net for someone else) can reduce leakage and improve targeting towards those with higher returns.

To the best of our knowledge, there is no evidence on the first and last hypothesis in the literature. Regarding hypothesis 2, there is some evidence that higher public wages are correlated with lower corruption, but most of the evidence is cross-sectional (Van Rijkenghem and Weder, 2001; Rauch and Evans, 2000). Dal Bo, Finan and Rossi (2013) provide experimental evidence that higher wages improve selection into public service, but our study differs because it involves increasing the pay of existing health workers when asking them to take on a new task, thus shutting down the selection margin. Di Tella and Schargrodsky (2004) provide some evidence that higher-paid procurement officers respond more to corruption crackdowns in Argentina than lower-paid officers; however, their results could reflect factors other than wages and could run through channels other than corruption. Regarding hypothesis 3, Olken (2007) finds that top-down audits reduce corruption among local officials granting road-construction contracts, but bottom-up monitoring does not, in part due to information problems. In our context, misconduct by frontline providers is likely easily observable by the local community since the targeting rule is based on pregnancy status, so the scope for bottom-up monitoring is higher, potentially reducing the need for top-down audits.

3 Study design

3.1 Study Sites

Our sample consists of 168 rural health facilities (72 in Ghana, 48 in Kenya and 48 in Uganda). We chose these three countries as follows. First, we picked Ghana for the experimental site since it did not have any bed net distribution program and therefore it was possible for the research team to implement one with randomized variation in program features. Second, and *after* observing relatively high performance in Ghana, we picked Kenya and Uganda because they both had government-led bed net distribution programs through

prenatal clinics, are among the countries perceived as most corrupt according to Transparency International (TI), and because, as we shared our initial Ghana results, we got anecdotal reports that leakages were high in both these countries. We thus chose two additional countries where the *prior* was that leakage would likely be on the high side, hence providing an upper bound for the average costs of corrupt behavior on the part of health workers, while Ghana, ranking much better on the TI corruption index, was perceived as possibly providing a lower bound.

In each country, health facilities were selected for inclusion based on a census conducted of all of the public and private health facilities in a given region/province.[5] Inclusion criteria for health centers in the study were: (1) having an antenatal care clinic (ANC); and (2) being rural or semi-rural. For the Ghana sample, we had the following additional criteria: (3) having no other healthcare facilities within a 2 km radius, no hospitals within a 5 km radius, and not more than one other ANC within a 5 km radius;[6] (4) having no free LLIN program currently in place (which very few had); (5) having at least two stores within a 2 km radius willing to participate in a voucher scheme (only 6% of clinics were excluded by this criterion)[7]; and, (6) being accessible for net deliveries (less than 2% were inaccessible). Our final sample spans 21 districts in Ghana, 10 districts in Kenya, and 6 districts in Uganda.[8]

Table 1 presents average baseline characteristics for the 168 health centers in the study. They have been operating for 16 years on average and 85% of them are public. Health centers in the study sample enroll around 28 new ANC patients every month on average, and receive 63 revisits by existing ANC patients. They have on average 2.9 health workers (trained nurses and/or midwives) in charge of ANC patients and roughly 50% of health centers conduct outreach visits (i.e., they go to remote communities and provide "mobile" ANC services there). Only 13% are located within 10 kilometers of a store selling bed nets.

3.2 Timeline

The data collection in Ghana took place between October 2011 and April 2012. At the time, there was no bed net distribution program through antenatal care clinics, nor any other distribution scheme, although the Ministry of Health in Ghana had done some limited distributions of bed nets through antenatal care clinics in the past so health workers were

[5] We sampled one of 10 regions in Ghana, one of 8 provinces in Kenya, and one of 4 regions in Uganda.

[6] Since the research team had to fund the bed net distribution program in Ghana (see section 3.3 below), this inclusion criterion was to keep subsidy costs manageable by limiting the potential increase in ANC attendance in response to the program.

[7] The stores did not have to carry LLINs on their own prior to the program.

[8] At the time of sampling, the three countries had 170, 208, and 112 districts each, respectively. Ghana and Kenya have had administrative changes since then.)

somewhat accustomed to this type of scheme.

In Kenya and Uganda, data collection took place between May and September 2013. Since 2009, national policy in Kenya is that all pregnant women are provided a free long-lasting insecticide treated net (LLIN) at their first antenatal care visit. Funding for this distribution program comes primarily from the Global Fund to Fight AIDS, Turberculosis and Malaria, and from the President's Malaria Initiative. In Uganda, such distribution is not yet a national policy, but funding from the President's Malaria Initiative and USAID enabled such distribution in parts of the country, including our study area, starting in 2012 and ending in October 2013.

3.3 Ghana experiments

The 72 health facilities in the Ghana sample were invited to participate in an NGO program called SALI ("Saving Lives"). The program mimicked those ongoing in Kenya and Uganda, and consisted of distributing free Long Lasting Insecticide-Treated Nets (LLINs) to pregnant women during routine antenatal care visits. The program was approved by the Ghana Health Service and was implemented by antenatal care clinic staff (most of them midwives or nurses). We hired and trained SALI staff, whose job was to roll out the distribution program – namely, to visit health facilities to introduce the program, deliver bales of nets and train health workers on the eligibility criteria for the free net and on record-keeping. The SALI staff was completely unaware that an evaluation of the SALI program would be implemented, as were the health facilities.[9]

The program was rolled out into the 72 clinics over a 7-week period, from mid-October to early December 2011. The distribution program was announced as a continuous scheme, with health centers (or shops when applicable) given instructions on how to get a new delivery of LLINs before their stock ran out. In practice, the program stopped abruptly in all study health centers in mid-March 2012 when the Ghana Health Service rolled out a separate (unannounced) free distribution scheme for LLINs. Given this, health centers in our sample were exposed to the SALI program for up to 150 days, with an average of 109 days.

Prior to rolling out the program, we grouped the 72 clinics into 6 strata with comparable average characteristics (in terms of size of the health center, remoteness, and proximity to district borders). Within each stratum, we then randomly assigned the clinics into treatment groups that varied along several dimensions of the program that we hypothesized could affect the extent of leakage and extortion.

[9] As such, the protocol involved deception of research subjects (health workers). As per IRB requirement, health workers were "debriefed" on the true intent of the research study in the Fall 2013, after the study had been completed.

Distribution mechanism (Direct vs. Voucher): We randomly varied whether the LLINs were distributed directly through health centers, or indirectly through a voucher scheme wherein the health workers at prenatal clinics would distribute vouchers that could then be redeemed for a free LLIN at a local store. We assigned 48 health centers to "direct distribution" (as in the Kenya and Uganda government programs), and 24 health centers to a "voucher scheme." Since the great majority of health centers did not have any store selling bed nets in their vicinity, we stocked one or two local stores (located within two kilometers of health center) with LLINs and instructed shopkeepers to give one free LLIN to anyone who came in with a voucher from the local clinic and a corresponding ANC registration card.[10]

Staff monitoring (Audit vs. No Audit): Half of the clinics were randomly selected for the introduction of an "audit treatment." The audit treatment was rolled out in those clinics during the second through fourth weeks of January 2012. At that time, health workers were informed that the NGO implementing the program would perform audits, starting within the next month. How the audits would be performed was not disclosed, but health centers were warned that, if the audits revealed either leakage or extortion, the program would be shut down, depriving the local community of the program.

Pay (Compensation vs. No Compensation): In clinics with direct distribution, where health workers had the responsibility to manage the LLIN inventory and coordinate with the SALI project staff to avoid stockouts, we randomly varied whether health workers received compensation for implementing the program. The compensation was a fixed monthly fee of 100 Ghana cedis (US$60, corresponding to approximately 17% of the median monthly salary of a nurse or midwife or 25% of the median monthly salary of any healthworker) paid via direct deposit onto health workers' bank accounts.

Scarcity (Low vs. Large Delivery): Finally, within direct distribution clinics, we randomly varied whether the stock of LLINs delivered to the health center at the onset of the program was high or low. Since clinics were instructed to call the program officer to restock the nets whenever they would run out, this variation in the level of the initial stock should have no effect unless it affected the salience of the "budget constraint" – if a large stock made health workers less conscious of the scarcity and the fact that leaking the subsidy to ineligibles implicitly comes at the cost of not giving the subsidy to an eligible person.

Balance Columns (2)-(5) of Table A1 test for balance across our experimental groups in Ghana, both in terms of baseline characteristics (Panel A) and program implementation details (Panel B). We regress each dependent variable on a dummy variable for being as-

[10]Shops in our program did not make a piece-rate profit from nets, and so testing whether vouchers decrease stockouts was not a motivation for this treatment, although that could in principle be another advantage of vouchers.

signed to the voucher treatment, audit treatment, pay treatment, and large stock treatment. Columns (2)-(5) present coefficients and standard errors from these regressions. We find no statistically significant differences.

4 Data

In all three countries, we collected data through two completely independent teams unaware of each other's existence. The first is a team of "mystery clients" (undercover enumerators) asked to do decoy visits to health centers and their communities. The second is a team of regular surveyors, who administered surveys to ANC clients, health workers, as well as other professionals. In Ghana, we also have administrative data from the SALI staff (itself completely independent from the data collection teams), which kept program implementation records and also asked health centers to keep a log of program beneficiaries.

4.1 Decoy visits data

We sent undercover enumerators to local communities, who were trained to perform two types of decoy visits:

(1) *"Mystery Client" visits*: To identify leakage to a clearly ineligible individual, male undercover enumerators visited clinics (and stores, in the case of the voucher treatment) and tried to obtain a subsidized net. After concluding the interaction and once out of sight, mystery clients recorded the details of their encounter with the local health workers, including whether they were asked to pay a bribe. To minimize possible suspicion among health workers, mystery clients dressed casually and never visited the same health center twice. They were not asked to follow a specific script. Both the order in which mystery clients visited a health center and the timing (across and within days) in which clients visited a health center were randomized.

In Ghana, we paid enumerators 5 GHC for any bed net they were able to bring back from such mystery client visits. We scheduled 10 mystery visits per health center, 5 before the audit rollout period and 5 after. This led to an average of 0.6 mystery visits per health center per week. In Kenya and Uganda, because the bed nets distributed were from the government programs rather than our own NGO program, we did not incentivize enumerators to pay bribes for bed nets. We scheduled 3 mystery visits per health center over the course of two months.

(2) *Informal community interviews*: In all three countries, enumerators spoke with a convenience sample of community members about whether bed nets were available in the

area, if so where, at what price, what the eligibility criteria were, whether they thought an ineligible person would be able to obtain a net, and whether they themselves had received a net at the health center.[11] To elicit truthful answers, enumerators posed as visitors and did not introduce themselves as enumerators in Ghana and Kenya. In Uganda, we were unable to obtain an IRB waiver to conduct these visits undercover so they were conducted by the regular survey team described below in Section **??**. Again, no enumerator performed this activity in the same area twice. We polled around 18 community members per health center in each of the three countries.

4.2 Regular survey data

We use three types of regular survey data.

(1) ANC Clients Back-checking surveys: An important outcome is whether eligible clients received nets. To verify this, we hired regular teams of surveyors that conducted surveys with former ANC clients, at their homes. In all three countries, health workers keep registers of the women who come in for antenatal visits. These ANC registers include a record of each visit, as well as some rudimentary contact information (typically just the woman's name and the area she is from). These registers were used to sample randomly 20 pregnant women who had visited the facility for antenatal care in the previous 4 months.[12] The survey team attempted to visit these women at their homes and administered a short survey about their experience at the ANC clinic, their bed net ownership and usage, including whether they received a bed net from the local health center and at what price. A subset of them were also asked to play the dictator game (so that we have a basis of comparison for the health workers). The survey team was successful at reaching the great majority of the women sampled for this survey in Ghana (93%), but less so in Kenya (71%) and Uganda (67%). The rest could not be traced, typically because ANC registers contain almost no information on client's addresses and therefore tracing women from outer villages was particularly difficult. The higher attrition rate in Kenya and Uganda is likely due to the fact that the samples in these two countries included semi-urban health centers, who receive clients from a wider

[11] During each visit, the mystery clients were instructed to discuss with three individuals at the local market, as well as three households in their homes. The questions about whether the community members themselves had obtained nets were only asked in Uganda and Kenya.

[12] We think it is unlikely that health workers modified how they fill ANC registers in response to the bed net distribution programs, especially since (1) they likely did not expect anyone to use the ANC registers for audit purposes since they were asked to keep alternate records of bed net recipients, (2) in all countries the registers are formatted with one registrant per row (so all revisits are recorded on the initial row) which makes them very difficult to use for monitoring (i.e., difficult to calculate the number of visits the clinic would have received, which is the relevant metric for monitoring). As such, our prenatal client survey sample is likely a representative sample of the population of prenatal clients visiting the health centers.

catchment's area.

(2) Surveys of Health Workers: Health workers involved with prenatal clients were sampled for a survey that measured basic demographics, other-regarding preferences (i.e. dictator games) and other personality traits. This survey was administered by our regular surveyor teams and took place after all other data collection exercises had been completed, since being surveyed on one's level of intrinsic motivation and altruism could temporarily affect on-the-job performance. We were not able to survey all health workers involved with prenatal clients due to official leaves, or because some health workers being too busy for a survey or simply absent. To limit this we visited health centers multiple times to reach as many health workers as possible. We successfully interviewed 89% of health workers in Ghana, 74% in Kenya and 69% in Uganda.

(3) Surveys of Other Professionals: To get some sense of how intrinsic and extrinsic motivation vary between health workers and other people, our regular survey teams also conducted short surveys to measure other-regarding preferences (i.e. dictator game) and other personality traits with non-health workers, in particular, teachers, as well as (in Ghana and Uganda only) shopkeepers and microfinance agents. We also implemented dictator games with a random subset of ANC clients.

4.3 Ghana administrative data

In Ghana, where we set-up the distribution scheme at each participating health center, we have administrative data on bed net deliveries at each facility (timing and quantities delivered). We also have logs kept by health workers, in which they were asked to record some basic information (name, prenatal card number and address) for each person they gave a bed net or voucher to. The survey team attempted to visit these individuals at their homes and administered a short survey identical to the one administered to ANC clients. Surveyors were successful at reaching 94% of the individuals sampled for this survey. The success rate in tracing these individuals is in itself an outcome of interest.

5 Performance Results From Three Countries

We first examine the performance of the standard program (bed net distribution at clinics). For this we exclude from the analysis the 24 health centers in Ghana with a voucher scheme, keeping 48 health centers from each of the three countries studied, and we present the overall mean as well as country-specific means for each outcome, as well as the p-values for tests of equality for each country-pair.

5.1 Do the Eligible Receive the Full Subsidy?

We first consider the effectiveness of the bed net subsidy programs in reaching intended beneficiaries. The results from interviews with women randomly sampled from the ANC registers show that as many as 76% of intended beneficiaries received a net at their first prenatal visit as per program protocols (Table 2, column 1), and 80% received one at some point (column 3).[13] When we exclude clinics with reported stockouts at the time, the share of the eligible population receiving the subsidized net at their first prenatal care visit reaches 81% (column 2). Only 1% of them were asked to pay something in exchange for the net. [14]

The high average performance levels we observe mask some heterogeneity across countries. The coverage rate among the eligible is significantly higher in Kenya (90%) than in the other two countries, with Uganda trailing behind at only 69% coverage at the first visit conditional on nets being in stock (column 2). When asked why they did not receive a bed net, around 9% of the Ugandan women (20% of those who ventured an explanation) mentioned that it was because they already had a net or were rich enough to afford one, suggesting that health workers may have been targeting the subsidized nets to those needing them the most. Extortion is also significantly higher in Uganda, although the absolute level (3%) is still low.

Errors of exclusion or efficient targeting? In Table 3, we test more formally for whether those eligible who do not get the subsidy seem to be errors of exclusion (truly poor women who should have received a net) or the outcome of health workers exercising discretion over how to allocate the subsidy based on their local information. Specifically, we investigate whether, within clinic, those prenatal clients who have a higher socio-economic status (because they are more educated or wealthier), and thus are more likely to be able to afford a net on their own, are those less likely to receive a free net. We find suggestive but weak evidence that more educated women were less likely to get nets, potentially suggesting that some health workers were somewhat targeting the nets to those most likely to be

[13]These estimates exclude any ANC registrants who were sampled from the registers but we were unable to track. A very conservative lower bound approach would be to assume all of the registrants who we were unable to track and interview did not receive nets – note that we believe this is too conservative since the likelihood of tracking was based on factors that were plausibly orthogonal to likelihood of net receipt (e.g., observed coverage did not depend substantially on observables). The conservative lower bound approach would yield a 64% coverage rate for Kenya, 71% for Ghana, and 46% for Uganda.

[14]These results differ somewhat from those of Keefer and Khemani (2013), who estimate that up to 16 percent of households in Benin paid for bed nets that were *possibly* (depending on the time at which they were bought) supposed to be free. Even if they were all supposed to be free, the extent to which this result corresponds to a "tax on the poorest" is unclear, however – as hypothesized by the authors, it could be that frontline service providers use their local information on who is truly needy or unable to pay to effectively price discriminate, and use revenues from informal payments to improve service quality, e.g purchase equipment for the health facility.

liquidity-constrained. The magnitude of the effect is modest, however. For each year of education, the likelihood of receiving a free net reduces by 0.5 percentage points. This implies that a woman at the 75th percentile in terms of years of education (7.5 years) is 2.25 percentage points (11%) more likely to *not* receive a free net than a woman at the 25th percentile (3 years of education only).

5.2 Leakage to the Ineligible

Columns 1-7 of Table 4 show the results of the decoy health center visits by our "mystery clients" trying to obtain nets for which they were ineligible. First, on 20.5% of the visits in Kenya and Uganda, the clinic was actually out of stock (we know this from independent visits made by the survey team – see column 1). Stockouts were not measured independently in Ghana, but mystery client reports suggests it was rarer (4.6%, column 2). We thus focus on non-stockout visits to estimate leakage and make meaningful comparisons across countries. (Note that the stockout number used in Ghana is likely an upper bound, since health workers could have told ineligibles asking for nets that the clinic was out of stock as a way to gently deny their request; we still condition our leakage estimates for Ghana on no stockouts in order to have conservative – i.e., upper-bound estimates.)

Only 4.7% of the 685 non-stockout attempts made across all three countries were successful (column 3). This varied from 11% in Uganda to 8.7% in Kenya and to 2.2% only in Ghana. All of the nets ultimately leaked to mystery clients in Kenya and Uganda were given out for free (column 4), which is not surprising since the mystery clients in these two countries were not incentivized to pay for the (government sponsored) nets. What is more surprising is that while mystery clients in Ghana had a higher reservation price – we paid them 5 GHC per (NGO sponsored) net they successfully acquired from health centers, they were less successful at obtaining nets than their counterparts in Kenya and Uganda. Only 1.3% obtained a net by bribing and only 0.9% got a net for free (compared to 9% in Kenya and 11% in Uganda). Active requests for payments (presumably, bribes) from health workers, shown in column 5, were rarer in Kenya (3.6%) and Uganda (1.1%) than Ghana (5.0%). However, interpreting this difference is unclear because the average amount requested in Ghana was very high (90% of the full price of the net, even after bargaining had happened - column 6). For this reason, actual transactions occurred after only a quarter of the payment requests, suggesting either that some health workers were asking for a high price as a way to get rid of the visitor asking for a net, or that they intended to replace the leaked net with a purchased net, or that they did not want to break the rules or be corrupt for too small an amount of money.

These relatively low levels of leakage observed through decoy visits are consistent with informal interviews conducted by mystery clients with randomly sampled community members (columns 8-10 of Table 4). In all three countries, just around 10% of community members thought the male (and so obviously ineligible) mystery client could possibly get a net from the local facility. When asked if they themselves were able to acquire a net, less than 4 percent of men said they did (and this is an upper bound since some of them may be reporting a net they legitimately got for a pregnant wife or child under five).

Errors of inclusion or efficient targeting? In Table 5, we investigate the extent to which the leakage to our mystery clients (especially in Uganda and Kenya, where around 10% of mystery clients obtained free nets) comes from health workers bending the targeting rule when it is too harsh. In particular, we test whether the health workers are more likely to leak nets to mystery clients whose "narrative" made them appear as having a higher return to bed net usage, for example because they had a vulnerable child. The results in Table 5 suggest that this is the case. Mystery clients who mentioned a child were significantly more likely to obtain a free net. This result holds within country (columns 3-4) and also helps explain the cross-country variation we observe in leakage. Indeed, in Ghana, mystery clients systematically said that the net would be for their own use, while in Uganda and Kenya, some mystery clients argued they had a sick child at home. [15]

Of course, to the extent that pretending to have a needy child at home is "cheap talk", the fact that health workers respond to it is not necessarily evidence of efficient targeting – the health workers may perceive that they are targeting when they are not. On the other hand, mentioning a pregnant wife did not increase the odds that the mystery client obtains the subsidized net, often because health workers responded to such demands by saying "then tell your wife to come for prenatal care and she will get one".

Total Local Leakage Rate (Ghana only) Leakage to mystery clients may be an underestimate of leakage to local community members, since health workers may be more willing to break rules for people they know. In addition, our measure of leakage to community members relies on self-reports, which could also be biased downwards. To go around this problem, in this section we estimate an upper bound of total leakage using a completely different data source: the administrative records of bed net deliveries to health centers, as well as the records on beneficiaries kept by health centers, which we audited. We can do this exercise only in Ghana, the only country for which we have information on the total

[15] We view this evidence as suggestive, since the mystery clients' stories were not randomly selected, so the story used could also be endogenous to the interaction or correlated with other mystery client characteristics.

number of nets supplied in each clinic (we have this data since we implemented the program ourselves through the SALI team; it was not possible for us to obtain detailed govermental records of bed net deliveries to individual health centers in Kenya and Uganda). Combining all of the available information for Ghana, we estimate an upper bound for the percent of bed nets unaccounted for of 13%.[16] Figure 1 shows the distribution across the 48 clinics of the estimated (upper bound) number of bed nets unaccounted for. In the vast majority of clinics, the number of bed nets unaccounted for was quite low, with a median of 15 and a 75th percentile of 37 nets, numbers that would not be unreasonable for simple misplacing.[17]

5.3 Cost-Effectiveness Implications

5.3.1 Are the local leakage rates we observe high or low?

As discussed above, we estimate an overall leakage rate of just 4.7% to mystery clients across the 3 study sites. While these estimates may understate leakage (if health workers tend to leak more products to people they know), administrative records from Ghana suggest an upper bound of leakage of 13%. Is 13% high or low? Clearly, this figure is much lower than the unfathomably high rates of leakage in some studies. For example, Reinikka and Svensson 2004 estimate leakage rates for education grants in Ghana and Uganda of 49% and 87%, respectively,[18] while Niehaus and Sukhtankar (2013) find leakage of 70% for government wages in India. Our leakage rates are also lower than the lower bound of 18% found by Olken (2005) for leakage of food in a food relief program in Indonesia, though on par with recent evidence on the allocation of government transfer benefits in Indonesia (Alatas et al. 2013).

But maybe a better way to gauge the importance of 13% leakage is to estimate its impact on the cost-effectiveness of free distribution programs. Assuming no positive health impacts from leakage (so counting leakage as a pure deadweight loss, a strong assumption), 13% leakage implies an increase in the price per bed net delivered to an eligible person by 13% with no change in total health benefits. This would increase the cost per life saved as

[16]The percent of bed nets unaccounted for = 1 - (number of ledger entries * (% of valid entries) / number of nets distributed). The percent valid entries is equal to (1-% duplicates)*(1-% not found)*(1-% ineligible)*(1-% of listed beneficiaries who did not receive a net). This estimate is an upper bound since some of those not found or not recorded in the administrative ledger may have been legitimate program beneficiaries. The number of bed nets unaccounted for = number of nets distributed - number of ledger entries * (% of valid entries).

[17]Note that the number can be negative either as a result of sampling error in the data used to estimate the percentage of valid entries (so we may underestimate the number of valid entries), or errors in the records kept by the SALI program on the number of nets they delivered (though we think this is unlikely); in any case it is reassuring that it is never less than -10 nets.

[18]Reinikka and Svensson (2004) also report leakage rates of 76% in Zambia and 57% in Tanzania for school grants.

estimated in Cohen and Dupas (2010, Table IX) by $28 to $86, depending on the assumptions made regarding the importance of private and social returns among the eligible. The cost per life saved through free distribution would remain below $750 in the least favorable scenario (col. 9 in Table IX of Cohen and Dupas 2010), and as low as $226 in the most favorable one (col. 1). This is well below the cost-effectiveness threshold of $241 per disability-adjusted life year saved suggested by the World Bank in the 1993 World Development Report (World Bank, 1993).

5.3.2 Leakage Across the Entire Delivery Chain

Our results suggest that leakage at the point of distribution (once the nets have reached health facilities) is limited and do not threaten the cost-effectiveness of free distribution. But what about higher up in the chain? During the first mass distribution of bed nets in Kenya, a one-time scheme surrounding Malaria Day in April 2001, Guyatt et al. (2002) estimated that at least 20% of bed nets intended for distribution to pregnant women through ANC clinics had leaked before reaching the facilities. While such leakage does not contradict our finding that health workers at the point of distribution are performing well, it does have a different implication for the overall cost effectiveness of subsidy programs.

Higher level corruption is sure to be present in some countries and contexts (for example, in programs like those studied in Reinikka and Svensson 2004). But how important was it in the programs we studied? In this section, we do a simple accounting exercise to estimate an upper bound on the total rate of leakage, including leakage prior to the nets reaching the health centers, in the Uganda and Kenya government programs. We find that leakage higher up must have been very limited.

In Uganda, the Stop Malaria program (SMP) we audited reports distributing a total of 268,804 bed nets to 34 districts for the October 2012 to September 2013 period. In these 34 districts the total estimated ANC population over that period was 493,631.[19] Thus the program delivered bed nets to cover 55% of eligible pregnant women. We find a coverage rate of 66%, which is actually *higher* than the maximum potential coverage rate. While the fact that our coverage rate exceeds the overall rate is clearly because the area of study must have received more bednets per pregnant woman than average (perhaps because our study area is centrally located and may have received a higher share of procured bed nets than more remote regions), the numbers strongly suggest leakage higher up in the chain must have been minimal.

In Kenya, for the year 2013 2,800,000 free ITNs were procured for an estimated 2,837,475

[19] See http://www.usaid.gov/sites/default/files/documents/1860/SMP_Year_5_Annual_Report-Final_Oct2012-Sep2013.pdf, p. 9, last accessed August 26 2014.

eligible pregnant women and children under one nationwide.[20] This implies a maximum potential coverage rate of 98%. Compared to our observed coverage rate of 91% among pregnant women, this suggests a total leakage rate of just over 7%. Note that this is likely an upper bound since the 98% potential coverage rate assumes perfect allocation across health centers, and thus is itself an upper bound: since nets are delivered in bales of at least 100, it is likely that some health centers had a surplus at the end of the year while some others were stocked out.

To conclude, while corruption higher up in the distribution chain is not the focus of our study and while such corruption is certainly important in other countries and contexts, it does appear in this case that local leakage makes up a sizeable portion of overall mistargeting. This suggests that our finding that local leakage is low also implies that the overall efficiency of the program is high.

6 Experimental Results from Ghana

We now turn to the effects on performance of the four randomized program features in Ghana: the voucher scheme, the audit threat, compensation pay, and reducing the perceived trade-off between leakage and serving eligible patients by delivering a large stock at the onset of the program. Because the audit threat was rolled out midway through the program, we use a difference-in-differences specification to determine the effects of audits, comparing the results before- and after- the time when audit threats were rolled out at clinics that were vs. were not sampled for the audit threat. Specifically, we estimate regressions of the following form:

$$\begin{aligned} y_{ict} &= \alpha + \beta_1 Voucher_c + \beta_2 Audit_c \times Post_t + \beta_3 Pay_c + \beta_4 LargeDelivery_c \\ &\quad + \beta_5 Post_t + \delta Audit_c + \eta' X_c + u_{ict} \end{aligned} \tag{1}$$

where y_{ict} is the outcome of individual i at health center c in period t, X_c is a vector of health center level controls (specifically: randomization strata fixed effects, the timing of program introduction, baseline ANC attendance, and ANC staff size), and $Audit_c$, $Voucher_c$, Pay_c and $LargeDelivery_c$ are treatment dummies. $Post_t$ is a dummy equal to 1 if t is the post-audit rollout period, and 0 otherwise. We cluster the standard errors at the health center level.[21]

[20] see http://www.pmi.gov/docs/default-source/default-document-library/malaria-operational-plans/fy12/kenya_mop_fy12.pdf?sfvrsn=6, Table 4 on p. 18, last accessed August 26 2014.

[21] Three health centers had overlapping staff so they are considered as only one cluster.

The results are shown in Table 7. We see little effect of most of the experimental treatments, except for the voucher scheme. The first two columns of Table 6 show that subsidy coverage among the eligible was lower under the voucher treatment (row 1). Health workers were over 16.7 percentage points less likely to deliver the subsidy to prenatal patients (15.2% less likely for the first visit).[22] The voucher scheme did not affect extortion, as bribe requests were minimal (1%) under both the voucher and direct distribution schemes.

The percent of community members who were aware of the nets program was 8 percentage points lower (off of a base of 72 percentage points) in the areas surrounding voucher clinics relative to direct clinics (cols 5-6). That voucher schemes might have lower awareness is intuitive: vouchers, which can fit in a pocket, have lower visibility than bulky bed nets.[23] Low awareness could explain the lower coverage rate observed among the eligible: unaware women are unlikely to request a voucher if the health worker does not offer them one. At the same time, mystery clients were 3.4% more likely to obtain a program net in voucher clinics than in direct clinics, a large increase relative to the base level of 2% in direct clinics (and significant at 10%). Lower community awareness in voucher communities could mean that there was less community monitoring of health workers, which made them feel more comfortable accepting a higher proportion of offers from the ineligible.

Besides the reduced awareness effect, the voucher scheme may have performed less well due to its impact on the intrinsic job motivation of health workers asked to implement the distribution program. Indeed qualitative evidence provided by the program implementation team suggests that the voucher scheme lowered health worker morale, because health workers felt as though they were not trusted. In fact, 2 out of 24 voucher clinics refused to implement the program at all, while 0 of the 48 direct distribution clinics refused.[24]

The audit threat did not affect overall performance.[25] Also notable is the fact that the

[22]Because vouchers add an extra step to the process (pregnant women have to go to the store to redeem the voucher), incomplete redemption could also increase the coverage gap between voucher and direct clinics. In our sample, however, redemption rates are very high (over 95%). Thus, the gap in overall net receipts (17.3 percentage points) is only a little larger than the gap in product receipt at the clinic.

[23]Of course, bed nets were also being distributed by the stores in the voucher scheme, but community awareness of what happens in stores may generally be lower than of what happens in clinics, since stores are less likely to engage in subsidized schemes.

[24]We thank Kathleen Beegle for pointing out that this morale dampening effect may have been particularly pronounced in our experiment for the following reason. Health workers knew that we delivered bed nets to local shops for safekeeping, instead of delivering them to the health center. Therefore health workers likely perceived the voucher program as an anti-corruption scheme. If we had instead asked health workers to distribute vouchers for bed nets readily available in the retail sector, the voucher scheme may not have been perceived this way, as the health workers would have understood we were only subsidizing the clients, and not also subsidizing the local delivery costs. In practice, this was not an option we could pursue since 90% of health centers did not have a shop selling bed nets within 10 kilometers (see Table 1).

[25]When we estimate the effects of audits separately for clinics in the voucher scheme, we do find that the audit threat reduces the tendency of performance to worsen over time in these clinics, but the effect is small

payment treatment had no effect on any outcomes measured. The reason does not seem to be low power, since we can often rule out even modest effects (particularly because the sign of the point estimates is often opposite of what we would expect). For example, our 95% confidence intervals allow us to reject effects of payments on coverage as small as 6 percent.

Finally, we find inconclusive evidence on whether the large delivery treatment increased leakage. On the one hand, it somewhat increased leakage of free nets to mystery clients (column 9 of Table 6): the effect is not trivial in magnitude (a 1.6 percentage point increase off of a base leakage rate of only 2%) but insignificant at conventional level.[26] On the other hand, we find a large and significant negative effect of the large delivery treatment on the likelihood that community members refer mystery clients to the health facility for a bed net. Ultimately, it does not seem to be the case that making health workers aware of the tightness of the budget constraint can improve targeting.

7 Discussion

We find markedly higher performance of health workers in Kenya, Ghana and Uganda than has previously been found among public service providers in developing countries. Consequently, the experimental treatments in Ghana had limited effects. In this section, we explore possible explanations for the high performance levels of ANC workers in our study areas. We first document that the high performance we observe was not specific to the programs studied (bed net distribution). We then document that health workers appear positively selected in terms of pro-social motivation compared to other professionals with comparable pay, and that they also exhibit higher levels of job-specific intrinsic and extrinsic motivation. Within the health sector, these characteristics have some, albeit modest, predictive power for the performance level we observed in our audit studies.

7.1 Performance on other tasks

Table 7 presents data suggesting that health worker performance in our sample is high across the board, and not just with respect to bed net subsidy programs. Data from the ANC patient interviews show that nurses spent an average of 18 minutes with each patient.

compared to the cost of audits.

[26] This could be the reason why we observed more *free* nets being given to ineligible mystery clients in Kenya and Uganda than in Ghana (what we call "benevolent leakage"). Indeed, since the Ghana program was implemented by a small NGO at a small scale with unknown quantities of nets to offer, health workers may have been more reluctant to give subsidized nets out to the ineligible, compared to health workers in Kenya and Uganda where regular deliveries from district headquarters means that some leakage does not increase the risk of exclusion error (a pregnant woman missing out on a net).

There is some heterogeneity across countries: the figure is 25 minutes in Kenya on average, compared to 12 minutes in Ghana, with Uganda right in between at 21 minutes (col 1). Nurses conducted palpation (the key prenatal check that nurses are supposed to perform) for 92% of the clients, and this is comparable across countries (col 2). Average wait time for a checkup is right around an hour on average, but somewhat longer in Kenya and shorter in Ghana, consistent with the durations of each consultations (that is, women have to wait longer when nurses spend more time with each patient). While it is difficult to benchmark these numbers, they are clearly much larger than the 4-8 minutes spent per patient among doctors in India, Paraguay and Tanzania or the one question asked per patient in India reported in Das, Leonard and Hammer (2007) (in fact, visit times are longer than the amount spent in rich countries). ANC staff members also seem to engage in good record-keeping, with 96% of the key identifier fields filled in inthe registers (col 5) and 81% of entries having every key fields filled in (col 4).[27]

Figure 2 shows the results of unannounced attendance spot checks conducted at each clinic in the Kenya and Uganda samples. Of the health workers who were supposed to be on duty, 8% were absent in Kenya and 20% in Uganda, numbers which leave room for improvement but are much lower than the 35% rate found across countries and 38% rate found in Uganda by Chaudhury et al. (2012).[28] Since clinics in this setting are large enough that health workers can load-share, absenteeism may not compromise performance, as evidenced by the fact that clinics were closed for fewer than 1% of mystery client visits (Table 7, col 6). Also suggestive that attendance may not have direct consequences for service quality is the fact that we do not find a correlation between attendance and any of our other performance measures (e.g., coverage, leakage) as shown in Table A2.

7.2 Explaining high performance

7.2.1 Pro-social Motivation

As discussed in section 2, the likelihood that health workers engage in what we call "corrupt" behavior decreases with their level of pro-social motivation. Thus one reason that we may

[27]The "key fields" are name, registration date, ANC card #, address, # children, and gestational age at registration. We use data from the ANC registers on sampled patients only (we have the information for most clinics for all register entries but have not entered it). Note that the percent-filled ledger results in Panel G are a lower bound of the percent of key fields that health workers fill in because some clinics' ledgers may not have included all of the fields, but we cannot distinguish in our data whether it is blank because the health worker left it blank or because the ledger was missing the field.

[28]Note that our measure follows Chaudhury et al. (2012) and excludes health workers who were on authorized leave. As argued by Chaudhury et al. (2012), this measure may overstate attendance if authorized leaves are over-reported. For example, if we assumed that all of the workers in our data who were reported as "away on official duty" are truly absent, then absence rates increase to 26% and 36%, respectively.

see relatively high performance of health workers is if they have high levels of pro-social motivation. What level is sufficient to deter bad behavior is not clear, but if pro-social motivation explains our result, we should see that: (1) health workers to be more pro-socially motivated than workers in other sectors where corruption or shirking are higher, and (2) among health workers, pro-social motivation and performance are positively correlated.

To test (1), Table 8 presents results from surveys administered to health workers and other professionals. In Panel A, we present country-level averages of pro-social motivation measures among health workers. In Panel B, we run the following regressions:

$$y_{i,c} = \beta_1 + \beta_2 \times Teacher_i + \beta_3 \times Shopkeeper_i + \beta_4 \times MFI_i + X_i + v_c + \varepsilon_{ic}$$

where y_{ic} is the outcome of worker i in country c, and $Teacher_i$, $Shopkeeper_i$ and MFI_i are dummy variables equal to 1 if the individual is a teacher, shopkeeper or microfinance agent, respectively; and v_c is a vector of country fixed effects. Table 8 presents the coefficient estimates for β_2 , β_3 and β_4, each representing the difference between the respective profession and health workers. X_i is a vector of demographic controls (age and gender).

The results suggest that the great majority of health workers say that they receive personal satisfaction from helping people and do not expect anything in return from helping someone (Panel A); and, within country, much more so than other professionals we surveyed (Panel B). Among health workers, those in Uganda appear the least pro-socially motivated, and this is also the country where performance was lowest.

Besides survey responses, which can be subject to social desirability bias, we have an incentivized measure of other-regarding preferences in the outcome of a dictator game. In this game, respondents are given an envelope with bills and asked to privately divide the money between themselves and someone else. We conducted this game with health workers, randomly selected ANC clients, and other professionals such as teachers, shop owners and microfinance agents. We gave players envelope with ten bills (of 1 GHC in Ghana, 50 Ksh in Kenya and 1,000 UGX in Uganda) and told them that the money they left in the envelope would be delivered to a randomly-selected community member living in their community.[29] Interestingly, the share left in the envelope by health workers is identical across all three countries (26-27%). The detailed results in Figure 3 show that in Kenya and Uganda health workers leave more money that most other groups we surveyed (the only group that is as generous as health worker are employees at microfinance institutions (MFI) in Uganda). The situation is different in Ghana, where health workers appear to be less altruistic than teachers and other professionals, though this result is to be intepreted with a grain of salt

[29]To avoid social pressure effects, the respondent was told that the surveyors would not open the envelope themselves.

given the timing of data collection.[30]

Within the Uganda and Kenya samples, we embedded a "honesty" game in the dictator game, as follows. For a random sample of participants, we put 11 bills in the envelope instead of the announced 10, and recorded whether the participant mentioned this to the surveyor. The share of participants who mentioned/returned the extra bill to the surveyor was around 40% in both countries, and not significantly higher among health workers than other professions. In Uganda, the total amount left in the envelope by those who got an extra bill was higher by 60% of the extra bill value on average, suggesting that 60% of the extra bill was passed on to the anonymous community member. In Kenya this figure was 40%. In both countries, health workers passed on a larger share of the extra bill but the difference is not significant.

While the evidence so far suggests health workers have higher level of pro-social motivation than others, an important question is whether this directly maps into higher performance (question 2 above). In Tanzania, Brock, Lange and Leonard (2013) find a positive correlation between altruism as measured through the dictator game and effort provided by doctors in interactions with patients, suggesting that this experimental measure of other-regarding preferences directly relates to on-the-job performance. Callen et al. (2013) find that doctors with higher public sector motivation are less likely to be absent and less likely to falsify reports. In Zambia, Ashraf, Bandiera and Lee (2013) find that community health workers who were recruited for their commitment to the social mission (compared to those recruited for their interest in pursuing a successful career) performed worse, though it appears pro-social motivation can be leveraged by non-financial rewards such as social recognition in order to increase effort (Ashraf, Bandiera and Jack, forthcoming). Because we do not have health worker specific performance outcomes (all of our performance measures are at the clinic level), we can only test for correlations between health workers values and performance at the clinic level. We do so in Table 10, exploiting both within-country and across-country variation in levels of other-regarding preferences. We find that the clinic standardized score on an index including our five measures of other-regarding preferences is positively correlated with coverage rate among the eligible and negatively correlated with leakage to the ineligible.

Why are health workers more positively selected than teachers? The nascent literature on

[30]In Ghana, the dictator games were played in 2012 with health workers and ANC clients, and in 2014 with the other professionals. In both instances we asked them to split 10 bills of 1GHC each. Given an inflation rate of approximately 9% over this time period, one concern is that the two rounds of dictator games are not comparable because the stakes differed (though the evidence on this is mixed, see Andersen et al. 2013 for some recent evidence that stakes may matter in the ultimatum game). This could explain the apparent negative selection of health workers in terms of altruism in Ghana, inconsistent with the survey data presented in Table 8.

selection into public service (Finan and Ferraz, 2011; Dal Bo, Finan and Rossi, 2013) finds that increasing the pay of bureaucrats leads to better selection on various dimensions. In our study areas, teachers are on average paid slightly less than health workers, while they have comparable years of education (columns 5-6 of Table 8). This suggests that positive selection into health work could come from higher pay. Alternatively, Hanna and Wang (2013) find that students who cheat on a laboratory game are more likely to select into public service in India, where corruption is rife. Positive selection into health work in our context could be the result of reduced corruption opportunities in this line of work.

Yet an alternative hypothesis is that, unlike teachers, health workers must invest time and energy to gain the qualifications to work in the health field specifically. As such, they likely place non-negligible value on issues beyond their own compensation, such as the health of people in their community. This explanation is however difficult to reconcile with the evidence that a significant share of medical doctors in India, Tanzania and Senegal, despite a long training, do not seem to care much for their patients (see Das and Hammer, forthcoming, for a review).

Of course, it is also the case that the higher observed levels of pro-social motivation among health workers could partially reflect treatment, not selection (e.g., that being a health worker makes someone a more generous person because they see more people in need). That would not change the fact that high pro-social motivation among health workers may help explain their high levels of performance.

7.2.2 Intrinsic job motivation

Even holding pro-social motivation constant, ANC nurses and midwives could be more intrinsically motivated to perform well on their job than other professions if their perceived return to effort is higher (e.g., because potential recipients could die if deprived of essential health products). Columns 1-5 of Table 9, which has a format identical to that of Table 8, provide suggestive evidence that this may be the case. The great majority of health workers in all three countries see their jobs as benefiting society, believe their work is appreciated and have high levels of job satisfaction. On all these measures the differences with other professions are significant. Within health workers, those in Uganda appear the least intrinsically motivated, and this is also the country where performance was lowest. Intrinsic job motivation does not appear significantly correlated with our performance measures, however (Table 10, row 2). There has, however, been evidence from other contexts that improving motivation through simple interventions (peer monitoring and encouragement) improves effort (Brock et al., 2013).

The experimental result that providing financial compensation to health workers for

implementing the Ghana program had no effect on performance is consistent with health workers being sufficiently motivated without it. The relatively poor performance we observed under the voucher scheme in Ghana, which undermined health workers autonomy, is also consistent with an important role for intrinsic job-specific motivation.

7.2.3 Extrinsic motivation

Table 9, columns 6 to 8, show that health workers are also highly extrinsically motivated. They generally report high levels of job insecurity, with the majority of health workers "strongly disagreeing" with the statement that "health worker jobs are very secure" (column 6). This is consistent with short surveys we conducted with in-charge nurses in both Kenya and Uganda, which revealed that around 10% of them knew at least one health worker who had lost her job due to poor performance. In Ghana, no in-charge reported knowing of someone who had lost their job, but they argued it did not mean misconduct would go unpunished – it rather seems that in equilibrium the threat of job loss is enough to deter misconduct. Importantly, health workers' perceived level of job security is significantly lower than that of teachers.

The fact that the quality of their performance is easily observable by community members could further increase extrinsic motivation levels among ANC nurses and midwives. Indeed, the tasks they have to do are fairly standard, and in the specific context of the bed net distribution schemes we audited, leakage is easily observable (though less so in a voucher scheme) since the eligibility criteria is a commonly observable one (pregnancy). Thus the quality of their performance is much less subject to the "credence good" problem that plagues the health care sector more generally (Das and Hammer, forthcoming).

Finally, we find that health workers feel very closely monitored by the ministry of health, though relatively less so in Uganda, where they also performed relatively worse overall (Table 9, column 7). Relative to other professions, the level of perceived monitoring is significantly higher among health workers (Panel B). Since monitoring coupled with lack of job security foster accountability, the high perceived levels of monitoring could contribute to health workers' overall high levels of performance. We observe suggestive evidence for this mechanism in Table 10 – coverage among the eligible was higher in health facilities whose health workers had a higher extrinsic motivation score. Absenteeism was also lower in these facilities, though the effect is only significant at the 15 percent level.

The fact that health workers believe they are accountable could explain the experimental finding that the threat of top-down audits was ineffective at increasing performance in Ghana: health workers may have expected there to be an audit in any case, even before the experimental audit threats were made.

8 Conclusion

Increasing coverage of life-saving health products in rural sub-Saharan Africa requires distribution at heavily subsidized prices, and the potentially most cost-effective way to do this is through existing health systems. But, it is an open question whether government health workers can do this effectively. Will they respect the eligibility rule? Will they demand bribes? Will they even bother to implement the program? What features of a distribution scheme are necessary to insulate public health subsidies from such threats to their effectiveness?

We shed some light on these questions by auditing government distribution schemes in Kenya and Uganda, as well as implementing and auditing a program in Ghana, in which we randomly varied several features, including bonus pay, the threat of audits, and whether the distribution is direct (in-kind) or indirect (through vouchers). A key contribution of this study is measuring performance, extortion and leakage in various unobtrusive ways, notably through having ineligible men attempt to buy the subsidized product, informal conversations with community members, and back-checks of women who should have received the subsidy.

Our first result is that distribution programs administered through existing health centers are much more effective than conventionally believed. Overall, across the three countries, 80% of eligible women received the subsidy, only 1% of eligible women were asked to pay bribes, and at most 10% of subsidies leaked to ineligible people, most often for free, and most often when ineligibles mentioned having a needy child. We can rule out that the relatively low level of leakage against bribes comes from a lack of demand from ineligibles, since in Ghana we experimentally "tempted" health workers by sending ineligible men with a high willingness to pay for the subsidized product, and we still found almost no leakage. While we see some differences across the three contexts we study, the overall picture is one of remarkable homogeneity, despite the fact that the programs we consider are implemented by different institutions (the government in Kenya and Uganda, vs. an NGO in Ghana) and audited at very different points in their implementation (after more than a year in Kenya and Uganda, vs. in the first few months in Ghana).

Since performance is already so high, it is perhaps unsurprising that our experimental results suggest a limited role for further improving performance through the threat of top-down audits or bonus pay. On the other hand, voucher schemes, which are popular as a way to reduce health workers' discretion and which have been implemented in a number of countries (most notably in Tanzania), appear to reduce program effectiveness: they make the program less visible and therefore reduce demand, and also appear to dampen health workers' intrinsic job motivation (especially if perceived as an anti-corruption measure). Together,

these factors imply that a voucher scheme increases exclusion errors (intended beneficiaries not receiving the subsidy) without changing the already fairly low rate of inclusion errors (ineligibles getting the subsidy).

The relatively high levels of performance we observe go against the growing conventional wisdom that service provision in developing countries is universally poor. In fact, permissions to conduct this study were difficult to obtain, because the main funding agency (NIH for the Ghana experiment) and the data collection agency (IPA) were very wary of its highly sensitive nature. Anyone we discussed our study design with *ex ante* expected us to find very high levels of leakage. Why are our results different from expectations?

One consideration is that service quality varies from country to country and so far service provision has only been studied rigorously in a small subset, mostly outside of sub-Saharan Africa. The seminal Chaudhury et al. (2006) study includes 6 countries, only one of them in Africa (Uganda), while many others focus on South Asia (i.e. Das and Hammer, 2007; Banerjee, Deaton and Duflo 2004; Muralidharan et al. 2011). What's more, absenteeism is typically considered as a good proxy for performance (the Chaudhury et al. 2006 study exclusively measured absenteeism), and while this may be an important metric in contexts where health centers are small enough that absenteeism of one worker means the health center is closed, absenteeism may not have direct consequences on service and product delivery in more common contexts. In our data, health worker absenteeism does not correlate in any way with our measures of coverage or leakage (Table A2). Another important difference is that health workers responsible for the subsidy programs we considered are nurses and midwives (who staff ANC clinics throughout Africa), not medical doctors–those whose performance has been shown to be very low in multiple contexts (Das and Hammer, 2007; Das, Hammer and Leonard, 2008). We find evidence of high levels of pro-social motivation, intrinsic and extrinsic job motivation among nurses and midwives, but we cannot speak to the performance level or characteristics of medical doctors in our areas of study. Indeed, because doctors often engage in more complicated tasks, their performance is more difficult to monitor, and so their extrinsic motivation could be quite different. There is a lot of anecdotal evidence that medical doctors tend to leak subsidized drugs (such as antimalarial medications) out of the public facilities' pharmacies and into their own private pharmacies or clinics, and this may very well be the case in our study areas.

One limitation of our results is that we consider a targeting rule that is very easy to verify, and so makes it harder to hide leakage. So, it could be that leakage rates are higher for other, less-obvious targeting schemes (e.g., if the targets were based on poverty levels). While we fully acknowledge that leakage rates could be different under a different targeting mechanism, it is important to note that many products/subsidies are in practice targeted at

women or other easily identified subgroups such as young children. Thus, assessing leakage levels for "easy" targeting rules is important as a standalone research question even if the external validity to other targeting rules is unknown.

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Table 1. Characteristics of the Health Facilities in the sample

	Sample Mean [Std. Dev.] for:			
	Full Sample	Ghana	Kenya	Uganda
# of monthly ANC new registrants[a]	27.99	25.73	29.64	29.75
	[20.06]	[20.31]	[19.31]	[20.50]
# of monthly ANC follow-up visits	63.06	90.22	49.40	35.98
	[61.25]	[77.59]	[36.44]	[29.23]
# of midwives and nurses for ANC	2.93	2.01	4.15	3.08
	[2.28]	[1.20]	[3.31]	[1.58]
Facility conducts outreach ANC activities	0.49	0.23	0.92	0.46
	[0.50]	[0.42]	[0.28]	[0.50]
Years since facility is operating	16.01	17.25	13.96	16.30
	[15.86]	[13.74]	[16.86]	[17.67]
Public facility	0.85	0.90	1.00	0.60
	[0.36]	[0.30]	[0.00]	[0.49]
Has a maternity ward	0.82	0.85	0.96	0.63
	[0.39]	[0.36]	[0.20]	[0.49]
Accessible during the rainy season	0.89	0.81	0.94	0.96
	[0.32]	[0.40]	[0.24]	[0.20]
Nets available for sale within 10km	0.13	0.10	0.10	0.21
	[0.34]	[0.30]	[0.31]	[0.41]
Health worker privately sells nets at facility	0.02	0.04	0.00	0.00
	[0.13]	[0.20]	[0.00]	[0.00]
Number of Health Facilities	168	72	48	48

Notes: For Ghana sample, includes all health facilities, whether sampled for direct or indirect (voucher) distribution.

[a] ANC stands for antenatal care

Table 2. Coverage and extortion among eligibles

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Data Source:	Backcheck surveys with random subset of ANC Clients						
					If not offered net:		
	Received net at first ANC visit	*If no stockouts*[a]*:* Received net at first ANC visit	Received net at some ANC visit	*If offered net at some visit:* Was requested to pay	Thinks reason is stockout	Don't know why	Thinks reason is already has one
Overall Mean	0.76	0.81	0.80	0.01	0.25	0.50	0.07
Ghana	0.74	0.77	0.79	0.01	0.11	0.63	0.04
Kenya	0.90	0.90	0.91	0.01	0.66	0.17	0.06
Uganda	0.63	0.69	0.66	0.03	0.25	0.49	0.09
Observations	2,028	1,495	2,028	1,605	473	473	473
P-value for equality of means:							
Ghana = Kenya	0.00***	0.00***	0.00***	0.72	0.00***	0.00***	0.69
Ghana = Uganda	0.03**	0.16	0.01***	0.04**	0.01***	0.03**	0.08*
Kenya = Uganda	0.00***	0.00***	0.00***	0.02**	0.00***	0.00***	0.54

Notes: There are 144 health facilities in the sample (48 per country). Ghana sample: Only includes facilities sampled for direct distribution.

[a] Clinics with no stockouts identified using data from attendance checks in Uganda and Kenya, and from mystery client visits from Ghana.

Table 3. Non-coverage among eligibles: Errors of Exclusion or Efficient Targeting?

	(1)	(2)	(3)	(4)
Data Source:	Backcheck surveys with random subset of ANC Clients			
Dependent Variable:	Received net - any visit			
	All	Ghana	Kenya	Uganda
Years of education	-0.005*	-0.005	-0.003	-0.007
	[0.003]	[0.004]	[0.004]	[0.006]
PCA of wealth (standardized)	0.007	0.022	-0.002	-0.008
	[0.010]	[0.014]	[0.017]	[0.021]
Health facility Fixed effects	X	X	X	X
Observations	2,028	771	671	586
R-Squared	0.361	0.284	0.388	0.359
Dep. Var. Mean	0.796	0.794	0.914	0.664

Notes: Standard errors in brackets, clustered at the level of the health facility. Ghana sample: Only includes facilities sampled for direct distribution. Regressions have month fixed effects to control for potential stockouts. The mean number of years of education among clients surveyed is 5 (4.2 in Ghana, 4.6 in Kenya and 6.9 in Uganda, which adopted free primary education much earlier). The gap between the 25th and the 75th percentile in terms of years of education is 4.5 years.

Table 4. Leakage to ineligibles: Evidence from mystery client visits and community interviews

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Data Source:	"Mystery client" (MC) visits							Community Interviews		
			If clinic had nets in stock[b]			If Payment requested:				
	Clinic out of stock during visit (as measured through other data sources)[a]	MC told that the clinic is out of stock	Acquired program net	Acquired program net for free	Payment requested for net	Initial amount requested as percent of full price[c]	Final amount requested as percent of full price[c]	Respondent thinks that (male) surveyor could get a net at a health center	Ineligible young man received net (lower bound)[d]	Ineligible young man received net (upper bound)[e]
Overall Mean	0.205	0.134	0.0467	0.0378	0.0424	0.902	0.745	0.0993	0.00699	0.0381
Ghana		0.046	0.022	0.009	0.051	1.070	0.882	0.092		
Kenya	0.042	0.090	0.087	0.087	0.036	0.121	0.097	0.093	0.025	0.069
Uganda	0.368	0.472	0.110	0.110	0.011	0.323	0.323	0.113	0.000	0.007
Observations	288	766	685	687	684	27	27	2,559	143	289
P-value for equality of means:										
Ghana = Kenya		0.19	0.03**	0.01***	0.51	0.00***	0.00***	0.98		
Ghana = Uganda		0.00***	0.01***	0.00***	0.01**	0.00***	0.00***	0.31		
Kenya = Uganda	0.15	0.00***	0.59	0.59	0.24	0.00***		0.35	0.31	0.00***

Notes: Missing coefficients mean that outcome not collected in that country. There are 144 health facilities in the sample (48 per country). Ghana sample: Only includes facilities sampled for direct distribution.

[a] Stockout data collected during attendance spot checks done by the research team in Kenya and Uganda

[b] Conditional on there not being a stockout (calculated as discussed in aa for Kenya and Uganda, and from MC reports in Ghana). Upper bound in Ghana since health workers could have told mystery clients they were stocked out to get rid of them.

[c] Full price calculated as the wholesale price converted to local currency using exchange rate during the middle of the ANC registration times.

[d] Lower bound because set to missing when he received net but someone in the household was pregnant or under 5

[e] Upper bound because includes people who got a net but were in a household that may have been eligible (was reported to have a pregnant woman or child under 5). Only upper bound if assume percent of eligibles that get nets weakly higher than percent of ineligibles.

Table 5. Leakage: Errors of Inclusion or Efficient targeting?

	(1)	(2)	(3)	(4)
Data Source:	Mystery Client visits			
Dependent Variable:	Received free net			
	All	Ghana	Kenya	Uganda
Requested for pregnant woman	0.012	0.011	0.023	
	[0.023]	[0.014]	[0.14]	
Requested for child	0.18***			0.19**
	[0.045]			[0.089]
If asked, said that had child	0.11**		0.11	
	[0.047]		[0.075]	
MC signaled that educated	0.0077	0.0077		
	[0.016]	[0.0090]		
Healthworker female	-0.012	-0.012		
	[0.022]	[0.013]		
Health facility Fixed effects	X	X	X	X
Observations	683	455	137	91
R-Squared	0.402	0.114	0.466	0.375
Mean of the Dependent Variable	0.0378	0.009	0.087	0.110

Notes: Standard errors in brackets, clustered at the level of the health facility. There are 144 facilities in the sample (Ghana sample excludes voucher clinics).

Table 6. Ghana: experimental results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Data Source:	Backcheck surveys with random subset of ANC Clients			Surveys with Program Log beneficiaries	Community Interviews		"Mystery Client" visits			
Dependent Variable:	Received net/voucher at first ANC visit	Received net/voucher at some ANC visit	*If offered net at some visit:* Was requested to pay	Listed beneficiary ineligible	Respondent thinks that (male) surveyor could get a net at a health center	Respondent aware of net distribution program	Payment requested for net	Acquired program net	Acquired program net for free	Clinic stocked out
Effect of:										
Voucher	-0.152**	-0.167**	-0.002	0.013	-0.065**	-0.077**	0.036	0.034*	0.006	0.056**
	[0.068]	[0.065]	[0.008]	[0.012]	[0.026]	[0.036]	[0.026]	[0.018]	[0.008]	[0.026]
Audit	0.029	0.065	0.017	-0.032**	-0.057	0.017	0.003	0.010	-0.012	0.009
	[0.057]	[0.055]	[0.013]	[0.014]	[0.044]	[0.066]	[0.031]	[0.025]	[0.013]	[0.040]
Large delivery	0.001	0.003	0.009	-0.000	-0.060***	-0.035	0.015	0.016	0.011	-0.026
	[0.059]	[0.055]	[0.007]	[0.012]	[0.022]	[0.035]	[0.022]	[0.012]	[0.007]	[0.022]
Health worker payment	-0.069	-0.065	-0.003	0.010	-0.009	-0.003	0.010	0.001	0.002	0.009
	[0.061]	[0.059]	[0.007]	[0.012]	[0.021]	[0.035]	[0.021]	[0.012]	[0.007]	[0.020]
Later program period	-0.080*	-0.122***	-0.021**	0.003	0.058*	-0.025	-0.046*	-0.036*	0.001	-0.002
	[0.042]	[0.041]	[0.010]	[0.008]	[0.029]	[0.051]	[0.025]	[0.019]	[0.011]	[0.031]
Observations	1,158	1,158	815	1,229	1,322	1,322	717	717	720	718
R-Squared	0.094	0.108	0.023	0.027	0.030	0.025	0.028	0.029	0.029	0.060
Dep. Var. Mean in direct distribution facilities	0.744	0.794	0.00873	0.0144	0.0916	0.716	0.0503	0.0209	0.00833	0.0460

Notes: There are 72 health facilities in the sample, all in Ghana. Each column corresponds to an OLS regression with randomization strata fixed effects and three health-center level controls: timing of program introduction, baseline ANC attendance and ANC staff size. Standard errors clustered at the health facility level. ***,**,* indicates significance at 1, 5 and 10 percent. "Effect of Audit" is the difference in differences coefficient, so the coefficient on AuditXLater program period, where "later program period" is the period after the initial audit threat in audit clinics, or after the audit threats were conducted at nearby clinics for non-audit clinics; all regressions also control for the main effect of audits.

Table 7. Performance beyond net distribution

	(1)	(2)	(3)	(4)	(5)	(6)
Data Source:	Backcheck surveys with random subset of ANC Clients			ANC Register Audit		Mystery Client visits
Dependent Variable:	Avg. minutes spent with nurse during ANC checkup	Palpated by nurse during visit to ANC[a]	Average wait time for checkup	Had all key fields filled in ANC register[b]	% of key fields filled in in ANC register[b]	Clinic closed during first visit attempt
Overall Mean	17.91	0.918	63.70	0.793	0.964	0.00595
Ghana	12.294	0.908	57.900	0.808	0.963	0.006
Kenya	25.249	0.901	72.374	0.778	0.965	0.000
Uganda	20.956	0.959	65.741	0.779	0.964	0.014
Observations	2,283	2,414	2,246	2,617	2,617	1,008
P-value for equality of means:						
Ghana = Kenya	0.00***	0.77	0.03**	0.46	0.84	0.04**
Ghana = Uganda	0.00***	0.00***	0.32	0.46	0.94	0.41
Kenya = Uganda	0.01***	0.00***	0.41	0.97	0.87	0.15

Notes: Standard errors for regressions clustered at clinic level. There are 168 health facilitiesin the sample (Ghana sample includes all facilities, including those sampled for indirect distribution via vouchers). Results are identical when the voucher facilities are excluded.

[a] Not conditional on receiving a checkup, so lower bound since some patients may have not wanted to get a checkup. We do not condition on saying that they received a checkup in case patients only call a visit a checkup if they have been palpated.

[b] Key fields are name, reg date, ANC card #, address, # children, and gestational age at registration.

Table 8. Pro-social Motivation and Selection into Health Work

	(1)	(2)	(3)	(4)	(5)	(6)
	Pro-Social Motivation				Job Characteristics	
	Survey response on a scale from 1 (don't agree) to 5 (strongly agree) to the statement:					
	Helping people brings personal satisfaction	If you help someone, they should do you a favor in return	It is important to do good things for my community	My family comes first, my work second	Monthly pay[a]	Years of education
Panel A. Country-level averages across health workers						
Ghana	4.85	1.46	4.94	3.33	235.84	14.02
	[0.05]	[0.11]	[0.03]	[0.10]	[13.99]	[0.23]
Kenya	4.90	1.32	5.00	3.27	387.66	15.87
	[0.05]	[0.11]	[0.00]	[0.13]	[16.28]	[0.06]
Uganda	4.63	2.40	4.79	3.30	141.22	15.67
	[0.05]	[0.14]	[0.03]	[0.14]	[7.15]	[0.13]
Observations	450	450	449	444	412	449
P-value for equality of means:						
Ghana = Kenya	0.47	0.35	0.04**	0.69	0.00***	0.00***
Ghana = Uganda	0.00***	0.00***	0.00***	0.83	0.00***	0.00***
Kenya = Uganda	0.00***	0.00***	0.00***	0.87	0.00***	0.17
Overall Mean	4.791	1.731	4.906	3.300	250.7	15.13
Panel B. Comparisons with other professions (omitted category: health workers)						
Teacher	-0.28***	0.47***	-0.11***	0.24**	-43.56***	0.13
	[0.06]	[0.10]	[0.03]	[0.10]	[12.73]	[0.12]
Shop owner	-0.35***	1.26***	-1.61***	0.96***	-121.61***	-6.10***
	[0.08]	[0.14]	[0.14]	[0.13]	[18.28]	[0.45]
Microfinance agent	-0.32***	0.96***	-0.16***	0.71***	-128.40***	-1.98***
	[0.08]	[0.15]	[0.05]	[0.12]	[12.49]	[0.22]
Observations	1,136	1,138	1,134	1,127	1,094	1,172

Notes: Panel A: Data from surveys with health workers only. Ghana sample only includes workers from facilities sampled for direct distribution. Panel B: Data from surveys with health workers, shopkeepers, teachers and MFI agents. Regressions control for country FE. Cols (5) and (6) of panel B also control for worker gender and age. *** p<0.01, ** p<0.05, * p<0.1.

[a] Winsorized at 99th percentile. Converted to USD using the exchange rate at the time the survey was taken, except for the other profession salaries (i.e., non-healthworker salaries) in Ghana: since healthworkers in Ghana were surveyed two years before the other professions (2012 vs 2014), the other profession salaries were first converted to 2012 Ghana cedis using inflation rates, then converted to USD using exchange rates at the time the healthworker surveys were conducted.

Table 9. Intrinsic and Extrinsic Job Motivation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Survey response on a scale from 1 (don't agree) to 5 (strongly agree) to the statement:							
	Intrinsic Job Motivation					Extrinsic Motivation		
	As a [*profession*], I have the responsibility to be a role model in my community	This [*work place*] plays a very important role in this community	I am very satisfied with my job	People in remote areas do not have enough appreciation for [*profession*]	[*Profession*] should be paid more	[*Profession*] jobs are very secure -- even if a worker does a bad job they won't be fired	This [facility/school] is closely monitored by the Ministry of [Health/Education]	This [facility/school] is closely monitored by local NGOs
Panel A. Country-level averages across health workers								
Ghana	4.91	4.90	4.34	3.13	4.71	1.29	4.83	2.28
	[0.03]	[0.04]	[0.12]	[0.13]	[0.07]	[0.07]	[0.06]	[0.15]
Kenya	4.91	4.97	4.08	2.38	4.66	1.24	4.91	3.50
	[0.06]	[0.03]	[0.13]	[0.16]	[0.09]	[0.08]	[0.06]	[0.17]
Uganda	4.88	4.87	3.83	3.09	4.69	1.52	4.36	4.01
	[0.03]	[0.03]	[0.10]	[0.11]	[0.05]	[0.07]	[0.10]	[0.09]
Observations	450	449	448	447	448	449	448	446
P-value for equality of means:								
Ghana = Kenya	0.96	0.12	0.15	0.00***	0.66	0.65	0.38	0.00***
Ghana = Uganda	0.52	0.54	0.00***	0.78	0.83	0.02**	0.00***	0.00***
Kenya = Uganda	0.64	0.01**	0.13	0.00***	0.74	0.01***	0.00***	0.01***
Overall Mean	4.900	4.909	4.094	2.890	4.688	1.352	4.703	3.220
Panel B. Comparisons with other professions (omitted category: health workers)								
Teacher	-0.01	-0.15***	-0.45***	0.50***	-0.08	0.46***	-0.40***	-0.15
	[0.04]	[0.03]	[0.11]	[0.12]	[0.06]	[0.08]	[0.06]	[0.12]
Shop owner	-0.52***	-1.01***	-0.14	0.46***	-0.78***	N/A	N/A	N/A
	[0.08]	[0.11]	[0.11]	[0.15]	[0.11]			
Microfinance	-0.52***	-0.33***	-1.03***	0.05	-0.17**	0.18*	N/A	N/A
	[0.07]	[0.06]	[0.15]	[0.14]	[0.08]	[0.10]		
Observations	1,138	1,133	1,134	1,126	1,131	997	870	867

Notes: Panel A: Data comes from surveys with health workers at 144 health facilities. Ghana sample only includes workers from facilities sampled for direct distribution. Panel B: Data from surveys with health workers, shopkeepers, teachers and MFI agents. Each column is a separate regression, with controls for country FE. Standard errors in bracket. *** p<0.01, ** p<0.05, * p<0.1.

Table 10. Correlations between performance, health worker and clinic characteristics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Data Source:	Backcheck surveys with random subset of ANC Clients			Community Interviews	"Mystery Client" visits				Attendance checks
Dependent Variable:	Got net/voucher at first visit to clinic	Got net/voucher at any visit to clinic	Payment requested for net (conditional on offer)	Respondent thinks that (male) surveyor could get a net at a health center	Payment requested for net	Acquired program net	High potential opportunity to acquire net	Clinic stocked out	Percent absent
Healthworker characteristics									
Pro-social motivation (standardized index)[a]	0.037*	0.038*	0.0004	0.006	-0.0034	-0.030***	-0.045**	-0.029	0.0029
	[0.022]	[0.020]	[0.004]	[0.008]	[0.0093]	[0.011]	[0.021]	[0.024]	[0.039]
Intrinsic job motivation (standardized index)[a]	0.022	0.015	0.001	0.01**	0.0079	0.011	0.023	-0.013	-0.026
	[0.017]	[0.016]	[0.003]	[0.006]	[0.0086]	[0.0078]	[0.021]	[0.018]	[0.022]
Extrinsic job motivation (standardized index)[a]	0.038*	0.03	-0.003	-0.0006	-0.01	0.014	0.014	0.016	-0.029
	[0.023]	[0.021]	[0.004]	[0.009]	[0.0090]	[0.012]	[0.022]	[0.026]	[0.019]
Similarity to local population (standardized index)	-0.0021	0.0029	-0.0004	-0.008	0.00012	0.012	0.03	0.059***	0.014
	[0.019]	[0.017]	[0.003]	[0.009]	[0.011]	[0.013]	[0.020]	[0.021]	[0.017]
Clinic characteristics									
Above-median ANC registrants	-0.046	-0.038	0.008	0.03*	-0.0071	-0.038**	-0.0019	0.069*	-0.02
	[0.040]	[0.037]	[0.008]	[0.02]	[0.015]	[0.018]	[0.031]	[0.036]	[0.045]
Clinic accessible in the rainy season	0.026	0.019	0.0005	0.01	0.013	0.014	0.074**	0.018	-0.016
	[0.077]	[0.074]	[0.007]	[0.03]	[0.022]	[0.021]	[0.037]	[0.049]	[0.074]
Total number of staff working in ANC	0.0089*	0.011**	0.0001	-0.003	-0.0054**	-0.00087	-0.0057	-0.0063	-0.0022
	[0.0052]	[0.0045]	[0.0006]	[0.003]	[0.0023]	[0.0017]	[0.0042]	[0.0055]	[0.0062]
Private facility	-0.43***	-0.49***	0.002	0.05	-0.043	-0.063**	-0.11*	0.078	
	[0.12]	[0.12]	[0.008]	[0.05]	[0.041]	[0.024]	[0.057]	[0.057]	
NGO facility	-0.15**	-0.14**	0.07**	0.06*	-0.024	-0.026	0.029	0.16	-0.061
	[0.071]	[0.068]	[0.03]	[0.03]	[0.021]	[0.042]	[0.074]	[0.11]	[0.053]
Observations	2028	2028	1549	2559	765	766	762	766	96
R-squared	0.065	0.073	0.035	0.014	0.02	0.043	0.082	0.133	0.242
Mean of the dependent variable	0.76	0.8	0.01	0.1	0.041	0.043	0.14	0.13	0.083

Notes: Each column is a separate regressions, with controls for country fixed effects, the experimental treatments in Ghana, and healthworker age and gender. Columns (1) and (2) also control for whether there were any stockouts in those clinics, as measured by the attendance checking team in Uganda and Kenya (there is no control in Ghana where stockouts were determined by healthworker effort). Standard errors clustered at the level of the health in brackets. ***,**,* indicates significance at 1, 5 and 10 percent. Ghana sample: Direct distribution clinics only.

[a] Indexes are averages across standardized variables as grouped in Tables 8 and 9, which are then re-standardized to have a mean of 0 and std dev of 1. The pro-social motivation index also contains the share left in the dictator game (shown in Fig 3).

Table A1. Ghana experimental sample: Summary statistics on participating health centers and balance check

		Coeff. Estimate (s.e) on Treatment Dummy:			
	Sample Mean [Std. Dev.]	Voucher	Audit Threat	Large Delivery	Health worker Payment
Panel A: Baseline Characteristics of Health Centers					
# of monthly ANC new registrants[a]	25.73	-0.45	2.56	1.49	-1.79
	[20.24]	(6.73)	(4.91)	(6.02)	(6.02)
# of monthly ANC follow-up visits	90.22	11.67	11.01	-1.56	10.40
	[77.32]	(25.89)	(18.88)	(22.95)	(22.95)
# of midwives and nurses for ANC	2.01	-0.06	-0.42	0.29	-0.37
	[1.20]	(0.39)	(0.28)	(0.35)	(0.35)
Facility conducts outreach ANC activities	0.23	-0.05	0.00	0.05	-0.12
	[0.42]	(0.14)	(0.10)	(0.13)	(0.13)
Years since facility is operating	17.25	-3.81	-0.43	1.12	-2.69
	[13.69]	(4.68)	(3.41)	(4.20)	(4.20)
Facility is a small CHPS	0.25	0.02	0.06	0.13	0.04
	[0.43]	(0.14)	(0.10)	(0.13)	(0.13)
Public facility	0.90	0.02	0.03	0.13	-0.12
	[0.30]	(0.10)	(0.07)	(0.09)	(0.09)
Has a maternity ward	0.85	-0.02	-0.08	0.04	-0.04
	[0.36]	(0.12)	(0.09)	(0.11)	(0.11)
# of other ANC facilities within 10 km radius	2.08	-0.27	-0.50	-0.96	-0.21
	[2.91]	(0.95)	(0.70)	(0.85)	(0.85)
Has distributed nets in the past	0.07	-0.08	0.03	0.00	-0.08
	[0.26]	(0.08)	(0.06)	(0.08)	(0.08)
Accessible during the rainy season	0.81	-0.08	0.11	0.00	0.00
	[0.40]	(0.13)	(0.10)	(0.12)	(0.12)
Distance (in km) from region capital	86.29	-1.54	8.49	10.62	-6.80
	[49.43]	(16.32)	(11.92)	(14.60)	(14.60)
Nets available for sale within 10km	0.10	-0.02	-0.03	-0.04	0.04
	[0.30]	(0.10)	(0.07)	(0.09)	(0.09)
Health worker privately sells nets at facility	0.04	0.06	0.03	-0.04	0.04
	[0.20]	(0.07)	(0.05)	(0.06)	(0.06)
ANC client Dictator Game: Amount given (out of 10 GHC)	1.91	-0.24	0.05	-0.34	-0.16
	[1.48]	(0.49)	(0.36)	(0.44)	(0.44)
Panel B: Program Implementation Details					
Phase-in Rank (1 to 6)	3.50	0.40	-0.06	0.63	0.54
	[1.71]	(0.56)	(0.41)	(0.50)	(0.50)
Initial stock of nets delivered	184.03	2.08	12.50	129.17	8.33
	[146.24]	(44.16)	(32.25)	(39.50)***	(39.50)
Total # of staff who attended training	4.59	-0.58	-0.73	-0.21	0.20
	[2.16]	(0.73)	(0.52)	(0.64)	(0.64)
Share of Category 1 staff trained	0.81	-0.16	-0.05	-0.17	-0.02
	[0.28]	(0.09)*	(0.07)	(0.08)**	(0.08)
In-Charge present for training	0.68	-0.10	0.08	-0.12	-0.29
	[0.47]	(0.15)	(0.11)	(0.13)	(0.13)**
Duration of program (days)	109.06	-8.73	-0.89	-2.96	3.04
	[22.39]	(7.31)	(5.34)	(6.54)	(6.54)
Number of Health Facilities with Treatment	Total N=72	24	24	24	24

Notes: Each row corresponds to one OLS regression. Standard errors in brackets. ***,**,* indicate significance at 1, 5 and 10% levels.

[a] ANC stands for Antenatal Care

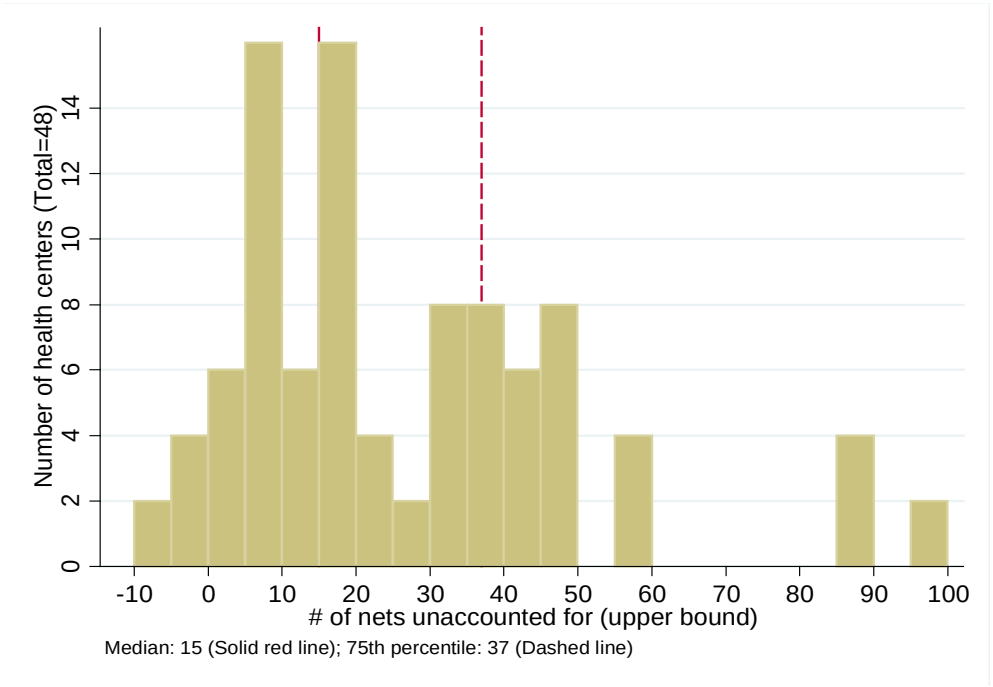
Table A2. Correlations between performance measures and absenteeism

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Data Source:	Backcheck surveys with random subset of ANC Clients			Community Interviews	"Mystery Client" visits			
Dependent Variable:	Got net/voucher at first visit to clinic	Got net/voucher at any visit to clinic	Payment requested for net (conditional on offer)	Respondent thinks that (male) surveyor could get a net at a health center	Payment requested for net	Acquired program net	High potential opportunity to acquire net	Clinic stocked out
Healthworker characteristics								
Share absent	0.0015	0.00028	-0.006	-0.03	-0.025	0.0041	0.025	-0.023
	[0.091]	[0.088]	[0.008]	[0.03]	[0.023]	[0.063]	[0.12]	[0.16]
Clinic characteristics								
Above-median ANC registrants	-0.033	-0.026	0.008	0.03	-0.0087	-0.046**	-0.026	0.026
	[0.039]	[0.035]	[0.008]	[0.02]	[0.014]	[0.018]	[0.028]	[0.032]
Clinic accessible in the rainy season	0.019	0.012	0.0008	0.01	0.015	0.0064	0.054*	-0.02
	[0.079]	[0.078]	[0.006]	[0.03]	[0.024]	[0.021]	[0.028]	[0.045]
Total number of staff working in ANC	0.0048	0.0071	0.0002	-0.002	-0.0052**	-0.002	-0.0066	-0.0053
	[0.0052]	[0.0043]	[0.0006]	[0.003]	[0.0024]	[0.0019]	[0.0042]	[0.0046]
Private facility	-0.46***	-0.51***	0.004	0.04	-0.04	-0.054***	-0.066	0.11***
	[0.16]	[0.16]	[0.008]	[0.05]	[0.037]	[0.019]	[0.042]	[0.036]
NGO facility	-0.19**	-0.17**	0.07**	0.06*	-0.018	-0.036	-0.014	0.12
	[0.079]	[0.076]	[0.03]	[0.03]	[0.021]	[0.042]	[0.079]	[0.11]
Observations	2028	2028	1549	2559	765	766	762	766
R-squared	0.078	0.082	0.034	0.01	0.016	0.035	0.086	0.124
dep var mean	0.76	0.8	0.01	0.1	0.041	0.043	0.14	0.13

Each column is a separate regressions, with controls for country fixed effects, the experimental treatments, and whether the healthworkers had the "honesty test" as a part of their dictator game. Columns (1) and (2) also control for whether there were any stockouts in those clinics, as measured by the attendance checking team in Uganda and Kenya (there is no control in Ghana where stockouts were determined by healthworker effort). Standard errors clustered at the level of the health facility in brackets. ***,**,* indicates significance at 1, 5 and 10 percent. Ghana sample includes only facilities sampled for direct distribution.

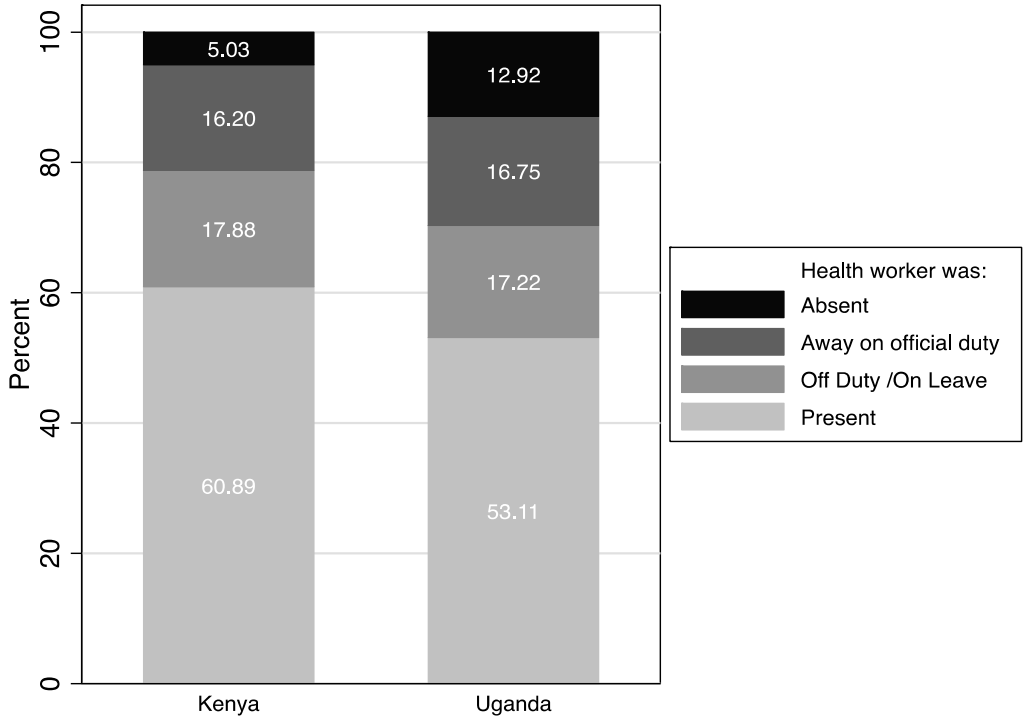
[a] Indexes are averages across standardized variables as grouped in Tables 8 and 9, which are then re-standardized to have a mean of 0 and std dev of 1. The other-regarding preferences index also contains the share left in the dictator game (shown in Fig 3).

Figure 1. Clinic-level Estimate of the Number of Program Bed Nets Unaccounated for (Ghana only)



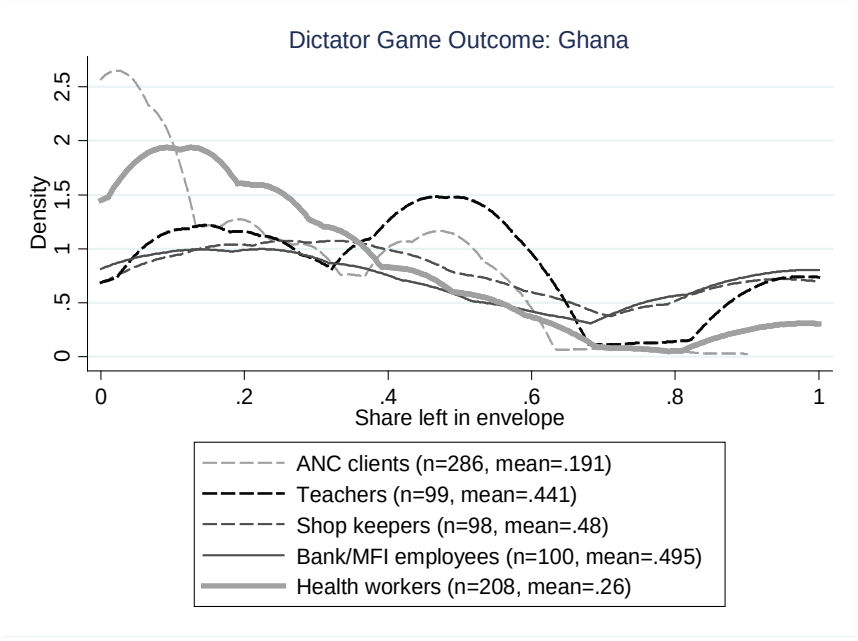
Note: Based on 48 health facilities with direct distribution (all in Ghana). For each facility, the estimated number of program nets unaccounted for is the difference between the total number of nets delivered to the facility and the estimated number of "valid" (eligible) beneficiaries listed in the program ledgers. The prevalance of invalid ledger entries was established through audits of randomly selected listed beneficiaries.

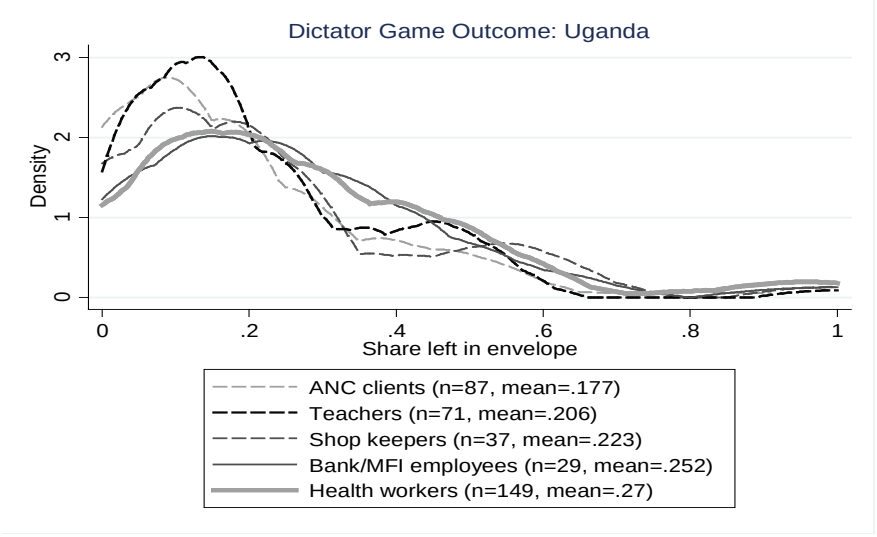
Figure 2. Health worker attendance data



Notes: Individual-level data from one unnannounced spot check. Kenya: 188 health workers from 48 facilities. Uganda: 214 health workers from 48 facilities.

Figure 3. Other-regarding preferences of health workers compared to others





Notes: The dictator game allowed the participant to leave as much money as they wanted, anonymously, for a community member, out of an envelope with 10 bills.